

Advances in Visual Semiotics



# **Approaches to Semiotics**

**118**

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# **Advances in Visual Semiotics**

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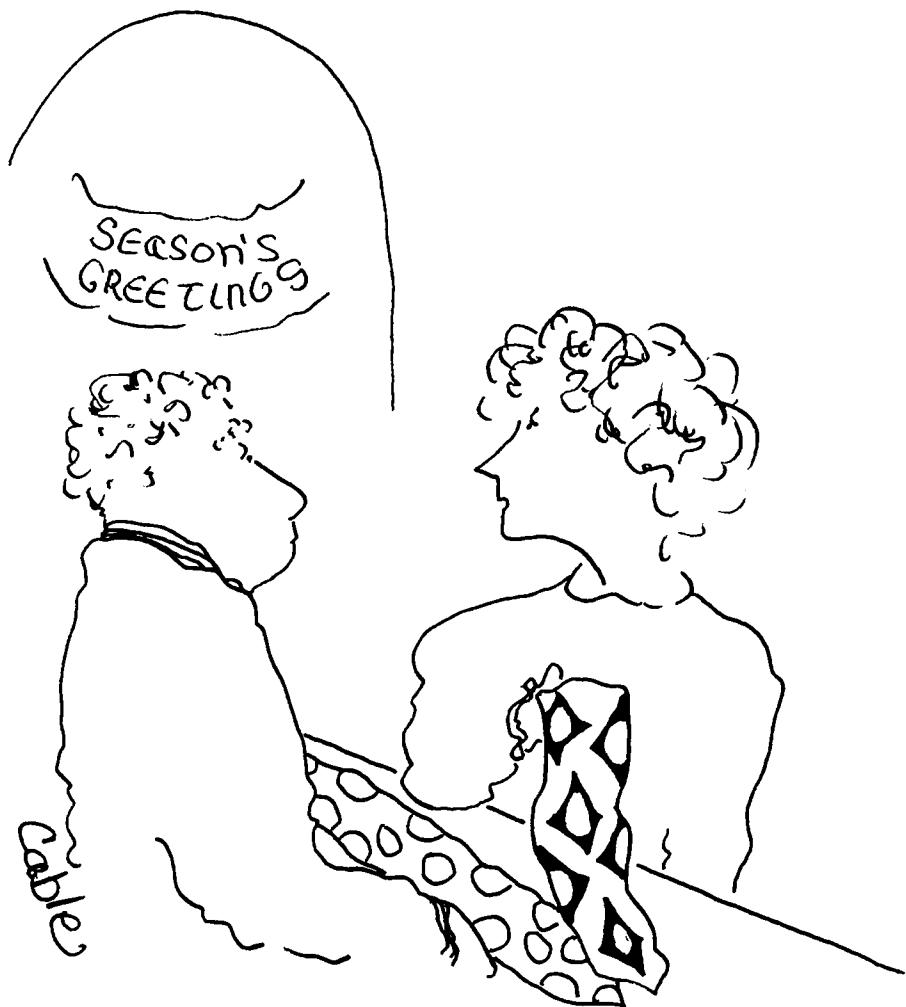
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*'I had something in mind that was, well . . . a little less semiotic.'*

(Cartoon by Carole Cable. Reprinted by permission of the artist.)



## Preface

The undersigned 'co-invented' *The Semiotic Web* in 1986 as a subseries of Mouton de Gruyter's 'Approaches to Semiotics' series, which was launched by Sebeok in 1969 and, at the time of writing, is in its 124th volume. In all, the seven *Web* volumes which we have co-edited to date—each of which, including this one presenting *Advances in Visual Semiotics*, was typeset at the Indiana University Research Center for Language and Semiotic Studies—constitute over 4,500 printed pages. An appropriate epigraph for this book would seem to be Saint Augustine's exclamation: 'Thanks be to you, O Lord, for all that we see!'

With Sebeok's recent retirement from the Center's Chairmanship after thirty-seven years, and Umiker-Sebeok's appointment to a professorial rank in Semiotics and Information Science on the Bloomington campus of Indiana University, both of us now turn our attention to other scholarly endeavors. Accordingly, we have asked our publisher to allow us to relinquish this time-consuming responsibility. Since, however, we continue to believe that the *Web* occupies both a singular and an important niche in the world-wide semiotic landscape, we recommended that it be continued, if not necessarily in the same format—which, in any case, we considered to be still tentative and emerging—under the editorship of another colleague.

This richly multipartite volume on 'Advances in Visual Semiotics' will therefore be the last *Web* under our co-editorship. As in the preceding six volumes, we wish however to perpetuate and enhance the appreciation of the spellbinding semiotic metaphor of the web. For, as Joachim Schult has shown in 1986 (*Zeitschrift für Semiotik* 8 [3], 253-76), semiosis in spiders features not merely identifier indexes, but icons and symbols as well. We know that there are gregarious spiders in Paraguay whose webs stretch up to forty feet, but these are puny as compared to a more modern human artifact which is known as the World Wide Web, the architecture for a vast, hyperlinked network of information sources which spans the globe and gives new meaning to the epigraph E.M. Forster gave his 1910 novel, *Howards End*, 'Only connect....' Putting paralyzing arachnophobia no less than a

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fear of computers behind us, this is the contemporary image we wished to evoke through this subseries. And, as Othello said to poor Desdemona of the handkerchief an Egyptian gave to his mother, "Tis true; there's magic in the web of it"!

Thomas A. Sebeok  
Jean Umiker-Sebeok

Bloomington  
June 22, 1994

## **Percepts and Concepts of Visual Semiosis**



# **Visual Semiotics, Pragmatics, and Communication**

Jean-Jacques Boutaud<sup>1</sup>

The images in today's *media* or *videosphere* (Debray 1992) leave no doubt that ours is no longer an age of 'hidden' persuaders. The pioneering analyses by Vance Packard seem to belong to another era given the present context in which the trend increasingly is toward interaction in communication, or more precisely, toward a simulacrum of interaction. Not that images today do not try to manipulate and to seduce, or no longer have recourse to connotation. They still do, in their attempt to touch receivers at the level of their perceptions, cognition, and interpretations.

But nowadays the process gives the illusion of having been reversed, at the initiative of receivers seeking signification, wanting to use their competence to manipulate meaning in its complicitous relationship with images. While it is true that entropy reduces signification within the media, and that the use of stereotypes and the impoverishment of subjects are being constantly denounced, it is nevertheless also true that at the most fundamental level the demand for the production of meaning has never been greater.

In an attempt to gain legitimacy, content analysis often unknowingly repeats the process of signification, which draws in particular on the message's form and expression-plane. It is there that the receiver has the impression of being in that 'space of mediation' (Lindekens 1976) in the mind where things are given a form, where it is a question of returning to the origins of the signifying process. Increasingly, the passive consumption of images has been replaced by the more or less conscious desire to discover the principles which led to their elaboration, to the construction of the visual message, to *recognize* the formal, even before the conceptual, traces.

Such an approach leads to an emphasis on enunciation rather than on the utterance, with the abundance of elements which dictate or signify the production of meaning manipulating the signifier rather than it being a case of the final product manipulating its receiver. The intentional nature of the visual message is received as an appeal for interpretive cooperation in relation to the structure as given, and content is accorded less importance as utterances are in any case neutralized by redundancy and the inflation of standard everyday messages. From this point of

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view there is already a tendency to reduce everything to its formal qualities, which explains, in the ontology underlying the Benetton advertisements for example, the displacement from a sensitive subject (AIDS, death, birth, suffering) to a tangible form (eidetic, geometric, chromatic), which then constitutes the ultimate space for the exchange of the signifier. Pictures in the newspaper as well as those used in advertising demonstrate the way in which the message is validated through the use of the most *evocative* formal organization, in which enunciatees are affected most in their competence to decode.

The above considerations are sufficient to establish basic connections between semiotics, pragmatics, and communication, disciplines which all have a certain visibility due to their interdisciplinary nature, their various areas of application (in terms of material supports, fields of study, etc.) and the productivity of their discourses, whether strictly orthodox or not. However, whereas semiotics, in particular visual semiotics, is distinguished by and, in a certain sense, isolated by the rigorous nature of its concepts, communication is a field which is less well-defined but which nevertheless corresponds to unprecedented social demand. Situated between a semiotic approach, which is heuristically of great value but somewhat inaccessible, and a communicative approach, which is more accessible but whose object is ill-defined, pragmatics constitutes an approach where it is possible to begin with the sign relation and, following Peirce, semiosis. The preceding considerations concerning the priority accorded the formal system in the cooperation between enunciator and enunciatee lead us, however, to extend the analysis, from the sign to signification. This is the perspective of visual semiotics as such, which takes the expression-plane rather than the referent as its object. From this point of view it is necessary to rethink communication as a strategy capable of modeling not the referential or conceptual, but rather the formal elements of the message in an enunciatory framework involving coproduction of signification. The utterance fixes attention on the discontinuity of distinctive features (textual, eidetic, topological, chromatic signifiers), as opposed to the continuity of the sign, in the unfolding of semiosis.

Images used in advertising will be examined here for the purpose of introducing, on an epistemological and methodological level, certain elements of the articulation between semiotics, pragmatics, and communication. Through these images, expression and cooperation are given a framework, on two levels: that of the sign, which activates, starting from the referent, the more or less conscious search for meaning; and that of signification, which actualizes the conditions of production,

in particular through the structure of formal elements and through a topography of meanings, which the enunciator attempts to reappropriate. For methodological reasons the advertisement studied here has a simple structure, sufficient however for us to define the points of contact between the visual sign and the object of communication, whose terms need to be briefly set out here.

### Theoretical Assumptions

Whereas semiotics operates on the basis of deconstruction (Arias 1991), caricatured in the axiom 'every decoding is a new encoding' (Lodge 1992: 53), theories of communication arrive at similar conclusions through a constructivist approach (Watzlawick 1988) which denies the reality of reality (Watzlawick 1976), emphasizing rather its construction through representation. Or more exactly, through the system of representations, since to communicate is, from a systemic point of view, to enter into the 'orchestra' (Scheflen 1973: 181), to enter into a universe saturated with (verbal and nonverbal) signs and to apply one's plan or strategy to that of the other. To a monadic vision of subjectivity is substituted the permanence of intersubjectivity in a context in which significations precede us but in which the relation is established *hic et nunc*. The principle according to which 'everything communicates' is of great consequence in a pragmatic field in which signification concerns less the relation between the source and the sign than that between the source and the receiver insofar as it is mediated by the signs of this communication (Watzlawick et al. 1967). To this theoretical position should be added the Austinian intuition which assimilates communication to its performative dimension of purposive action, an action with a particular end (Austin 1962). This principle can be applied to images inasmuch as they mimic, through the structures of enunciation, an interpersonal relation. Indeed, the opacification of the sign and the revelation of the signifying structure, which—rather than a naturalized scene or a transparent image—is more and more the case in advertising, explicitly signify the desire to find a point of contact between the enunciator (implied-real) and the enunciatee (implied-real) confronting their respective competence to communicate, a competence which constitutes an absolute necessity in the modern world.

At a level greater than the sign (considered as a discrete unit) or less (the whole image taken to be a sign), the expression-plane establishes the elements of a *rela-*

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*tion*, to which the pragmatics of communication accords primacy over *content*. In other words, the modalities of the production of images by placing formal elements in relation take precedence over the simple recognition of lexicalizable elements. In this articulation of semiotics and communication, to understand the way in which the relation subsumes content is to establish the primacy of enunciation over utterance. In all contexts, and in particular in the media, the relation is produced and reinforced by the frame (here the relation to the object advertised in a specific temporal and situational context), by the position of the protagonists—the enunciator and the enunciatee (the actantial function they have and the definition of their relation determined by the construction of the message), by the expectations the type of situation favors, etc.

Mimicking interpersonal communication, the mediatic function, instead of disappearing, is revealed in the solicitation of the enunciatee, both enunciator and enunciatee constructing an (ideal) image of the other in this ‘space’ in which exchange takes place, the space of enunciation. Giving a form to signifying matter is no longer solely the manifestation of the ability of the addresser-enunciator to manipulate the receiver, but also of the ability of the receiver to manipulate the image of the enunciator through the act of reading (Eco 1985). The hypothesis can be put forward that there is no need to speak of metacommunication, since the primacy of relation presupposes its presence in all acts of communication. In connection to advertising, this inscription of the relation corresponds to

a complex processus of *simulation of social practice* and presupposes, by that very fact, the articulation, the chiasmus of two spaces: one which is semiotic, and another which is pragmatic, the space of language and that of social practice. Reading is an operation in which a social actor becomes a subject exercising a cognitive doing in relation to a given cultural object. (Davallon 1980; my translation)

The receiver considers himself alternately as an enunciatee-enunciator in a vicarious relation to the original addressor, less because of the relation to a product or trademark conventionally accorded the axiological semes of the seduction of advertising (the dominant connotative approach) than because of the relation to a discursive form through which the form of exchange between enunciator and enunciatee is mediated.

As for the content-plane, it is made up, in the case of social interaction, of the information contained within the utterance, notably through the observations, opinions, feelings, and experience shared in interlocution. In the semiotic universe, it can be considered as the trace of the signified, of content, for which the expression-plane acts as a support, or as a signifying economy based on the three metafunctions described by Halliday (1985), although the distinction between expression and content, utterance and enunciation, relation and content, is not always clear. Within this pragmatic perspective, the following metafunctions, which are not incompatible with the epistemé of the Peircean model, can be retained (Kress and Van Leeuwen 1990):

- (a) The ideational metafunction: 'any semiotic system has to be able to represent, in a referential or pseudo-referential sense, aspects of the experiential world outside the particular system of signs'.
- (b) The interpersonal metafunction: 'any semiotic system has to be able to project the relations between the producer of a sign or complex sign and the receiver/reproducer of that sign'.
- (c) The textual metafunction: 'any semiotic system has to have the capacity to form texts, complexes of signs which cohere both internally and with the contexts in and for which they were produced.'

This model only partially coincides with the homologation between relation/content and expression-plane/content-plane, the formal structure of signification structuring and thereby subsuming the expression and exploration of the sign and the process of interpretation. The communicational model prolongs this dichotomy by duplicating the relation/content distinction with that between digital and analogic. There would seem to be a new point of articulation with semiotics.

These questions have been sufficiently debated for it to be possible to summarize the axiomatic of Palo Alto by saying that the digital represents the language of content, and the analogic the language of relation. The digital draws on the left hemisphere of the brain, which is definitional, logical, and analytical, and is connected to language, thought, writing, and arithmetic; whereas analogic language is identified with the dominant functions of the right hemisphere, which is intuitive and affective, inscribing images and figures within the global perception of relations, of configurations. An epistemological shift to linguistics would place three of the Jakobsonian functions on the side of digital language, on the side of content: the referential function, the metalinguistic function, and the poetic or rhetorical function. Analogic language, the language of relation, fulfills the

expressive, impressive, and phatic functions; clearly on the side of enunciation, it gives priority, semiotically, to the expression-plane.

This correspondence on the epistemological level could also include the famous classification by Peirce of the relation of the sign to its (dynamic) object: the *icon* (through a qualitative similarity or resemblance), the *index* (through a relation of contiguity, a direct action or reaction), and the *symbol* (through a code, convention, law, rule, or habit). Indeed, the distinction between the two aspects of communication, relation and content, could be considered to parallel that between

the indexical and the symbolic: the signals of relation, in particular of enunciation, are to be found for the most part on the side of the index and of the thing itself (markers of behavior, of hierarchy, of intention or context, all these aspects of enunciation are located at a level below that of the semiotic break of the utterance). Content (the utterance), on the other hand, is by definition detachable, and therefore symbolic or digital. (Bougnoux 1991; my translation)

In advertising the emphasis placed on the activity of the sign, based on indexical or analogic traces as well as (verbal and nonverbal) symbols, which are digital in nature, suggests that it is necessary to go beyond the purely iconic trace. The productivity of the analysis, in the relation of the sign to its object, is thus increased based on elements other than the expression-plane—until now the object of enunciation and of the relation between enunciator and enunciatee based on the formal structure subjected ideally to the competence of each individual. These are questions which will be verified shortly through the analysis of a specific advertisement.

But even now it can be seen that the articulation between semiotics, pragmatics, and communication has great heuristic value. The communicational model, with notions such as content and relation, digital and analogic language, poses the question of the sign in its (iconic, indexical, symbolic) relation to its object; but it is also related to signification, through the homologous relation to (formal or plastic) marks of enunciation on the expression-plane. From the sign to the production of meaning, from the opening provided by pragmatics to the analysis of the signifying system, communication can find a solid foundation in semiotics, and, in return, closing the epistemological circle, can provide it with a conceptual framework relating to the function of these processes in social interaction and the

dynamic of exchange, where (and we will come back to this) it is more and more a question of 'producing meaning' so as to be 'well received' (Goffman), of producing the meaning for each instance of enunciation which constructs an ideal image of the other. This is not far removed from Lacan's 'desire of the desire of the other.'

### **Semiotic Continuity and the Attraction Exerted by the Signified**

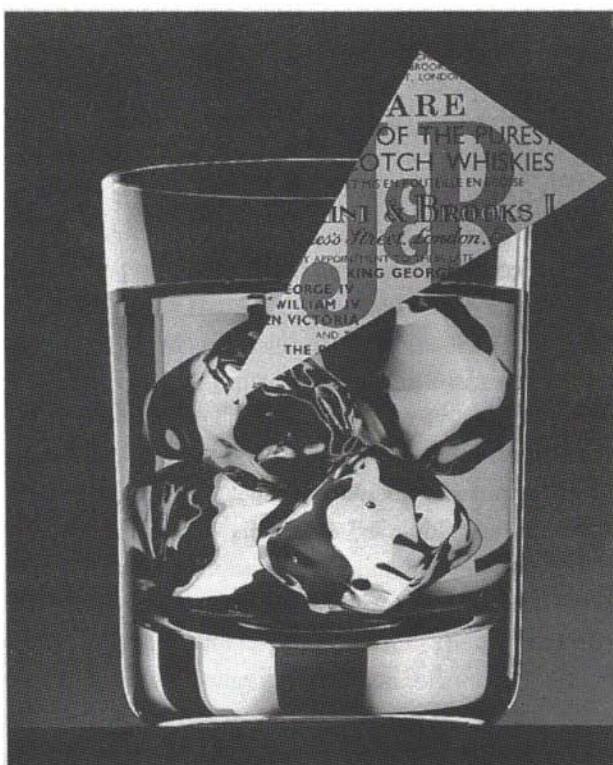
The decision to analyze the particular advertisement chosen was determined by the relatively few elements it puts into play: an enlargement of a full glass stands out against a monochrome background, with part of a label superimposed over it (Plate 1). The reduction to two elements against a common background has the advantage of provoking and focusing attention through the dissatisfaction resulting from the simple referential grounding of the analogic vision (Boutaud 1992). The tensiveness of the subject in relation to the message is increased within the already explicitly intentional framework of advertising. However, the 'icy' scene of enunciation is substituted for the sememic specter of seduction, with its pathemic investment.

A legal justification could be found for this structure, such as the impossibility in France of associating any action whatsoever with the image of an alcoholic beverage. As a result, the action is transferred from the utterance to the enunciation, in the fiduciary space which brings the enunciator and enunciatee together in their ability to understand the tricks of the sign, to grasp signification in its totality through the economy of the signified.

Semiosis and the interpretive cooperation which it presupposes does not prohibit the lexicalizable units linked together in the image from being considered globally, as one sign unit prior to any segmentation. The archaeology of meaning then proceeds, as has been suggested for communication in advertising (Souchier 1992), by levels of signification, which can be reduced to a series of propositions, or even to one fundamental proposition:

—*formal relation instituted through perceptual imprinting*: I am an image which stands out from the visual flux, due to my graphic and plastic properties (texture, form, color, etc.).

—*formal relation instituted through mimesis*: I am an image of the object in its relation to itself (the icon of a glass and, even if incomplete, of a label).



L'ABUS D'ALCOOL EST DANGEREUX POUR LA SANTÉ, CONSOMMEZ AVEC MODÉRATION.

Plate 1.

—semantic relation instituted through exteroceptive connection: I am an image of a state qualified (potentially) as positive: the presence of the glass of alcohol. Through this metonymic displacement, from the glass to the representation of a class of objects or of an activity, a conceptual content is 'substituted for an analogic, representational container, the way a scheme is substituted for a schema, a noemic element is substituted for a noematic element. What the mental image deduces from the photo is a stereotypical state, indicative of psycho-social conditioning' (Lindekens 1986; my translation). Certain qualities are thus predicated of the object.

—*semantic relation through disengagement*: I am an image of an aspectualized object (by the use of light, the frame, exposure) able to support different narrative trajectories through disengagement, which can be actantial (introduction of a subject), temporal, or spatial (projection of a temporal or spatial localization outside enunciation).

—*rhetorical construction of an actualized discourse*: I am an image which inscribes, through formal reduction and the ellipsis of the label, the impossibility, given legislation concerning the advertising of alcoholic beverages, of explicitly representing connotation or a narrative trajectory. However, it is precisely on this rhetorical basis that I establish an enunciatory contract. I compensate for the formal and geometrical reduction through the power of the ellipsis, which is in a dialectical relation to the visual hyperbole, the synesthetic function and the ‘freedom’ of the ‘internal’ forms in the glass.

—*pragmatic construction of an advertisement*: I am an image which connects the enunciator to a metaposition and makes manifest, beyond all constraints, an advertising strategy, thereby cumulating an aesthetic, rhetorical, and symbolic premium (each of these registers is able to reinscribe a trajectory of semiosis).

—*pragmatic construction of a brand image*: Finally, I am an image which can fixate a brand identity, a brand image, transforming the object advertised into an object of value, not because of its particular qualities (this is of less and less importance in a universe of signs) but through the action of discourse (Kapferer and Thoëníg 1989). This is the aim of commercial advertising: at the (temporary) end of semiosis, social practice connects the pragmatic subject to the culturalized object.

Some might consider the above (re)construction of semiosis to be artificial. It should be seen merely as a heuristic attempt to produce a model of one of the forms of semiosis. Perceptual and cognitive activity work together to undermine the linearity of the process, in which inferences continually come into play. The separation into discrete levels of signification is justified only by methodological considerations, but ‘our percepts themselves are not discrete, monadic, atomized operations. Whatever the dynamic force of perceptual experience, we are at all times conscious of a sort of continuous flux of experiences, rather than of a succession of discrete judgments’ (Tiercelin 1993; my translation).

In the pragmatic context of advertising there is nothing which requires that the image be treated globally, as we have been doing, and attention to the various elements of the image leads to a mobilization of interpretants, in the language of

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Peirce, in the passage from the immediate object (as an actualized sign) to the dynamic object (the relation of the sign to its object). Distinguishing different modes of activity of the iconic sign in this simulacrum of intentional representation is then not inconceivable. Every element treated as a signified partakes of intersubjectivity, just as in communication every element of behavior partakes of interaction. Limiting ourselves to the Peircean distinction, in the relation of the sign to its object, between icon, index, and symbol, we logically consider an advertisement to be an icon. It is not connected to its object through continuity or natural contiguity in the way an index is. Nor does it establish, through analogy with its object, a semiotic break comparable to that of the symbol, whose degree of motivation hides neither the arbitrary nor the conventional nature of this relation. However, a closer examination of the advertisement analyzed here reveals that locating the visual message on the iconic level alone would not account for its structure. Indices and symbols play a role in signification and appeal to the cooperation of the receiver.

The *iconic* utterance uses certain lexicalizable items for support: the label; the glass; the liquid; the ice cubes, positioned ostentatiously (hyperbolically exposed) and ostensibly (ready for a perceptual judgment). The distinction between the analogic form of the objects and the digital form of the hidden linguistic signs in the truncated label interferes with representation. Already the *symbol* crosses over the semiotic break, like a point, a pick, a punctum, an ‘angle’ of vision, entering into the heart of the image. Already the eye sweeps the agitated surface of the liquid contained within the glass. We pass from an ‘icy’ formal universe into a sort of ‘expressive galaxy’, from *ratio facilis* to *ratio difficilis* (Eco 1992: 23-26). Structured as an appeal for cooperation, the advertising paradigm cannot help but place indices in this cryptic world contained within the glass, in a certain sense giving the message life from within. From traces to imprints, from lines to forms, the imagination is given a shape. Silhouettes are outlined, light and reflections catch one’s eye, and, from index to index, one cannot have helped noticing, in the bottom of the glass, the white figure, the bird—symbol of the imagination. We have already referred to the transformation, through advertising, of an object into a culturalized object of value. Here we are overwhelmed by all the indices within the image, and brought back to the primary function of the imagination. That is perhaps the symbolic power of aestheticization in advertising.

**Semiotic Discontinuity and the Attraction Exerted by the Signifier**

This first reading has made it seem that the subject, having arrived at a state of fusion and participation with the indices on the level of the form through a sort of perceptual entelechy, marks a pause in the process of semiosis. It is true that from level of signification to level of signification, from objects to interpretants, from content to relation, the links between signifieds make manifest and prolong the illocutionary force of the iconic utterance.

At the same time this reading reproduces a simulation of the play of inferences, founded on logic and thus neither arbitrary nor free. For methodological and strategic reasons which seem to us to be faithful to the performative nature of the message, this play of inferences leads the receiver to recognize the addresser, through the transformation of the referential object into an object of value. The transformation takes place, in the final instance, in exceeding the analogic level, thus producing signification—reciprocal competence—in the recognition of indices. From this point of view the cryogenic figure of the bird-symbol, in the depths of the glass, is no longer a subliminal hypothesis but a motif exerting an attraction, a helper for perception in its quest for meaning and the correlative construction of the object. It is as if, in order to be able to see, it were necessary to forget the object before our eyes. But at the same time it becomes clear the extent to which such a perspective can be a part of the semiotic project. To detach oneself from what one sees in order to describe the system of signification corresponds to the very nature of the project. However, to detach oneself from what one sees through the break between what is perceived and what is conceived, through the progressive unfolding of the signified in the imagination, very quickly leads us away from semiotics.

The role of such phenomena in the communicative process should be distinguished from that founded on purely semiotic bases. Our first semiotic reading revealed the ambivalent nature of the index, which, of all signs, is the one mostly closely connected to the imprint of form, to the deep trace, and which, because of that, is most likely to separate from the image through subjection to what is felt, to what is experienced. From the European point of view, however, the semiotic has to do not with what is experienced but with what is encoded. A hypothesis to be developed would be to understand the performative nature of the iconic utterance not through the productivity of the signified alone, as has been the case up to now, but even more through the modal competence of the subjects to construct a model

of the relation between the expression-plane and the content-plane. As a result the topicality of the (meta)discourse on the image can be seen, the reciprocity at the two poles of communication in relation to enunciation, in the complicity of producing meaning. How can what is produced 'by' the image be put into parallel with what is produced 'within' the image?

Significantly, this proposal to enter 'within' the image is related to the position characterized by Jean-Marie Floch (1990) as 'substantial' in his semiotic square of types of advertisements. Interdefined by its relation to *referential* advertising (the representational function) and *mythical* advertising (the constructive function), the primitive terms of the semiotic square, and by its opposition to *oblique* advertising, *substantial* communication constitutes a pole of signification, at the deep level, as well as a strategy:

It is not a question here strictly speaking of the production of an illusion of reference. That is precisely a result of referential advertising and, above all, the illusion of reference presupposes a certain accommodation with the reality which seems to be reproduced, a sort of 'proper distance'. The meaning effect produced by substantial advertising, however, is rather one of the strangeness of the world, the *presence of the object facing the enunciatee* ... the substantial image favors tactile values. Close-ups, absolute clarity of lines and forms, often seen full on: substantial advertising *reverses the relation of the subject to the world*. (Floch 1990: 208; my translation, emphasis added)

Beyond the specific example, then, there is a fundamental relation to the image in its ability to turn back on ourselves. Its very obviousness makes it seem to take the initiative, attempt to catch the subject's eye, catch it, and then completely absorb the subject. It is for the image to test the subject. Going from phenomenology to semiotics, the terms of this operation are dependent on criteria already referred to here and worth specifying: the competence of the subject, put to the test by the image. In other words, the illocutionary force of the image is understood as an act of communication.

Competence, in our context, can be identified with the bringing into play of the conditions necessary for the realization of the performance of reading the image. It mobilizes on the one hand a semantic competence which accounts for the elements virtually engaged in the program of reading, and on the other hand a modal competence which makes it possible to pass from the virtualization to the realization of

the program. Considering first the modalization of *doing*, from the performative angle of communication, competence is organized as a hierarchy of modalities (Greimas and Courtés 1979: 54). But the performance of reading and the eventual conjunction of the subject and the object of value presuppose the qualification of this subject and its institution.

According to our hypothesis, the purpose of manipulation is to institute the subject and to qualify it on the cognitive basis more of a formal seduction (subjected to the test, to the performance of reading) than of a conceptual seduction (for, as we have seen, the signified always tends to regenerate and to evade interpretation). If the hypothesis is verified, the pragmatic dimension, communication founded on a culturalized object of value, is articulated in the function of a cognitive dimension, the competence to manipulate the sign in the interaction between enunciator and enunciatee.

On the content-plane, the affirmation of competence is facilitated by the syncretic nature of advertising, whose tendency to create isotopes combines with a tendency to use stereotypes. Although, from a cybernetic point of view, redundancy undermines information, it is essential for communication and the relation. On the expression-plane, the form of the message relies on a level of organization sufficient to motivate the competence of the subject and to favor his qualification as an enunciator. To the stereotyped forms of content are added the stereotyped forms of expression, beginning with the syntactic rules governing the interrelations between the basic elements of the visual field: topological relations, gestalt relations, laws governing the interactions of colors (Saint-Martin 1987: 89-100). It is impossible to go into detail here and provide an in-depth analysis of the syntactic rules governing our document, but it is nevertheless necessary to come back to them briefly. The formal organization is based on the attraction of two interconnected geometrical forms set off from the background: a rectangle (the glass) and a triangle (the label), which, as strong gestalts (Moles 1992), meet the criteria of 'good forms' (Saint-Martin 1990: 73-112). The competence of the enunciator is tested in contact not with surfaces, but with organized fields of energy, which specify the internal-external activity of the figures. In a space which is vectorized (the direction of the triangle), dialectic (regularities-tensions), and contrasted (bright/dark, sharp/blurred), a system of signification is put into place, without recourse to the referent. By looking for discrete distinctive features the enunciator avoids the double trap (and double disappointment) of the referential tautology and of erratic interpretation. A system is put into place, the 'moment of

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the code' is revealed, already through a semi-symbolic codification (Floch 1985; Thürlemann 1982) and through a series of homologations between expression and content:

upper : lower :: /inanimate/ : /animate/  
sharp : blurred :: /calm/ : /energetic tension/  
interior : exterior :: /concentration/ : /void/  
angularity : curvedness :: /penetration/ : /enclosure/

Each of these categories would of course require validation and many more tools (Groupe μ 1992) for a complete analysis of the system and of the correlative production of the object. But that is not what we have tried to do here. Rather, it has been a question of constructing a hypothesis according to which the iconic utterance works its illocutionary power in the seduction of its formal structure (which is not to be confused with the expression of a style). Here the competence of the enunciator is realized in a pragmatic and cognitive doing independent of any idiosyncratic reaction to a particular element and unrestricted by the hold exercised by the referent, even if (or precisely because), as we have seen, the play of interprétants knows no absolute limits. Competence is tested first of all against the system of oppositions between the two levels of signification recognized as pertinent. But what has always guided a certain semiotic approach defines the framework for the exchange between enunciator and enunciatee. This is an operation which finds in the paradigm of advertising a friendly terrain, syncretic with the synesthetic and semiotic manifestations and verifying the weight of the relation and the analogic on content and the digital. From the iconic to the social space the perlocutionary effect of the message can virtually be realized in the conjunction of the subject with the object of value. But for the subject, the image will always remain one of the freedom (or the belief in such freedom) to exercise more than ever his competence in the frequenting of and in complicity with the sign. Is this not, then, the modern form of persuasion which characterizes social discourses?

### Note

1. Translated from the French by Paul St.-Pierre, Département de linguistique et de traduction, Université de Montréal.

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## **Iconism**

Groupe  $\mu$

### **The Problem**

#### *Critique of the Notion of Iconicity*

The concept of iconicity poses various problems. Some are logical and epistemological, others technical. For a long time, both sorts of problems have made it seem that the very concept of iconism was an aporia, and consequently, that it ought to be evacuated from theory.

It is probably Umberto Eco who has most fully developed the critique of this concept, and in the most solidly argued way; he has returned time and again to this theme, from *La struttura assente* to *Segno* and *A Theory of Semiotics*. His criticism is directed toward the naive notions present in all the definitions of the iconic sign—shown by terms such as resemblance, analogy, motivation—when they insist on the similarities of configuration between the sign and the object it represents.<sup>1</sup> Thus Peirce speaks of ‘native resemblance’, or says that a sign is iconic when ‘it can represent an object principally by its similarity’ (*CP* 2.276; 1978: 149); according to Morris (1946), the iconic sign has, ‘from a certain point of view, the same properties as that which it denotes’; Ruesch and Kees see in it ‘a series of symbols which are, in their proportions and their relations, similar to the thing, the idea, or the event they represent.’<sup>2</sup>

Eco easily exposed the weaknesses of these ideas: a certain icon—for example, a hyperrealist portrait—has virtually none of the properties of the object it represents (for instance, the texture of the skin or the mobility of the subject). And trying to qualify the claim of the similarity of properties with careful phrases (like Morris’s ‘from a certain point of view’ or Peirce’s ‘principally’) amounts to a caricature of a scientific method: would we say that ‘the atom is indivisible “from a certain point of view”?’ Eco ironically asks, although in this case his irony is misdirected (1975: 258). But if by chance this ‘point of view’ could be defined, then the concept of iconism as isomorphism could be reconciled with the demands of science. This is the route which Eco seems at first to take:

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Even if we concern ourselves solely with perception, it is necessary to take the precaution of asserting, for example, that the iconic sign constructs a model of relations (between graphic phenomena) which is homologous to the model of perceptive relations which we construct in encountering and remembering the object. (Eco 1970: 21)

But even the precaution of comparing two *models* of perceptive relations will seem illusory to the Eco of *A Theory of Semiotics*, who will completely do away with the notion of iconism in the name of epistemological coherence. In fact, he notes, iconism seems to ‘define many different phenomena: from the “analogical” of measuring instruments and computers, to the case where the similarity between sign and object is produced by very sophisticated rules which must be learned, and to the case of the specular image’<sup>3</sup>; all these phenomena would fall not within the province of the semiotic but, for example, within that of mechanisms of perception.

A first attempt at the clarification and classification of these heterogenous phenomena had already been made by Nelson Goodman (1968), who, curiously, put forward examples quite comparable to those used by Eco in a work published the same year. Concerning the notion of iconicity, Goodman made a distinction between two types of relationship: *resemblance* and *representation*. These relationships have logical properties which are quite different. Thus resemblance is reflexive ( $A \in A$ ) and symmetrical (if  $A \in B$ , then  $B \in A$ ), properties which representation does not have: it is absurd to say that an object represents itself (reflexivity), and it is, generally speaking, absurd to say that a person represents his or her portrait (symmetry). Other, more empirical arguments show that resemblance and representation have nothing to do with each other: two objects which closely resemble each other are not necessarily predisposed to represent each other (would we say that a twin ‘represents’ his or her sibling?), and furthermore, representation can be achieved by means of objects which resemble very little that which they represent. Goodman cites the excellent example of a canvas by Constable: it represents a castle, but in fact has more points of resemblance with any other painting than with a castle, and yet it is that castle which it represents and not another painting.

The conclusion is obvious: representation, where an object ‘stands for’ its subject, has no necessary relationship with resemblance. Ultimately, anything can represent anything (thus Goodman rediscovers the principle of arbitrariness).

The idea of the *copy* must therefore be abandoned in favor of that of the *reconstruction*: this, it will be seen, is our position, which will however allow us to avoid radically evacuating the concept of motivation.<sup>4</sup>

Returning to Eco, we find that questioning the definition of iconism leads him to the even more fundamental questioning of the very notion of the sign. This notion is doomed to be inoperative if we try to reduce it to the idea of a semiotic unit, a unit which always enters into a fixed relationship with a signified. To save the idea, it is necessary to conceive of the sign as a connection, forever challenged by circumstances, between imprecise ‘expressive textures’ and vast and unanalyzable ‘portions of content’. Drawing conclusions from this, Eco decides that the goal of a semiotic will no longer be to develop a typology of signs, but rather to study the modes of production of the semiotic function.<sup>5</sup>

Although his criticism is rigorous, it still suffers from one logical error: it is difficult to see how maintaining the notion of iconism would *necessarily* lead to ‘a theory of the profound motivation of the sign’—every sign—evacuating the arbitrariness of the definition of the sign. We will show later how arbitrariness can, in a model of the iconic sign, coexist with motivation: in the one which we will propose, arbitrariness will be doubly present, thanks to the concepts of ‘iconic type’ and ‘iconic transformation’.

One can, however, agree with the greater part of the criticisms roughly outlined here, an outline which nevertheless synthesizes what is essential in the debate over iconism as it has been carried out for fifteen years or so.<sup>6</sup> One will agree in any case that the problem of isomorphism has until now been stated in terms which emerge more from rampant empiricism and common sense than from scientific method.

We will go even further, and say that a definition based on intuitive notions such as ‘analogy’ or ‘resemblance’ leads, if one follows it through to the end, to two propositions which are contradictory but equally uninteresting: (1) ‘Every object is its own sign’ (because it has all its own characteristics and properties, in accordance with Morris’s definition!); and (2) ‘Anything can be the sign of a given object’ (since ‘two objects chosen at random will always have some property or another in common’<sup>7</sup>). The first proposition ends up dissolving the very notion of sign (which necessarily supposes the alterity of expression and content). The second results in the dissolution of the semiotic perspective itself: this perspective takes as given, in fact, that some distinction at least structures the content, and

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that the same can be assumed at the level of expression; this condition vanishes if everything refers to everything else.

A meticulous and rigorous analysis of the positions taken by Goodman and Eco has been carried out by Sonesson (1989). It also leads to the rejection of both theories, using many arguments which are similar to ours.

A theory which would retain the notion of the iconic sign, and which would give a scientific basis to the 'similarity of configuration' which up until now has only been an intuition, should then conform to two conditions: (1) it must respect the principle of alterity, show that the 'iconic sign' possesses characteristics which show that *it is not* 'the object', and thus display its semiotic nature (which would give a rational foundation to Morris's vague 'from a certain point of view'); and (2) it must show how oppositions and differences function, or in other words how this 'sign' is structured, the limits of which are, to say the least, problematic.

### *Critique of Criticism; or, Must We Smash the Icon?*

The body of criticism opposed to the notion of iconicity forces us to reengage with the problem on new ground. To begin this reexamination is perhaps, first of all, to extend criticism even farther and examine a concept which has attracted less attention than that of isomorphism: the concept of the object. We will reflect on this concept later, after having reformulated the problem of the relationship between the sign and the object. By examining this concept we will show that one can perhaps envisage a solution to the problem of isomorphism. Pushing criticism further than our predecessors, we will end up, paradoxically, at a position which is less radical than theirs.

Indeed, to refer everything back to a typology of the modes of semiotic production, as Eco does, or to evacuate the problem of reference<sup>8</sup> are ways of avoiding the whole issue (out of spite or despair?). At any rate, it seems to us that a project of the typology of the modes of production, valid though it may be, does not do away with the problem of isomorphism. On the contrary: the project forces us to deal with the problem. We will end by returning to the problem of production (and reception), showing that it too is fundamental in the description of the iconic sign.

*The Problem of Relationship.* A theory of the modes of production of signs cannot do without a converse theory of the reception of those signs, which is reciprocal to the first theory.<sup>9</sup> Reception can certainly be described as a sort of production (as a process which produces meaning). But nothing indicates *a priori* that the rules of one are necessarily the rules of the other. The obligation to remain aware of this bilaterality involves the obligation to pay attention to the relationships which continue to exist between the nebulae of expression and those of content. To explore these modes of relationships, we must perfect a model which takes into account the heterogeneity of the phenomena previously catalogued as iconic. This heterogeneity may be nothing more than a consequence of the current state of semiotic reflexion, and at this stage it can be seen as a mere empirical intuition. It does not constitute a sufficient reason for trying to avoid the whole issue, a strategy which we denounce here. This model will have to *account for* (which is not the same thing as ‘assume’) the processes which are the basis of the naive definitions which have been criticized. It will also have to be powerful enough to allow for the description of the reception of signs (and therefore the production of reference) as well as their production. This is the model which we will construct later by elaborating the concept of *transformation*.

*The Object.* The criticisms formulated by Eco essentially target the iconic *relationship*; we must not forget, however, that their validity depends on the value attributed to the *elements* involved in this relationship. If the naive definitions of iconism have their shortcomings, perhaps their main flaw lies in the naiveté with which they describe the objects lucky enough to be iconized: the idea of a ‘copy of the real’ is naive first of all because the very idea of ‘the real’ is naive. Most of the criticized definitions in fact take iconized objects as an empirical given (an ‘always already there’, as would have been written a few years ago). And that’s the rub. Linguistics has long wallowed in a conception of the referent as a thing—a conception which has a hard time surviving in visual semiotics (for a reason which we will detail later, and which we will call the *commensurability* of the referent and the signifier).

Therefore, criticism must focus on the notion of the represented object as much as, if not more than, on the relationship supposed to exist between this ‘object’ and the sign. It is precisely this kind of criticism which Greimas and Courtés urge us to take up (1979: 177): ‘To identify visual semiotics ... as an immense analogy of the natural world is to lose oneself in a labyrinth of positivist presupposi-

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tions, to claim that one knows what “reality” is, that one knows the “signs” whose imitations would produce this or that semiotic.’ Unfortunately, in an attempt to escape the labyrinth of positivist realism, one may be tempted to go too far in the other direction and opt for the idealism previously denounced.

‘Objects’ exist not as an empirical reality, but as creations of the mind: their identification and stabilization can only be temporary, since they are only arbitrary divisions cut out of a substance that could not be analyzed without this division. If one remembers the fundamental distinction between ‘methodological structuralism’ and ‘ontological structuralism’ (Eco 1988: 96), the latter being based on the idea that the operators leading to a model are structurally homologous to the relationships between ‘things’ in reality, it will be obvious that we are radically committed to methodological structuralism. Indeed, if an iconic sign has a referent, this referent is not an ‘object’ extracted from reality, but always and from the beginning an object produced by culture.<sup>10</sup> One will remember the criticism which Goodman (1968) made of the theory of resemblance. It is as clear to him as it is to us that it is impossible to perfectly copy an object; for example, a human being can be described on many different levels: as a group of atoms, of cells, as a friend, etc. If we copy something, it is a chosen *part* of the object, and one communicates it in an utterance in which *what* is said cannot be dissociated from *how* it is said, in which *content* is one with *comment*. Clearly, we are closing in on a more accurate definition of Morris’s still rather vague ‘point of view’.

This brings us to a famous distinction in semantics: that established by Morris between the *designatum* and the *denotatum*. Only the *designatum* ('what is taken account of')—Morris 1938: 4) is part of semiosis, the *denotatum* (the real existing object) being excluded from it.

This opposition, as clear and convincing as it appears, is however not altogether satisfactory: while the ‘real existing object’ is certainly to be excluded from semiosis, the definition of the *designatum* presents a problem and conceals a certain ambivalence. Remember that for Morris ‘the *designatum* of a sign is the sort of object the sign refers to, that is to say, objects possessing properties which the interpreter can come to know through the presence of the vehicle of the sign’. It is therefore ‘not a thing, but an objective category, a class of objects’ (1974: 18). However, if the *designatum* is a class, that class is actualized *de facto* in particular speech acts. Morris shows this a few lines later:

Signs which refer to the same object do not necessarily have the same *designata*, since what one notices in the object can vary according to the interpreter.... To ask what the *designatum* of the sign is, in a given situation, is to ask which characteristics of the object or of the situation one notices solely as a result of the presence of the vehicle of the sign. (1974: 17-18)

It can be seen that the concept of the *designatum* includes two quite distinct things: on the one hand, the class or category (classes which are differently segmented, more or less stabilized and identifiable depending on the culture, but in theory independent of particular speech acts), and on the other hand, the actualization of the class in a given situation of signification. As shown by the expression ‘that is to say’ in his definition of the *designatum*, Morris constantly confuses these two points of view.

This is why we abandon in what follows the term *designatum* to distinguish between the two orders of things until now often confused in the notion of the ‘iconic signified’: the iconic *type* on the one hand (which we will compare with classes), and the *referent* on the other. This referent constitutes the actualization of the type, and not a ‘thing’ anterior to any semiosis.

Our discussion about the object brings us closer to a triadic definition of the sign. Triadic in that it substitutes for the traditional binary structurings (signifier-signified, expression-content) so far applied to the iconic sign, a relationship among three elements which will be defined in the next section: the *signifier*, the *type*, the *referent*. Three times two relationships occur among these three elements.

*Production and Reception.* Let M be a model (referent) and I its iconic sign.<sup>11</sup>

It is possible to break up I into a set of elements E or dots such that each of them, independently of its coordinates, indicates the value of the element in one of the visual dimensions.<sup>12</sup> For instance E ( $x_1, y_1$ ), located in  $x_1$  and  $y_1$  on the surface of the image, would have a determined value for brightness, saturation, and nuance: together these three values will define the color vector for this particular dot. In theory, this description should suffice.<sup>13</sup>

Having thus at our disposal an exhaustive analytic description of I, we can describe the model M in the same way and compare the two results. If the image is iconic, certain dots on the image’s pattern will correspond to dots on the model’s pattern, while others will not. The correspondence in question will gener-

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ally be *adjusted* through one or several transformations  $t$ . The set of elements in  $I$  will thus be divided into two subsets  $I_1$  and  $I_2$  such that  $I_1 + I_2 = I$  and that the transformation  $t_1$  operates between  $M$  and  $I_1$ :

$$\begin{matrix} t_1 \\ M \rightarrow I_1 \end{matrix}$$

Where do the elements in the subset  $I_2$  come from? They can only come from the producer of the image, which we will designate by  $P$  (and which can be a machine or a human). Being produced by  $P$ , these elements will be (generally speaking) the result of a  $t_2$  transformation of  $P$ , which yields

$$\begin{matrix} t_2 \\ P \rightarrow I_2 \end{matrix}$$

The global figure for the iconic sign and its production can thus be represented as in Figure 1.

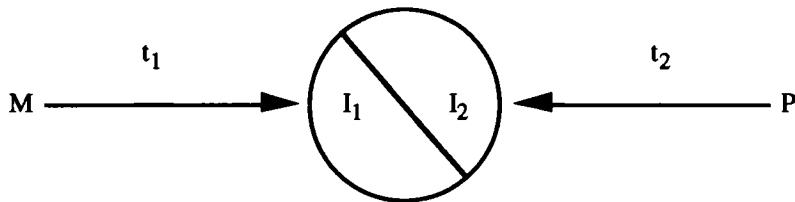


Figure 1. Production of the iconic sign

The first advantage of this simple figure is that it immediately locates the global image  $I$  in a mediating position between  $M$  and  $P$ . Since there is no reason to consider only the subset  $I_1$  relevant, receivers apprehend and interpret  $I_2$  as well as  $I_1$ . They can also go back to  $M$  from  $I_1$ , by inverting  $t_1$ , and to  $P$  from  $I_2$ , by inverting  $t_2$ . (Turner paints Turner just as much as mist on an estuary.) In fact the  $t_2$  transformations constitute a channel through which the producer expresses him or herself. Thus the model opens up the prospect of a study of styles (see Klinkenberg 1990) in which these are considered as a pattern of relationships between expression and content, relationships whose existence we know of but which can only be identified by inference, since their code is not formulated.

These relationships would nevertheless be the true carriers of the *meaning* of an image. As a result of being faced with a mediating structure, the receiver R is also put in a mediating position.

To sum up, the iconic sign does possess certain characteristics of the referent, thus conforming to its classical definition (to be amended in a way soon to be disclosed). But it simultaneously possesses certain characteristics which come not from the model, but from the producer of the image: insofar as this producer offers definable features, another function of the sign is to allow the recognition of the producer.<sup>14</sup> Finally, because it displays characteristics which differ from those of the referent, the sign appears as distinct from the referent and thus respects the principle of alterity.

The iconic sign is thus a mediating instance with a twofold reference function: it refers back to its model (or referent) and to its producer.<sup>15</sup>

### *Synthesis*

To meet the various criticisms brought against the concept of iconism, the retained model will have to conform to the following set of criteria which have been progressively elaborated by us and previous semioticians. They are systematically listed in the following paragraphs:

The model of iconism must:

- (1) Have as its point of departure a referent which (a) is not an ‘actually existing object’—which falls outside any semiotics, as indeed outside any theory—but (b) has already been modelized (c) without belonging to a class that cannot be actualized.
- (2) Account for the alterity between sign and referent, and thus permit the identification of the sign as sign.
- (3) Also account for the isomorphism effect between the referent and the signifier without yielding to an object-bound naivety; this also implies that it must account for the essentially cultural *decision* to identify (or not identify) a semiotic phenomenon as isomorphic to the referent.<sup>16</sup>
- (4) Account for the multiplicity of the forms taken up by this isomorphism and thus for the heterogeneity and unreliability of the iconic relationship, as well as for the cultural nature of the codes allowing the recognition of the work in the identification of a sign.

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(5) Account for both the decoding (that is, the identification of a referent, which can be absent or unreal) and the coding of iconic signs.

(6) Account for the diversity of possible semiotic approaches (focusing on the signifier, on the type, on the referent), which vary according to the circumstances of the semiotic act, and thus for the relativity of the notion of iconic ‘unity’.<sup>17</sup>

### General Model of the Iconic Sign

#### *Three Elements*

The iconic sign can be defined as the product of a triple relationship among three elements. The originality of the proposed system is that it breaks the binary relationship between a ‘signified’ and a ‘signifier’, which has raised unsolvable problems. The three elements are the iconic signifier,<sup>18</sup> the type, and the referent. The distinction between these last two notions—too often confused in a definition of the ‘iconic signifier’—will make it possible to solve the problems mentioned above. Three times two relationships are established among the three elements, so that it is impossible to define one element independent of the others with which it is correlated (therefore each of our preliminary definitions will have to be regarded as provisional only). These elements and relationships are presented in Figure 2.

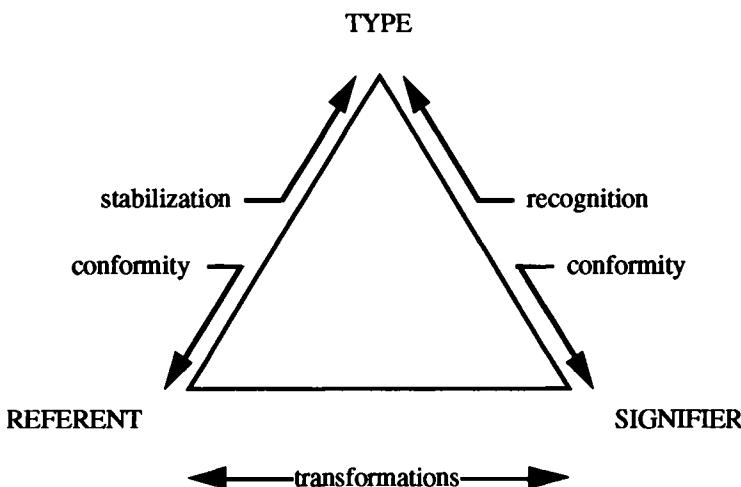


Figure 2. Model of the iconic sign

The analogy between this model and other semiotic triangles, particularly the one developed by Ogden and Richards, is obvious. There are, however, marked differences—notably in the status given to the referent, and in the relationship between referent and signifier, which we present as less mediated. This is why we present this connection—which will be explored further—as a continuous rather than a dotted line.<sup>19</sup>

The *referent* mentioned here is a *designatum* (and not a *denotatum*, which by definition falls outside the pale of semiosis), but it is an actualized *designatum*. In other words, it is the object regarded not as a rough accumulation of stimuli but as a member of a class (which does not necessarily imply that the referent is real—see Lavis 1971). The existence of this class of objects is sanctioned by the existence of the type.

However, type and referent are still distinct: the referent is particular, and has physical properties. The type, by contrast, is a class and has conceptual properties. For instance, the referent of the iconic sign *cat* is a particular object, of which I can have a particular experience, whether visual or otherwise; but it can be said to be a referent only insofar as this object can be associated with a permanent category—that of being a cat.

The notion of *type* refers to an internalized and stabilized model which, when combined with what is perceived, is the basis of the cognitive process. In the field of iconics, a type is a mental construct resulting from an integration process (which can be genetically described). Its function is to guarantee equivalence (or transformed identity) between the referent and the signifier; this equivalence is never attributable solely to the transformation relationship. The relationship between referent and signifier is thus one of ‘co-typing’.

The *signifier* is a modeled set of visual stimuli corresponding to a stable type which can be identified based on the properties of the signifier, and can be associated with a referent perceived as a hypostasis of the type as well; signifier and referent are linked by transformation relationships (see above).

A type has no physical properties; it can be described through a set of conceptual properties, some of which can coincide with the referent’s physical properties (for instance, returning to the example of the cat, the shape of the lying or sitting or standing animal, the presence of whiskers, of a tail, of stripes), while others (i.e., mewing) do not. These features are the product of paradigms whose terms add up in a logical sum: for instance, the type ‘cat’ consists of the paradigm for

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color (black, red, etc.), the paradigm for position, and a number of other paradigms):

$$T = (a_1 \ a_2 \ a_3 \dots) \ (b_1 \ b_2 \ b_3 \dots) \dots$$

As will be shown later, the product of the paradigms defining a type does not consist of a set number of terms: the only requirement is that the terms selected allow for the recognition of the type based on the principle of redundancy. Each term has a set number of possible variations which constitute a paradigm.

### *Three (Double) Relationships*

The relationships between the three elements defined above can be described either genetically (as part of the process of sign formation)<sup>20</sup> or synchronically (as part of the way the iconic message functions, whether at the production or at the reception end). We are concerned here only with a synchronic approach.

*Signifier-Referent Axis.* Note that this relationship establishes a direct link between the two terms, which leads us away from a linguistic model. Since both terms have spatial properties, they are commensurable. Commensurability cannot be ruled out in the name of the semiotic radicalism we have argued against. Such commensurability accounts for what even the most advanced theoreticians retain in their discourse under the name of ‘referential illusion’: this notion implies that some of the object’s features are expressed in signs, while some of the sign’s features do not belong to the object.<sup>21</sup> Using rather more scientific words, Eco wrote about a homologation between two models of perceptive relationships. The relationships on which this commensurability or homologation is based may be called *transformations*.<sup>22</sup>

A first description of these transformations was formulated by Ugo Volli (1972), who tried to capture the notion of motivation by means of geometrical concepts. Such geometrical transformations, however, have only a very limited power of explanation: they can account for the fact that the limited size of an icon compared with its referent does not prevent the recognition of its type, or for the production of two-dimensional icons for three-dimensional referents, but they cannot explain the production of one-color icons, narrowings of the defined field,

plays on contrasts, or the equivalences between painting and photography, photography and architectural blueprints, sketches and maps.

To Volli's geometrical transformations we must add analytical (in the mathematical sense of the word), algebraic (based on continuous variation in size), and optical (starting from the respective positions of the sender or receiver on the one hand, and the product or stimulus on the other) transformations. We will not detail these various operations here; they have already been described elsewhere (in Groupe μ 1992: 156-185).

Two final observations. First, the operations for the transformations between signifier and referent must be approached from both directions (signifier → referent and referent → signifier), depending on whether we are considering the sign's reception or its emission. In the second case transformation rules are applied in order to develop a signifier starting from the perception of a referent (which can be either concrete and actual, or hypothetical). In the first case, these transformation rules are applied to extrapolate some of the features of the referent from the features of the signifier; this reconstruction through transformation can be done based on the data provided by the type or by an archetype. Say that we start from a two-dimensional icon of an undefined being recognizable as an animal: my knowledge of the relationship between animal drawings and animals helps me to extrapolate the three-dimensionality of the referent.

The other observation takes us further afield: it is worth emphasizing that transformations account not only for the referential illusion (the connection between signifier and referent), but also for the equivalence between two signifiers: a black-and-white photo and a color photo, a photo and a drawing, a map and an aerial photograph, and so forth. The model is thus too powerful. It is not the phenomenon of the transformation in itself which turns a visual feature into either a signifier or a referent: we will show that the process of attribution belongs to a different sphere.

*Referent-Type Axis.* This relationship is characterized by *stabilization* and *integration*. The relevant features derived from the contact with the referent are grouped into paradigms that make up the type. In the other direction (from the type to the referent), an operation can be isolated which consists of a test of *conformity*, the mechanisms of which are identical to those at work in the third relationship.

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*Type-Signifier Axis.* Since a type is a grouping of paradigms, the signifier's visual stimuli can be subjected to a test of *conformity*, which reveals whether or not these sense manifestations correspond to the type—at least if we adopt a perspective which rules out the study of the genesis of the signifier. In this perspective we might have mentioned the *actualization* of the type, which is an operation consisting of selecting one element in the paradigms of the type. Actualization should not be confused with transformation: simply stated, one never draws (or paints) a type.

If we examine the relationship from the other direction, from the signifier to the type, the process at work is one of  of the type. The test of conformity brings together a (singular) referent and a (necessarily general) model. Since the model is constructed of paradigms, many different objects can fit one type (whether as signifiers or as referents).

The criteria for recognition are both quantitative and qualitative: while the number of features making recognition possible plays an undeniable part, the nature of these features matters just as important. For instance, the type 'cat' can easily be recognized from features that can be identified as belonging to the types 'whiskers' or 'triangular ears', without the two having to be simultaneously present. The problem can be summed up as follows: there is no necessary product of identification features—rather, there is a necessity to reach a minimal identification rate through the theoretically free association of elements whose types are limited in number.

The problem of the relationship between type and signifier is of crucial importance in general semiotics. Edeline (1972) showed that in general semiotics the minimal discursive unit could take on linguistic forms as a syntagm which could be predicative (the earth is round) or verb-centered (water runs). Let us consider what light this sheds on the process of analysis through which we can identify a type, and which can be reduced to the following formula (see Groupe μ 1992: ch.III, 3.3): presence of feature  $I_1 \rightarrow$  implies  $D_2, D_3, \dots \rightarrow$  test of this presence  $\rightarrow$  acceptance or rejection. Specifically, let us consider the statement 'Gold glitters', which consists of an entity and a quality, a determining type, a subject and a predicate (according to the vocabulary we use). This statement is said to be deductive because it moves from the type to its occurrence, from extension to comprehension. It has the form of a propositional function and can be dealt with according to the tables of predicates. It can also be formulated in terms of classes, which means that tables of classes can be applied to it,<sup>23</sup> here 'gold [glittering objects]'. To

move from one specific occurrence to the type—which is the receiver's situation—we have to turn the syntagm upside down. But the relationship contained in the minimum syntagm is not symmetrical (as would be one of equivalence), which is expressed in the popular saying: 'All that glitters is not gold'. The presence of the determiner 'glitter' is not enough to infer that the object is gold; at most a glittering object is 'perhaps golden'. This time the logical process is of another kind, and we see that in the present instance the result is always hypothetical, whether it concerns an induction or an abduction (the most immediate and hypothetical kind of reasoning through inference, which Peirce compared to perception—see Eco 1988: 174-77).

The point of this discussion was above all to draw attention to the perceptual origin of this minimal syntagm,<sup>24</sup> and to the gestalt model pertaining to the separation of an entity (subject) on the basis of a translocal quality (predicate). Any recognition of a type from a signifier (which can be easily verified in a natural context) is thus necessarily conjectural, by virtue of the logical status of the concepts, relationships, and processes involved in the functioning of an iconic sign.

## **Two Debatable Questions**

### *Is the Notion of Motivation Still Valid?*

One of the potentially surprising consequences of ternary structures for the iconic sign is to invalidate the concept of motivation, which was the subject of long debate (involving, among others, Peirce, Morris, Goodman, Greimas, and Eco). This notion is fraught with an aggravating ambiguity which arises from the attempt to limit it to a unitary definition. In fact, it is important to distinguish its realization on the signifier-referent axis from that on the signifier-type axis. By motivation, we often mean simultaneously a partial physical identity of the signifier with the referent (this partial identity being describable by means of transformations), and a conformity to the characteristics of the type. It is because he fails to distinguish between these two axes that Eco can affirm that the iconic sign has 'no material element in common with things': true for the second axis, but a gross oversimplification for the first.

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We can thus use two propositions to reformulate the concept of motivation as presented by our predecessors; but each, considered alone, leads to an impasse. (a) Concerning the referent, a signifier can be said to be motivated when it is susceptible to transformations which allow the structure of the referent to be restored (in conditions which we will describe). But this type of relationship is not sufficient to make these two elements into a signifier and a referent. Without a semiotic relationship, the idea of motivation loses all pertinence. (b) Concerning the type, a signifier was said to be motivated when it conformed to the type, whose recognition it made possible. But such conformity and recognition exist on the basis of an encyclopedic definition. Since it is an abstract model, a type has no physical features as such and is thus not commensurable with the signifier. One cannot, strictly speaking, represent a type. The connection between type and signifier is thus arbitrary, as suggested by Goodman.

As previously said (particularly in the *ad absurdum* reasoning with which proposition [a] ends), motivation exists only when the two conditions of transformation and conformity are simultaneously present. These two conditions are not only interdependent—they are also hierarchical: transformation depends on conformity. Indeed, to speak of motivation on the first axis, it is necessary to apply the transformations in such a way that what is to be transformed and the result of the transformation clearly conform to the same type. In this way we forestall the following simple objection: considering that any sequence of transformation can be applied to a spatial configuration, any object can be said to be motivated in relation to another (in front of a drawing of a cap, one could state ‘this is a pipe’). We must therefore emphasize (and this is a crucial point) that transformations must maintain co-typing—that is, they must allow the signifier to retain a structure in which it remains identifiable as a hypostasis of the type of which the referent is also a hypostasis.

### *When Is a Visual Fact an Icon?*

This final and important problem can be stated in more precise terms: given a series of visual stimuli, what causes a referent and a type to be associated with them, and makes them into a sign? This question is rarely asked, but it is prejudicial.

Such an association is not necessarily *a priori*. If I encounter a cat, I do not usually say to myself, ‘there goes an icon of the photograph of a cat’, as Goodman noted. However, Goodman made a rule of something which is at most a fact of lived experience. In theory, nothing in objects predisposes them to assume the role of signifier or referent. The converse proposition is also possible: a human body can be a sign (in *Body Art*, for example). Fetishism sometimes leads to this semiotic perversion (?), that the first and real object of passion becomes what most people take for the substitute (possibly iconic) for a person, which person for the fetishist would only be a pale icon of the true object of desire. Finally, an object considered by a society to be a sign, such as a painting, can be the referent of another sign....

Nothing in transformation itself creates the iconic relationship. The transformation rules we have discussed take into account the relationships between the signifiers of two icons (the aerial photo and the map, the painting and the drawing, etc.) as well as those between referent and signifier. In addition, the difference between these two kinds of relationships should not be overestimated: on the one hand the referent in question is already a visual model, produced by a coded perceptual elaboration; on the other, in any semiotic system, the signifier is not a physical reality but a theoretical model (also elaborated by a perceptual code) which takes into account physical stimuli.

The semiotic literature is full of instances in which the same empirical object is in turn endowed with the status of a referent or of a signifier: from those objects in store windows disqualified as objects as soon as they become signs, which had already attracted the attention of Abraham Moles, to those signs said by Umberto Eco to be occasional since they occasionally consist of the same substance as their possible referent, such as the empty bottle to which I point in a restaurant to indicate that I would like a full one.

Eventually, the problem of visual stimuli not necessarily being semiotic—or, more simply, the problem of the distinction between objects and signs—can only be pragmatic. To go back to an example made famous by Eco’s discussion of it: a glass of beer will be considered not as a sign, but as an object if its liquidity can actually quench my thirst, if its temperature cools my hand. By contrast, it will be regarded as a sign if the object can only be used on the condition that it is given a number of properties different from those perceived: my taste buds can perceive neither the taste nor the temperature of a photographed beer; yet the absent properties (taste, coolness) correlated in the object with the perceived properties (its

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color, for instance) can make me salivate. (In any case this correlation is only part of the definition of an object.) This explains why we can sometimes hesitate. I can be deceived by a sign; but in this case it is no longer for me the sign of an object, but the object itself.

As a general proposition we can say that certain communications have a notificative indication (in the sense given to the term by Prieto) while others do not. In many cases the indication is clear, because it is made explicit by a code. This explicitness derives from the 'frame', in the very general sense of the term. This frame provides clues for the reading: pedestals, particular places, particular modes of execution, linguistic indications. A matchbox is not the sign of another box. But if I do not know what a matchbox is and I am shown one, the shown object becomes the sign of its class, through the selection of some features (the box with the brand name 'Gauloises' is equivalent in this context to any other box, 'Belga' or 'Dunhill'). When I show an object to turn it into a sign, I thus rob it of some of its functions, and I reorganize the list of its features: the given context (which includes linguistic, social, gestural, and other rules) is the agent of the change.

In this way iconism depends on our knowledge of the rules governing the use of objects, which can turn some of these objects into signs. However, the notification is not always as explicit as in the case of the frame, as can be seen from the last example.

We must therefore generalize the explicative hypothesis. We can propose that any visual stimulus must undergo a test of semiosis, the result of which is influenced by pragmatic considerations, based in turn on the not necessarily spatial characteristics of the object. The glass of beer on the poster, which includes a number of features belonging to the object, may very well make me salivate, but some of its features indicate the impossibility of using it in the normal way one uses a glass of beer, and consequently demonstrate its semioticity. We can see how appropriate is the title given by van Lier to his recent book (1980), in which he calls man 'The Signed Animal' (*L'Animal signé*): does not our reflection show to what extent we are engaged in a relentless and compulsive quest for semiosis?

## Conclusions

To sum up, the emission of iconic signs can be defined as the production, in the visual channel, of simulacra of the referent thanks to transformations applied in

such a way that their result conforms to the model proposed by the type corresponding to the referent (co-typing). The reception of the iconic signs identifies a visual stimulus as proceeding from a referent to which it corresponds provided adequate transformations have been carried out: the visual stimulus of the sign and the referent can be said to correspond because they both conform to a type which accounts for the particular organization of their spatial features.

The iconic style results from transformations having been carried out by the producer as well as by the receiver of signs.

## Notes

1. All these definitions have their source in the concept of isomorphism, which *Gestalt* psychologists have taken a bit too far, even in their own domain. Let us make it clear that we are focusing here on the iconism which manifests itself along visual channels. But we are not unaware that there can be iconisms which are tactile, auditory (onomatopoeia, sound effects, imitative music), etc., and that these manifestations can become stabilized in certain codes (sign languages, Ameslan, etc.). Part of the following discussion is, however, applicable to all iconic signs.
2. For them, not only is the image isomorphic to the object, but the retinal image would also be (which is false—see Frisby 1979), and they go so far as to postulate a cervical reconstruction which is spatially isomorphic to the perceived object. Recent research has shown the absurdity of this postulate.
3. Volli (1972) was to show that the adjective ‘iconic’ could be taken in a *general sense* or in a more *limited sense*. In a general sense, it designates the similarity, always partial, in configuration between a sign and its referent. Thus, according to Volli, the form taken by the magnetization of a videotape is an icon of the image which is recorded, even though it is indexical. In a limited sense, ‘iconic’ would be reserved solely for those configurations which manifest themselves along visual channels; in this case, we would say that the image which can be perceived on the screen is an icon of the events represented. The opposition *limited/general* corresponds explicitly here to an opposition *visual perception/all possible channels of perception*, but the examples furnished—like those put forward by Eco—show that it also applies, within a given channel of perception, to different sorts of relation-

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ships, which may be more or less sophisticated, between configurations. We must therefore reflect on (a) the hypothesis of the applicability of the concept of iconicity to channels other than the visual, and (b) the possibility of developing a model which would allow for the diversity of the relationships between visual configurations.

4. Another distinction to be credited to Kowzan: between iconism and *mimetism*. For Kowzan, ‘the iconic character of a sign is manifested at the stage of reception and interpretation’, and its mimetic character ‘at the stage of creation and transmission’, so that ‘only signs which have been intentionally created and transmitted by a consciously producing subject, therefore only artificial signs, are capable of being mimetic’ (1988: 221). Thus the color of a newborn’s skin can be iconic—can give us information about the parent—but it is never mimetic. Let’s overlook the concept of intentionality and the artificial sign, as well as the fact that icon, so defined, can become a synonym of clue.

At the same time, let’s remember the importance of taking into account the reception and the production of signs. If we continue to speak of iconism as a single thing, we will have to construct a model which allows for both processes.

5. Which constitutes paragraph 3.6 of the *Trattato*.
6. The radicalism of Umberto Eco is shared equally, for epistemological reasons (though less well argued), by the Greimasian school of thought. This school radicalizes the autonomy of a visual semiotic in relation to the world of perception. For Floch (1982: 204), ‘the semiotic of planar languages claims to be Saussurian and integrates the principle of immanence which founds an autonomous theory of signs’. (But, as we have already said, the principle of immanence, to which we also subscribe, does not eliminate *ipso facto* the possibility of a relationship of motivation.) In the most explicit article written on the subject, Ada Dewes Botur (1985: 80) states: ‘The hypothesis of the autonomy of visual semiotics implies, by definition, *their autonomy in relation to the referent*, in relation to this object of the “real” world whose sign they are supposed to be.... A consideration which brings us back to the discussion about *iconicity* of visual semiotics and reactivates the distinction between “natural” and “artificial” semiotics which we have tried so hard to avoid.’ And reminds us—as Eco (1973) so rightly did—how much this desire

- to find visual signs which have a one-to-one correspondence to real objects (and to see in painting a description of the world) has held up research.
7. This recalls the surrealist game of 'The one in the other...'.
  8. Dewes Botur (1985). The iconoclastic disciple goes much further here than her master. The article 'Iconicity' in Greimas and Courtés's *Dictionnaire raisonné* (1979) does indeed provide a critique which Botur's study develops; however, it manages to keep a place for 'referential illusion', which is even more prominent in the article on 'Figurativisation'. Let's also remember that Hjelmslev, often quoted by the Greimasian school, distinguishes between semiotic systems and symbolic systems, the latter consisting of only one level or two levels connected by a 'conformity relationship' (Greimas and Courtés 1979: 234), a relationship which is not further elucidated. For Floch, the system of 'planar objects' is 'semi-symbolic', since there are partial correlations between the two planes as soon as the two terms of an opposition on the plane of content can be seen as homologous to two figures on the plane of expression Sa and Sb' (1982: 204). The model we will propose does without this ill-defined category ('partial correlations somehow create micro-codes'): the relationships hereby established between type and signifier are semiotic, like some of the relationships between signifier and referent; only some of the latter relationships are part of the symbolic order.
  9. A remark also made by Thürlemann (1985: 63-64). We have already underlined the necessity of taking both processes into consideration.
  10. A similar reflection—which remains unsatisfactory—started with Volli (1972). According to him, the process of iconization would include two stages. An iconic sign does not have a source of stimuli as a referent, but 'an already semiotized object'. In order to create a motivated relationship between the form of the expression and the form of the content, by means of a transformative operation, it is necessary to first socially establish the stimuli, semiotize them by discovering their pertinent aspects. The precision thereby gained, although precious, is not completely satisfying: it still allows us to imagine that 'non-semiotized' objects could exist, like 'noble savages' of the real world, alongside semiotized objects, sanctioned by culture. In fact, everything we have shown about the process of perception shows that from the moment one calls up the notion of the object, one is already in the sphere of the cultural, hence of the semiotic.
  11. To simplify matters we shall consider M and I as two-dimensional.

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12. The following considerably develops and elaborates Krampen's model (1973).
13. Provided the selected grain be smaller than the fovea brush—that is, 200 seconds in the angle. This will result in a cutting up of the image according to a discrete pattern. Lines, contours, and textures will be indirectly defined by this system, as they do not constitute ultimate components of the visual sign.
14. This reading produces in its turn a third semiotic function.
15. Let us note however that while the  $t_1$  transformation is exclusively visual, the  $t_2$  transformation is in no way visual, even though its outcome is visual.
16. Indeed, a sign is only a sign when participating in a semiotic act which institutes it as such. As Minguet noted: ‘The property of the word “gold” to be scratched by the tip of a penknife does not turn it into an image of gold, which can similarly be scratched; this property does not belong to the word as sign’ (1962: 46).
17. As can be seen, we generalize the program already outlined by J.-M. Floch: ‘How can semiotics retain the notion of the sign as something arbitrary and account for the fact that some images appear to be “true to life”?’ Denying that photography, for instance, is ‘pure analogy’ does not eliminate the necessity to elaborate a theory of the semiotic conditions of the phenomenon. It will first be stated that the ‘likeness’ is only the effect of a constructed meaning (‘referential illusion’), and does not derive from some power to re-produce. Iconicity will then be redefined as the result of a set of discursive procedures resting on the (highly relative) representation of what each culture conceives of as being reality (what is perceived as a perfect likeness at a given time in a given culture is not at all similar to the referent in other circumstances), and on the ‘realist’ ideology assumed by producers and receivers of the images (particularly by their receivers). It can thus be seen that iconization is no longer some ‘faculty’ which would belong to images, but a semiotic phenomenon to be found in other forms of discourse, such as literature (Floch 1982: 205).
18. As we have seen, the iconic signifier is theoretically if not empirically distinct from the plastic signifier, since the two types of signifiers can be made of the same material, but their respective substances are different since their forms are different.
19. This convention is a mere graphic artifice and should not be endowed with a significance it does not have, as happens in the criticism formulated by

Francesco Casetti (1972: 44): ‘Rafforzata la linea nel segno iconico, anzi resa esclusiva, la verità non può più essere data dal posto que l'entità occupa nel tutto, ma dalla realtà oggettuale di cui essa è insieme il supplente e la rappresentazione. La verità, insomma, non è più la coerenza, ma è ancora l'adeguazione.’

20. In a diachronic approach one would expect the relationship between referent and type to come first, since the type results from the referent. Or, to put things more accurately, the repeated experience of stimuli (which are regarded as coming from a referent once this status has been given to the source of the stimuli by semiosis) yields a stable form as an elaborated type. Consequently, a type has a historical and anthropological status and is stable only in that it offers a model: it is not some sort of Platonic Idea. Moreover, it is impossible to consider this relationship as one-directional: what happens is a dialectical relationship between the type (whether elaborated or being elaborated) and experiences of the referent. One experience of a referent can obviously lead to the elaboration of a type, but such such a type can claim no better status than that of a shaky hypothesis.
21. Hence the definition of iconicity (which in another context is largely open to criticism) as determined by the number of common features. If the similar part is important and the unshared part limited, the sign can be read as a *trompe-l'oeil*, and indeed the viewer cannot distinguish the sign from the object: the sign is ‘taken for’ the object. Conversely, as the shared features tend to diminish, the sign becomes less and less iconic and tends to become an *arbitrary sign* (the *label*, for instance, a file used in heraldry as a mark of cadency, is barely recognizable as the representation of a piece of cloth, *lambeau*). According to Sonesson (1989), the ‘ontological’ value of an image is directly related to the number of features it displays.
22. We do not use the word ‘transformation’ in its linguistic sense (a field in which the word refers to a dynamic connection between base-generated deep structures and surface structures).
23. According to Blanché (1957: § 47), ‘Belonging to a class can be assimilated to a predicative function.... Tables of classes duplicate tables of predicates.... A (monadic) predicate has a comprehension of a predicative function, it is its meaning.’
24. Note that a syntagm has a linear dimension, which gives it an orthogonal position in relation to an image. But here the syntagm corresponds to the

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operations carried out by the producer of the images—who only works from types—as well as those carried out by the receiver.

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**Groupe μ** (Center for Poetic Studies, University of Liège) has, for more than twenty years, undertaken an extensive body of interdisciplinary work in rhetoric, and in linguistic or visual communication theory. Apart from the authors of the

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present article—Francis Edeline, Jean-Marie Klinkenberg, and Philippe Minguet—the group has counted as members Jacques Dubois, Francis Pire, and Hadelin Trinon. Beyond their personal research in biochemistry, cultural sociology, aesthetics, or semiotics, the authors have published collectively *Rhétorique générale* (1970, since translated into a dozen foreign languages), *Rhétorique de la poésie* (1977), *Rhétoriques, sémiotiques* (1979), and *Traité du signe visuel* (1992), as well as more than fifty papers in such journals as *Communications*, *Poétique*, *Versus*, *Cahiers Internationaux de Symbolisme*, *ERA*, *Le Français Moderne*, *Texte*, *Documents de Travail d'Urbino*, etc. or in collections of papers like *Mélanges Greimas*, etc.

## **Visual Iconicity in Literature; or, What is *Werther*?**

Göran Rossholm

The subject of the present essay is double: on the one hand, iconicity—in particular visual iconicity—in literature; and on the other, a general concept of absolute iconicity. The investigation starts with an unorthodox version of the concept of iconicity—compositionality and indirect reference—which is then tested on some linguistic iconic candidates, such as chronological rendering, quotation, and parallelism. (Since the ideas of compositionality and indirect reference are more fully accounted for elsewhere [Rossholm forthcoming], I give only a brief sketch in the present article.) So far, the survey is restricted to iconic *representation*. The rest of the essay is devoted to another kind of iconicity: something pretends to be something, takes the place of something, has the appearance of something. The sole literary example is Goethe's novel *The Sorrows of Young Werther*. From the literary point of view the article narrows toward the end, to the semiotic analysis of a single novel (or one novel genre). On the other hand, the investigation also moves toward a wider perspective, where the relation between this novel and kindred non-literary symbols is discussed, and where a general notion of absolute iconicity is presented.

### **Iconicity**

Lessing noticed that works of pictorial art are organized by the spatial principle *nebeneinander* and that literature follows the temporal principle *nacheinander*. Furthermore, he concluded that what is represented should behave likewise: pictures should depict things *nebeneinander* and literature should render events occurring *nacheinander*.

This is, of course, wrong. But let us suspend our disbelief and dig out the theoretical foundation of Lessing's thought—and rebuild it in a more acceptable way.

Lessing (1) dissects the symbol, (2) presupposes a matching between the resultant parts of the symbol and parts of the denotatum, and (3) claims that a certain

relation (*nach-* or *nebeneinander*) must hold between the established parts of the symbol and between the corresponding parts of the symbolized.

This view on art and literature is truly iconic, and becomes still more so if we change (3) from the normative to the declarative. It approaches Peirce's iconic category the diagram, and it fits well into classical remarks on the iconicity of literature (such as in Jakobson 1970). However, before elaborating these ideas, let us shift theoretical ground.

## Compositionality

Nelson Goodman's theory of symbols appears at first glance to be the least commendable in this context. His well-known and notorious iconoclasm with regard to pictures leaves no room, it seems, for a general concept of iconicity also applicable to literature. However, I have elsewhere argued (Rossholm forthcoming) that a concept of iconicity, with a certain Lessingian air, is not only consistent with Goodman's theory in general and with his criticism of the concept of similarity (or resemblance) in particular; Goodman in fact prepares the ground for one feature of iconicity with his concept of 'indirect (or mediated) reference' (Goodman 1984: 61-71), to which I will soon return.

But first a reconsideration on the idea of segmentation in the Lessingian line of thought. The picture is composed of parts which are *nebeneinander*, superimposing the same arrangement between the parts of the represented object. If we disregard the relation projected from symbol to symbolized (or, if you prefer, the other way round) and only demand that any part of the symbol represent some part of the symbolized, we have a concept—I suggest we call it 'compositionality'—worth more careful study. A picture of a man can be dissected into parts representing his nose, his cheek, and so on; and the part representing his nose can be dissected into parts representing parts of his nose and so on. This does not imply that the portrait is naturalistic in style; the procedure can be applied to a cubist portrait as well. Neither does it imply that the portrait is more like the portrayed man than, let us say, his brother, or another portrait.

However, compositionality would be too strong a condition for representative pictures if we interpret the 'so ons' in the previous paragraph as continuing *ad infinitum*. It would have the consequence that every bit of a representative picture represents something—which simply is not true. But we can at least imagine

pictures—Absolute Representative Pictures—which are compositional in this sense, thus giving us an idea of an extreme on the scale of compositionality—let us say Absolute Compositionality.

Even if the concept of absolute compositionality has no application to pictures beneath the ideational sphere, it can easily be relativized to fit other symbol systems. A musical score is compositional with respect to the note signs. The score as a whole denotes the whole sounding musical piece, and parts of the score down to the limit of note signs denote parts of that piece. And, with the most utilized literary example in iconological contexts, the referentiality of Cæsar's words 'Veni, Vidi, Vici' is compositional down to the limit of words, the English translation down to the limit of sentences, and the quotation of the same words, in Latin or English, down to the limit of letters.

It should be emphasized that compositionality is a relation property, in semiotic contexts relevant for reference relations—a specific kind of reference may be compositional, absolutely or relatively, or not.

### **Indirect Reference**

The concept of compositionality in no way conflicts with Goodman's ideas: neither with his view on representation as a kind of denotation and pictures as constituting syntactically and semantically dense symbol systems, nor with his criticism of the notion of similarity (or resemblance—see Goodman 1976, 1972). The theoretical foundation for the second feature of Lessingian iconicity—point (3) above—is already given by Goodman with his concept 'indirect reference'. The fundamental relations of reference in Goodman's theory are denotation and exemplification. The word 'red' denotes red things, and something red may exemplify the word 'red'. So exemplification runs in the opposite direction from denotation, and, as opposed to direct denotation, it is selective: a tailor's swatch exemplifies some color label (word or other denotative symbol), but not every label which denotes the swatch—for instance, it does not exemplify 'having the weight of a quarter of an ounce'. Indirect reference, then, is reference by several connected links of exemplification or denotation or both. If the tailor's swatch is interpreted as referring to textiles in stock, it first exemplifies the label 'red', which then in turn denotes selectively a bolt of red fabric. Various phenomena, such as allusion, metaphor, narrative layers in a story, rite, and variation (in aesthetic contexts) have

been treated as indirect reference by Goodman and his followers (Goodman 1984, 1988; Elgin 1983; Scheffler 1981).

Indirect reference in the example above—from swatch to textile via color label—is certainly iconic in a rather unsophisticated way: a common feature, hence a similarity, links symbol to symbolized. Our three Cæsarian examples above can be treated in the same way if we allow for relation terms, and not only property terms (like ‘red’), as mediating labels. The iconicity of the three cases can thus be illustrated as in Figure 1.

In all three cases we have the characteristics of iconic representation (as I use the term): direct denotation, indirect reference, compositionality, and cooperation—the direct and indirect reference dissect the symbolized object in the same way, and the resultant parts relate compositionally to each other.

### **Iconicity in Language**

The most frequently cited example of iconism in language is temporal matching. Other common iconic candidates are conditional constructions, various forms of parallelisms, the degrees of the adjective, and phonetic features correlated to semantic categories.

Haiman (1985) characterizes the iconic reference of conditionals: ‘the protasis precedes the apodosis as the given precedes the new’. The same structure as the one for textual/temporal precedence applies. Other kinds of precedence, such as when the order of value is manifested in the order of an enumeration, fits in too. The structures for the three other linguistic phenomena mentioned can be given as shown in Figure 2.

The referential structure of parallelism is an instance of a much more general iconism: when two (or more) juxtaposed strings of words (a) refer to similar denotata, and (b) exhibit some kind of similarity; and (c) when these latter similarities *as similarities* point to former ones *as similarities*. Haiman gives several kinds of examples under the heading ‘symmetry’ (1985). There are also proposals in the semiotic literature of types of morphological iconism other than the degrees of the adjective: Jakobson, for instance, suggests that the extra morpheme of the plural ‘tends to echo the meaning of a numeral increment’ (1970). If we disregard the distinctions of linguistic level (phonetics, morphology, syntax), the third structure differs from the first only in that the two symbols stand in no textual relation to

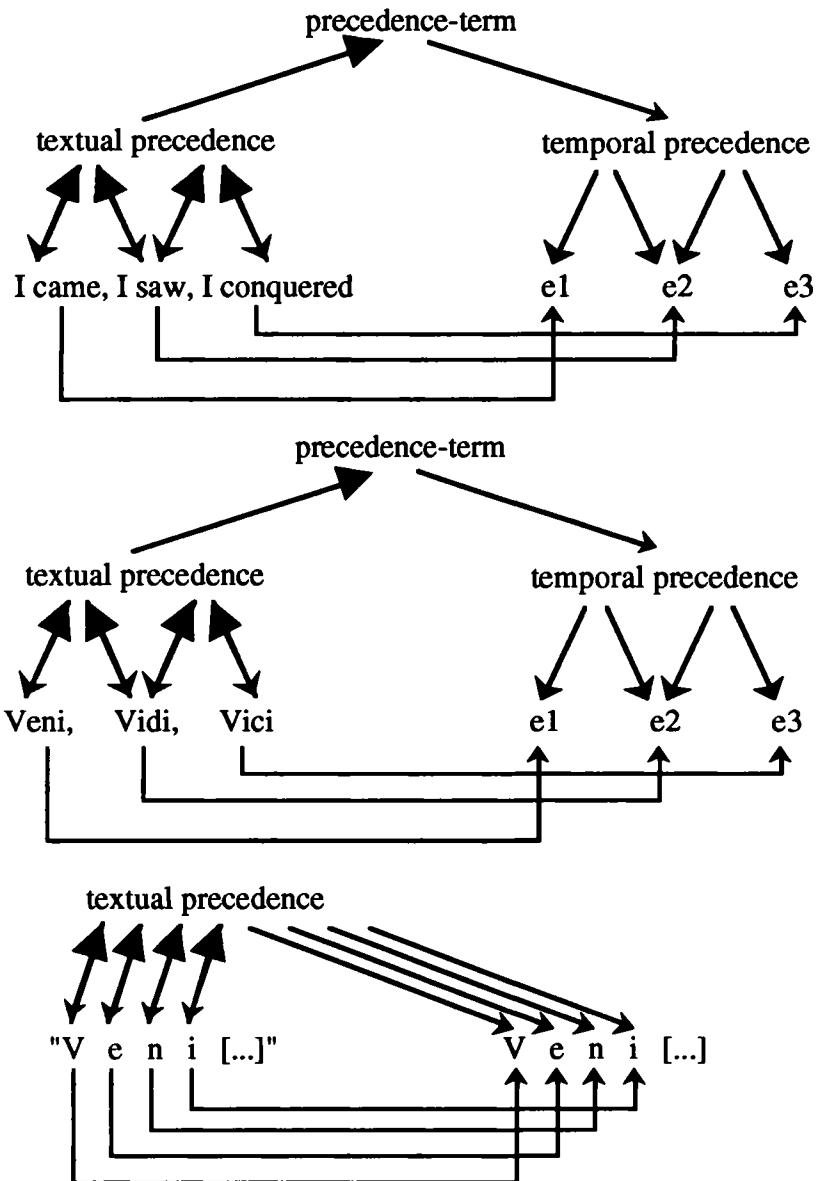


Figure 1. Iconicity relations in 'Veni, Vidi, Vici'—e1, e2 and e3 are the three events of Cæsar's coming, seeing and conquering; solid heads on the arrows indicate exemplification, open heads indicate denotation.

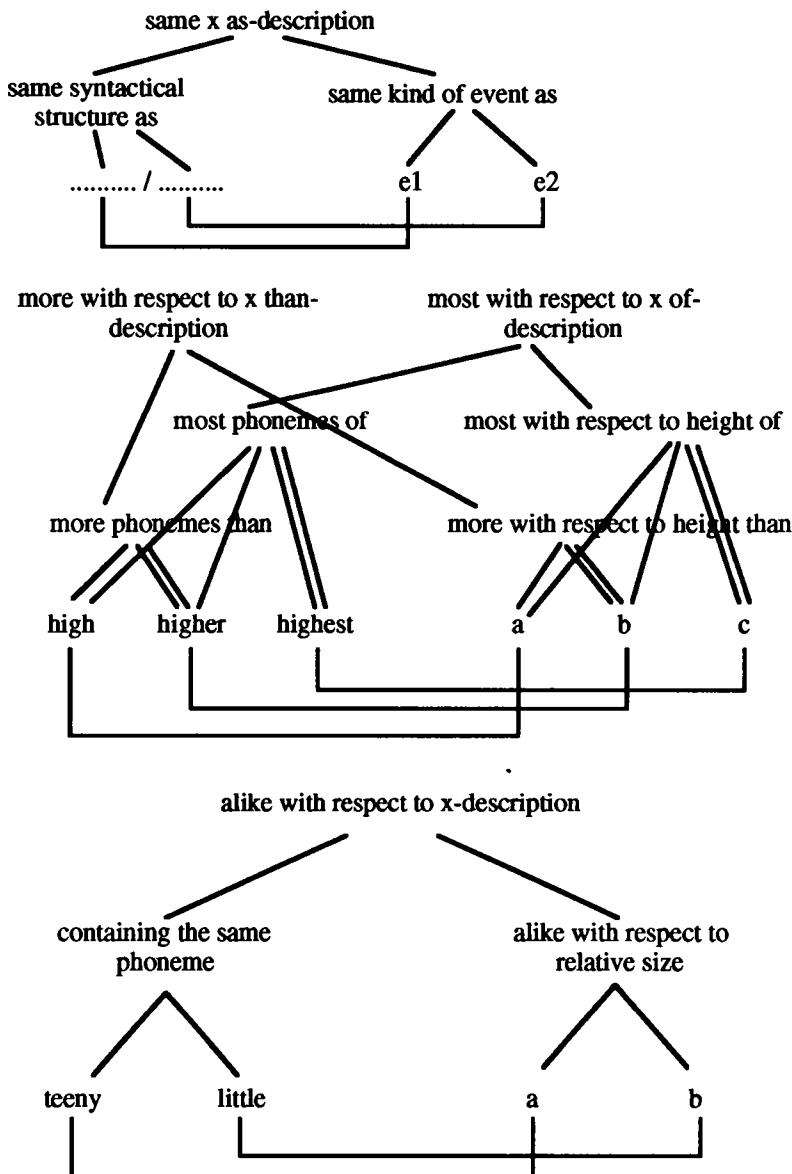


Figure 2. Denotation and exemplification run as in Figure 1. Double lines indicate first place in an ordered n-tuple.

each other. If, keeping to the example, we complement the observations on correlations between *ee*'s and smallness in English by a piece of speculative soundsymbolism, decreeing that the *ee*'s express smallness (either as a consequence of the indirect reference or as its source), we get an instance of Goodman's referential relation 'expression': the ee-sound exemplifies the term 'small', taken in a figurative sense.

However, these remarks are digressive from the theme of the article—visual iconicity in literature. Obviously, any of the structures above could harbor visible denotata—and none must. So none of them are, in the very general forms above, examples of visual iconicity. But are they iconic in the full-blown sense—that is, are they compositional? For the last two illustrations the question seems odd. The concept of compositionality presupposes that the signs may be taken as one composite sign, and that the denotata are individuals making up wholes or composed of parts (or both). But what is the composite sign 'high higher'? And what is its denotatum, and where are the parts? To make sense of the question, we must first turn these bits of *langue* into pieces of discourse. We can imagine someone pointing to three men, writing 'High, higher, highest', and then turning to three particularly short men and designating them with three terms of smallness, each with an ee-vowel. And if the three latter men were not too small to be seen, we would in effect have a case of visual iconicity. The illustration for parallelism above is interpretable in the same way: the denotata can be assumed to be two visible events, and the denotatum of the whole construction the whole consisting of these two events. And, of course, it could be the converse: the denotata could be invisible, the parallelism could give two aspects on one and the same event—it could be just one of the men who is high, and thus both higher (than the others) and highest (of them all); and finally, one and the same man is often both little and teeny.

### **Visual Iconic Representation**

The examples of iconicity above could (with the exception of those regulated by the precedence-relation) be dismissed as non-categorical. However, what is and is not a semiotic category is grounded in considerations of the semiotic fabric as a whole, even when that fabric is not yet explicitly formulated. In the present context the foundational terms are denotation, indirect reference (and therefore

exemplification), and compositionality on some level; and these can be used (at least provisionally) to delineate categories of iconic representation. Whatever fits into the places of the words *Veni*, *Vidi*, and *Vici*—that is, whatever will (1) exemplify some precedence-relation which will either lead (via a mediating higher label) to the referents, ordered by some other precedence-relation (as in the first two illustrations above), or directly denote the referents (as in the third one); and (2) denote in a direct and orderly way the three referents (or whatever) which, as one whole, are directly denoted by the symbols as one composite symbol, will be an instance of iconic representation on some level, depending on the level of compositionality. Visuality is not integrated in the first two structures: in some instances the referents will be visual, in some not. In the third case, however, visuality is inscribed: whatever is ordered by the relation ‘textual ordering’ is something to look at (or, more precisely, to read).

The paradigmatic case of this kind of iconism is the quotation. Its role in literature, especially in literary narratives, is extensive and pertinent, and also problematic. Quotation not only manifests itself as an element in stories (for example, in dialogue), but is an essential organizing feature of certain narrative genres and of narrative structures. The first-person novel, the letter novel, the Chinese-box novel, and other kinds of narrative are organized by segments and layers of quotation. Questions concerning the quotational status of the process of inner life, and the relation between quotation and linguistic forms close to quotation, are relevant for the analysis of various narrative phenomena, such as focalization and representations of inner life in fiction.

Still, as the sole result of an investigation of visual iconicity in literature, this might seem a bit meager and trite.

There is, however, another kind of visual iconicity in some written narratives which, to be sure, narrows the literary field, but opens up perspectives on more general topics, such as the place and character of the novel in the world of signs, the possibility of a concept of nonrepresentational iconism, and which, finally, allows us to see the impossible, the Absolute Icon.

### **What is *Werther*?**

Recently several literary theorists have suggested that novels generally represent other species of verbal products—in particular assertive speech acts. McCormick

summarizes what he calls ‘the Standard View of Fictionality’ with the formulation ‘What makes a text fictional is its representation of the performance of illocutionary acts’ (1988: 40). Barbara Herrnstein Smith observes that a line in a dramatic work represents an utterance—which is obviously true—and declares that a novel, such as Tolstoi’s *The Death of Ivan Ilyich*, in the same sense represents a fictional biography—which is not true (1978: 24-30). A text running ‘What follows here is the true biography of Ivan Ilyich: “...” would *contain* a representation of a biography. But that is not what Tolstoi has written.

However, there is a certain kind of fictional literature, alluded to in the previous paragraph, which seems akin to the representational picture, and to which our (not Tolstoi’s) invented Ivan Ilyich story belongs: namely, novels and short stories which pretend to be, which simulate, something they are not. I choose Goethe’s novel *The Sorrows of Young Werther* as an example.

The individual letters in the book represent Werther’s letters, but what about the novel as a whole? It is presented as a copy of a published collection of authentic letters, framed by a short introduction and a true closing narration. The similarity between the text in our hand and the imaginary object goes further than the ordinary quotation: not only does the choice of letters and punctuation match; the choice of typeface, the spacing, and so on also corresponds to the nonexistent copy of the authentic collection of letters. But the novel does not represent the imaginary book. One reason for rejecting the representational thesis is this.

We might, in front of fictive representations, such as depictions of centaurs or separate Werther letters, make the counterfactual assumption that the fictive referent exists. The symbols (the picture and the string of words) continue to represent—they are still a centaur picture and a Werther letter. (They also denote.) But if we imagine that the total fiction of Goethe’s novel is true—that is, that the book we are reading is a copy of a published collection of authentic letters—then the object in our hand ceases to represent what it represents, according to the thesis. It no longer represents the authentic collection; it *is* that authentic collection, as much as Churchill’s autobiography *is*, and certainly not represents, an autobiography.

The mistake is a confusion of levels. A literary work which is a quotation denotes what is quoted—the quoted text is one level below the work. But the label ‘published collection of authentic letters’ or the label ‘autobiography’ is not denoted by the works in question; on the contrary, these labels denote the works. The work is one level below the label.

In the Churchill case we might go one step further: Churchill's text is not only denoted by 'autobiography'; it exemplifies that label. Since generic classifications are so vital to our reading of a text, it is warranted to incorporate genre into the totality of what the work means. But the correct genre label for *Werther* is not 'collection of authentic letters', but 'letter novel'—*Werther* exemplifies 'letter novel'. And this is not just another label—it differs from the fictive; in fact, it is incompatible with it.

Fictive genre labels cannot be handled in a manner analogous to fictive representation. A picture of a centaur is simply a centaur picture, denoting nothing. But since exemplification implies denotation—if *a* exemplifies *b*, then *b* denotes *a*—we cannot talk about fictive exemplification. Still, the relation between Goethe's novel and the label 'collection of authentic letters' seems to be closer to exemplification than to representation. In the opening we can read: 'I have diligently collected everything I have been able to discover concerning the story of the poor Werther, and here I present it to you in the knowledge that you should be grateful for it.' These pseudo-editorial words can be paraphrased: 'This book exemplifies "collection of authentic letters".' As a first step in our effort to answer the question 'What is *Werther*?' I will, very provisionally, baptise the relation between work and fictive genre label *Schein* exemplification. If for no other reason, the linguistic monstrosity of the term calls for its elimination.

### ***Schein* Exemplification**

There are, of course, many kinds of novels other than 'letter novels' which exhibit the characteristics of *Schein* exemplification: fictive diaries, travel accounts, and so on. And not every work which consists of letter quotations is a *Schein* exemplification. Cortázar's short story *Letter to a Young Lady in Paris*—in its entirety a quotation of a letter—only represents a letter, but contains no explicit or implicit reference to itself as a publication of that letter.

I will, however, at this point leave literature for a while, to chase other kinds of *Schein* exemplifying symbols.

In an analysis by Eco (1990), a forgery is an object between two agents—a Claimant, who asserts that the object is authentic, and a Judge, who reveals it as a fake. Eco furthermore makes a distinction between forgeries which are presented as identical to an existing work (such as *Mona Lisa*) and forgeries which are presented

as hitherto unknown but genuine works (such as a hitherto unknown Leonardo). The latter he calls forgeries *ex nihilo*.

Some similarities between *Werther* and forgeries *ex nihilo* are obvious, especially in the perspective which Eco adopts—namely, the forgery as revealed. The reader knows, as does the Judge, that the work is not what it appears to be, and is presented not as something already known, but as a work out of nowhere. But what about the Claimant? In the forgery case, he is real, exterior to the symbol (that is, the forgery), claiming that the symbol is genuine. In *Werther* we have an interior Claimant stating that the text is authentic in the words already quoted: ‘I have diligently collected everything I have been able to discover concerning the story of the poor Werther, and here I present it to you in the knowledge that you should be grateful for it.’ ‘Here’ is the text in front of us; the novel, or part of it, presents itself as something it appears to be but is not.

Let us leave this case and turn to another. The frequent use of ‘present’ in the previous paragraphs may motivate the introduction of a deceitful self-presentation: a man who introduces himself to another as someone he is not, and in fact as someone who does not exist—a fake self presentation *ex nihilo*. An introduction is a reference to somebody as somebody: ‘this is my mother’. The symbols used are most often indexical—a nod, a pointing gesture, a deictic phrase—and a naming or description. The indexical reference is denoting; I denote someone as someone. Self-introduction is similar: I refer—by denotation—to myself as someone, and insofar as my act is correct I thereby exemplify the descriptive label (or the name) used. Someone who correctly introduces himself as the President of the United States denotes himself as President of the United States, and thereby exemplifies the label ‘President of the United States’. An impostor *ex nihilo* may introduce himself as the present King of France, and hence denote himself as ‘King of France’ but exemplifying nothing—only *Schein* exemplifying ‘King of France’.

This example has moved us closer to the *Werther* case. The Claimant is in both cases part of the symbol—a time slice of the introducer himself can be conceived as symbol—and the means used for self-reference are in both cases indexical.

Several points of comparison are neglected in this sketch; for instance, *Werther* is not intended as a fake, contrary to the forgery; the false self-presentation is, as given above, indefinite in this respect. But instead of analyzing these examples further, I suggest that we continue to wander among things which are not what they seem to be—such as dummies and toys.

The decoy is a ducklike object, made of wood or plastic—but to the duck it is a duck. The two conflicting labels ‘decoy’ and ‘duck’ (or ‘letter novel’ and ‘collection of authentic letters’, or ‘forgery’ and ‘genuine Leonardo’) correspond to two irreconcilable perceptions of two distinct creatures, one featherless and one not. This is, however, not essential for dummies: the ugly paper soldier, designed to be treated as an enemy in war, is known by the shooting soldier to be a paper board, *Schein* exemplifying ‘enemy’.

In the next room in our Hall of Fakes, we have toys, and the catalogue text contains a meditation signed E.H. Gombrich. He declares that the idea ‘that all images should be “read” as referring to some imaginary or actual reality’ is a prejudice, and takes the hobby horse as an illustration of an alternative view. Many images are related to their correlates by being substitutes rather than representations, and the function shared between substitute and substituted justifies our classifying them as both belonging to the same class instead of relegating the horse and the hobby horse to the two distinct levels of signification: ‘the hobby horse is a man made horse’. Gombrich elucidates these ideas:

The first hobby horse (to use eighteenth-century language) was probably no image at all. Just a stick which qualified as a horse because one could ride on it. The *tertium comparationis*, the common factor, was function rather than form. Or, more precisely, that formal aspect which fulfilled the minimum requirement for the performance of the function—for any ‘ridable’ object could serve as a horse. If that is true we may be enabled to cross a boundary which is usually regarded as closed and sealed. For in this sense ‘substitutes’ reach deep into biological functions that are common to man and animal. The cat runs after the ball as if it were a mouse. The baby sucks its thumb as if it were the breast. (Gombrich 1963)

Gombrich focuses on a wider range of phenomena than toys—namely, substitutes in general, with implications for the genesis of figurative art: ‘We may sum up this Just So Story by saying that substitution may precede portrayal, and creation communication.’

The relations between the terms ‘representation’ and ‘substitution’ in Gombrich’s article are somewhat vague: ‘in a sense’ the substitute is a representation; more narrowly, in ‘the more precise meaning which the word has acquired in the figurative arts’, the substitution is not a representation. It is also unclear in

what sense the hobby horse is a horse. The latter point is the main target of Israel Scheffler's criticism (1992) of Gombrich's article. In short, Scheffler shows that Gombrich's thesis loses credibility if 'horse' is interpreted literally, and weight if it is taken metaphorically. Scheffler's own account runs as follows: the hobby horse is, like the word 'horse' or a picture of a horse, a symbol which stands for horses. But we may call the hobby horse 'horse' mention-selectively: that is, we are using a figure of speech where we talk about labels in terms of their denotata—instead of saying 'the actor playing Polonius was brilliant', we say 'Polonius was brilliant'. Scheffler then traces the roots of mention-selection in the child's linguistic development. In the first phase the child makes no distinction between symbols and referents—the term 'horse' applies to horses as well as 'horse' or horse-pictures—or hobby horses. Under the pressure of adult semantics, the child enters the second phase: the hobby horse is separated from the class of living horses, but only sideways. The hobby horse belongs to another *kind* of horses—namely, pretend horses. In the final, adult phase, horse and horse symbol belong to different semantic strata, but as reminiscence of an ancient semantics the latter may still be mention-selectively referred to as a horse.

I find Scheffler's criticism accurate, and his genetic account of our (and Gombrich's) inclination to speak mention-selectively clarifying. Still, I want for a while to dwell on the intriguing territory Gombrich points out: substitute symbols.

### **Substitution and Indexicality**

If we look back upon the previous cases of *Schein* exemplification, we can notice that two of them fall within the domain of substitutes: the fake Leonardo can, if well done, take the place of a real Leonardo to an art collector; and the decoy takes the place of a duck comrade to the duck. Whether the false self-introducer substitutes or not depends on the context; I leave it to the reader to develop him further in such a direction. But it is the context which determines whether or not a symbol is a substitute. A substitute is usually placed in a surrounding to which it is tied with significant links: the false Leonardo may appear at Sotheby's, and there play the role of what it substitutes for; the decoy swims in the water, as that which it substitutes for; the hobby horse is ridden by the boy, as the horse for

which it is a substitute; and the paper soldier is shot at with bullets by a soldier, as would be the enemy for which it substitutes.

If we conclude with Scheffler, against Gombrich, that there is no rivalry between substitution and representation, what then is the relation between these two phenomena? None. A substitution may represent what it substitutes, it may represent something else (a forged Mona Lisa does not represent the real one but a woman), or it may represent nothing (you may use a thin coin as a substitute for a screwdriver). However, aside from these trivialities concerning substitution and symbolization, I think there is one detail about the way substitutions symbolize which is worth attention.

The symbolizing substitute's dependence on use makes its reference often appear less stable than, for example, the reference of Mona Lisa.

Let the hobby horse simply be a broomstick, nothing else. It then seems reasonable to delimit its representative life to the moments when it is used to ride on. When it is put away in the corner of the room (or used to sweep the floor), it represents nothing. And the referential structure is the same as for other representations, with the *tertium comparationis* as mediating term: the ridden stick exemplifies 'is ridden', which selectively denotes horses, which are also directly denoted by the stick. However, when we turn to the decoys the instability of reference becomes more subtle.

We visit a shop for hunting equipment. On a shelf we find ten decoys. We can't see any difference between them, and classify them as ten synonymous duck-representations. We choose one, put it in the water, and wait for ducks. Is it still synonymous with its nine colleagues on the shelf? And if it represents a duck, is it a real and particular duck, a duck in general, or a fictional duck? A reasonable interpretation seems to be that the decoy represents what it substitutes for: a nonexistent duck swimming in the water at the same spot and time as the decoy. In other words, our decoy is no longer synonymous with the nine left in the shop, nor does it mean the same as it did some hours ago.

If we compare this symbol with some other fictional ones, we can observe a peculiarity characteristic of many substitute symbols. A painting of a unicorn is a unicorn-label denoting nothing. But we can imagine that the picture denotes, and that it does so according to the formulation of the label—that is, it denotes a unicorn. The same thought experiment applied to the decoy results in a paradox: if the decoy denotes according to the label 'duck-at-spot-s-and-time-t', there is no decoy there to denote anything; its place and time is occupied by the denotatum.

The same puzzlement arises for nonfictional substitutional symbols: when Sherlock Holmes (whom we will assume for the moment to exist) makes a dummy of himself to cheat his enemy, he is producing a Sherlock-Holmes-at-spot-s-and-time-t-label, where s is the place actually occupied by the symbol.

This phenomenon is close to verbal deixis—the decoy means something like Duck Here. The hobby horse and the paper soldier can be interpreted in same way: when we change the surroundings, the symbol aquires a new reference with respect to Here and Now. There is, however, a difference: the deictic utterance is not annihilated by its denotatum; there is room for both.

Does this mean that we have a class of denotative symbols which are not only vacuous, but necessarily so, for if they were not vacuous they would not be? Or does it mean that they do not refer in the way I have suggested—that the decoy is a duck representation but not a duck-at-the-decoy's-place representation? I believe linguistic intuitions about words such as 'representation' are insufficient to decide the matter. A bit of conceptual violence is needed, and I suggest the following doctrine of denotative signs: the proposition that x is a y-label (y-description, y-representation, y-diagram, y-picture, and so on) is, if the specification of y is non-contradictory, always consistent with the proposition that x denotes y—that is, *that there is something* that is identical to x and *that there is something* that is identical to y, and that the first denotes the second. (The formulation does not rule out impossible descriptions [such as 'round square'] or pictures [such as Escher's or Oscar Reuterswärd's].) Adopting this principle, I will classify the decoy as a duck representation, the paper soldier as a soldier representation—and stop there. The rest is substitution, and *Schein* exemplification.

The forgery and the false self-introducer are different: the symbol—that is, the painting or the man—is referred to as being a Leonardo or as being Leonardo: in the first case by another symbol (the Claimant), and in the second by the symbol itself. The self-reference in the second case does not threaten the symbol's status as symbol.

### **What Werther Is**

Like the decoy, the novel has an appearance of something it is not—a printed copy of a collection of authentic letters. Like the decoy, it plays the role of being that thing, here and now. Like the forgery *ex nihilo*, it represents the same things the

imagined object represents—Werther's handwritten letters. Like the false self-introducer, it refers to itself (in the opening lines, quoted above) as that thing which it is not. And as with the paper soldier and the hobby horse, no deception is intended.

An account of these features in terms of indirect reference will be strongly reductive, but it will do for one major point of this article—the demonstration of the iconicity in *Werther*. One of two alternative structures applies to the decoy, the paper soldier, the forgery, the false self-introducer, and Goethe's novel: (Figure 3).

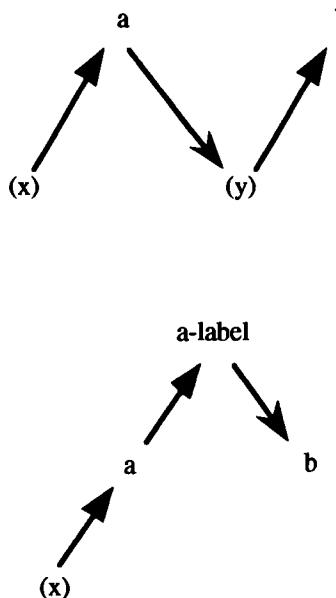


Figure 3. Structures of indirect reference.

In the first structure  $x$  is the decoy,  $a$  are specifications of features common to decoy and duck,  $y$  is a duck, and  $b$  is the label 'duck'; the decoy refers indirectly to the label 'duck'. Besides, since the decoy represents a duck we have a direct denotational relation from  $x$  to  $y$ , which is omitted since it is not obligatory for *Schein* exemplification. However, if we take the decoy to represent and *Schein* exemplify a fictional duck, the second structure applies ( $x$ ,  $y$ ,  $a$ , and  $b$  are the same as before), and instead of the direct denotation from  $x$  to  $y$ , the decoy will exemplify 'duck-label'. The forgery—read as forgery—fits the first structure if an existing work is

copied, and the second if it is *ex nihilo*. It also exemplifies a label in conflict with *b*: namely, *b*-forgery. Concerning the false self-introducer, the label *a* can be a description of his act of presentation, a description which (we assume) also denotes the person as whom our impostor introduces himself (that is, *y*), and *b* is the designating phrase used in the introduction—for example, the name of *y*. (If the presentation is *ex nihilo* the second structure applies.) But there is in this case one more referential characteristic: the person refers to himself as *b*.

Since the printed authentic collection of *Werther's letters* is fictional, the second structure applies to the novel. And like the false self-introducer, the text (or a part of it) refers to itself as something: namely, a printed authentic collection of letters. Finally, like the forgery, the text exemplifies a label contradictory to *b*: namely, 'letter novel'. So, one answer to our question of 'what *Werther* is' runs as shown in Figure 4.

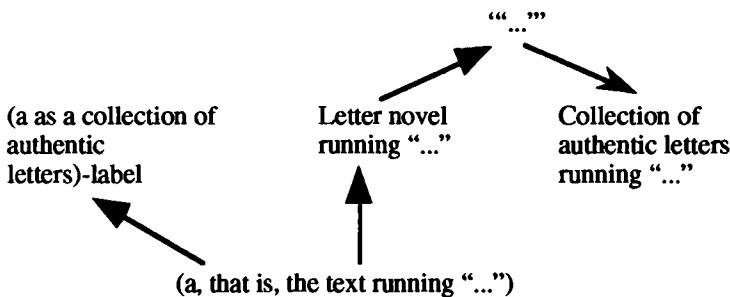


Figure 4. Structure of *Werther*.

However, this structure does not imply absolute iconicity. The relations between the symbolizing and the symbolized parts must be settled in more detail.

Any part of the novel *Werther*—the book in my hand—refers indirectly to a part of the imagined collection of authentic letters; or better (since that collection does not exist), any part refers indirectly to a part-of-the-collection-of-authentic-letters-label. In this sense the compositionality is absolute as opposed to the compositionality of pictures with respect to what they depict, scores with respect to the music prescribed, or, in short, to any representative relation.

However, such a formulation only guarantees some similarity, given by the mediating links of the indirect reference; it does not ensure that every part of the actual book has the exact appearance of the imagined one. So, we have to add:

any appearance-label applying to our book or any part of it also applies to the imagined book; or better (since the latter does not exist), any appearance-label applying to my book refers indirectly via the label ‘collection of the authentic letters by Werther’-description to the label ‘collection of authentic letters by Werther’.

Since it fulfills these two conditions, Goethe’s novel is an absolute icon. It should be noted that the two formulations are logically independent. Only perceptible parts can instantiate an appearance-label, so the second formulation delimits compositionality and admits all appearance-labels. The first formulation is unrestricted with regard to compositionality, but it does not imply any complete similarity of appearance.

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## **On Pictorality: The Impact of the Perceptual Model in the Development of Pictorial Semiotics**

Göran Sonesson

Ever since Lessing and other Enlightenment semioticians, pictures have been taken, as a matter of course, to be more ‘strongly material’ than literature, the more transparent, or ‘subtle’, expression plane of which is made up of ‘articulate tones’—i.e., linguistic sounds, or phonemes (cf. Wellbery 1984; Sonesson 1988: 105ff). Yet there has long existed a discipline focused on the material character of language, that part by means of which language is given to perception (phonetics), and even a sub-field consecrated to the linguistic expression plane in its function as a carrier of meaning (phonology or phonemics), whereas we have hardly begun to consider seriously the material, and therefore perceptual, nature of pictorial meaning, let alone the perceptual organization specifically characterizing the pictorial expression plane. Even the Prague school model, which is the only one in ‘classical semiotics’ to insist on the peculiar perceptual nature of the process by which artifacts are turned into signs, was principally conceived to account for literary and other verbal meanings, rather than pictures.

The general study of pictures, or pictorial semiotics, may have to start out from something equivalent to phonetics, although it will only attain maturity, as linguistics did, when it is able to create a domain parallel to phonology. In the early 1960s, the art historian E.H. Gombrich (1960: 7) declared the creation of a ‘linguistics of the visual image’, separate from art history, to be an urgent task; yet as of the late 1970s, the psychologist J.J. Gibson (1978: 228) was still complaining over the fact that nothing even approximating a ‘science of depiction’, comparable to the science of language, had been developed. In the meantime, and since then, Gibson and his disciples and colleagues, such as Hochberg, Kennedy, and Hagen, have been making important contributions toward a psychosemiotics of picture perception. But psycholinguistics is not the whole of linguistics, nor is there any reason for the semiotics of picturehood to be coextensive with the psychology of picture perception. Yet this should not impede pictorial semiotics from being informed by the study of perception, as was phonology in actual fact, not only in its Praguean variety.

If we take pictorial semiotics to be involved with the study of pictorial signs *per se*, of some general property, more peculiar to pictures than iconicity, which may be termed ‘pictorality’, or picturehood, and if we suppose it to apply empirical methods to this study, then it certainly is a novel endeavor—far more so than linguistics and literary theory; more, in fact, than film semiotics and the semiotics of architecture. Indeed, the only other domain properly devoted to pictures, art history, has always been, and mostly continues to be, fascinated by the singularity of the individual work of art. To the extent that pictorial semiotics can be identified as the science of depiction, considered as a peculiar mode of conveying information, its purview will involve, at the very least, a demonstration of the semiotic character of pictures, a study of the peculiarities which differentiate pictorial meanings from other kinds of signification (particularly from other visual meanings, and/or other meanings based on iconicity, or intrinsic motivation), and an assessment of the ways (from some point of view or other) in which the several species of pictorial meaning may differ without ceasing to inhere in the category of picture.

More explicitly semiotic work on pictorial meaning has been accomplished, with some influence from Gombrich, but without any connection to Gibson, by the French Structuralists. Some of the more innovative thinkers of that group, such as Lindekens and Tardy, have already devoted some attention to the perceptual peculiarities of pictures, repeating and applying the findings of Gestalt psychology and the studies of eye-movements. In his critique of the iconicity of pictorial signs, Eco insisted on the correlation, not between the picture and the thing itself, but between the former and the ‘perceptual model’, yet failed to give any substance to the latter notion. Clinging to the autonomy postulate, the representatives of the Greimas school denied any relevance of perceptual psychology to their study, refusing to take account, in this or any other way, of the specificity of iconicity (in the Peircean sense, and not, of course, the quite different Greimasian one—cf. Sonesson 1990c), let alone picturehood. Fernande Saint-Martin, and more recently the Belgian Groupe μ, take for granted the importance of perceptual organization to pictures, yet both are explicitly determined to dissolve pictorality into the more general sphere of visual semiosis.

In the following, we will investigate the more distinctly perceptual character of pictures, as opposed not only to linguistic and other non-visual signs, but also to visual, non-pictorial signs. After considering the relevance of the domain of visual semiotics, postulated by, among others, Saint-Martin and Groupe μ, we will

summarize our critique of the critique of iconicity, given in more detail elsewhere (cf. Sonesson 1989a: III; 1990c; 1992a, c, and e; 1993a, b, and c), and then proceed to an appraisal of such properties as 'density' and 'repleteness', taken by Nelson Goodman to be the defining characters of picturehood. As we go along, we will suggest that the perceptual character of pictures must be allowed to have a much deeper influence on the way pictorial signs are analyzed, and that it is rather on the basis of a closer scrutiny of the linguistic model than from its outright rejection that we may hope to regain the perceptual model.

### **The Viability of Visual Semiotics**

From one point of view, then, pictorial semiotics should be a part of visual semiotics—if there is such a discipline. There certainly are precedents for this division of the field of semiotics: Roman Jakobson (1964) has treated of the differences between visual and auditory signs, and Thomas A. Sebeok (1976) has divided up semiotics according to the sense modalities. Indeed, this conception is at the heart of Lessing's seminal discussion of the differences between painting and literature. Kümmel (1969) is perhaps the real pioneer of this domain, but his book mostly reads as a catalogue of visually conveyed ('sichtbare') phenomena. More recently, Preziosi (1983) has conceived of architecture as being a kind of visual semiosis, which he then opposes to linguistic meanings, identified with auditory semiosis; and Saint-Martin (1987) has been very explicit in choosing visuality as her domain. The title of Groupe μ's (1992) latest book, and many of its headings and subheadings, suggest that it is concerned not with pictures, but with something more general called visual semiosis, or visual meaning.

#### *Visuality as a Hjelmslevian 'Form'*

On the other hand, from the point of view of Hjelmslevian semiotics, we would normally not expect visuality, being a mere 'substance' or even 'matter', to determine any relevant categorizations of semiotic means. In their dictionary, Greimas and Courtés actually claim that sense modalities, identified with the expression substance, are not pertinent for semiotics, and this is no doubt the reason for visuality being one of the many layers between the unique picture and signification *per*

*se* being left out of consideration in Floch's analyses. We have already pointed out (in Sonesson 1988, 1993a and b) that this type of argument is based on a confusion of the terms 'substance' and 'matière', as employed by Hjelmslev and in their ordinary usage. Thus, the term 'matière', to Hjelmslev, is simply that which is unknowable, and, as a consequence, not susceptible of being analyzed (that is, it is the residue of the analysis); and 'substance', which in the earlier texts is the term used for 'matière' in the above-mentioned sense, stands in the later works for the combination of 'matière' and 'form'.

Thus, 'substance' in the early works, and 'matter' later, simply means 'that which is not pertinent relative to the other plane of the sign' (see discussion in Sonesson 1989a: II.4, 1988); it does not necessarily stand for matter in the sense of ordinary language—that is, the material of which something is made, or the sense modality. If the material or the sense modality turns out to be relevant in relation to the other plane of signification, it becomes form (from Hjelmslev's standpoint, this is what happens in connotational language). In an earlier article, Groupe  $\mu$  (1979) appeared to make precisely this error in making 'allomateriality' one of the possible characterizing traits of the collage; but this analysis has recently (1992: 331ff) been partly rephrased as heterogeneity of textures, and although some residues of the earlier analysis linger on (1992: 333ff), this is not as disturbing as it once was, since the Hjelmslevian framework is now largely dispensed with.

The psychology of perception certainly seems to suggest the existence of some common organization which puts all or most visually conveyed meanings on a par. If, as we have argued, all signs must also be objects of perception, there is every reason to believe that the modality according to which they are perceived determines at least part of their nature. This is indeed the position taken by Groupe  $\mu$  (1992: 58f), who go on to compare this conception to that favored by such linguists as Saussure, Martinet, and Bloomfield, according to which the vocal character of language is one of its defining characteristics. More to the point, they observe that the linearity of verbal language is a constraint imposed on linguistic form by the characteristics of the vocal channel by which it was once exclusively conveyed. That is, the qualities of the visual sense modality are of interest to semiotics, to the extent that they specify formal properties embodied in each system addressed to that particular sense. Hjelmslev (1953) does not reason differently when he posits different 'forms' for written and spoken language. The example of linearity, adduced by Groupe  $\mu$ , is interesting in its own right,

however, for about the only thing Saussure (1968: 39) has to say about pictures—or, to be precise, paintings—is that they are multidimensional semiotical systems ('une séme multi-spatiale'), as opposed to verbal language, which has a unique spatial dimension: that of temporal extension, or linearity.

Nevertheless, it is not certain that the visual mode, although imposed by the vehicle of communication, defines the most fundamental domain of which pictures form a part. There may be other, perhaps more important division blocks of semiosis, to which pictures and some other visual signs pertain, such as, for instance, that of iconicity. Indeed, we will suggest that iconicity is at least as important for the understanding of pictorality as visuality, and that the latter must be considered a particular variety resulting from the conjunction of visuality and iconicity. Furthermore, to the extent that there is a legitimate domain of visual semiotics, it should undoubtedly comprehend much more than pictures, buildings, and sculptures, which are the only visual signs discussed by Saint-Martin and Groupe μ. Curiously, in spite of the promise made in the introduction to ignore received categories such as art, Groupe μ (1992: 12ff), like Saint-Martin (1987), would seem to be the victims of the sacred trinity of art history: painting (to which drawing, photography, and so on are conveniently assimilated), sculpture, and architecture.

As soon as we leave the traditional divisions of art history behind, this trichotomy turns out to have a very limited value. Instead, sculpture should be compared to such *semiotically* similar objects as the tailor's dummy. At one point, Groupe μ (1992: 405f) actually mentions marionettes as being a kind of sculpture to which movement has been added. But why not also add the ballet dancer, whose art is certainly visual? There are also significations which are only partly visual, such as those of theatre communication. Others might be considered not to have an intrinsically visual organization—e.g., writing, the conformation of which depends in part on spoken language. But all kinds of gestures and bodily postures, objects, dummies, logotypes, clothing, and many other phenomena must be counted as visual signs and significations. In fact, even visual perception *per se* supposes a pick-up of meaning of sorts. Not only should we therefore have to go through the arduous task of determining the ways in which the various kinds of visual semiosis (beyond those of pictures, architecture, and sculpture) differ, but it also remains to be shown that they all have sufficient properties in common to be considered 'visual signs' (or at least 'visual significations'), in the sense of this property being relevant to their 'form'.

*The Dimensions of Pictorial Specificity*

In differentiating pictorial meaning from other meanings, we should be particularly interested in knowing not only how they are distinguished from other kinds of *visual* signification, but also how they differ from other *iconic* signs—that is, from other signs motivated by similarity or identity (see Sonesson 1989a: II.2.2 and III.6). Moreover, not all signs that are visual and iconic would ordinary be described as pictures. Something more would seem to be needed in order to characterize picturehood. Most semioticians, even those (such as Eco) who have used the picture as the principal whipping-boy of their critique of iconicity, have simply ignored the need for further characterization. In other cases, the peculiarities of the picture sign have been addressed in oblique ways only: by Peirce in terms of qualities and exhibit import, and by Saussure with reference to spatial dimensions. Husserl, however, describes pictorial consciousness as something which is ‘perceptually imagined’. The most radical stance has been taken by Nelson Goodman, who simply rejects the ordinary sense of picture, in order to introduce his own. It might be argued, however, that as he becomes prescriptive rather than descriptive, Goodman ceases to be of interest to semiotics, whatever may be the value of his theory to philosophy.

The image is one of the three subtypes of iconic signs (or ‘sub-icons’) mentioned by Peirce: the one in which the iconic relation is assured not by relations, as in the diagram, nor by relations between relations, as in the metaphor, but by ‘simple qualities’. The opposition between image and diagram, in this sense, echoes Degérando’s (1800: I.153ff, 262ff, II.302ff) distinction between ‘sensuous’ and ‘logical analogy’. It must be noted that the image so defined is not necessarily a picture in the ordinary sense: it may be addressed to other senses than the visual (onomatopoetic words might thus be described as ‘acoustic images’). In addition, there are, as we shall see, a number of reasons, stemming from semiotics and psychology alike (notably Gibsonian psychology), to think that pictures, in the ordinary sense, are not based on ‘simple qualities’, whatever that may mean; in fact, they must rather be Peircean diagrams or metaphors (although Peirce must have thought otherwise), in the sense of supposing an identity between relations, and relations between relations, present on the expression and content planes. Pictures do, however, convey an illusion of there being a similarity of ‘qualities’, which is not true of diagrams. Therefore, the difference between qualities and rela-

tions may have less to do with the difference of iconic 'ground' joining expression and content together than with the effect produced by the two types of iconic signs.

As we noted above, Saussure (1968: 39) observes that, whereas language is unidimensional, painting depends on a semiotic system deployed in multiple dimensions. This does not appear to be peculiar to pictures, however, for clothing certainly supposes at least two combinatory dimensions (or syntagmatic axes) the slots of which are defined by the body parts and the proximity of the different layers to the body, respectively (cf. Sonesson 1988; 1991; 1992d; 1993d); and, if suprasegmental features are taken into account, even verbal language will have to be considered multidimensional (as claimed by Jakobson). The question is, therefore, to what extent multidimensionality is a relevant property of the pictorial expression plane—that is, a property of the pictorial 'matter' which is also a property of the corresponding 'form'. It certainly does not define the order in which units are put together, according to rules of ordering, as is the case with clothing and language. Closeness to the body and body part location do determine together the positional meaning of a piece of clothing; in a picture, however, in the core sense of a sign depicting a real-world scene, things are not basically defined by their horizontal and vertical position. It is true, of course, that horizontal and vertical position, just as position with respect to the 'harmonic' or 'disharmonic diagonal' and other spatial axes defined by Saint-Martin's (1987) analytical scheme, may add shades of meaning, and even essential building blocks, to pictorial signification, but they are not the defining characteristics of pictorality, because they may distinguish many visual signs which are not pictures, not only in the sense of the core meaning, but even in an extended sense. Nevertheless, spatial dimensions may turn out to be important to the picture sign in more supple ways: the projection of the (ordinarily three-dimensional) content plane onto the two-dimensionality of the expression plane is one of the spatial characteristics of picturehood.

We can only grasp the nature of the picture sign once we have discovered and characterized a number of neighboring sign types: those, for instance, which are conveyed visually, like pictures, but differ in other respects; and those which are iconically grounded, as pictures most certainly are, but which are different as to the peculiar character of their iconicity, or in other ways, from the picture sign. It will then be seen that the particular character of pictorial iconicity, unlike most others, involves what Gibson and Husserl alike have termed 'indirect perception',

and that it is to account for this peculiarity of pictures that a ‘perceptual model’ urgently needs to be reconstructed.

Before anything more can be said about picturehood, however, it will be necessary to delve deeper into the issue of iconicity, which we have every reason to retain, in spite of the misguided critique of this notion by such important thinkers as Bierman, Goodman, Lindekens, and Eco. It is true that Peirce and his followers have made little effort to justify this concept: instead of recurring, as is customary, to an argument of authority, we will now turn to a logical scrutiny of the counter-arguments, and to a reappraisal of the relevant findings of cognitive and perceptual psychology.

### The Metacritique of Iconicity

As the term is used in semiotics, iconicity unavoidably derives from Peirce’s conception of the icon, even when, as in the Greimas school approach, it has been broadened and then narrowed again in a different way, into something like ‘the illusion of reality’, a kind of ‘verisimilitude’, also apt to be found in literature. On the other hand, iconic signs are often falsely taken to be the same thing as visual signs, although, in Peirce’s view, there is nothing intrinsically visual about iconicity. Sometimes, for instance in cognitive psychology, when discussing ‘iconic codes’, the latter is more properly seen as another, conflicting usage of the same term (e.g., Kokers 1977). It is also common to confound iconicity and picturehood, when in actual fact, if we rely on Peirce’s definition, pictures constitute only one variety of iconicity, and are not even supposed to form the best instances of it.

We are interested not in discovering ‘what Peirce really said’, but rather in making use of his concepts to the extent that they fit in with what has since then been established by semiotic reasoning and psychological findings. In the following, we will first delineate a particular interpretation of Peirce’s division of signs, and then proceed to elucidate the reasons why the criticism leveled against iconicity, and the common-sense notion of picture which it includes, cannot be considered valid. We will then suggest one way in which Peirce’s conception of iconicity, and of the picture as an instance of it, has to be amended, to take care of the counter-arguments which we will use to salvage pictures from the critique of iconicity.

### *Aspects of the Weathercock*

Peirce insists that the sign has three parts; however, if we are not mistaken, the third element, the interpretant, is simply that which determines the relation between the other two.<sup>1</sup> More precisely, the interpretant is the function which picks out the relevant elements ('grounds') of expression and content. As for the difference between content and referent, which is often taken (notably by the readers of Ogden and Richards) to be what the distinction between object and interpretant is all about, it is actually taken care of by a subdivision of the second unit, Peirce's object, which shall be termed content in the following.

The term 'ground' stands for those properties of the two things entering into the sign function by means of which they get connected. Thus, like Hjelmslev's 'form', it is a principle of pertinence dividing those properties involved in the sign function from the others. In the case of the weathercock, for instance, which serves to indicate the direction of the wind, the content ground merely consists in this direction, to the exclusion of all other properties of the wind, and its expression ground is only those properties which make it turn in the direction of the wind—not, for instance, the fact of its being made of iron and resembling a cock (the latter is a property by means of which it enters an iconic ground, different from the indexical ground making it signify the wind).<sup>2</sup> It will be seen, then, that the Peircean 'ground', just like Hjelmslev's 'form', rests on the principles of 'abstractive relevance' and 'apperceptive supplementation' embodied in Bühler's Organon model (cf. Figure 1 and Sonesson 1989a: II.4.2).

Thus the ground is the potential of things to serve in a particular type of sign relation. It is important to note, however, that there is a 'structural' element to Peirce's conception: given a particular domain of this world containing objects which may be termed signs (although one may think that strict criteria for what may be included in this domain are lacking in Peirce's work), Peirce's claim is that, when considered *from a particular point of view*, this domain must be partitioned into exactly three sub-domains. The point of view in question is the kind of relationship obtaining between the expression and the content and/or referent involved in the sign function (and Peirce similarly proposed two other points of view, giving rise to different partitions). In actual fact, not just any such relationship is considered relevant: we are concerned with different kinds of motivation (including the zero-type). Two important consequences ensue. If we want to show that there are more kinds of signs than those recognized by Peirce, we must make

sure that we are really considering signs from the same point of view as he does (this appears to be the trouble with the extensions proposed by, among others, Sebeok and Helbo). On the other hand, in fairness to Peirce, we must, as far as possible, interpret the three sign types in such a way that the definitions, when put together, exhaust the domain of signs. This latter requirement becomes necessary because of the numerous conflicting definitions of the three sign types which appear in Peirce's work.

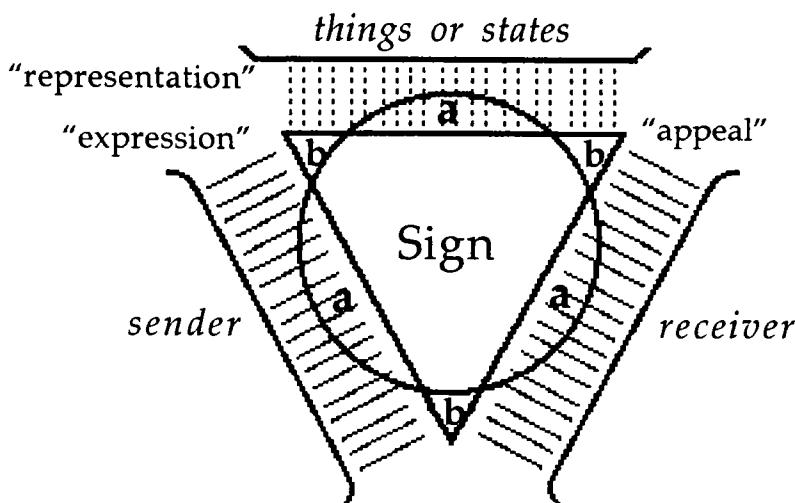


Figure 1. Bühler's Organon model, with (a) the principle of abstractive relevance, and (b) apperceptive supplementation

An icon, then, is a sign in which *the 'thing' which serves as its expression in one or another respect is similar to, or shares properties with, another 'thing', which serves as its content*. Yet two objects being iconic with respect to the same properties are transformed into a sign only by participating, in addition, in a sign relation. However, according to Peirce, the similarity between two 'things' entering into such a sign relation must exist independent of the latter. Two items sharing an iconic ground are apt to enter, in the capacity of being its expression and content, into a semiotic relation forming an iconic sign, to the extent that there is some set of properties which they possess independently of each other, which are identical or similar when considered from a particular point of view, or which may

be perceived (or, more broadly, experienced) as being identical or similar, where similarity is taken to be an identity perceived on the background of fundamental difference. Since both Franklin and Rumford are Americans, Peirce claims, one of them may serve as a sign of the other; but the fact that Franklin is an American is quite unrelated to Rumford's being one.

An index, on the other hand, is a sign in which *the 'thing' which serves as its expression is, in one way or another, connected with another 'thing', which serves as its content*. Again, the two objects partaking of a relation of indexicality are transformed into a sign only by participating, in addition, in a sign relation. Even in this case, according to Peirce, the connection between the two 'things' entering into the sign relation must exist independent of the latter (but not necessarily precede it, as is shown in Sonesson 1989a: I.2.5). An indexical ground is involved if two 'things' are apt to enter, in the capacity of being its expression and content, into a semiotic relation forming an indexical sign, due to a set of properties which are intrinsic to the relationship between them, such as it is independently of the sign relation. Indexicality may conceivably be reduced to either contiguity or factorality.<sup>3</sup>

In a conventional sign (which Peirce, rather idiosyncratically, terms a symbol), on the other hand, there is no relationship linking the two 'things' which serve as expression and content of the sign relation, apart from the sign relation itself. It is thus a kind of residue category. There can be no conventional ground; for the conventional sign is literally ungrounded, and may be constructed on the basis of any two 'things', without any particular requirement being imposed on their properties.

It is possible to distinguish different varieties of iconic grounds. Peirce mentions only the diagram, the image, and the metaphor, but as soon as we give up Peirce's propensity for seeing everything in terms of threes, there really seems to be no reason for stopping at that number, or even for including that series. According to Peirce, the iconic ground of images is made up of simple qualities; diagrams render relations of the parts of the content by analogous relations of the parts of the expression (which would include, but not be restricted to, diagrams in the ordinary language sense); whereas metaphors 'represent the representative character of a representation by representing a parallelism in something else'. When discussing evidence from perceptual psychology, we shall see that pictures, in the ordinary language sense of the term, cannot be images in this sense, but should rather be counted as diagrams or metaphors.

If a particular iconic sign produces the illusion of literally seeing in the two-dimensional surface of the expression plane the projection of a scene extracted from real world three-dimensional existence (with or without a suggestion of lineal perspective), then it is more particularly a pictorial sign, or a picture, as this term is ordinarily used. Thus a photograph, Leonardo's *Mona Lisa*, and some instances of modernist art are pictures in this sense. The symbol, in the sense in which this term is ordinarily used—not by Peirce, but in the European tradition (including Saussure)—is also a kind of iconic sign, having certain indexical traits: it reposes on the isolation of an abstract, not necessarily perceivable, property, connected with a generalization from the object serving as an expression, and a particularization from the object serving as a content. Thus we have the scales signifying justice, in which the common property is the abstract, transmodal one of equilibrium; or a dove standing for peace, in which the peacefulness of the animal is certainly not a property of real doves, but a very real property of the dove as conceived in the sign (cf. further discussion in Sonesson 1989a: III.6, 1990c, 1992f, 1993c).

### *The Delusions of Semiotic Iconoclasm*

During the renewal of semiotic theory in the 1960s and 70s, many semioticians were eager to abolish the notion of iconicity, taking pictures as their favored example, while claiming that pictures were, in some curious way, as conventional as linguistic signs. Most notably, Bierman, Goodman, Lindekens, and Eco argued against using similarity as a criterion in the definition of iconic signs and/or pictures. Some of these thinkers, such as Bierman and Goodman, were mainly inspired by logical considerations, together with a set of proto-ethnological anecdotes, according to which so-called primitive tribes were incapable of interpreting pictures; Eco and Lindekens, in addition, wanted to show that pictures, conforming to the ideal of the perfect sign, as announced by Saussure, were as arbitrary or conventional as the sign studied by the most advanced of the semiotic sciences, general linguistics.<sup>4</sup> Saussure himself never went to such extremes; in his unpublished notes he recognizes the motivated character of both pictures and miming, but at least in the latter case he argues that the rudiment of convention found in it is sufficient to make it an issue for semiotics (cf. Sonesson 1991a, 1992d, 1993d).

The most interesting arguments against iconicity were adduced by Arthur Bierman (1963), and were later repeated in another form, by, notably, Nelson Goodman (1970). According to one of these arguments, which may be called the *argument of regression* (cf. Sebeok 1976: 128), all things in the world can be classified into a number of very general categories, such as ‘thing’, ‘animal’, ‘human being’, etc., and therefore everything in the universe can refer to, and be referred to, everything else. Thus, if iconicity is the origin of signs, everything in the world will be signs. This may not be so far from what Peirce thought: at least Franklin and Rumford are, as we know, potential signs of each other. It is certainly a conception of the world common in the Renaissance, and among Romantics and Symbolists. In the case of more common iconic signs, however, like pictures and models, either a conventional sign function must be superimposed on the iconic ground, or the iconic ground must itself be characterized by further properties. Even in the former case, however, iconicity is still needed, not to define the sign, but to characterize iconic signs (cf. Sonesson 1989a: 220ff).

Differently put, if Peirce meant to suggest that there are three properties—iconicity, indexicality, and symbolicity—which, by themselves and without any further requirement, trigger the recognition of something as a sign, then the argument of regression will create trouble for his conception. On the other hand, if he merely wanted to suggest that something that was already recognized as being a sign could be discovered to be an iconic (rather than an indexical or symbolic) sign, by means of tracing it back to the iconic ground, then the argument of regression will have no bearing on it.

According to another argument, which has been termed the *symmetry argument* (Sebeok 1976: 128), iconicity cannot motivate a sign, for while similarity is symmetrical and reflexive, the sign is not. Pigments on paper, or carvings in a rock, could stand for a man, but not the reverse; nor will they, in their picture function, stand for themselves. Even as late as in their *Traité*, where they take a more skeptical stand on the critique of iconicity, Groupe μ (1992: 125f, 130) still accepts this argument, which is actually untenable. The error consists in identifying the common-sense notion of similarity with the equivalence relation of logic. The equivalence relation, as defined in logic, is undoubtedly symmetrical and reflexive, and thus cannot define any type of sign, since the sign, by definition, must be asymmetrical and nonreflexive. But to identify similarity with the equivalence relation is to suppose man to live in the world of the natural sciences, when in fact he inhabits a particular sociocultural Lifeworld. Similarity, as experienced

is this Lifeworld, is actually asymmetrical and nonreflexive. Indeed, this fact is not only intuitively obvious, but has now been experimentally demonstrated (notably by Rosch 1975; and Tversky 1977; cf. also Sonesson 1989a: 220ff, 327ff). Thus, for instance, subjects would consider Korea to be similar to China, rather than the reverse, because China, being better known, is endowed with more properties, and thus serves as the standard of comparison. Contrary to the argument of regression, the symmetry argument may thus be warded off, without introducing a supplementary sign function, and without amending the definition of the iconic ground.

Goodman also argues that a painting is actually more similar to another painting than to that which it depicts. However, similarity should not be confused with identity: indeed, between two pictures (two canvases, etc.) there is identity, according to a principle of pertinence, and on the basis of this property a picture, like any other object, may be used as an identity sign or an exemplification (as, for instance, in an art exhibition, or in front of the artist's workshop—cf. Goodman 1968). There is similarity, on the other hand, only on the basis of a fundamental dissimilarity. It is certainly not in their 'important' properties, if that means the attributes defining them as 'selves', that the picture and its referent (or content) are similar. In fact, the hierarchically dominant categories of the picture and its referent must be different; for a picture which is just a picture of the picture-of-X is indistinguishable from a picture of X (cf. Sonesson 1989a: 226ff).

### *A Nose Is a Nose Is a Nose*

There is a common-sense aspect to Eco's argument against iconicity which should be taken seriously, as far as pictures are concerned: on closer inspection, Eco rightly observes, there is really no similarity between the painted nose and the nose of a real person. On the other hand, this observation has no bearing whatsoever on iconic signs which are not picture signs: indeed, the American-ness of Franklin and Rumford is identical, as far as it goes, as is the roundness of circles and other round things, as well as the pattern and color of a tailor's swatch and the cloth it exemplifies.

It could be said, and has often been claimed, that each object is its own best icon. Paradoxically, however, no object can ever become an iconic sign of itself in the absence of a convention for defining its use as a sign. The alternative anal-

ysis of pictures proposed by Goodman, Eco, and others, or something similar to it, would really be needed not for pictures, but for some other iconic signs, which rely on identity. Goodman's and Greenlee's contention that the referent of each picture is appointed individually, and Eco's proposal that the relations of the picture are so correlated with those of the referent, are incompatible with what psychology tells us about the child's capacity for interpreting pictures when first confronted with them at 19 months of age (as demonstrated in a famous experiment by Brooks and Hochberg—cf. Hochberg 1978, 1980). On the other hand, we do have to learn that, in certain situations, and according to particular conventions, objects which are normally used for what they are become signs of themselves, of some of their properties, or of the class of which they form a part: a car at a car exhibition, the stone axe in the museum showcase, or the tin can in the shop window, the emperor's impersonator when the emperor is away, and a urinal (if it happens to be Duchamp's 'Fountain', or Sherrie Levine's paraphrase thereof) at an art exhibition.

When used in this way, to stand for themselves, objects are clearly iconic: they are signs consisting of an expression which stands for a content because of properties which each of them possess intrinsically. And yet, without having access to a set of conventions and/or an array of stock situations, we have no way of knowing that something is a sign, or what it is a sign of: of itself as an individual object, of a particular category (among several possible) of which it is a member, or of one or other of its properties. We have to know the showcase convention to understand that the tin can in the shop window stands for many other objects of the same category; we need to be familiar with the art exhibition convention to realize that each object stands for itself; and only if we have learned the convention associated with the tailor's swatch can we know that the swatch is a sign of its pattern and color, but not of its shape. We shall use the term 'secondary iconicity' to designate a relation between an expression and a content of the kind described by Peirce, which can however be perceived only once the sign function, and a particular variety of it, is known to obtain (cf. Sonesson 1989a: II.2.2, 1992a).

The picture, on the contrary, is a *primary iconicity*: it relies on a relation of similarity which is seen to obtain before taking cognizance of the sign relation, and which helps to establish it. We have shown that the similarity relation in itself may be asymmetrical and irreflexive, but we have not explained why the referent of the picture, rather than the pictorial signifier, comes to be seen as the standard of comparison, thus playing the part of China to the signifier's Korea.

This is so, as we shall see, because of regularities obtaining in every possible human Lifeworld.

Among the several apocryphal stories of tribes failing to recognize pictures as such, there is in fact one verified case in which the group had never seen paper, and was therefore led to focus on the material *per se*. When pictures where instead printed on cloth, the members of the tribe immediately recognized the sign function and perceived the pictures. This relativistic story really serves to show that, as Husserl would have said, the form of relativity is not itself relative: to this tribe paper, being an unknown material, acquired such a prominence that it was impossible for these people to see it as a vehicle for something else; on the other hand, it is precisely because paper is so trivial a material to us that we have no trouble construing instances of it as pictorial signifiers. The same story could probably be recounted in terms of the experience of every single child: Boris Uspenskij has told us (personal communication) that the first time he saw an oil painting, he was unable to discover the picture because of the oil texture, although he was already capable of interpreting outline drawings.<sup>5</sup>

It thus becomes necessary to posit a kind of taken-for-granted hierarchy of prominence among the things of the Lifeworld: some ‘things’ are more apt to serve as expressions of a sign relation than others (i.e., those which are relatively less prominent). For something to be a sign of something else, it must be ranked relatively low on the scale of prototypicality applying to the ‘things’ of the Lifeworld.<sup>6</sup> In their study of the basic metaphors which underlie both poetry and ordinary language, Lakoff and Turner (1989: 160ff) describe a ‘cultural model’ which they call ‘The great chain of being’. This model, which ‘places beings and their properties on a vertical scale with “higher” beings and properties above “lower” beings and properties’ (1989: 167), has been studied by historians of ideas since the time of Lovejoy, but Lakoff and Turner show it to be still current and active in a lot of everyday thinking, as for instance in ordinary adages. This ‘commonplace theory about the nature of things’ (1989: 170) would need only slight emendations in order to account for the naturalness with which surfaces are able to represent scenes, rather than the reverse. Such regularities of the Lifeworld, together with the similar laws of environmental physics, formulated by Gibson, and other commonplace theories of the world, stand at the origin of an even broader domain of study, which we could call the ecology of semiosis.

Even so, we are left with little knowledge about the peculiar traits of iconicity characterizing the picture sign. In the following we will try to gain a deeper

understanding of these peculiarities, by focusing critically both on the effort, notably by the early Eco, to analyze pictures into features, and the suggestion, by Goodman and the later Eco, that pictures do not allow of any division at all.

### **Beyond Density and Repleteness**

For a long time, semioticians tried to demonstrate the existence of some kind of minimal unit of pictorial meaning, sometimes termed ‘iconeme’, which was supposed to have no meaning of its own, but to discriminate the meanings of larger wholes, just as phonemes do in relation to words or morphemes. Umberto Eco (1968), who was an early proponent of this conception, later recanted completely, arguing that there could be no distinctive features in pictures (1976); even more recently (1984), he has claimed that the very question lacks pertinence to semiotics. Yet, curiously, to the extent that he continues to defend his earlier theory of triple articulation in the cinema, Eco is still committed to a feature theory of pictures.

Goodman’s position is more unambiguous. Although he would deny the relevance of the common-sense notion of picture, prototypical cases of pictures in the latter sense are among those signs he would qualify as being ‘analogous’, or ‘semantically and syntactically dense and replete’. Density is a property of sign systems the possession of which implies that no matter how close a division of the signs is made into smaller parts, it will always be possible to proceed with the division, introducing a third unit between each earlier couple of items, and so on indefinitely. Density is semantic when it applies to content units (to referents, in Goodman’s nominalist terms), and syntactic as far as it involves the varieties of expression (Goodman’s ‘marks’). A dense system is replete when its signs can be divided from many—perhaps infinitely many—different viewpoints. Density and repleteness, in Goodman’s view, apply to pictures both as carriers of reference and as exemplifications—that is, in terms more familiar to semioticians, as ‘iconic’ and ‘plastic’ language respectively. As we will see, this means that pictures are semiotic atoms, in the original sense (i.e., not susceptible of being divided in any non-arbitrary way into smaller units).

Both Goodman and Eco relied in their arguments on a comparison with verbal language: Eco originally to underline the parallel, and Goodman and the later Eco because they wanted to emphasize the difference. On both counts they were

wrong, however, because they had erroneous ideas about ordinary language, as reconstructed in modern linguistics.

### *The Linguistic Model Regained: Hyletic Issues*

The central concept of Goodman's theory is the 'symbol system', which henceforth will be termed 'sign system', and which we, stripping it as far as possible of Goodman's nominalist metaphysics, will conceive to be made up of an expression scheme and a content scheme (cf. Goodman 1968, 1984; Elgin 1983, etc.).<sup>7</sup> Sign systems differ, on this account, according to the way 'marks' or 'inscriptions' are assigned to the units of the expression scheme, called 'characters', and according to the way in which the schemes themselves are correlated. The latter preoccupation is of course semantic; that Goodman should consider the former problem to pertain to the domain of syntax is curious, for rather than having to do, in Carnap's (1958: 79) terms, with 'the ways expressions are constructed out of signs in determinate order', it involves the reduction of variants to invariants (i.e., of 'substance' to 'form') characteristic of the linguistic domains of phonematics and graphemics, for which Hess-Lüttich has proposed the term 'hyletics'.

Goodman uses a particular variant of a sign system, a notational system, as a prototype, or ideal type, in relation to which other sign systems are defined as approximations. A notational system, simply put, is made up of a series of separate, discontinuous characters, which are correlated with a content scheme, equally segregated, in such a way that each character in the system isolates the object(s) to which it corresponds, and inversely, so that each object isolates the characters correlated with it. A musical score comes close to being a notational system, and verbal language approaches the ideal in some respects, whereas pictures are found at the other extreme.

We will first have a look at what Goodman terms the syntactic aspects, and which should, more properly, be assigned to hyletics. A notational scheme is an expression scheme which is syntactically disjoint (i.e., none of its marks belongs to more than one character), and finitely differentiated (i.e., it is theoretically possible, in the case of every two characters of the scheme, and of every one of its marks which does not belong to both characters, to determine to which one it does not belong)—see Figure 2. For a notational scheme to become a notational system, it must be adequately correlated with a content scheme, which is a seman-

tic question, to which we will turn below. Our familiar alphabet, the Arabic numerals, the binary, telegraphic, and basic musical notations meet the ‘syntactic’ (i.e., hyletic) requirements. Pictures, on the other hand, are syntactically nondisjoint and dense throughout, which means that a single mark may belong to several characters, and that between any two characters of the system a third can be introduced. It should be noted that the requirements for a notational scheme are mutually independent: a scheme in which every difference of the length of straight marks, however small, counts as a difference of character, is disjoint but not finitely differentiated; and there will be finite differentiation but not disjointness in every scheme in which all marks are conspicuously different, but some two characters have at least one inscription in common.

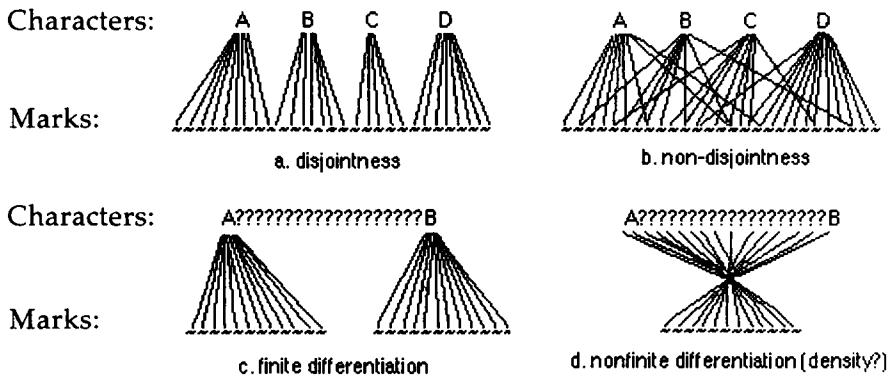


Figure 2. A visualization of Goodman’s ‘syntactic’ requirement: disjointness and finite differentiation (from Sonesson 1989a: 231)

The real issue, however, hinges on the comparison to verbal language, which Goodman calls ‘discursive language’, and considers to be possessed of an expression scheme which is disjoint and finitely differentiated. According to Goodman, the expression scheme is made up of the characters integrating the sign system, with no regard to the corresponding content scheme. Formally, a character is defined by the class of all inscriptions or utterances corresponding to it: thus, ‘a’, ‘A’, and ‘α’ are all a-inscriptions. Similarity, in Goodman’s view, cannot be used to relate all inscriptions to their corresponding character (cf. Goodman 1970). Not even topological similarity is required: of two a-inscriptions, one may be closed and the other open (see Figure 3a); and there may be topological similarity

between two inscriptions which do not belong to the same character (the middle one and the rightmost in Figure 3b). The only way of defining a character must therefore be by enumeration of its marks. In practice, Goodman always starts from a given 'alphabet', but even so, the study of disjointness and finite differentiation supposes the inscriptions to be listed.

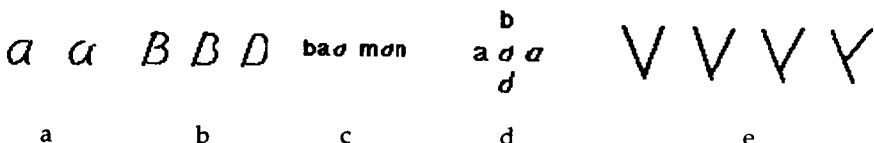


Figure 3. Varieties of inscriptions (from Sonesson 1989a: 232)

This is certainly a language of Goodman's own invention. Already at this point, the description is incompatible with the findings of modern linguistics. In the case of ordinary language, no listing of its inscriptions is feasible, since the latter must be infinite in number (because a given phoneme or grapheme will be realized differently by different persons, and by the same person on different occasions). This is connected with another finding, according to which the characters forming the expression plane cannot be conceived independently of whatever serves as the content, the former being allo-functionally defined in relation to the latter (in the sense of picking out 'form' from mere 'substance' or 'matter'). In the case of actual language, the 'alphabet' (i.e., the repertoire of elementary signs) is not given beforehand, but must be recovered from the 'texts', which means that segmentation must precede, or coincide with, the classification of inscriptions into real characters. If we pay attention to these observations, we will find that verbal language (as opposed to the logician's constructed language) is not so different from pictures after all: indeed, on at least some interpretations of the notion of inscription, verbal language is also syntactically non-disjoint.

In order to accomplish the listing of the inscriptions, Goodman would first have to reduce the tokens to types; but it is exactly for this purpose that he needs the listing. The prospects for listing the features of which phonemes, graphemes, and so on are made up may seem more promising; but even these, as conceived in phonology (for instance, traditionally, as voiced vs mute, or more abstractly, as diffuse vs compact, etc.) or in graphemics (for instance, the circle, strokes, and

points imagined by Mounin), are types, not tokens. What is needed is a principle of relevance, relying on the one hand on oppositions inside the expression scheme, and on the other hand on relations to the content scheme. In Goodman's example (reproduced as Figure 3b), the 'B' and the 'O' with an intermediary case are really two prototypes, linked by a third case close to the limit of both. Naus and Shillman (1976) demonstrated in the case of the pairs 'V/Y', 'C/F', and 'U/H' the existence of a trajectory passing over a determined point of transition (Figure 3e). Over and above that, however, the differences which matter are those which make a difference to meaning: 'a' and 'ɑ' are both a-inscriptions, because the exchange of one for the other in a word does not change the content of the word.

Goodman consistently reasons as though two inscriptions could be separated from each other, before being ascribed to different characters, but this is clearly impossible in the case of handwriting, and even more so as far as spoken language is concerned: there is simply no point where, from the physical point of view, the realization of one phoneme comes to a close without the realization of the next having already begun. This means that the string of inscriptions cannot be divided up into parts before each inscription has been attributed to a type, and they can only be associated with expression types once a correlation with the content plane has been established. Thus, both the idea of listing an 'alphabet' beforehand and the resolution to treat expression separately are plainly wrongheaded.

There is a sense, we noted above, in which ordinary language is clearly non-disjoint. Consider Goodman's (1968: 137f) claim that two inscriptions which look alike may, because of the context, be determined to be at one time a 'd', at another an 'a' (Figure 3c), but that, when the same occurrence has to be taken in two ways, it must belong to a 'third character' (Figure 3d). In fact, of course, as long as the notion of context has not been specified, it is not obvious why it should not be possible to dissolve all cases of nondisjointness—not only that of the letter cross, where the 'time-slice', in terms of reading time, is unequivocal, but also the parallel case of pictures. It is never clear, to be sure, whether Goodman intends inscriptions to be unique time-spaced occurrences, or some kind of sub-categories. Thus, in Elgin's (1983: 98f) 'authorized version', the reasoning is clearly in terms of sub-categories, when a system in which



is substitutable for 'A' and for 'H', without 'A' being substitutable for 'H', is said to be non-disjoint, for in the opposite case there would be no possibility of substi-

tution. If so, however, the trivial fact of neutralization, well-known to linguistics, will make all ordinary language syntactically non-disjoint.

Nevertheless, it will turn out to be more rewarding to take the clue from Goodman's letter cross and consider inscriptions to be time-space slices. Each segment of spoken language which manifests a phoneme necessarily manifests at the same time some part of the intonation contour, along with a number of expressive values and other paralinguistic features. Similar observations are valid for handwriting, and even for printed letters. But this means that ordinary language is non-disjoint, each occurrence being a member of a number of characters. No notion of context will save language from non-disjointness in this case, because it is the same time-slice which must be multiply classified. There is, however, a fairly traditional way of resolving this problem, which consists in saying that the types to which the same occurrence belongs are members of different sign systems or, in other cases, of different parts of the same sign system: thus, in the case of spoken language, paralinguistic features would normally be considered to form a system independent of the phonemes, whereas intonation is considered a part of language proper (cf. Trubetzkoy 1958). In the latter case, then, inscriptions would be nondisjoint inside language as a whole, but disjoint once an adequate partition of language has been made.

And this really brings us to the heart of the matter: we have been studying the ordinary act of speech long enough to know, more or less, what an adequate ascription of its properties to sign systems and their parts should be like, but since we have only recently taken up a serious study of pictures, we are hardly in a position to know whether it derives from a single system which is non-disjoint, or instead realizes types from several sign systems—perhaps from more sign systems, and system parts, than verbal language. Goodman never encounters this problem, because he does not stop to consider syntax, in the received sense: the ordering of units which supposes segmentation, which in turn cannot be realized without the ascription of units to sign systems. This is why he discovers no system in pictures.<sup>8</sup>

### *The Linguistic Model Regained: Semantic Issues*

A sign system the expression scheme of which is notational will also be a notational system, if the way in which the expression is related to the content meets

three requirements: it must be unambiguous, semantically disjoint, and finitely differentiated from a semantic point of view. Thus, no expression is allowed to stand for more than one (type of?) referent; no referent should be apt to be described by different labels in the system, most notably those which partly overlap, such as 'phenomenon', 'animate being', 'mammal', 'gorilla', 'heavier than an acorn', etc.; and it should always be possible to decide which of several particular labels apply, such as 'purple', 'dark purple', or 'halfway between dark purple and deep purple'. Not only pictures, but also verbal language turn out to fail all these requirements. Both are semantically nondisjoint, dense throughout, and ambiguous. Curiously then, Goodman's theory makes pictures and verbal language appear to be similar semantically—that is, exactly where our intuitive notions of these sign systems makes us anticipate the fundamental difference.<sup>9</sup>

Or at least it will seem so, once we realize what Goodman's criteria are all about. Given a referent, it is not possible, in the case of nondisjointness and nonfinite differentiation, to predict which content, forming part of the sign system, will be applied to it: first, because there is a choice between different ways of construing the referent; and second, because the level of delicacy of the description is optional. It is true, of course, that when faced with a gorilla, we are free to describe it from different points of view, and to take many or few details into account, no matter whether we are making a drawing or writing a verbal report. But the interesting thing certainly seems to be the different constraints imposed on our options in the two cases. Instead of attending to this question, Goodman is content to reduce the difference between pictures and verbal language to what he terms 'syntax'—i.e., the different relations obtaining between tokens and types.

Actually, Goodman does intend to contribute to the description of these constraints, for, by implication, he acknowledges their existence in verbal language, but not in pictures. Taken together, semantic and syntactic density is supposed to give rise to 'analogy', which is taken in the familiar sense in which it is opposed to the 'digital'—that is, as something which varies continuously. In fact, Goodman fails to reconstruct this familiar sense of 'analogy'. The syntactic and semantic requirements really amount to a double system of projections, from the token to the type, and from the referents to the contents (cf. Figure 4). There must, however, be an infinite number of ways of projecting two (potentially) infinite series, such as the syntactic and the semantic schemes, onto each other, giving rise to many syntactically and semantically dense systems which combine the drawbacks of the systems that are dense in only one way, and which appear alongside

those systems which are analog in the common sense of the term. It is not enough for both expression and content to be continuous; it must be possible to map the two continuous series onto each other. Thus, analogy has not been reconstructed, but is simply introduced from the outside.

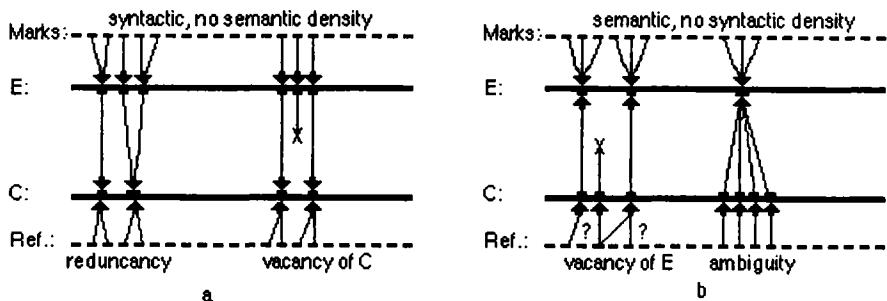


Figure 4. A visualization of the double projection of marks onto characters and of referents onto contents (from Sonesson 1989a: 239)

The point is not merely that analogy, in the familiar sense, is not the same thing as ‘semantic and syntactic density’ (with or without the corresponding ‘repleteness’, to which we will turn below); the mapping of one continuous series onto another is not really the essence of picturehood, without which there would be no way of determining what the picture is a picture of. Indeed, we know from the findings of psychologists such as Gibson, Hochberg, and Kennedy that the referents of pictures cannot simply be ‘appointed’, as Goodman would claim.

#### *Mount Fujiyama and the Electrocardiogram*

A ‘black wiggly line’ on a white background may, in Goodman’s (1968: 229ff) view, be a Hokusai drawing of Mt. Fujiyama, or a momentary electrocardiogram: in the first case, it would be a picture in the ordinary sense, and in the second a diagram, again in the sense of ordinary language (i.e., not, specifically, in Peirce’s wider sense). According to Goodman, both the diagram and the picture are members of dense systems, in the sense discussed above, but the latter is also replete. This is to say that, whereas in a diagram only changes along one dimension (i.e., the spatial co-ordinates) are relevant, in a picture many more types of

variation may be so: e.g., the relative thickness of the line, its color and intensity, its absolute size, and so on. The picture is like a multidimensional diagram!

What Goodman says about diagrams appears to be true, to some extent, about the electrocardiogram, but it certainly does not apply to all diagrams (cf. Figure 5). Thus, if the 'black wiggly line' represents the number of cars sold during different years, only the fragment of the line positioned exactly above the indication of the year is relevant, which means that the system is not dense. In fact, even the 'density' of the electrocardiogram is limited by the technical capacity of the measuring device. On the other hand, it would seem that some diagrams are 'replete', in Goodman's sense of the word. According to Bertin (1967), the relevant unit of the diagram is susceptible of variation along eight dimensions: location more or less up or down, location more or less to the left or the right, shape, size, color, clarity, coarseness, and orientation. Sometimes, it is true, it seems that Goodman (1984: 57f) would really want us to take repleteness to mean not that comparatively more dimensions are relevant, but that any variation will turn out to constitute a relevant dimension. But in this sense, not even pictures can be replete: for instance, the thickness of the line with which Hokusai represents the contour of Mount Fujiyama is undoubtedly irrelevant in its capacity to refer to the mountain, as is the whole inner contour of the line; they convey no meaning in the drawing considered as a picture of Mount Fujiyama.<sup>10</sup>

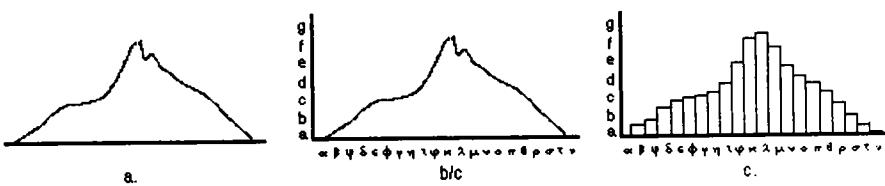


Figure 5. Mount Fujiyama and the diagrams (from Sonesson 1989a: 235)

It will be noted that the diagram brings its key with it: the terms and numbers inscribed along its vertical and horizontal axes serve to separate out the 'form' from the 'substance', and to assign a meaning to the units so delimited. Thus, the meaning of the diagram is really 'appointed', as is that of a doodle—for instance, 'Carraci's key', or Arnheim's doodle, which may be seen as 'an olive dropping into a Martini glass' or a 'close-up of a girl in scanty bathing suit' (Figure 6b). The characteristic property of a doodle is that the sign function is sparked off, and

meanings distributed to the parts, only once a verbal label has been attributed to the figure. In the case of a proper picture, on the other hand, we are immediately able to 'see into' the expression plane, and project as its content some part of the perceptual world, without receiving any further indication on how it should be taken. Thus, the droodle is like a picture, in that it refers to the perceptual world, but it is similar to the diagram in that it requires a label. Goodman's 'black wiggly line', when separated from its contexts, is in fact either a droodle or an unlabeled diagram.

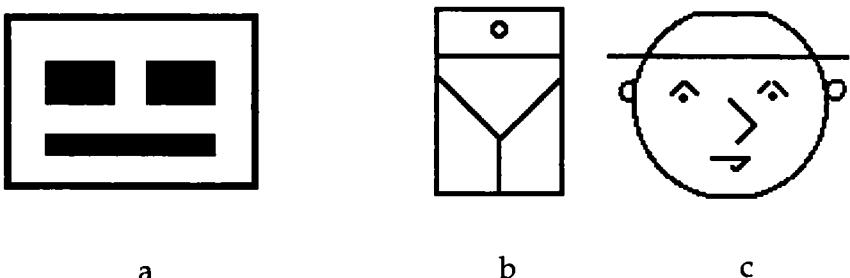


Figure 6. Pictures and droodles: (a) quadrangular face; (b) Arnheim's droodle; (c) Hermerén's droodle/picture

These observations take on a new importance when we consider Goodman's suggestion that the picture is comparable to, and in fact not coherently distinguishable from, an ungraduated thermometer. Actually, like an unlabeled diagram, an ungraduated thermometer is a curious, and largely useless, object: since no degrees are inscribed on it, we would be at a loss to know whether this particular thermometer is of the kind used for taking the temperature, baking a cake, or heating the oil. Apart from the physiognomic qualities of 'up' and 'down', and perhaps 'more' and 'less', it would carry no meaning. Yet no picture is meaningless in this way (cf. Sonesson 1989a: 239ff, 324ff). The diagram only conveys the variant information, the invariant being reserved for the labels, as Bertin (1967) observes, and this also applies to droodles; but in pictures, both the object and its particular properties are given together.

The real issue may thus be to account for the fact that some marks on paper are pictures, while others are only droodles. Contrary to Goodman and Eco, those psychologists who have been concerned with picture perception emphasize the

pervasiveness of features determining the identity of that which is perceived. For instance, Kennedy would show, using a familiar landscape scene, that certain constellations of lines meeting at particular angles stand for bounds, edges, surfaces, corners, and cracks of the three-dimensional perceptual world. Features like those discussed by Kennedy have been implemented in computer programs, and work out quite nicely. It does not follow, however, that this is really the essence of picture perception. Hochberg observes that there are, in addition to the spatial layout features, so-called canonical features, which account for the minimal opposition between Hitler and Chaplin in some caricatures. These caricatures, it will be noted, are not droodles: they are in need of no labels. In fact, canonical features may turn out to be much less marginal than Kennedy, and even Hochberg, imply. Indeed, even in Kennedy's picture, the sea and the clouds are not seen because of any layout features, but are clearly conveyed simply by means of prototypical forms. In fact, even the drawing of the house, with the same spatial configuration, could represent any number of other cubic objects, if not for its prototypical house features.

It may be suggested, then, that canonical features are really pervasive in pictorial perception. Just as the meaning of a sentence may be grasped directly, independently of the details of syntax, there may be a direct perception of gist in the picture, in some cases eventually supplemented by the registration of spatial layout. Indeed, it should be difficult not to see Figure 6c as representing a face, although Hermerén (1983: 101) claims that this is only because of 'the limitations of human imagination', since the same pattern may equally well be perceived as 'a jar from above, with some pebbles and broken matches on the bottom, and a stick placed across the opening'. There is nothing accidental, we submit, in those 'limitations of human imagination' invoked by Hermerén: they are imposed by the Lifeworld hierarchy of prototypical things. Indeed, there must be an infinity of objects whose light pattern, in a static view, would fit much better to the square pattern on Figure 6a than a face, and yet we cannot help seeing it. And although it is possible to impose the jar reading suggested by Hermerén on Figure 6c, it is only there in the droodle fashion, once a key has been given, and it is continually disturbed, and in fact overridden, by the more 'natural' face interpretation. It seems, then, that we come to the task of picture interpretation equipped with certain expectancies to encounter those objects which are normally close at hand in our everyday Lifeworld, such as faces and human bodies, in addition to such objects which, like Chaplin and Hitler, are introduced to us by our particular

culture, with its peculiar historical experience. Most or all objects and scenes may certainly be depicted, but if they rank below the apex of the hierarchy built of our Lifeworld expectancies, many more details are necessary for the object or scene to be recognizable.

### *Exhibitive Import and Pictorial Semiosis*

In spite of the existence of pictorial features, Goodman's observations on density are not entirely off the mark. Indeed, once we have determined whether a particular scribble realizes the category of a tree or of a woman's profile, the drawing will tell us a lot about the particular conformation of the crown, or the nose, the hairstyle, and so on. Similarly, once we realize that the 'black wiggly line' does indeed represent Mount Fuji, its minute details and variations will inform us about the particular shape of this mountain ridge. But not indefinitely: only up to a point set by the principle of pertinence embodied in the pictorial medium.

The term 'exhibitive import' was introduced by Greenlee as a label for a peculiar property of iconic signs observed by Peirce: that truths concerning their object not determining the construction of the sign can be discovered by direct observation of the sign vehicle. Thus, for instance, a map can be drawn by means of two photographs. Greenlee erroneously proceeds to dispute the specificity of this 'great distinguishing property', claiming that it is found also in novels, in respect of human situations, and this 'entirely independent of the perceptual qualities of the vehicle, in contrast to the imports of a lyric poem' (1973: 80). If we attend to Peirce's examples (which include algebraic formulae), we will realize that exhibitive import does depend on the perceptual properties of the vehicle: it is that which is shown, in addition to being signified. This, in turn, may have something to do with the fact that pictures simulate perceptual experience, and thus are able to build on the interpretive schemes used in the ongoing practice of everyday life.

According to the philosopher Richard Wollheim, pictures are instances of 'seeing-in': they involve a peculiar visual experience in which 'a state of affairs can be seen in a particular', with attention distributed evenly between the particular (i.e., the expression) and the state of affairs (i.e., the content or referent). Edmund Husserl described in very similar terms what he called 'pictorial consciousness', arguing that the content of the picture was 'perceptually imagined'. Very similar expressions recur in the work of the psychologist James Gibson, when opposing

the indirect perception involved in the seeing of pictures to the direct perception of the world. In this sense, the picture sign would be a particular kind of iconic sign which conveys the illusion of literally seeing the projection of a scene extracted from the real (or potential) world of three-dimensional existence into the two-dimensional lines and surfaces of the expression plane.

Although Peirce would have ascribed ‘exhibitive import’ (if he had used that term) also to algebraic formulae, it should be possible to characterize a specifically pictorial exhibitive content: it permits us to ‘see in’ a drawing of a human face (e.g., Figure 6a) those facial traits (the forehead, the cheeks, etc.) that are rendered by blank spaces between the lines and surfaces, and those features (e.g., the ears) that are not even marked in the drawing. Furthermore, those traits which have no expression proper may be at least roughly located in relation to the rest of the facial traits: that is, the ears which are not drawn can be shown to be lacking at a particular place.

It should now become clear why we must reject Eco’s early theory according to which pictures possess a double articulation, with *figurae*, equivalent to phonemes, adding up to signs, at the level of words, which then are combined to form pictures or iconic statements (cf. Sonesson 1989a: III.4.2, 1992e and f). Considered in themselves, the lines and surfaces that make up a picture are indeed deprived of meaning, just as phonemes are; but whereas the phonemes, once they have been put together to form a word, continue to lack separate meaning, pictorial traits take on, and distribute among them, the global meaning of the whole configuration. Like the phonemes /m/, /æ/, and /n/, forming the word /mæn/, the strokes and dots making up the picture of a man are in themselves meaningless even when considered in their particular spatial location; however, after having been put together, the phonemes continue to be deprived of meaning as such, whereas the strokes and the dots begin to take on the aspects of different proper parts and attributes of the man they contribute to form. Thus, the different parts and properties of the man are not distributed among the phonemes /m/, /æ/, and /n/, as they are among the strokes and dots forming the corresponding picture. This process, by which meanings accrue to pictorial features, may be termed ‘resemanticization’.<sup>11</sup>

Magritte’s familiar drawing, ‘Le viol’, may be seen either as a face or as a woman’s trunk. When considered alone, the smallest elements do not suggest any particular meaning. But at least when putting the two half-circles containing two smaller circles side-by-side, we seem to be seeing two breasts. This interpretation

is as its most determinate at the penultimate configurational level; but at the highest one, when the hair is added, another interpretation—that of a face—gains the upper hand. Once we reach this level, some details which were present beforehand lend their support to it: the holes in the small circles, and their relative dimension, makes them look much more like pupils of the eyes than nipples; indeed, the proportional locations of the inner details are more nearly those of a face than of a trunk. As a whole, the drawing is of course ambiguous, in Goodman's sense, as well as in the familiar one; yet this ambiguity only extends, for some subparts, to a certain level of interpretation—i.e., to the 'context', in the precise sense of the next configurational whole.

In some respects, picture perception, like visual perception in general, conforms more to what could be termed the medical model than to the linguistic one. In medicine the study of symptoms has long been designated, in many parts of the world, by the term 'semiology' or 'semiotics'. In the 1960s, when all respectable signs were thought to possess double articulation, Barthes (1972) tried to show that even the medical symptom was endowed with it. According to Barthes, when scurvy was first identified 150 years ago, it was believed to possess four symptoms, all of which separately indicate other diseases. Rather than resembling meaningless *figurae* adding up to a sign, as Barthes claims, this may at first seem to parallel the linguistic compound, in which several meaningful units combine into a higher-order entity. In fact, symptoms combine to indicate diseases in a way quite different from that of compound words, because one single symptom can already have the entire disease as its meaning, though given in a dubitative mode, whereas a part of a verbal compound corresponds merely to part of the meaning of the whole.

Here the expression is probabilistically, rather than deterministically or conventionally, coupled to the content; the more expressions are produced for the same content, the more firmly the content is established. And when all possible expressions for a particular content have been given, the complete series of expressions is indistinguishable from the content. In fact, the symptom simply repeats the logic of all ordinary perception: it adds its hypotheses to the information given, and must then confirm them or let them be falsified. The symptom is a sign only because medical semiotics has objectified it; expression and content are in fact only provisionally differentiated. The picture would seem to function in the same way, save only that its content is heterogeneous to its expression.

In his analysis of Schulz's comic strip 'Peanuts', Gauthier (1976) observes that there is no separate expression for such meanings as eye, opening/shutting of eye, the eye in profile/from in front, or even the parts of the eye. The same line may participate in conveying the contents 'eye', 'openness of eye', 'profile view', 'smile', 'happiness', and so on. In Goodman's parlance, all these would seem to be examples of a 'mark' being ascribed to several different characters. Yet many different things are confounded in this example. The line that makes up part of the configuration that means eye may possibly participate in the expression of the meanings smile and happiness, in the same way that the real eye in the real world participates in the expression of these real-world meanings. Thus, as in a compound word, the eye, together with other signs, builds up a larger unit; but unlike the case of verbal language, the eye retains its own meaning. Then, we encounter one of the peculiarities of the 'Peanuts code': that there is no separate expression for parts of the eye. Third, and more interestingly, there are clearly features that must go together, if the result should be what is considered a prototypical picture: a visual display which has separate expressions for the eye as such, its state of openness, and the point of view from which the observer confronts it, could be some kind of notation (such as those used by Birdwhistell and Kendon to describe occurrences of gestural communication), but it would no longer be a picture, simply because such a dissociation would not respect the conditions of Lifeworld experience. Simple modifications of such traits, however, may be the signs of a pictorial rhetoric, as a coalescence of characters in one mark which does not coincide with those of visual reality.

Thus, in Klee's *Mother and Child*, in which a continuous contour line encloses both part of the mother's face and that of the child, the process of resemanticization which is characteristic of pictures concurrently starts out from two centers of attention, corresponding to the sub-whole of the woman's face and the sub-whole of the child, and then spreads their associated features outward until these enter into conflict with each other, giving rise to a zone of indecision, which may only be resolved in the doodle mode, alternatively according to one or the other interpretation. This is similar to what happens with 'the devil's tuning fork' and other 'impossible figures', although in this case the feature invariants which enter into conflict do not concern the spatial layout of the objects involved (see Sonesson 1989a: II.3.4).

## Conclusion

The relevance of perception to pictorial semiotics may reside less in properties stemming from the visual mode by means of which pictures, among other things, are conveyed than from the special character of ‘indirect perception’, which is not simply perception, nor merely the *renvoi* on which Jakobson used to insist. We have seen that picturehood is a particular modification of iconicity, and we have hinted at some of its peculiarities, mainly by showing in which way theories of pictures fail to capture their specificity. Although perception has often been invoked in the development of pictorial semiotics, this acknowledgment has mostly been superficial. The real impact of the perceptual model in pictorial semiotics, and in visual semiotics generally, can only be the result of the critical encounter, and thorough cross-cultivation, of perceptual psychology and semiotic theory.

## Notes

1. We shall not, in the following, make use of Peirce’s intricate terminology, for the essential points may no doubt be stated without it. We will avoid the term ‘symbol’, which Peirce uses to stand for conventional signs, since it has an entirely different meaning in the European tradition; indeed, in the latter context, the same term is mostly used for a particular variety of the iconic, or similarity-motivated, sign.
2. For this claim, which is based on Savan and Greenlee, cf. Sonesson 1989a: III.1 and literature referred to there.
3. Note that if we choose to define indices in terms of causality, which is also an option appearing in Peirce’s work, it will be impossible to exhaust the domain of signs by means of the three sign types; moreover, many examples of indices given by Peirce certainly are not causal (cf. Sonesson 1989a: I.2, 1993a).
4. For more details on the critique of iconicity and the errors it involves, see the entire third part of Sonesson 1989a.
5. Uspenskij himself seems to favor a more radically conventionalist interpretation of this experience, which is unacceptable to us for reasons given above.

6. No doubt signs can also be made out of high-ranked Lifeworld ‘things’ (as in the case of secondary iconicity, discussed above), but then the sign function must be introduced explicitly as a convention or be expected in the situation (see Sonesson 1989a: III.3.1).
7. For a more complete treatment of the issues involved, cf. Sonesson 1989a: III.2.4-5 and III.6.1.
8. Further issues pertaining to Goodman’s identification of the properties manifested by the picture as an exemplifying sign and as a vehicle of reference, as well as the nature of diagrams, are considered in Sonesson 1989a: 233ff.
9. For a thorough analysis of these requirements, as well as of Goodman’s failing to reconstruct ‘analogy’, cf. Sonesson 1989a: III.2.5.
10. These properties may of course be relevant when the picture is considered as exemplifying aesthetic properties (i.e., as a ‘plastic’ sign, in the sense of Groupe  $\mu$ ), which shows that Goodman (1968: 233) and Elgin (1983: 121f) are wrong in thinking that exemplification and reference give rise to the same segmentation. Cf. Sonesson 1989a: 233f.
11. This argument is given more fully in Sonesson 1989a: III.4.

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## **The Psychosemiotics of Picture Perception**



## The Construction of Pictorial Meaning

Julian Hochberg

Pictures, as they are used to represent and communicate objects and scenes, cannot be explained either as surrogates for what they represent (i.e., as optically equivalent), or as a culturally-determined language of arbitrary signs and syntax, the two most extreme but potentially explicit approaches. To account for how, and under what conditions, iconic displays are similar to their referents, we must consider the looking behavior that is engaged in recognizing things in the world, and how that behavior can be satisfied by pictures. We will necessarily learn something from such an enquiry about how we perceive the things of the world. We may learn something about language and the communication of more abstract meanings as well.

In the first section, I will argue that we can recognize or identify pictures of things (even if they are only outline drawings) from experience with only the things themselves, and with no pictorial information about depth (depth cues). This necessarily means that outline drawings share some physiological equivalence with objects' edges, at least so far as recognition is concerned, and that spatial information (size, distance, etc.) is not needed for that function (contrary to the widespread assumption that it is).

The second section reviews the classical problem inherent in using flat pictures to convey information about 3D objects and scenes, and the classical solution to that problem, which used its explanation of pictures to help explain psychology quite generally. The third section introduces the ecological realist argument, in which pictures (and especially outline drawings) are not diagnostic of how we perceive the things and layouts of the world; and the fourth discusses the conventionalist view that pictures are arbitrary patterns or signs given their meaning by cultural experience. In both of these otherwise antithetical positions, pictures must be thought to communicate much as verbal language does (although Gibson, the founder of ecological realism, vainly struggled to find a way out of this conclusion, it is strongly coupled to his argument that picture-perception is unrelated to normal perception).

The fifth section considers why we should be prepared to recognize objects without resorting to their 3D spatial characteristics. In the sixth, I discuss some major theories of how this might be done, based on features or components given in the 2D projection. Biederman has speculated that such nonarbitrary features, learned from the objects of the world and not from artistic convention, provide for recognition by their combinations (as do phonemes in recognizing words). Because of the figure-ground problem, such theories do not tell us what features will be extracted in the first place. More generally, I raise the Gestalt theoretical approach to figure-ground, show how the more global derivatives (modern minimum-principle attempts) fail, how object-familiarity makes a strong and perhaps fundamental contribution to figure-ground formation, and suggest that the Gestalt 'laws' are themselves intermediate-sized features that are most likely to pinpoint (but not determine the identity of) objects in the field of view.

I then outline why, given the actual sequential processes by which we cast our glance around any scene or picture, it is useful or even necessary to have something like the Gestalt laws, and like familiar meaningful shapes in the mind's eye, by which to parse the field of peripheral vision, to guide the relatively few glances by which we gather detail, and to take that detail into account in reaching the consequences of the inquiry. I propose, in short, that it is with respect to the specific needs of human visual inquiry that the objects and layouts they represent are similar: the need for a structure, necessarily 2D both when looking at a 3D world and at 2D pictures of it, that must direct and store the successive glances by which inquiry proceeds.

The last section is an attempt to apply this account, in which objects drive recognition and communication quite generally, to some of the more abstract kinds of communication for which pictures are used.

First, I return to the source of these speculations.

#### **Pictures (Including Outline Drawings) Can Signify Familiar Objects Without Any Pictorial Training Whatsoever**

Anecdotally, immigrants from picture-free (Orthodox) communities report no noticeable inability to recognize pictured objects and people. As direct experimental evidence: a young child who had simply never received instruction in or asso-

ciations with pictures correctly named line drawings like Figure 1 on his first contact with them (Hochberg and Brooks 1962).<sup>1</sup>

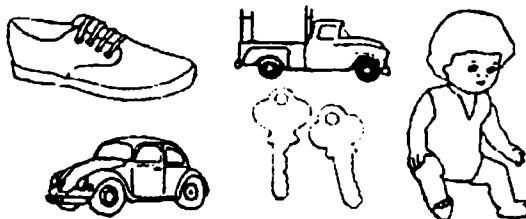


Figure 1. No prior pictorial training was needed to name the objects in these outline drawings. (Hochberg and Brooks 1962)

This fact, if we accept it as such, has widespread theoretical consequences, not all of which have yet been faced. I know of no contrary evidence. Studies do show that younger children have more trouble using and making pictures that provide spatial information (e.g., Hagen and Jones 1978; Krampen 1993; Willats 1977), which is not surprising, and some writers claim to have shown that people need training to perceive scenes represented in Western-style pictures. Most explicitly, Hudson asserts:

Pictorial representation of a three-dimensional scene requires the observance and acceptance of certain artistic or graphic conventions.... There are three such cues concerned with form only, viz., object size, object superimposition or overlap, perspective. The incidental evidence furnished by...African samples indicates that these pictorial conventions are not accepted in such sub-cultural groups. (Hudson 1962: 185)

Such studies have themselves been strongly criticized on various grounds (Deregowsky 1968; Hagen 1974; Jahoda and McGurk 1974; Jones and Hagen 1980; Kennedy 1974; Kilbride and Robbins 1968; Mundy-Castle 1966), but in any case they simply do not tell us that the recognition of pictured objects requires training. Thus, Hudson's study, which reports incorrect readings of perspective,

reports virtually no difficulty in recognizing the outline drawings of warriors and animals.

The view that pictures comprise arbitrary visual codes that must be separately learned is termed *conventionalism*. Most conventionalist arguments take the misuse of linear perspective as their centerpiece. The problem with this choice is that linear perspective (along with some related cues, like texture-density gradients) is special: it is global in scope (potentially applying to everything in the picture), metric in information (specifying not only that one thing is nearer than another, but how much so), and *only offers consistency from a single viewpoint*. What viewers perceive when those conditions are violated is an interesting question, with which I will be briefly concerned, but the fact that the consequent inconsistencies are tolerated does not of itself reduce perspective in particular, or pictures more generally, to arbitrary conventions. As we will see, other and older cues are local in their effect; are ordinal rather than metric (i.e., signifying that something is nearer but not by how much); and are essentially independent of viewpoint.

Furthermore, the fact that Figure 1 offers no explicit depth information (other than a weak form of interposition we discuss below) argues that depth need not be signified at all in order to achieve fully recognizable, realistic nonarbitrary pictures that draw on the same mechanisms by which we perceive the world. And if that is true in the world itself, what we have to explain by the study of perception is greatly changed. Let us first consider why it has been thought that depth cues (like perspective) should be needed in pictures.

### **Pictures (Which Are Flat Objects) Are Not the 3D Things They Represent**

That is surely true (although it holds little epistemological interest today, and will hold even less as holograms and virtual reality become more common). But pictures and their referents are indeed physically equivalent for certain critical perceptual behaviors: although layouts at i and ii in Figure 2A are so different, the two provide the eye of the viewer with patterns of light—*optic arrays*—that are roughly similar. Most classical psychologists take the success of such pictures as indicative of how we see depth in the world. (In fact, most texts on experimental psychology list Leonardo's pictorial depth cues in discussing how we see the world, not how we see pictures.)

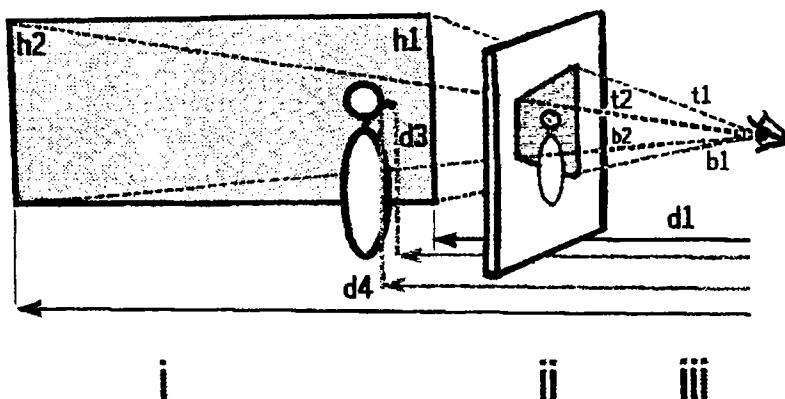


Figure 2A. A layout in 3D space (i) and its picture (ii), both of which reflect light (iii) to the eye in very much the same pattern. The equal heights of the 3D wall ( $h_1$ ,  $h_2$ ) and the unequal heights ( $t_1$ ,  $t_2$ ) of its picture in (ii) offer identical visual angles to the eye when the latter is at the proper or canonical viewpoint. Distances  $d_1$ - $d_4$  in, i.e., the third dimension, are lacking in both the picture and in the light to the eye from the layout.

The most pervasive account is this: informed by the pictorial (and other) depth cues, (a) we perceive objects in the world as 3D volumes and forms, and correspondingly (b) we perceive objects in pictures by means of their represented volumes and forms in represented space. A process of *unconscious inference*, in which the viewer derives objects' sizes, shapes, and surface colors from the spatial layouts that are signified by the depth cues in both cases, is usually part of this standard explanation: to perceive the equal heights ( $h_1 = h_2$ ) and the figure's volumetric parts (e.g., nose and torso), in both the world and the picture, the viewer must rely on the perceived distances ( $d_1$ ,  $d_4$ ) to give meaning to the optic array (represented here by  $t_{1,2}$ ,  $b_{1,2}$ ).

As I said above, I will argue that the depth cues are probably not critically important in perceiving objects either in pictures *or in the world*: that is, one probably need not first perceive its structure in depth in order to recognize an object (note that there are no depth cues in 1). But I think that the classical approach, which bases its explanation of how we see the world at least in part on how artists have learned to make pictures, holds up better, after some serious revisions, than either of its two main challenges: Ecological Realism derived from

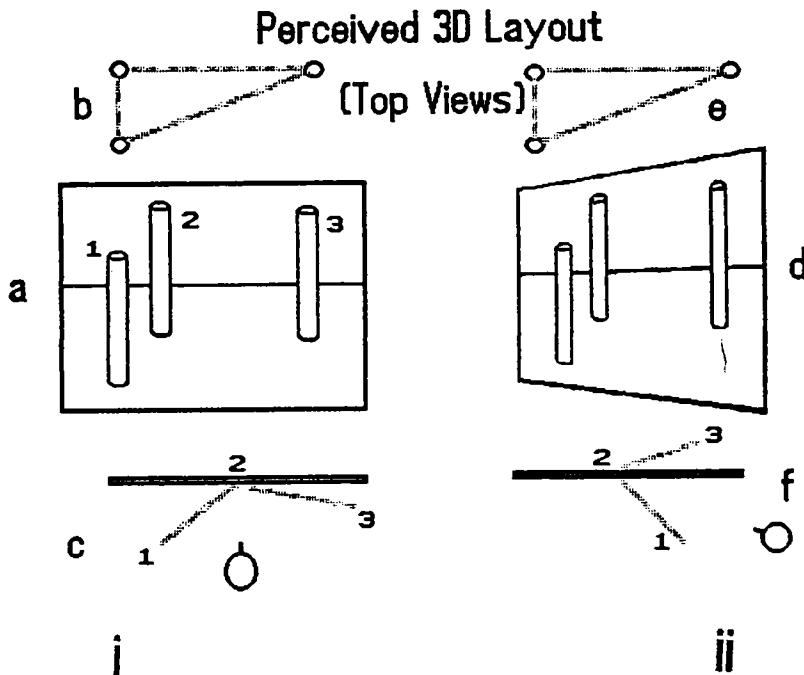


Figure 2B. Effects of noncanonical viewpoints are usually small, but depend on what the viewer seeks. At i and ii, canonical and noncanonical viewpoints are sketched. At (a), a pictured layout of poles (1-3); when reporting what the layout would look like from above, viewers do much the same (b, e) whether the picture is viewed from in front (c) or from the side (d, f). However, when describing how the poles seem aligned in space relative to the picture's plane, viewers give very different reports (c, f) at the different viewpoints (Goldstein 1987).

Gibson, and Conventionalism derived from Nelson Goodman. I reject these two iconoclastic arguments not merely in pursuit of truth but in attempting to explicate what we can learn about the perception of the world through the study of pictorial representation.

#### Why Ecological Realists are Wrong in Considering Pictures as Nondiagnostic

To the Ecological Realists who follow Gibson (1966, 1971, 1979), the distal properties of things in the world (physical sizes, distances, 3D forms, etc.) are *directly*

*specified* by the information in the array of light that is offered by the world to the moving viewer. Pictorial representation is then a critical problem: the information from a picture (e.g., Fig. 2Aii) specifies a flat pigmented surface, not a 3D layout. The study of pictures is therefore somewhat pointless, since it is not diagnostic of how viewers perceive objects' surfaces in the world; the static pictorial depth cues presumably lose whatever borrowed power they had once the viewer is free to move and replace them with the irrefutable 'ecologically valid' informative variables in the optic flow. (And illusions therefore supposedly cannot occur under 'normal' seeing conditions—i.e., with a moving observer.)

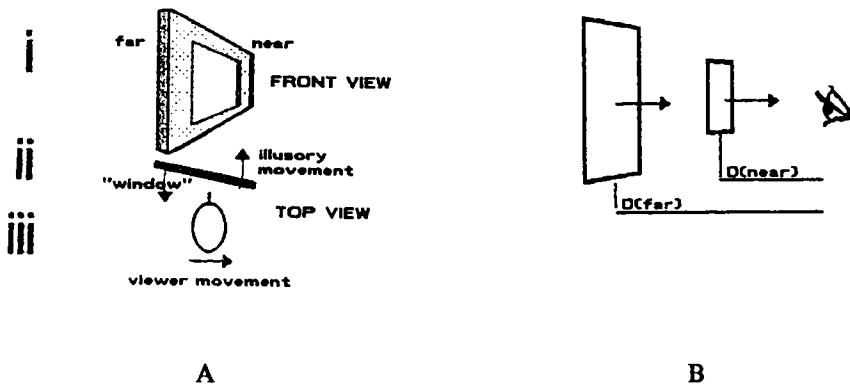


Figure 3. (A) A stationary flat object that, because of the static depth cues painted on it (the frontal view is at (i)), is misperceived as being nearer appears on the left when the reverse is true (shown from above at (ii)), is seen in illusory movement when the viewer moves (ii, iii) (Gogel and Tietz 1992; Hochberg and Beer 1991).

(B) Of two objects approaching the viewer in computer simulation, the larger one appears the closer even when further off, in accord with the static depth cues of relative size and against the motion-based (optical expansion) information. (DeLucia 1992)

All those assertions are wrong: when viewed by a moving observer, such static (pictorial) depth cues as perspective do *not* (depending on their strength) succumb to the information in the optic flow provided by the motion. In Figure 3A, viewers moving past a stationary Ames window with its small end the nearer tend to see instead the large end as nearer, and see the entire form in the appropriate illusory

concomitant motion (Gogel and Tietz 1992; Hochberg and Beer 1991); young infants reach for the large end of the Ames window (as they normally do for the nearer of two objects or edges) when the two are equidistant (Yonas et al. 1986); the larger of two approaching objects appears closer in time-to-contact, even though in fact further off, as in Figure 3B (DeLucia 1991); the Müller-Lyer illusion, often attributed to a misapplied assumption of convergent perspective (e.g., Gregory 1970), survives in 3D layouts even when these are viewed by moving observers (DeLucia and Hochberg 1991). So it is simply not true that the pictorial depth cues are effective only in statically-viewed pictures.

Furthermore, 3D layout is itself not necessarily seen in the depth that presumably makes it so different from pictures: after a class demonstration of a motion picture of two moving objects, one being a picture and the other a 3D model of what the picture represented, most viewers could not tell which was 3D until a reshowing in which their attention was called to the optic flow in the latter (Hochberg 1962); in the laboratory, Epstein and Broota (1986) showed that at least some distal properties are not perceived unless viewers are directed to attend those attributes. This point will become crucial when I try to pinpoint the perceptual actions for which picture and world are inherently equivalent stimuli.

How then can we apprehend a world of 3D objects in which depth information is not necessarily used first and always? Perhaps objects' precise 3D forms and surface orientations are not central to the recognition of familiar objects or familiar categories of solid objects. I argued this initially (Hochberg 1971, 1978) in the context of what Cutting (1986) calls the La Gourniere problem—how we recognize objects when viewing their pictures at a slant to the line of sight (Cutting 1986, 1991; Goldstein 1979, 1987, 1991)—and Cutting now has data (1991) which strongly argue that the distortions provided by such offside viewing are in fact largely without effect.

Ecological Realism thus recedes as a potent opponent, and perhaps as a viable metatheory (see also Cutting 1993). What of Conventionalism?

### **Conventionalism, which Holds that Pictures Signify the World Only through Arbitrary Markings that Must Be Learned through Practice, Is Wrong on Both Counts**

This position is held by innumerable writers on art and film, and also by some philosophers although opposed by others; Goodman (1968), Kepes (1944), and

Wartofsky (1979, 1980) are perhaps the clearest proponents of conventionalism in connection with pictures. We saw above that some objects can be recognized from their pictures with no previous association between pictures and objects. This alone is enough to reject the conventionalist position on narrow grounds, but I believe that it will be instructive about visual cognition to review the arguments for conventionalism and why they fail. I will try to show that the means by which pictures signify depth or space, and by which they signify recognizable objects, persons, or scenes, are not arbitrary either in their optical geometry or in how they have been used, and depend instead on the means by which we perceive the world itself.

First, a reminder of a strong and inherent limitation to the conventionalist argument (and to the ecological realist argument as well). The same physical picture—a ceiling mural or a photograph on cardboard—that looks convincingly flat under one set of viewing conditions may be a completely convincing *trompe l'oeil* under another set. Thus, from the designated viewpoint the ceiling of St. Ignazio seems open to a view of majestic 3D figures against a cloud-filled sky; a photograph that offers no binocular disparity but that is viewed through a lens that hides the pictures' edges (as in a stereoscope) provides a strikingly plastic and convincing depth (Schlosberg 1941); indeed, pictorial cues within a single view may initiate the binocular vergence-changes appropriate to the depth they signify (Enright 1991). If these cues were arbitrary, how could the marks on canvas, plaster, or paper be indistinguishable from the 3D scene they represent? and why should that set of marks, if designed by cultural convention to be effective under normal pictorial viewing conditions, be more effective when viewed under the constraints I have mentioned? These long-known facts should be kept in mind as we consider the argument that pictures are only arbitrary codes. But it is also important to remember that we routinely use pictures to convey recognizable objects and scenes, in normal viewing, which would simply never fool the eye under *any* conditions. I think that what I have said here assures us that neither a behaviorist (ecological realist) discussion of stimulus information, nor a conventionalist discussion of visual codes, can account for visual communication (or, I believe, for communication more generally).

Goodman probably presents conventionalism most rationally, an inquiry rather than a manifesto. Taking linear perspective as his example, he argues that it is routinely violated in viewing (i.e., that it is rarely viewed from the one position that would make its geometry fit the represented layout); that it is understood only

by those schooled in Western culture; and that its use is arbitrary in artistic practice (both artists and photographers routinely and deliberately violate the geometry of perspective). I will not review here how it is *not* arbitrary (see Gombrich 1972; Sedgwick 1983, 1991), how it is *not* simply culturally bound (see Jones and Hagen 1980; Tormey 1980), and how its systematic violation in artistic practice is (since Leonardo introduced *synthetic perspective*) *not* done whimsically, but done specifically to alleviate the violations of geometry provided by noncanonical viewing positions (Hochberg 1984; Pirenne 1970; White 1967). There is a more important issue here, a belief (apparently shared by Goodman and Gibson, among many others) that the perspective or size-gradient in the optic array, as it is therein provided by the world, is the relevant informative variable to consider. I want to distinguish local convergence or *diagonality* (cf. Gillam 1978) from the global geometry of vanishing-point perspective, introduced to artists in the Renaissance (White 1967) by architects, to organize the depicted surfaces within each picture so that they are consistent with each other and with what the desired scene would project to the eye at a single viewpoint.

The point is that in most drawings diagonality is enough to stand in for perspective when representing depth, and the viewer's stationpoint is irrelevant over a wide range of distances and directions. The cube in Fig. 5Dii, with no convergence at all, is usually taken as a good representation; much research has asked about what yields a good or acceptable perspective representation (e.g., Hagen and Elliott 1976; Perkins 1972) and about the effects of viewing from the wrong distance or direction (Cutting 1987, 1991; Goldstein 1979, 1987, 1991; Kubovy 1986; Pirenne 1970; Perkins 1973; Rosinski et al. 1977), and in general strict projective fidelity is not required. Moreover, the effect of viewpoint depends on what the viewer is asked to do with the pictorial information (see Fig. 2B, and Goldstein 1987), and we will see that the viewer often uses only the nearby and salient information. The fact is that the rules of perspective had to be introduced, and explicitly learned by the artist who wished to represent a layout dense with parallel edges and right-angled corners, *thereby implicitly acknowledging the insensitivity of the untutored—or inattentive—eye*.

Diagonality, like interposition and modeling, is a local depth cue—it can stand alone, like the cube in Figure 5Dii, and in its various uses in Figure 4Ai; it can be nonmetric in its effects; and its use clearly precedes the introduction of perspective (although I suspect that without a formal understanding of vanishing-point

perspective, artists would have learned to be wary of making pictures that included several salient examples of diagonality).

The more local depth cues need no special instruction.

People made pictures long before global linear perspective was introduced. The more local cues were far older and are still treated with more respect. Consider the remarkable painting (from the Groeningemuseum in Bruges) sketched in Figure 4Ai, painted by Jan Van Eyck in 1436 as realistically as was then possible, at just about the time of Alberti's major work codifying perspective. The picture makes some trivial and inconsistent use of perspective, but relies primarily on modeling, on height-in-field, and, above all, on *interposition* (as at a-d) and *intersections* (as at e) for its depth information. Only with sustained attention to the diagonals at b and at e does the discrepancy in their vanishing points (cf. Fig. 4Aii) make the base of throne and column appear nonparallel. Figure 4Ci sketches part of a painting from about the same period (1480, by the 'Master of the Saint Ursula Legend', in the Metropolitan Museum of Art), packed with interposition cues, with no perspective at all, and with no doubt as to degrees of depth being represented.

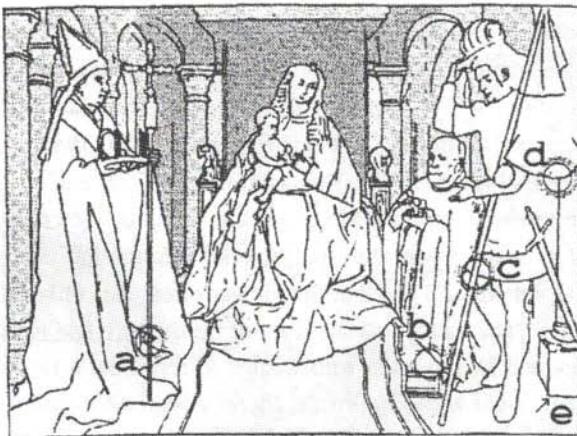


Figure 4Ai. Sketch of a highly realistic painting by Van Eyck (1436; see text). Some of the depth cues based on interposition and diagonality are circled (at a, c, d, and b, e respectively). (Modeling is effectively employed but not shown here.)

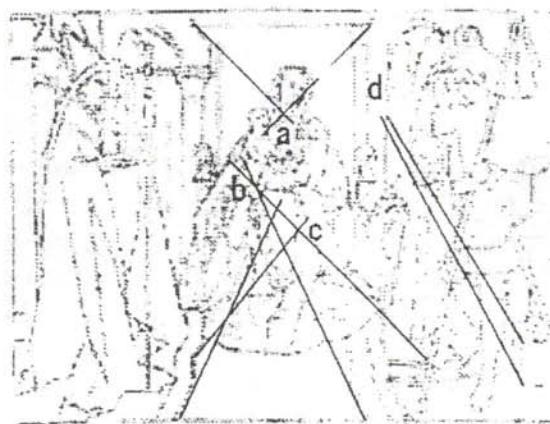


Figure 4Aii. The diagonalities in Ai do not fit a global vanishing-point perspective (because the sketch is inaccurate, the nonalignments shown here (a-d) are only approximate).

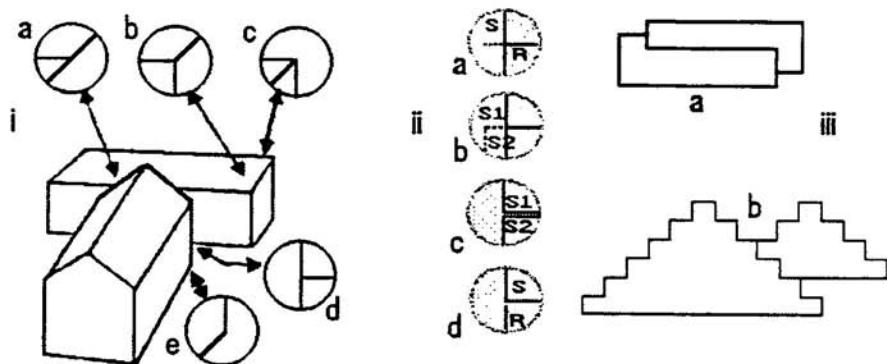


Figure 4B. (i) Interposition and intersection components arranged in a layout (adapted from Guzman 1969). (ii) Alternative ways in which Bi(d) can be construed as two surfaces (s1, S2) or a surface(S) and a wire or rod (R). The simplest formulation is that we tend to see the uninterrupted line as the edge of a nearer surface (see Ratoosh 1949). (iii) Troubles with this simple formula (upper figure adapted from Ratoosh 1949, lower from Chapanis and McCleary 1952).



Figure 4C. (i) A landscape executed with classical interposition (and height in field) as its depth cues; see text. (ii) Intact and disarmed interposition components as used by Cezanne and by many postimpressionists. Cues a, f are intact, b-e are disarmed (see text). (The sketch is modified from Hochberg 1984.)

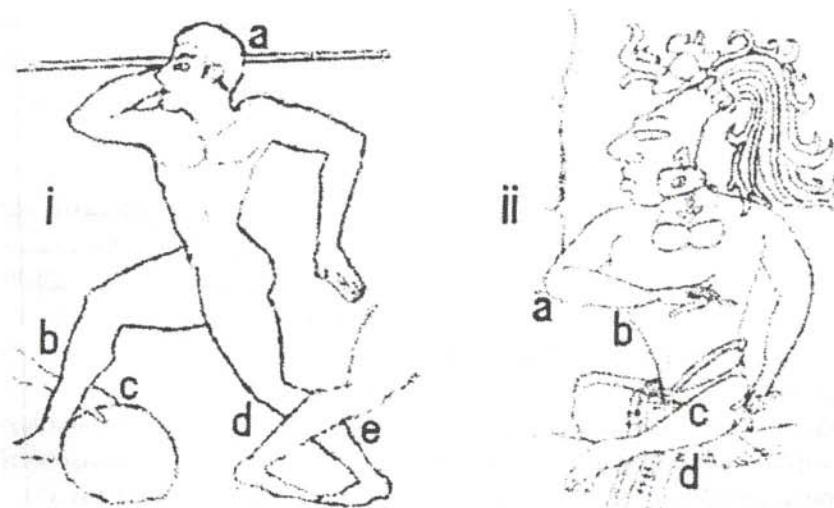


Figure 4D. Sketches of interposition in outline depictions on a Greek bowl (ca. 490 B.C.) and a Mayan vessel (ca. A.D. 800); see text.

These local depth cues are certainly nonarbitrary. Modeling or shading, which was made much easier by oil pigments (which Van Eyck helped introduce), emulates the light reflected from diffusing surfaces (for detailed analysis, see Horn 1981; Todd and Mingolla 1983), although the curvatures we actually perceive with such shading only sometimes, and only approximately, correspond to the physics (Todd 1989). Interposition, as a depth cue, is essentially this: the uninterrupted contour represents the edge of the nearer surface (for wider discussion of this and related cues, see Ratoosh 1949; Kellman and Shipley 1992).

Considered by itself, the typical interposition pattern shown in Figures 4Bid, 4Aid, etc. might simply be a 'T'. Once the viewer takes the step of construing that pattern as the edges of some (any) arrangement of surfaces in depth, the interposition formula describes the most likely (and the simplest) such arrangement. *Taking that step might be part of a learned skill in looking at pictures, but the cue itself is not thereby an arbitrary symbol that the artist is free to replace:* various construals of Figure 4Bid (and of 4Aid, etc.) are sketched at 4Bii. At *a*, a wire rod *r* continues under the surface, *s*; at *b*, surface *s1* continues under another *s2* (in an equivalent layout, *s2* might be above with the gray background below). Other alternative layouts are less likely, and require more *ad hoc* descriptors: at *c* and *d*, respectively, two surfaces *s1* and *s2* or a surface *s* and a rod *r* align precisely at their left edges. The last two construals specify and could result from only one precise positioning of the viewer's eye relative to the parts of the layout, making those alternatives less likely (and less simple) as explanations of the picture itself.

In a similar manner, we can argue that the *intersection* patterns, like those in Figure 4Aie and 4Bia-c, are also nonarbitrary, and are most likely to arise in the physical world from corners of objects; indeed, this set has been suggested as primitive elements that would allow computers to recognize objects in the world (Guzman 1969). Although these elements can be defined locally, their meanings (and their likelihoods) are affected by their context (by a syntax?) which is still to be spelled out: inspection of Figure 4Biiia, b and Figure 5Diii, iv show either the interrupted edge to appear the nearer, or the pattern itself to appear inconsistent (in that the connecting line must change its function between the local cues it connects). Note also that reconstruing an interposition cue would usually violate the larger shapes of any of the familiar objects in the pictures we have used. It is hard to see how the artist can avoid these cues, or how the viewer could fail to learn them from pictures, if they are indeed learned from pictures and not from the world (or are not prewired predispositions).

Of course, one might claim that the whole argument is manifestly invalid in that I am using outlines, which presumably can have no inherent connection with real objects' edges or silhouettes, and therefore must be learned symbols. To reject that claim, it is enough to remember the untutored recognition of the objects pictured in Figure 1; to consider the cross-cultural prevalence of outlines (see Figs. 4Di, ii); and to note that not only lines, but types of contours a viewer has never previously encountered (e.g., between regions of differently-moving random-dot textures) will serve to communicate recognizable shapes. As Hochberg and Brooks noted in 1962, lines must be members of a family of stimulus events—changes between one region and another—that includes objects' edges (cf. speculations by Hochberg 1962, 1980; Kennedy 1974, 1984; Marr 1982; Stephan 1990).

Whether or not these cues can be considered as nonarbitrary in some respects, however, their actual implementation might reflect quite arbitrary cultural convention. How have they in fact been used? In much the same ways, for thousands of years, across very different cultures and styles: Figures 4Di and 4Dii are, respectively, sketches from a Greek bowl of about 490 B.C. and from a Mayan vessel of ca. 1200 years later (both in the Metropolitan Museum of Art). If these were merely cultural codes, like phonemes or words in a language, would they have been so similar across such cultural discontinuity? And continue unchanged today?

With certain significant exceptions, they have remained among the leading depth cues because they are essentially ordinal (signifying that X is nearer than Y, but not by how much) and immune to violations of viewing position, as perspective is not. Some 360 years after Van Eyck's painting and Alberti's tome on linear perspective, David's large exhibition paintings, made to be viewed from many positions, *used even less perspective than did Figure 4Ai*, and therefore provide no feelings of distortion when viewed from anywhere along their width (see Hochberg 1984): perspective was avoided, local cues were not. And when artists wish for one or another reason to 'flatten the canvas' (we will consider one such reason later on), they characteristically eliminate the sharp discontinuity at the point of intersection which is the defining characteristic of interposition. The terminating line is deflected so as to continue into, and not intersect, the edge that it joins, as in *b-e* in Figure 4Cii, which is a sketch of Cezanne's painting of his father (dated 1866 and hanging in the National Gallery); this is clearly a deliberate technique, one that is easy to find as well in Matisse, Vuillard, etc. (see Hochberg

1980). In other words, these artists are acting as though interposition must be softened or disarmed, not merely ignored.

In short, there is presently no reason—whether anthropological, physical, artistic, or perceptual—to believe the local depth cues work only because they have been arbitrarily assigned spatial meanings. Culture may support, but it cannot explain, their power. But even if it could, that still would not imply that pictorial communication, to the extent that it includes represented familiar objects, is a learned result of cultural conventions: there is no reason to believe that the representation of depth precedes, or is important to, the representation of recognizable things and scenes. Indeed, it is quite possible that the reverse is true: that in pictures the projective depth cues are initially confusing (cf. Arnheim 1990) whenever they interfere with whatever features or components are most used in object identification and recognition.

### **Perceiving Objects in the Real World Probably Does Not Derive on Each Occasion from First Perceiving their 3D Form, Just As Recognizing Them in Pictures Does Not Necessarily Depend on the Use of Depth Cues**

If we repositioned the limbs in Figure 4Di, if so as to remove the interposition, which is the only depth cue present, would the objects not remain recognizable? It is true that pictured things and people *can* in fact be built up out of disconnected local depth cues alone, as in analytic cubism or in random-dot stereograms, so it is not an either/or proposition: both real objects and represented objects *may* be recognized in terms of their 3D layout (e.g., recognizing the protruding nose in Fig. 2A by registering distance D3). But neither *need* be recognized in that way. Consider yet again the main lesson of Figure 1: no depth cues are present to account for pictorial recognition. *What grounds do we have for believing that the same shoe or toy car that is recognized without depth cues when it is a picture would go unrecognized in the world except for its depth cues?*

The fact is that the notion of an unbridgeable gap between 3D objects and 2D pictures of them has few adherents among scientists concerned with object perception. There have been many proposals, especially in thinking about machine vision and neurophysiology, in which the 2D image serves to identify objects and some of their behavioral consequences (e.g., where a robot's hand might grasp them): to list a few, Biederman 1985; Binford 1971; Brooks 1981; Lowe 1985;

Witkin and Tenenbaum 1983. For many functions (e.g., what object lies before us or where it may be) it would be most efficient to use criteria based only on the 2D image or optic array. But beyond an appeal to efficiency, we should note that *the real world itself often offers us only the pictorial depth cues*: for example, past a few yards' distance, accommodation, convergence, and the very minor parallax of small head movements can reveal only large depth distances. These are often too coarse to be of much use in distinguishing one object from another. Or even if the object is near us, it may fall in peripheral vision where the resolution is insufficient for fine depth discrimination, or indeed may fall in only one eye's field of view and therefore offer no binocular disparity.

The idea that we define and recognize 3D objects in terms of how they are specified in a 3D spatial coordinate system (cf. Fig. 2) seems plausible, since that is how the objects themselves are usually defined physically, and it seems to be in accord with our casual experience of a seamless, 3D world. With respect to the first, there are many other ways to specify the objects we encounter, with the 2D optic array (and its associated retinal images) being at least as plausible, recent ideologies aside, given that it is necessarily present in any causal account of perception. With respect to the second point, whether or not one agrees that our conscious experience is inviolably spatial and seamless, such statements say nothing about the underlying cognitive processes at work.

My view is that recognition and perception quite generally are more opportunistic and task-dependent: I need depth information to recognize (and reach for) an unfamiliar frying pan's handle when viewed head-on, whereas I can recognize an apple (and reach for it)—or the handle of some *familiar* pan—by its color. At an organismic (as opposed to a synaptic) level, learning follows multiple routes, and so must the acquisition of meaning. Quite separate ways of using information about space and shape in recognizing objects are revealed by the differential effects of neurological impairment (Humphreys and Riddoch 1987). But if we don't use 3D form to recognize objects, we are somewhat adrift: on what features *that are shared by real and pictured objects* can object recognition then be based?

### **Shapes, Configurations (*Gestalten*), and Apprehendable Objects**

The question of how we identify or categorize a visual object still requires empirical research more than neurophysiological speculation. No relevant work that I

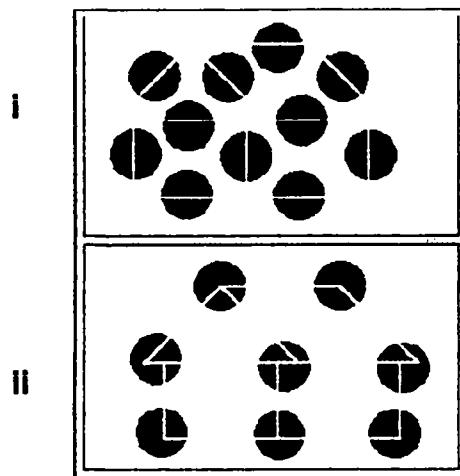


Figure 5A. Inflection points act as informative features or components in the 2D array. (The original observations and their theoretical context are from Attneave 1954; the use of apertures to present only a subset of an object's features are from Bradley et al. 1976; and this example is from Hochberg 1980.)

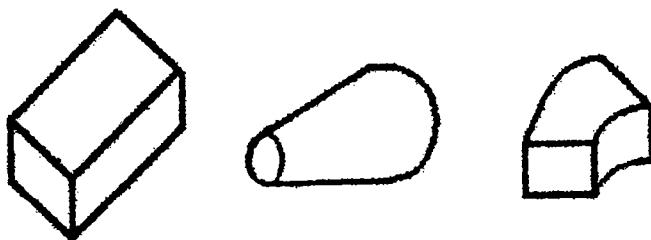


Figure 5Bi. A sample of the nonaccidental (relatively nonconfusable) set of 36 3D components, called geons, by which, in Biederman's (1985) proposal, all noun-class objects are recognized, much as words are recognized through their component phonemes.

know has used real objects; most used outline drawings or sine-wave gratings. And most research has studied how we recognize object category, and not identity (e.g., 'that is a dog', not 'that is Fido').

The seminal study here was Attneave's demonstration in 1954 that inflection points in a silhouette or outline shape carry most of the pictorial meaning. As a visualization of this point, compare *i* and *ii* in Figure 5A; subsequent studies have emphasized the role of such regions, or distinctive features, for object recognition (Biederman 1985). The number, relative placement, and topological properties of such features (e.g., which way do they point, are they curved or angular, etc.), as they are presented in the optic array at the eye, would be relatively independent of the object's overall size and slant to the line of sight. And there have been several theoretical proposals that classify objects in terms of features that should not often occur in the optic array only by the accident of the observer's viewpoint: thus, it is highly unlikely that the top object in Figure 5Bii is a nonrectangular trapezoidal shape viewed from just that one point which would receive a perfectly rectangular projection. (For discussions of such nonaccidental properties, see Biederman 1985; Binford 1971; Hoffman and Richards 1985; Kanade and Kender 1983; Lowe 1985; Richards and Hoffman 1985.) If we use such nonaccidental properties to recognize objects, that would explain how we can perceive the same object despite the very different retinal images we receive from different viewing distances and slants to the line of sight (the 'constancy problem'). It would also explain how we can recognize the object in a picture, despite its different size and despite the perspective distortions it incurs with most viewpoints, without depth cues, and with no appeal to spatial inferences. *The same perceptual process which brings us freedom from accidental viewpoints in the world would bring us the ability to recognize pictured objects and scenes.*

But such explanations, in which the recognition depends on shape defined in terms of its measured stimulus features, are inadequate. At this point, the picture is not like the object: the picture's surface lies at the same distance from the viewer on both sides of the outline, whereas with a real object any surface past its edge lies further away, and continues on behind the object.

Notice that the differences I have described at the real object's edge are those attributed, since Rubin, to *figure* vs. *ground* in pictures: in Figure 5Ci, *a* is a picture; *b* is an attempt to make clear what it appears like when the black, enclosed region is the figure with white being the ground; and *c* is a visualization of the white as figure with the black as ground. That is, even without any specific depth

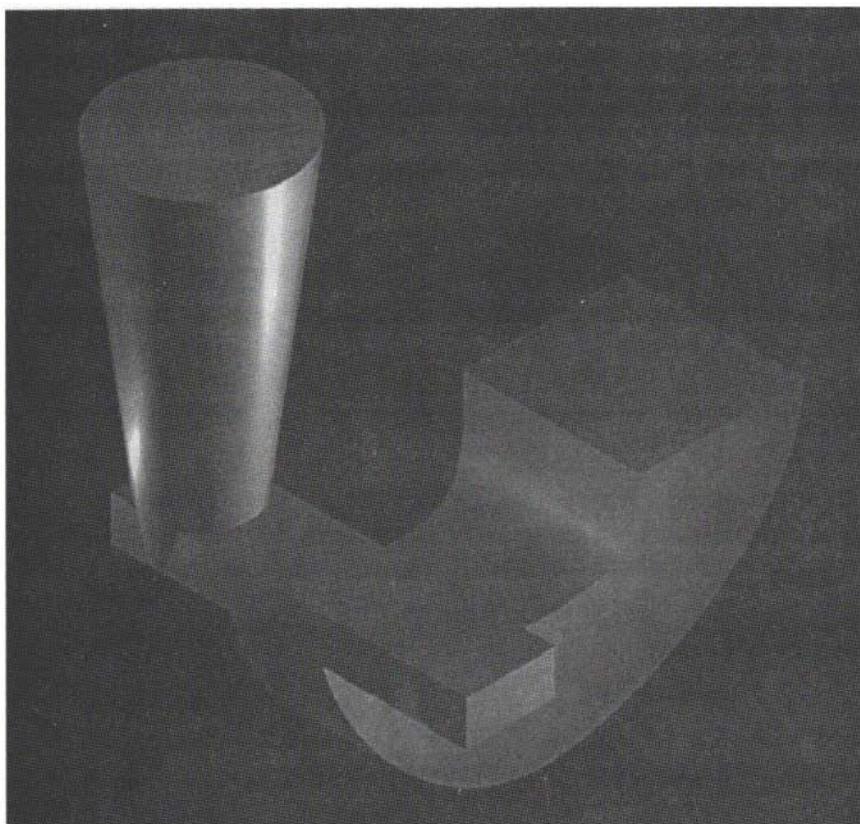


Figure 5Bii. Shaded, and therefore more 3D-appearing geons, assembled in an object for testing part of that proposal (C. Moore, dissertation in progress, Columbia University).

cues, we appear to treat pictures like objects and to afford them an element of ordinal depth (which may subsume our discussion about the interposition in Fig. 4Bii). Although it is easier to reconstrue figure and ground when looking at a picture than it is when looking at some region in the world, the problem holds in perceiving the real world as well: an object that has been camouflaged so as to be ground rather than figure has no perceived shape, and cannot be recognized.

With one and the same pattern in the optic array, the shape of the object, in terms of its nonaccidental features (convexities, concavities, etc.), may be totally different depending on which area is figure. That is why the description of an

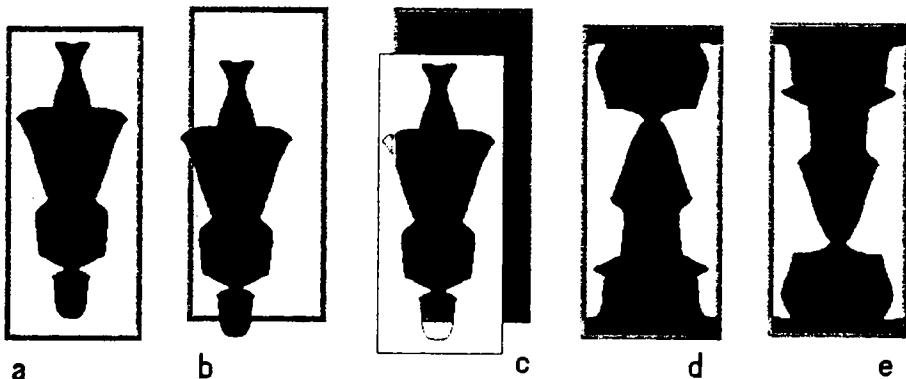


Figure 5Ci. Figure and ground: (a) A pattern. (b, c) The two alternative objects that are predominantly perceived in (a). The perceptibility of the two alternatives in (d) and (e) changes significantly when this page is inverted (and if you note the relationship between the white regions in d, e and the black region in a, b). Discussion in text.

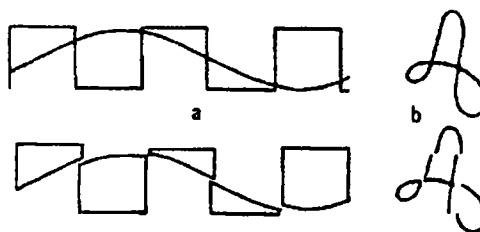


Figure 5Cii. The Gestalt 'law' of good continuation in the top patterns of (a) and (b) makes it difficult to construe these patterns as 5 patches (a, at bottom) and a 4 with small addenda (b, at bottom).

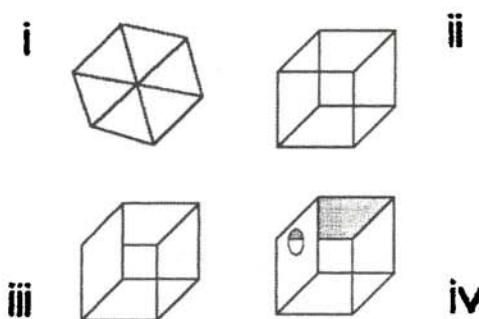


Figure 5D. The hexagon at (i) is much easier to see as flat than that at (ii) (after Kopfermann 1930). In the internal intersection at the tops of (iii) and (iv), the vertical line clearly marks a forward edge with the horizontal line occluded behind it. Yet if you attend the lower intersection, the two reverse. Discussion in text.

*new view level cloud new new*

*new cloud view cross level new*

Figure 5E. It requires great effort to find which curlicues in the top row also appear in the lower row, and which (if any) do not. If you turn this page 90°, so that the left-hand edge is then the top, the task will become far easier. (After a suggestion by E.J. Gibson; adapted from Hochberg 1964: Fig. 4-28E)

object in terms of such features cannot be taken as an account of object-recognition until the figure/ground issue is addressed.

It is widely assumed in psychology, and in the modeling of visual perception by computational neurophysiologists (starting with Hebb in 1944), that figure-ground segregation is 'fundamental': that it precedes and determines which shape will be perceived. The logic seems to be that laws of organization of one form or another,

which rest on the configuration and not on its acquired or assigned meaning, determine which alternative will be figure; then, having apprehended one shape or the other, the viewer's perceptual system can access the meaning that shape has acquired: e.g., cat, vase, N-lobed object, etc. I have long questioned whether figure-formation is a unified and fundamental process; whether it is a stage that must precede recognition, as most current theories propose, is now strongly contested (Peterson 1994). Such a sequence—first extract the edges, and then identify the shapes they define—would certainly be one logical route to object recognition; but neither an academic nor an engineering analysis holds much authority over the complex neural processes of evolution and behavioral abilities. The features by which shapes are to be identified often cannot be distinguished from each other until the object is recognized (Cavanagh 1987), and there must be top-down as well as bottom-up routes to object recognition.

In any case, whether or not figure-ground formation, based only on configuration (i.e., regardless of meaning), in some sense precedes the effects of familiarity, it is certainly true that all but the simplest configurations, if they lack familiar meaning, are hard to recognize from one glance to the next. In Figure 5E, viewers are usually unable to recognize whether any objects appear in one row but not the other; turning the curlicues vertically, which identifies them as faces, allows the viewer to carry them in memory long enough to make a quick comparison. The figural configurations are identical in the two cases, but unless they serve to signify recognizable objects (here, faces), which they do only when upright, their details are either not noticeable enough or are not retained long enough to compare to each other.

What then brings shape to configuration? Gestalt theory, highly respected by many writers on art (between the two World Wars and before deconstructionism and antiobjectivism came to dominate their writings), gave great weight to the structure of visual configurations and the field forces they were thought to engender, and gave much less importance to viewers' prior familiarity with objects. Thus, in Figure 5Cii, the 'law of good continuation' in the upper patterns of *a* and *b* conceals 5 closed shapes, and the familiar number '4', respectively, as is revealed by the lower patterns. *Ignoring object-familiarity would make generalized predictions possible, regardless of individual differences in life history.* After the second War, in fact, some of us felt that an objective science of pictorial significance was possible: 'laws of organization' and a 'minimum principle', previously sketched by Gestalt theorists in mostly subjective terms (Wertheimer 1958 [1923];

Koffka 1935), were now to be based strictly on potentially-measurable aspects of the configuration. For example, in Figure 5Cii, the figures as they are perceived in the upper set can be described with fewer end-points to specify (i.e., in terms of less information) than those in the lower set. And in quantitative terms, the pattern at 5Di is simpler as a 2D pattern (number of different angles, different line segments, etc.) than that at 5Dii, whereas they are equally simple as 3D patterns (it will be hard for you to see 5Di as 3D). That is, tridimensionality itself may be a matter of perceiving just that organization which requires the minimum information, rather than a matter of depth cues. (See Attneave 1954 and Hochberg and MacAlister 1953 for related approaches here; and see Leeuwenberg 1971 and Boselie and Leeuwenberg 1986 for a continuing effort to apply a minimum principle to simple drawings, an effort I now think is misguided [Peterson and Hochberg 1989].)

For although there certainly seems to be something to these factors, what that might be remains unclear after some 75 years. Even if they were better established than they are, however, they would not be evidence of a socially given language of vision (cf. Kepes 1944). Like the depth cues (which they might in part subsume), there is no reason to consider the Gestalt rules as merely arbitrary cultural prescriptions as to how visual configurations are to be structured (see Metzger 1953 and Hochberg 1980 for the argument here). And as with the depth cues, the Gestalt rules are now most plausibly thought of as features within the optic array (and therefore within the retinal image) that are diagnostic of what parts of a cluttered view belong to the same object (see Brunswik and Kamiya 1953 for the argument about proximity; see Hochberg 1972, 1980 for that about good continuation). Such principles could perhaps be learned by early experience with the world, requiring only the parallax provided by the infants' head movements and binocular vision to act as the 'teacher' for the developing PDP-like nervous system (see Becker and Hinton 1992 for a spectacular example of such self-teaching of binocular stereopsis); alternatively, they might have evolved during the species' adaptation to its visual ecology. And in any case, there is not the slightest reason to consider them as arbitrary and culturally determined rules.

But in 1994 these rules are still not sufficiently explicit to make a science. Would that they were: matters of theory aside, technology, education, and productivity would profit (see below). And they face an even greater and perhaps preemptive theoretical problem: figure-ground organization may itself be affected, at the very earliest level, by what shapes the viewer finds meaningful or

familiar, even before any shape can be perceived, and also by where his or her gaze (or focal attention) happens to rest within the configuration.

The white region is easier to see as figure in Figure 5Cie than in 5Cid, once you recognize the two familiar white half-objects in the former: when in the orientations which make them familiar, those shapes predominate (even after allowing for viewers' response biases). Peterson and her colleagues found that figure/ground effects of uprightness vary with the objects' *denotativity* (i.e., their judged familiarity); indeed, she makes a strong argument that denotativity effects are at work, in determining what the figure-ground organization will be, at least as early as the configurational factors, and *precede* figure-ground segregation in the course of visual processing (Peterson forthcoming); if that argument prevails, it calls into question both the traditional philosophical, and the modern computational, approaches to the perception of objects and their pictures.

And whether or not the effects of familiarity actually precede the very earliest stages of figural perception, or whether early recognition proceeds along multiple routes and iterative procedures, it is certainly true that the effects are manifest in the end results of all aspects of perceptual organization in which reconstrual can occur, as in the grouping of fragments into coherent objects and in the spontaneous reversal of ambiguous figures (Girgus et al. 1977), as well as in figure/ground organization. In all such phenomena, therefore, one cannot possibly predict, from the measurable stimulus alone, what object the viewer will perceive, without knowing what the viewer is prepared for.

Although of course we know something about what objects the viewer will find familiar, we don't have a vocabulary of such objects, nor do we know anything systematic about what elements different objects share (no thesaurus, no rhyming dictionary, etc.). Biederman (1985) has recently made an important proposal which, if it works out, would provide a major step toward such a vocabulary. It rests on the idea that objects may be recognized as combinations of primitive parts having *nonaccidental* properties (as this term was introduced at the beginning of this section). Biederman's powerful proposals are (i) that all class-noun objects (members of categories, like *chair*, *pot*, *hammer*) are recognized on the basis of various combinations of independent components, or *geons* (three of which are drawn in Fig. 5Bi), which are variations on simple non-accidental geometric shapes; and (ii) that the recognition process is based on these components as independent elements, and not on the overall shape. This proposal is important and welcome because it is simple, limited, and potentially testable and amendable.

Whether the recognizabilities of *unfamiliar* objects turn out to reflect the recognizabilities of their component individual geons, using pictures like that in Fig. 5Bii, is currently being pursued (Moore forthcoming). We do not yet know whether these proposed geons are in fact the best candidates for such  (RBC), or even whether the general RBC proposal is a good fit to how objects and their pictures are perceived and have cognitive consequences.

The cognitive consequences of perceiving an object or its picture go far beyond recognizing or naming an object's category (and some consequences may be demonstrated even when the objects themselves cannot be explicitly recognized—see Cooper and Schachter 1992). Objects themselves have narrative and social significance, mostly taught by culture (which includes pictured objects) and determined by their category (e.g., bishop's mitre in Fig. 4Ai). But objects also have perceptual consequences in ways that depend on their structure and their setting, not on their noun class. Let me list some of those ways.

Objects offer dimensions of similarity and resonance, like rhymes and puns in language: perhaps very different objects share fringe associations through any geons they may have in common, a point I would like to see addressed by proponents of RBC. Objects allow or invite behaviors that depend on their particular structures (in Gibson's terms, they present *affordances*), and not just on the noun class to which they belong: chairs afford sitting; books afford reading; encyclopedias afford reading *and* sitting. *Although there can be many versions of each object that supports these behaviors, the objects cannot be arbitrary: their structure is constrained by the functions they serve.*

Objects and their contexts, in the world and in pictures, can serve as guides, forecasts, and records for events, thoughts, and actions: e.g., the rosary and the abacus, the tally-sheet, roadmap, and diagram. These offer affordances for behaviors, but the behaviors are cognitive ones of looking, imagining, and thinking, not of reaching, sitting, or jumping. These cognitive behaviors are important: for both couch potato and competitive athlete, some 200,000 visual inquiries (glances) are made per waking day. As with other behaviors, the objects of these actions must be so structured as to support the acts performed. Pictures fall in this class of objects: they support the functions of looking, imagining, and thinking.

To discuss pictures in terms of their stimulus properties alone, or in terms of naming responses, is like an attempt to account for reading in terms only of what word is specified in some dictionary by some set of letters. Because where one looks and what one takes into account is both elective and selective, and depends

on what one seeks from that glance, no useful account of perception can be offered in terms of stimulus characteristics alone.

**How Pictures Are, After All, Similar to the Objects and Scenes They Represent, in the Behaviors of Visual Inquiry and Thought They Support: What Most who Write about Visual Communication Ignore**

We do not perceive either the world, or any picture of it, all at once. As in reading text, each glance is intended to provide details about some *small* specific part of the world that would otherwise remain in low-resolution vision. The voluntary sequence of glances, which determines much of what the eye will receive, is a behavior that we must consider, at least briefly.

When the eye turns toward some region in the optic array, its target was decided before the eye's swift movement (< ca. 50 msec) begins, and the action therefore comprises a specific visual question. The eye is then stationary for at least 200 msec (and often much longer), so even with the highest glance rate (ca. 4/sec) it is stationary at least 80 percent of the looking time. During that time, the fovea provides visual detail for only about 2 percent of what the eye receives (4° within an approximately 180° retinal image). Detailed information is available to the viewer only to the degree that it is accumulated across such glances, and that it is retained over the time to take those glances.

Although we can detect low-level differences in the peripheral field of view at the same time that we focus attention to obtain detailed information (Braun and Sagi 1990), *detailed* inquiries must proceed serially, one at a time. These fairly slow and very incomplete samplings of the visual field can be ignored only because their results seem so seamless, and we feel as though we have looked at the entire scene in homogeneous detail. That scene is not built up from the individual glances by taking the successive eye movements themselves into account and then integrating the contents of the glances accordingly; instead, the *relative locations* of the objects or parts of objects that fall within each glance remain unchanged when the gaze shifts, and these invariant features of the scene probably serve as the framework within which each glance's contribution is placed (Gibson 1950; Haber 1985; Irwin et al. 1990).

What about depth? If the new target lies at the same depth its details then are available as soon as the gaze has shifted to it; if it lies at a different depth the eyes

must change their focus and their convergence before the new target yields its details. *In either case, the eye is directed and redirected from one point to another within the 2D optic array, bringing one or another part of the 2D retinal image to the fovea.* Because the eye movements are made in two dimensions, and are made in response to the low-resolution 2D retinal image, so long as the viewer makes no parallax-producing head movements the retinal images are very much the same for a 3D scene and the 2D picture of it.

Many questions the eye asks are about 3D space, and many more are not, but they all are asked through these two-dimensional actions. The nature of looking behavior both allows pictures their representational significance and accounts for their specific characteristics. In what follows, I will try to sketch such an account (which differs in several ways from my earlier attempts to relate pictures to the act of looking—e.g., Hochberg 1962, 1980, 1984).

Unlike text, familiar environments and their pictures can usually be parsed into major objects even without making any eye movements: peripheral vision then provides the ‘gist’ of each scene that later glances, *if such are desired*, can serve to fill out. (Viewers can detect the incongruity of a single out-of-place familiar object in an outline-drawn scene flashed too briefly to permit an eye-movement—Biederman 1972). Given the time scale of glancing (no more than 4/sec) and the size of the optic array (ca. 180°), it must be that we usually stop with few glances, knowing only approximately what we might find if we should look further. This means that some of each real scene, and of each picture, normally remains at the level of gist.

Artists have obviously long known this (see discussion of Rembrandt’s Noble Slav, in Hochberg 1979). The primary feature of Impressionist pictures is that they are made for peripheral viewing, presenting only meaningless and *nonmemorable* patches to the high-resolution fovea: Figures 6Aib and 6Aic have different components (a substantial section has been inverted in the skirt of one of them), but it requires great effort to discover which version matches Figure 6Aia (these are locally-different but globally-identical sketches roughly like that of a figure by the post-Impressionist Seurat, who, like Cezanne, was clearly striving both to surmount and to exploit the differences between the foveal and parafoveal channels of visual information). In the real world and in realistic pictures, the peripheral and foveal information usually fit the same memorable structures, which have relatively coherent, simple, and characteristic silhouettes.



**Figure 6Ai.** A sketch styled after a figure by Seurat. Which version is unlike the other two, and how? See text.

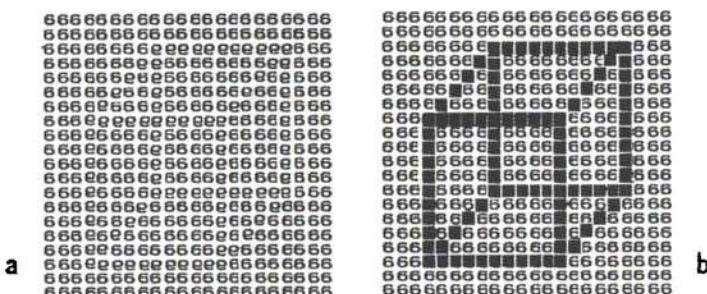


Figure 6Aii. A cube (like that at b) is outlined at (a) by inverted 6s. With great effort they can be traced out, but they do not accumulate to be perceived as a cube. Obviously, something between (a) and (b) is needed to make use of the visual periphery, but research has not been done that will let us be more specific.

That, one may argue, is why we have the Gestalt 'laws' as predispositions: proximity and good continuation in particular seem like quite generic cues as to what parts of the peripherally-viewed scene will turn out to belong to the same object or surface if they are looked at more directly. This is particularly important

whenever the viewer's head moves, since at that time points that are not on the same object (and are therefore likely to lie at different depths) will not then remain in the same, remembered relative positions.

In short, I am suggesting that the Gestalt factors are probably predictors of coherence, not 'laws of organization'. A preliminary parsing under the constraints they provide should usually serve, therefore, to greatly reduce the information that would have to be stored from glance to glance as compared with what would be needed to store the entire scene in independent details at foveal resolution. Familiar shapes should serve the same function. And so should those particular familiar 2D patterns, Leonardo's depth cues, that are characteristically provided by the regularities of the 3D world.

This returns us to the supposedly arbitrary, supposedly conventional use of linear perspective. Diagonality (not the vanishing point) is usually clearly present in peripheral vision, especially in what Segall et al. (1966) called 'carpentered environments'. Figure 6Bii, iii are intended to visualize roughly what retinal image would result from a glance at *a* and *b*, respectively, within the scene pictured in Figure 6Bi. (I have kept the same overall framework for these visualizations, and not centered each around its fixation point.) The diagonals in the viewer's 2D retinal image, as in the 2D picture, determine what eye movement is needed to look from the furthest (*c*) to the nearest (*d*) cornice. And *that pattern must be taken into account in all visual inquiries the viewer elects to make* (this includes any head movements that are needed, e.g., to gain sight of something presently occluded by an intervening object).

It is therefore not true that one can find perspective only in conventional pictures, since it is clearly present both in the optic array that meets the eye and in the retinal image the eye receives. It is very often declared that anyone can see that the railroad tracks do not converge (I won't give references here, because I consider the statement surprisingly silly: during each glance, anyone standing in front of the scene at Figure 6Bi would surely be able to tell you that the eye must move further from *a* to *d* than to *c*, that a finger or a gun must point higher to hit *d* than *c*, etc.). But the very notion of visual *composition*, which applies to the choice of scenic prospects as well as to pictures, depends on visible and memorable perspective. Of course, if you ask the viewer, in the real world, whether the building is shorter at *c* than at *d*, he or she will likely say that it is not. That is the wrong answer for looking, pointing, etc., but it is also clearly the correct answer *so far as a different set of behaviors is concerned* (estimating how high a ladder must

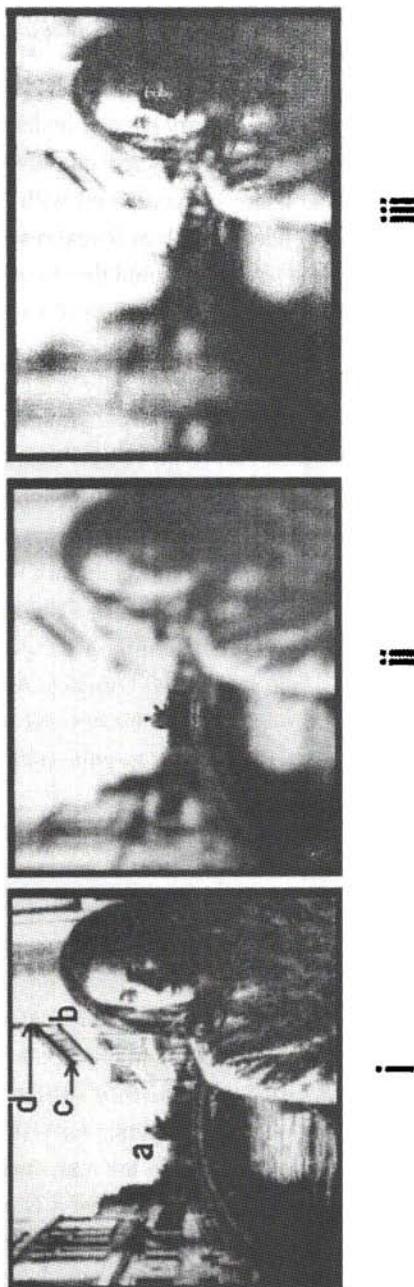


Figure 6B. (i) A photograph of a scene in depth. Essentially the same 2D eye movements are needed to move the fovea between any two points in the picture as are needed when regarding the scene itself. (ii, iii) Rough approximations to what the eye can resolve when glancing at points (a) and(b), respectively.

be, how the diagonals will change as one walks down the street, etc.). It is only because both conventionalists and ecological realists declare the retinal image to be ‘a myth’ that they can ignore the ways in which pictures are like the real world, and they can only do that because they are prepared to ignore the looking behavior that unites them.

Having argued their similarity, we must not miss the lessons about visual cognition offered us by the extremely important ways in which pictures are different from the objects and scenes they represent. Those differences change over the course of looking. In the real world, a glance from *a* to *b* in Figure 6Bi will have to be coupled to a change in the eyes’ focus and convergence if a clear image is to be obtained. In the picture, no such changes are needed. To the contrary, all the points in the picture remain in the same focus, testifying (along with other cues) to their equidistance. Although any pictorial depth cues that are present signal (falsely) that a change in focus will be needed (and in fact sometimes actually elicit the binocular behavior appropriate to the represented distance—Enright 1991), the very same looking behavior that the picture serves to guide and store in 2D contradicts those depth cues. Infants have well-developed stereoscopic acuity by 21 weeks of age (Held et al. 1980), so there is no chance that the child looking at the pictures of Figure 1 took them as anything but flat.

Such conflicts (when they are in fact viewed as conflicts and not merely ignored) provide part of the esthetics of pictures quite generally (cf. Polanyi 1970): a visual problem to be solved, with a satisfying reconstrual if successful. In Figure 6Ai, with which I mean to represent Impressionist paintings as well, the women are perceived as such only by peripheral vision, since foveal vision shows them to be separate shapeless dots. In 6Aiia, the reverse is true: a ‘wire cube’ is outlined by inverting a subset of the 6s, requiring the viewer to pick out and recognize the shape by tracing and remembering, if possible, the inverted 6s.

What makes it easy to ignore the dots (or brushstrokes) that fall in foveal vision in Figure 6Ai, and makes it hard to see the shape of the cube in Figure 6Aiia, is that we cannot store and compare more than a few visual features, from one glance to another, without some superordinate structure, gist, or schema. That schema is supported by the continually present coarse structure of extrafoveal vision. Consider the parallel in reading: reading a single word or two may be automatic and mandatory, but reading a sentence or a page is not. In reading any text which requires multiple fixations, the viewer must fit the successive sampled views into a meaningful context (not by keeping track of and compensating for the eye move-

ments); usually a local context is consulted and updated, rather than the overall story structure (Dosher and Corbett 1982; Glanzer et al. 1984; McKoon and Ratcliff 1992). In taking successive glances at a picture in which peripheral vision offers no structure that will serve to provide a context for foveal views, as in the pattern of 9s among 6s in Figure 6Aiia, the viewer must strive to provide one by applying an imagined structure. Many artists who have developed styles which appear to be intended to require such sustained efforts at construal (e.g., El Greco's fragmented chiaroscuro, Picasso and Braque in their cubist mode, or Ad Rinehart's white-on-white minimalisms) succeed in part by making their pictures relatively inaccessible to peripheral vision.

Let me try to tie up what I have been saying in this section. In viewing the world, as in viewing pictures, the undetailed field of peripheral vision must be parsed into regions which are likely to move as one—i.e., are likely to be objects; for this purpose, something like the Gestalt laws are reasonable cues. That parsing must provide enough information to let the viewer decide rapidly whether more detail is needed and, if so, where it is likely to be found. For this purpose, only knowledge about the retinal projections provided by specific objects, or categories of objects, will do. In the case of pictures, the artist's and viewers' shared knowledge about the world allows terse and incomplete allusion or implicature to be completed: one of the squiggly lines from Figure 5E, viewed horizontally, is just a squiggly line. But if it is presented vertically, with the implication that it is the silhouette of something familiar and recognizable, the only thing that could fit is a specific face or type of face. *It is not that I have learned to call that squiggle a face, but that I can readily fit a face to it and thereby account for and remember its major features.*

For efficient construction of the scene's or picture's meaning, peripheral vision must tell us where each foveal sample (the figure *a*, the eyes at *b*, the cornice *c*, in Fig. 6Bi) fits the scene. Of course, the relative positions of the details found in each glance may with great effort be obtained by keeping track of the sequence of directions in which the eye was pointed, but that is difficult and makes serious demands on what appears to be a nonautomatic and very limited form of structural memory. Placing each sample within some memorable part of some object *that remains salient in peripheral vision even after gaze direction has changed* is the best way to do this, lessening the need to consult the schema in memory as we would otherwise need to do in the attempt to regenerate a particular structure.

It is here that meanings beyond those of shape and recognizability enter this account of pictures and representation.

### Mental Structure in Picturing and in Picture-assisted Thinking: Pictures Serve as Both Maps and Virtual Windows

The structure of the real or represented scene itself has consequences for what we perceive, think, and feel. Many of these consequences go far beyond summarizing the configuration in 2D or the layout in 3D, and indeed are not determined by the stimulus information. Instead, they are provided by the viewer; they depend on how the viewer has construed the scene; they therefore may serve to test what the viewer has in *in fact* perceived, independent of what the viewer may *claim* to have perceived; and taken together, they comprise the pictorial meaning of the picture. I consider first an example of the *perceptual couplings* that are entailed in perceiving a pictured object, and that comprise its concrete visual, structural meaning; and second, an example of how pictured structures serve as anchors for more abstract thinking.

Perceptual couplings are inter-response constraints that normally reflect the inter-stimulus constraints found in the world. Thus, physically, given that interpolation specifies the vertical line as nearer than the horizontal line in the upper intersection within Figure 5Diii, the horizontal line must be nearer than the vertical one at the cross-shaped lower intersection. This coupling, or structural constraint, is *not* present within either the optic array or the picture. It is present in the structure of the object being represented, and we should expect the viewer's responses to be similarly coupled only insofar as the viewer's perception shares that structure. Saying 'cube' is not all we expect from one who really perceives what the picture represents.

Thus, the structure of the scene, and of the objects within it, implies relationships that are given not in the stimulation itself but in the mental representations provided by the viewer. Such mental structure is easiest to explore and measure where it mirrors physical structures, as in the previous example. These mental structures reflect physical relationships (of which, I note in passing, most viewers are not explicitly aware); these structures do not seem to be the arbitrary syntax of an arbitrary conventional pictorial language.

But neither are such structures in the mind's eye simply internalizations of the physical structures we might expect. In Figure 5Diii, the vertical line in the upper internal intersection (the T) remains securely the nearer, by a variety of psycho-physical measures, so long as the attentive gaze remains there; but with the gaze shifted to the nearby lower intersection (the cross), reconstruals soon occur, and the horizontal and vertical lines there alternate as to which is the nearer, as shown by various measures (Hochberg and Peterson 1987; Peterson and Hochberg 1983). With an effort, the viewer can trace through the relationship between the intersections, but it requires that continued effort: the structural consistencies of the real object do not automatically obtain, except locally, within the mental representation of the object that gives the glance its context and meaning.

I must add two points to give this phenomenon its proper context in the present account. First, it occurs in real objects as well as their pictures (Hochberg and Peterson 1987; Peterson and Hochberg 1983). Second, it is not merely a question of a single cue or feature being overlooked: following the paradigm of Figure 5Diii, we can extend the number of features indefinitely, as begun in 5Div, without halting the alternating reconstruals that occur when the gaze is directed at the lower intersection. *It is the absence of automatic extended parsing, not an object-wide, overall ambiguity of the information, that is revealed in such constructions.*

But phenomena like those of Figure 5Diii, iv, and all of the impossible layouts pictured by Piranesi, by Penrose and Penrose (1958), and by Escher attest that our mental or perceptual structures are not internalizations of physical structure (as is held uncritically by many perception psychologists—see Gregory 1970, 1980; Rock 1977; Shepard 1984), and which would mean that we need only study the measurable and physically lawful relationships within our visual ecologies. Although 'mental' in some sense, these representations would, if they were faithful internalizations of physical structure, then be tractable to study and prediction through mathematical analyses already perfected in engineering and physics. But we see that our perceptual structures are instead *selective construals* in which only some part of the structural information present is automatically used (see Cooper and Hochberg 1994): not only the physical stimulus information, but the viewer's efforts to discern the structure of the object or scene, and to test one or another construal, seem to be important in the perceptual process (Hochberg 1994; Hochberg and Peterson 1987; Peterson and Hochberg 1989). The nature of looking behavior, and the central/peripheral division of the retina, contribute heavily to this characteristic of perception, and help determine the ways in which the mean-

ing of a specific scene or its picture is acquired and tested through our separate glimpses.

Let me summarize the way in which meaning is acquired from separate glimpses, and then consider some of the consequences. The structure of a perceived object (or of its picture) has two levels: (1) the global, general shape or volume that may be disclosed by peripheral vision, *which remains in sight so long as only relatively small eye movements are made*; and (2) specific structural details, textures, and surface qualities that are available only to the small region of central viewing, and *are lost to sight as soon as the eye moves*. (There may be a similar hierarchy at work which depends more on proportions than on actual distance from the fovea *per se*, but the two have not been well separated empirically and I lump them together for the purposes of this discussion.) In general, the viewer takes only the fixations needed (or desired) to identify or confirm the object: when reading, if peripheral vision tells us that we confront a printed page, and what happens to fall near the fovea within a single fixation tells us that it is in some language we cannot read, or that it is a page we have just finished reading, no further glances may be motivated. When looking at some object or its picture, if the object is a familiar one, with a known structure, the viewer can at some cost generate and test that structure of detailed expectations, but will not usually do so: the behavior is like skimming text in which one could, *if one wanted to*, decipher the letter-by-letter structure of some long word, but in which the casual reader relies instead on context and on the confirmation furnished by just the word's overall length and its initial letters (this skill and propensity is what makes proofreading such a difficult task—Fisher 1975; Hochberg and Brooks 1970; Woodworth 1938).

Just so, with objects.

In general, as we have discussed in connection with Figures 5Diii, iv, the global structure of the scene or object does not *automatically* exercise precise constraints on where and how its details must fit. The global structure as perceived tends to be simple because only undetailed shapes are seen in peripheral vision and, unless our knowledge of its structure is specifically used to generate the object's local details (as we can generate the individual letters that make up some long word), that structure is undetailed as well in the memory that bridges the successive glances. And in general, the contents of the individual foveal glances are not *automatically* traced and related to each other, although they can be if a specific effort is made to do so. The input by the foveal glances is also limited in informa-

tion because the foveal pickup is limited in extent (in reading, it spans only about four letters), and *is further limited in what can be remembered without embedding in some more permanent structure*. This is probably part of why errors in global (vanishing-point) perspective whose detection depends on projection and alignment over a distance *can* be detected but usually are not, and why the pattern laid out in 6s among 9s in Figure 6Aiia does not behave like a picture.

With this account of pictorial looking in mind, let us return to the discussion of pictorial significance. Until now, I have discussed only such aspects of pictorial meaning as might be achieved from experiences with real objects in the world; if pictures and objects share some of the same perceptual processing, the reverse should also be true: objects should be able to acquire meaning from pictures without special instruction relating the two. Recognizing a live, 3D Goofy in Disneyland, previously seen only in cartoons, assures us that is so. But what about meanings, communicated by pictures, that do not have to do with the physical structure, or with the recognizability, of objects and scenes? These certainly matter: in addition to the physical layout, most pictorial representations are intended to communicate connotations and denotations, to provide implicatures and unverbalized commentary, to engender distinctions and generalizations. And of course, pictures are used to communicate less specific and unverbalizable implications that may be emotionally resonant and tailor-made for hermeneutical study. Much of art history and criticism consists of identifying the relevant icons (the armored figure at right in Figure 4Ai is St. George, and he is clearly the kneeling figure's patron).

Are these aspects of pictorial discourse and meanings inherently specific to, and learned from, pictures as such? I know of no reason to believe that. Pictures are usually used for such communication, rather than real people and objects and scenes set up in staged charades, but that seems likely to be more a matter of ease or economics than of inherent difference.

On the other hand, pictures are also often made in order to represent relationships, otherwise incomprehensible, that may be very abstract although explicit and not at all poetic in intent: data plots, maps, diagrams of logical structure, and the interactive displays that now pervade computer use. What makes for good representations of such specifiable and non-emotional relational meaning is an issue that is now important to science, education, and hi-tech industrial productivity (Tufte 1990). In line with the preceding discussion about object-perception and looking behavior in pictures, the Gestalt principles probably offer a rough guide-

line (Hochberg and Krantz 1986), because they tend to provide structures that can be held in perception from glance to glance, and make it easier to find the relevant information (see Larkin and Simon 1987). Assume therefore that the logical diagram in Figure 7Aia, in which one circle represents all policemen and the other represents all people who have big feet, is a useful step in testing some deductive reasoning about these categories; it is surely less useful when its topology is not visible peripherally across glances (Fig. 7Aib) or when it would require tracking and laying out the spatial consequences of the glance directions as in Figure 6Aii.

But are not the circles in Figure 7Aia merely an arbitrary convention, learned in Logic 101? Not if we assume that abstract thinking most naturally proceeds not in terms of abstract propositions, but in terms of mental representations (imagined objects) that allow the reasoner to keep track of the alternatives and to manipulate them mentally, as Johnson-Laird has argued very persuasively (Johnson-Laird 1983; Johnson-Laird et al. 1992), and assume further that here the circles and their regions of nonoverlap help keep the relationship ‘in mind’. Using more difficult inference problems, Bauer and Johnson-Laird (1993) found that diagrams which used arbitrary symbols to represent parts of the problem did not help at all. On the other hand, those diagrams whose structure could be readily altered in imagination to represent the different alternatives within the problem improved the speed and accuracy of the viewer’s inferences. Simplifying one of the devices used by Bauer and Johnson-Laird, the settings of the switches in Figure 7Aii might help ‘keep in mind’ that the state of affairs in which *a* disagrees, *b* is agreeable either way, *c* disagrees, and *d* agrees will, according to the structure of the problem, let the deal go through from left to right.

I find it likely that real objects like those pictured in Figures 7Ai, ii would help abstract reasoning no less than the diagrams do (although admittedly drawings offer much more freedom for multiple construal than do real objects), and would even assist reasoners who have never seen the diagrams themselves. Obviously, some experience with logical discourse will help, and one would have to be introduced to the idea of using the diagram as an aid in reasoning, but that would be true whether the assistance were given by picture or by object.

Magritte’s picture of a pipe, with its caption stating that it is not a pipe, is widely taken as self-evidently true, if epistemologically banal. I have been saying that its message is only partly true; if I made an object resembling the ubiquitous ‘forbidden’ symbol on the left in Figure 7B, and placed that object in front of Magritte’s picture or some version thereof, I would have produced either the 3D

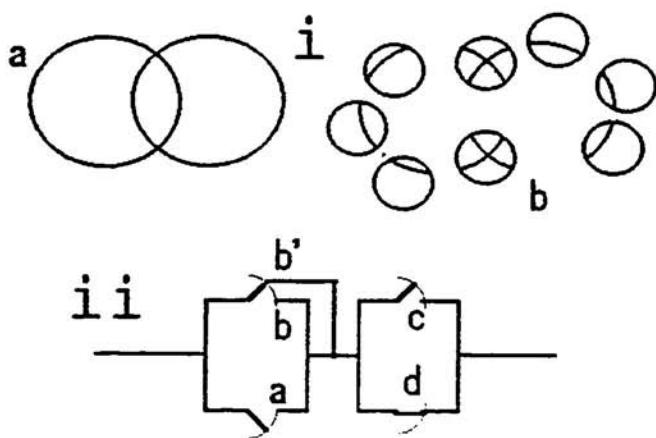


Figure 7A. (i) At (a), two overlapping circles that might be used to represent some logical relationship; at (b) the information about the circles is preserved, but it requires serial attention (as in 6Aiia) to consult them. (ii) A diagram that can represent the mental structure involved in reasoning through something like 'if a or either b or b', and if c or d, then...'. Simplified from Bauer and Johnson-Laird (1993).

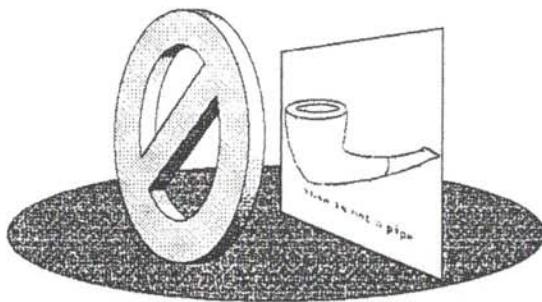


Figure 7B. Imagine this as an object and a picture which bears the inscription that it is not a pipe.

equivalent of a no smoking sign, or a multi-layered contradiction of Magritte's picture's message. As Goofy tells us, objects and pictures are mutually similar in important ways which we cannot allow conventionalism to dismiss.

### In Conclusion

When perceiving objects in a normal environment, the general structure of some partly occluded object helps the viewer attribute representational meaning to otherwise independent features in the optic array, by construing hidden structures against which those features can be tested, and which they can confirm or disconfirm. In the case of pictures, a scribble may be merely a line on paper until we construe it as part of a larger structure. In a real, cluttered environment, reconstruals are probably infrequent: The need to find some partly hidden object; the knowledge of its shape and size; the general constraints of where it is likely to be—all of these conspire to make reconstrual rare in the real world. And the same is true of realistic and detailed pictures, in which more careful examination continues to disclose new details that fit (like fingernails that admiring viewers can discern on scrutinizing some miniaturist's tiny figures). Such details are also nonarbitrary, and also confirm the original structure, down to the limits of the fidelity undertaken. This obviously *does not mean that the viewer can confuse these pictures (and most pictures) with the objects they represent, but that our looking behaviors allow us to draw on our knowledge of the world in formulating and testing our expectations of what we will see, and where we will see it, within a picture*. That, I think, is what the act of picturing involves, in the most general sense (Hochberg 1980; Lloyd 1982).

That culture plays an important role in all this is unquestionable. Where the picture not only acts as an aid in solving the problem, but acts to pose the problem and provide its premises, it is clear why the conventionalist argument is so tempting. Without the cultural context of the society and the religion, very little of the meaning intended in Van Eyck's painting (Figure 4Ai) is communicable. But without the underlying nonarbitrary facts about visual cognition that were discovered—and not invented—by artists thousands of years ago, there would be no pictorial communication as we know it.

Conventionalism surely has its place, but we cannot yet say what that place is, and how conventions achieve their effects, since we have yet to establish the limits

of the lawful and nonarbitrary in our perception of pictures and of the world from which pictures appropriate their meanings.

### Note

1. He was taught using an abundance of solid toys and miniature model scenes rather than picture books, and his rural environment was free of pictures; the occasional billboard glimpsed from the car went without comment.

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# **The Perception of Motion Patterns**

Howard S. Hock<sup>1</sup>

## **Parallel Processing Pathways**

Recent neurophysiological studies have provided evidence for two relatively independent processing pathways in the visual system: the parvocellular and the magnocellular (Livingstone and Hubel 1987; Merigan and Maunsell 1993). In addition to being color-sensitive, receptive fields in the parvocellular pathway are generally selective for high spatial frequencies and low temporal frequencies. Selectivity for high spatial frequencies implies sensitivity to luminance variations that occur over relatively small distances (i.e., high levels of acuity for spatial details), whereas selectivity for low temporal frequencies implies sensitivity to luminance that changes slowly, or not at all, as a function of time. As a result of these selectivities, the parvocellular pathway is well suited to the perception of static form. The magnocellular pathway, which is not sensitive to color, is generally selective for low spatial frequencies and high temporal frequencies. Selectivity for low spatial frequencies implies sensitivity to luminance variations that occur over relatively large distances (i.e., more global spatial information), whereas selectivity for high temporal frequencies implies sensitivity to rapidly changing luminance values. These selectivities result in the magnocellular pathway being well suited to the perception of motion.

In contrast with the projection to the parietal cortex, which is predominantly magnocellular, both the magnocellular and parvocellular pathways converge on the inferior temporal cortex (Ferrara et al. 1991), where both static form and motion can be the basis for pattern recognition (Ungeleider and Mishkin 1982). I will argue in this chapter that there is a qualitative difference in pattern recognition based on the static-form and motion pathways. The difference concerns whether or not the identities of a pattern's constituent elements are critical to the pattern's being meaningful—i.e., classifiable or recognizable.

### Object Recognition

There are several sources of evidence that the identification of their constituent parts contributes to the recognition of static objects. Bower and Glass (1976) presented unfamiliar two-dimensional drawings to subjects and one week later tested their ability to reconstruct them from memory when given portions of the drawings as retrieval cues. They found that the retrieval cues were most effective when they corresponded to identifiable parts of the drawings. For example, a small parallelogram embedded in the corner of a larger parallelogram was a more effective retrieval cue than a connected set of line segments from the original drawing that did not correspond to an identifiable part of it.

The parts of a form are critical for its recognition even when the form is very familiar. Treisman and Gelade (1980) showed that when subjects searched for the letter R in a field of other alphabet letters, the presence of P's and Q's slowed their search because if they searched too quickly, the diagonal line segment of the Q tended to be mistakenly joined with a nearby P to give the false impression of an R. The identity of the particular parts is crucial for this effect; the horizontal line segments from a nearby E would not have resulted in P's being mistaken for R's. Thus, even over-learned forms like alphabet letters depend for their recognition on the identity of their constituent parts.

Eleanor Rosch and her colleagues have studied the attribute-based category structure of real-world objects. They had subjects describe the attributes of objects, either from memory or while observing pictures of the objects, and found that the parts of the objects constituted a substantial proportion of subjects' attribute lists. These attribute descriptions were not arbitrary responses generated by subjects in order to meet the requirements of the experiment; they were related to the structure of the categories to which the objects belonged. Thus, Rosch et al. (1976) used subjects' attribute descriptions to identify the most inclusive level of categorization for which members of a category possess significant numbers of attributes in common. This so-called 'basic level' was the level of categorization at which the objects were most quickly identified. Rosch and Mervis (1975) analyzed subjects' attribute descriptions in terms of the number of attributes each object shared with the other members of its category. They found that objects sharing the most attributes with other category members were judged to be the most prototypical members of their category.

A theory based on the idea that objects are recognized through the identification of their component parts has been proposed by Irving Biederman (1987). In this theory, Biederman derives a limited 'vocabulary' of three-dimensional volumetric primitives (e.g., blocks, cylinders, wedges), which he calls geons, and asserts that objects are recognized on the basis of their constituent geons. Thus, the identification of a curved cylinder attached to the long, narrow side of a rectangular block is the proposed basis for recognizing a drawing of a briefcase (the curved cylinder corresponds to its handle), and the identification of a similar curved cylinder attached to the side of a straight cylinder is the proposed basis for the recognition of a coffee mug. Biederman argues that the recognition of real briefcases and real coffee mugs is based on the identification of these geons (see Cave and Kosslyn 1993 for an alternative view).

### The Substitutability of Constituents

For present purposes, the critical message from the above investigations is that even when the constituents of a static object retain their appropriate spatial relationships, the constituents must be differentiated in order for the object to be recognized. This point can be illustrated in the context of Biederman's theory. Imagine a drawing in which the spatial arrangement and even information regarding the relative size of each of the geons composing an object is retained, but all the geons are changed to spheres. In the case of the coffee mug described above, the drawing would become meaningless, and recognition would fail. This sort of substitution-of-constituents test would surely yield the same result for a wide variety of static forms, a possible exception being simple geometric figures or other simple two-dimensional forms (e.g., alphabet letters).

In contrast to static patterns, the identity of constituents is often of no importance for the recognition of patterns of relational motion. There are several well-known examples, the first of which is the perception of biological movement. In the everyday observation of our fellow human beings, we have no difficulty recognizing what they are doing. Based on the movements of their constituent parts (forearms, shoulders, thighs, feet, etc.), we can tell whether they are walking, jumping, or running. What is remarkable is the extent to which these percepts are unaffected by the substitution of constituents. In a classic series of demonstrations, Gunnar Johansson (1975) has shown that point-lights placed on a person's

joints can be substituted for his or her constituent body parts in a film of the person in action, without affecting the immediate recognizability of what he or she is doing. The recognition occurs without prompting (i.e., observers do not know beforehand what they are going to be looking at), and it requires as little as 200 milliseconds of observation. Further research has demonstrated that it is not even crucial for the point-lights to be placed on the joints; they can be in middle of the forearm, the middle of the thigh, etc., without affecting the immediacy and spontaneity of recognition (Dittrich 1993). However, a ‘snapshot’ of the point-lights anytime during the action produces a static pattern of randomly arranged points of light that is perceptually meaningless. Similarly, the isolation of the motion path of a single point of light is equally meaningless. What is essential for the emergence of meaning is the perception of relational motion among multiple point-lights.

Constituent-independent relational motion of point-lights can also provide information regarding unseen objects. Thus, perceivers can accurately estimate how much weight an actor is lifting based only on the relational motion of point-lights on the actor’s joints, can recognize when the actor is pretending to lift a heavy weight, and can accurately estimate how much weight the actor is pretending to lift. Runeson and Frykholm (1983), who reported these observations, argue that they reflect the kinematic specification of dynamics (KSD)—that is, the perceived motion (the kinematics) specifies a dynamic property of the lifted object (its weight).

Substitutability of an even more extreme nature has been demonstrated for other forms of biological activity by Michotte (1963 [1946]). He presented a rectangle lying on its side and consecutively increased its size by expanding it from its right side, reduced it back to its original size by contracting it from its left side, then repeated the expansion/contraction cycle a number of times. The result was the immediate, unprompted perception of a crawling caterpillar. A similar series of expansions and contractions of the rectangle resulted in the immediate perception of swimming.

Another compelling instance of substitutability comes from the perception of human interactions. Many years ago, Heider and Simmel (1944) created an animated cartoon in which several small geometric forms moved within and around an enclosing square with an opening on one side. When asked to describe what they were seeing, observers without prompting reported various types of social interaction, the most frequent involving two men competing for a woman.

Remarkably, only one of 34 observers limited their description to what was literally there, a display of moving geometric forms. Thus, the pattern of relational motion in the cartoon was sufficient to evoke previous experiences of social interactions, the geometric forms serving as placeholders for the people that might be participating in the perceived interaction. A major reason the motions of geometric forms took on social meaning was the perception of causal interactions among the moving geometric forms. One form (person) appeared to strike another, or when one form (person) approached, the other appeared to move away to avoid it.

The point made by all these demonstrations is clear. Meaning can be carried by patterns of relational motion quite independent of the identity of the patterns' constituents. Relational motion obviously provides information that is not present when objects are at rest. More significantly, however, it can render certain information, the identity of the pattern's parts, irrelevant for recognition. Thus, the functional role of the constituents of a motion pattern is not for identification (as, for example, in Biederman's theory), but to serve as 'placeholders' for the perceived motion pattern. Pomerantz (1981) has previously made this point for static stimuli. He classified them as Type P (only the position of the local elements affects pattern identification) or Type N (the nature as well as the position of local elements affects pattern identification), a distinction which is also the basis for Sonesson's (1989) comparison of configuration and structure in the semiotic analysis of static pictures. However, it is arguable from the previously described observations of Johansson, Michotte, Heider and Simmel, and others, that the contribution of part-identification to pattern recognition is more clearly differentiable for static as opposed to relational motion patterns.

### **The Perception of Causal Impact**

Causal interactions like those inherent in Heider and Simmel's animated cartoon have been extensively investigated in Michotte's (1963 [1946]) classic study. Michotte's basic sequential motion stimulus is very simple. Two spots of light (A and B) appear on a screen; A moves toward B and stops alongside it; then B moves away from A while A remains stationary. With appropriate spatial and temporal conditions, unprompted observers spontaneously report the strong impression that the motion of B depends on the causal impact of A. This causal launching is seen even when perceivers realize they are seeing spots of light rather

than real objects, and even when they can see that the points of light never touch each other. Causal impact is perceived even when the perceived motion of one or both spots of light is apparent, phi motion rather than real, continuous motion (Gordon et al. 1990). The identity of the constituents of the 'causal motion pattern' is again unimportant. Michotte reports that when a moving spot of light stops alongside an actual ball, and then the ball starts rolling, the perceptual impression is of the spot of light launching the ball.

The perception of causal interactions is of particular interest for several reasons: (1) it is a major reason why interactions of objects and people are perceptually meaningful; (2) it is consistent with the proposed substitutability-of-constituents characteristic of relational motion patterns; and (3) it brings alternative approaches to the study of perception into sharp contrast (Todd and Warren 1982; Gilden 1991). On the one hand, the previously mentioned KSD theory adheres closely to the Gibsonian emphasis on information in the optic array (Gibson 1966, 1979); it attributes the impression of causal impact to the pickup of dynamical information specified by the kinematics of the optic array. On the other hand, the 'cognitive approach' attributes the impression of causal impact to the perceiver's 'internalization' of how objects behave in the real world. That is, the impression of causal impact is an inference drawn from the perceiver's previous experience with colliding objects (this provided the impetus for Leslie's [1984] demonstration that human infants are capable of perceiving causal impact in Michotte-type sequential motion stimuli).

Experimental studies of causal interactions based on KSD theory have focused on the conservation of momentum in collisions. On the basis of this physical principle, the ratio of masses for colliding objects (the dynamical property) can be determined from their velocities before and after the collision (the specifying kinematics). Todd and Warren (1982) have shown that observers can indeed derive reasonably accurate estimates of mass-ratio from the perceived motion of colliding images of small squares, but when one image 'ricochets' off the other, their ability to do so is greatly diminished (Gilden and Proffitt 1989; Gilden 1991). The latter authors argue against KSD theory, which they assert should always result in accurate estimates of mass-ratio if the kinematics are lawfully related to dynamic information in the optic array. They assert, consistent with the previously mentioned 'cognitive approach', that judgments of mass-ratio are heuristic—that is, they are derived from interpretations based on observers' intuitive understanding of how real objects behave. Gilden (1991) suggests that estimates of mass-ratio

are based on heuristics like: 'if the incoming object ricochets backward, it must be less massive than the object it strikes' or 'the object whose post-collision speed is greater must be the less massive'. Such interpretations fail, he claims, when more than one heuristic is applicable, and the applicable heuristics conflict with each other. Studies by McCloskey et al. (1980) and others demonstrate the generally faulty nature of intuitions regarding the behavior of objects, pointing to the need for further caution regarding the usefulness of experience-based judgment heuristics.

Neither KSD nor heuristic-based accounts directly address the phenomenological aspect of causal launching. Why does the perceiver *experience* one spot of light applying a force to the other? Following the Gibsonian perspective, KSD theory argues that the mass-ratio of colliding spots of light is directly perceived. Kinematics may thereby provide information about the properties of objects, like their mass-ratio, but even the successful direct perception of mass-ratio does not imply that forceful impact is itself directly perceived. From the cognitive perspective, forceful impact cannot be perceived since it is not, in fact, present in a display of moving spots of light. The only recourse here would be to say that the experience of forceful impact is somehow included in the constructed perceptual representation on the basis of previously acquired knowledge of physical interactions (what it is that is included in the construction would remain to be determined).

### **Cooperativity: An Alternative to the Gibsonian and Cognitive Approaches**

Rather than the direct perception of forceful impact or its cognitive construction, it may be possible to attribute the experience of causal interactions among the two motion segments in Michotte's sequential motion stimulus to spatial interactions inherent in the neural processing of the spots of light moving on the surface of the retina. There is considerable evidence for such lateral interactions at many levels of the visual system. At the level of retina, receptive fields involve excitatory and inhibitory interactions among the responses of photoreceptors (Rodiek and Stone 1965), and it is also known that retinal receptive fields separated by very large retinal distances are nonetheless interactive (McIlwain 1966). At the cortical level, neurons with nonoverlapping receptive fields have both excitatory and inhibitory interactions (Gilbert and Wiesel 1979; Knierim and Van Essen 1992; LeVay

1988), and Movshon et al. (1978) have shown that interactions among subunits of complex cortical receptive fields are facilitating for small distances and suppressive for large distances, irrespective of the absolute positions of the interacting stimuli within the receptive field.

There is increasing evidence that neural structures involving distance-dependent excitatory and inhibitory interactions (as described above) are intrinsically cooperative, and thereby result in the formation of coherent patterns that are sufficiently stable to be consciously experienced. Based on a particular model of neural cooperativity (and some supportive preliminary data), I will argue that the experience of forceful impact in Michotte's sequential motion stimulus arises through spatio-temporal interactions that result in the impression of inertia in the movement of the 'launched' spot of light.

### **Cooperativity: Theoretical Principles**

Our understanding of cooperative phenomena in a wide variety of systems rests to a large extent on principles developed by Hermann Haken (1981). Haken points out that in both physical and biological systems, cooperativity is observable when small, local effects are coordinated or synchronized such that a coherent pattern is formed and the local effects are amplified (this is the basis for the operation of the laser). Since the coordination of local effects arises through local interactions, the emergent global pattern is self-organized. In the famous example of Benard convection, when the liquid in a dish is heated from below, interactions involving the friction-impeded rise of warm liquid and the contact-induced transfer of heat from warm to cold liquid result in the formation of a coherent pattern of rolling, cylindrical motion analogous to the formation of 'streets' of clouds.

The essential idea is that the pattern that is formed depends on the manner in which a particular spatial and temporal configuration of local effects is coordinated or organized. Different patterns can be formed as a result of differences in the configuration of local effects and differences in the ways in which the local effects are coordinated. Thus, one pattern might be formed when a certain configuration of local effects is coordinated or organized in one way, and a different pattern might be formed when the same configuration of local effects is coordinated or organized in a different way (in addition, the same coordinating mode could result in different

patterns being formed when configurations of local effects are sufficiently different).

When more than one coordinating mode is possible, one or the other predominates. Thus, a cooperative system is inherently competitive; different patterns are formed from the same configuration of local effects, depending on which coordinating mode prevails. Hysteresis generally occurs when a parameter that controls which of two patterns is formed is gradually changed. In a typical hysteresis paradigm, the initial value of the parameter strongly favors the formation of one of the patterns. Hysteresis is observed when the initially formed pattern is maintained, despite the parameter being gradually changed to values which favor the alternative pattern.

In addition to being able to persist despite parameter change to values favoring an alternative pattern (hysteresis), a pattern must also be able to persist in the presence of intrinsic system noise in order to be stable enough to have a meaningful influence on the behavior of a system (i.e., it must be temporally stable). The temporal stability of a pattern depends on the level of competition among coordinating modes. When one coordinating mode strongly dominates, the pattern formed on the basis of that mode is much more stable than the pattern formed on the basis of the nondominant mode. Cooperative mechanisms therefore provide the coordinating interactions among local effects that result in pattern formation, and if the patterns thus formed are sufficiently stable, they resist fluctuations arising at the local level.

### **Cooperativity in Motion Perception**

The principles described above have been successfully applied to the study of pattern formation in biological movement, for example in multilimb coordination (Kelso and Schöner 1987) and visual-motor coordination (Kelso et al. 1990). In this section, I review some recent evidence consistent with a cooperativity-based account of pattern formation for the perception of visual motion. The studies provide evidence for: (1) particular neural interactions in the cooperative organization of motion patterns; (2) two competing, coordinating modes; (3) self-organization; and (4) the cooperative amplification of local effects.

*Neural Interactions*

Williams and Sekuler (1984) have provided evidence for the coordination of local effects in the perception of a field of randomly arranged dots moving in randomly determined directions (these stimuli are called random cinematograms). Motion directions in random cinematograms are symmetrical in the sense that all directions are equally possible. Williams and Sekuler broke this symmetry by constraining the motion direction for a relatively small, randomly selected subset of the dots. Motion directions for the latter were sampled from a restricted range of possible directions. When the range was not too large, *all* the dots in the cinematogram appeared to move in the direction corresponding to the mean of the restricted range of directions (a similar result has been reported by Chang and Julesz 1984). The coordination of the motion direction for all the dots in the random cinematogram was attributed to excitatory and inhibitory interactions among directionally selective motion detectors that enhanced motion perception in the direction specified by the stimulus information and suppressed motion perception in alternative directions (Chang and Julesz 1984; Williams et al. 1986).

In a subsequent study, Nawrot and Sekuler (1990) presented random dot fields composed of horizontal bands of dots such that the bands with a specified direction of motion were vertically alternated with 'probe' bands of dots that, if presented alone, would have been perceived to move in random directions. For relatively small band-heights (i.e., small interactive distances), the perceived motion for the dots in the 'probe' bands was biased to be in the same direction as the perceived motion for dots in the bands with stimulus-specified directions of motion. However, for relatively large band-heights (i.e., larger interactive distances), the perceived direction of motion of the dots in the 'probe' bands was biased to be in a direction opposite to that of the bands with stimulus-specified directions of motion. Nawrot and Sekuler's results thus provided evidence for distance-dependent facilitating and inhibiting interactions among directionally selective motion detectors. For small interactive distances, motion in the same direction was facilitated. For larger interactive distances, motion in the same direction was inhibited, which implicitly facilitates motion in the opposite direction. In effect, a network of facilitating and inhibiting interactions among directionally selective motion detectors provides the neural basis for cooperative pattern formation.

### *Coordinating Modes*

The facilitating and inhibiting interactions proposed by Nawrot and Sekuler can be thought of as establishing two coordinating modes: one which operates over relatively short distances and biases perceived motion to be in the same direction (i.e., in-phase), and another which operates over relatively long distances and biases perceived motion to be in opposing directions (i.e., anti-phase). Hock and Balz (1994) have proposed a modification of this account. Instead of an in-phase coordinating mode for small distances and an anti-phase coordinating mode for longer distances, they have proposed in their differential-gradient model that both modes are possible at all distances, and that the strength of both modes declines with distance. The key feature of the model is that the decline (gradient) with distance is steeper for the facilitating (in-phase) than the inhibiting (anti-phase) interactions. In this way, the two coordinating modes are competitive. Both are potentially operative at all interactive distances, but because of the difference in the steepness of their distance gradients, the in-phase mode predominates for relatively small interactive distances, whereas the anti-phase mode predominates for relatively large interactive distances.

### *Self-Organization*

As indicated above, cooperative pattern formation can be entirely self-organized. That is, it can occur in the absence of an external influence on the system that specifies or codes the to-be-perceived pattern. Hock and Balz (1994) have studied the influence of competitive in-phase and anti-phase coordinating modes in a situation in which there is no stimulus specification of motion direction. They presented a long, horizontal row of dots for a specified duration (frame 1), then replaced it for an equal duration (on frame 2) with an identical row of dots that was laterally shifted so that the dots in the second frame were located at the exact mid-points between the dots presented in the first frame. Frame 3 was identical to frame 1, frame 4 was identical to frame 2, and so on. Spatial and temporal conditions were suitable for the perception of apparent motion, but the direction of perceived motion was ambiguous; each dot was equidistant on its left and right from the dots presented during the preceding frame. These stimuli were called counterphase rows-of-dots.

It would be expected on the basis of the stimulus information presented on each frame that the dots along each row would move in randomly determined directions (leftward or rightward) and the direction of motion would change randomly on successive frames. It is in this sense that there was no stimulus-specified external influence on the proposed, cooperatively organized network of directionally-selective motion detectors. Nonetheless, randomness in motion direction was never perceived. At any given moment, all the dots along the row always appeared to move as a unit. For small distances between the dots, the perceived motion direction remained the same on successive frames (i.e., a unidirectional motion pattern was perceived). For large inter-dot distances, the perceived motion direction reversed on successive frames (an oscillatory motion pattern was perceived).

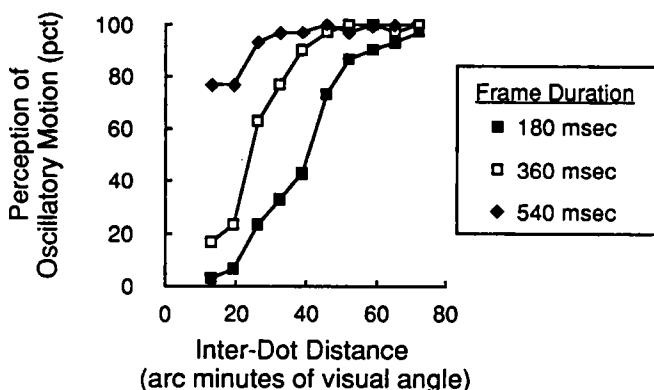
The spatial coherence of the patterns (all the dots along the row always moved as a unit) suggested that a transient burst of excitatory activity at the onset of each frame resulted in the initial predominance of the in-phase, facilitating mode of coordination for large as well as small interactive distances (i.e., motion was facilitated in the same direction for all the dots). When the frame duration was sufficiently long, the excitatory burst damped, and the inhibiting anti-phase mode emerged for relatively large interactive distances (the in-phase mode continued to predominate for small interactive distances). The formation of the temporally coherent unidirectional motion pattern was attributed to the persistence of the in-phase (facilitating) mode across stimulus frames, whereas the formation of the temporally coherent oscillatory motion pattern was attributed to the persistence of the anti-phase (inhibiting) mode across stimulus frames.

Consistent with this analysis, Hock and Balz (1994) found that longer frame durations favored the anti-phase relative to the in-phase coordinating mode, thereby enhancing the perception of the oscillatory relative to the unidirectional motion pattern. The effect of frame duration on the proportion of trials for which only the oscillatory motion pattern was perceived is presented in the upper graph of Figure 1.

### *Cooperative Amplification of Local Effects*

The coordination of local, direction-selective motion detectors thus results in the self-organization of two qualitatively different motion patterns for the counterphase row-of-dots. In order to determine whether the local horizontal motions are ampli-

**PERCEPTION OF OSCILLATORY MOTION PATTERN FOR COUNTERPHASE ROW-OF-DOTS STIMULUS**



**PERCEPTION OF CAUSAL IMPACT FOR MICHOTTE-TYPE SEQUENTIAL MOTION STIMULUS**

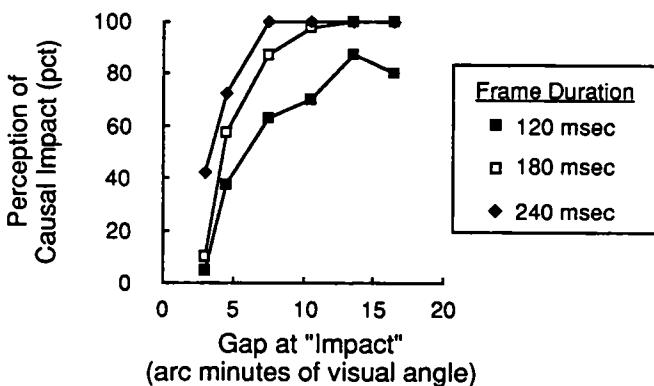


Figure 1. Upper graph: results obtained by Hock and Balz (1994) showing that the perception of oscillatory motion for the counterphase row-of-dots stimulus depends on both inter-dot distance and frame duration. Lower graph: results of preliminary experiment showing that the perception of causal impact for the Michotte-type sequential motion stimulus depends in a like manner on the gap at 'impact' between the two motion components (i.e., the distance between them after the first spot of light is shifted to a location near the second spot of light) and frame duration.

fied as a result of their coordination (Haken 1981), two of the previously described counterphase rows-of-dots were presented simultaneously, one above the other. Although the two rows were positioned to locally favor the perception of vertical motion of dots between the rows, the cooperatively organized horizontal motion patterns within each row overwhelmed the stimulus-favored vertical motion, providing clear evidence for cooperative amplification along the horizontal axis (Hock and Balz 1991).

### *Further Studies*

Space limitations preclude more than a brief mention of some of our further research indicative of cooperative interactions in visual pattern formation.

(1) Hock, Kelso, and Schöner (1993) have provided experimental evidence for the linkage between hysteresis and the temporal stability of visual motion patterns. For example, they found that the greater the hysteresis (the more an initially perceived pattern persists despite parameter changes to values favoring an alternative pattern), the less the temporal stability of the pattern (the greater the likelihood of a noise-induced spontaneous change).

(2) Evidence that local effects depend on the stability of the patterns that emerge from the local effects was reported by Hock and Schöner (1993) in an adaptation paradigm. They found that adaptation was selective to the local motions of a perceived pattern, but only when the perceived pattern was highly stable.

(3) Hock, Schöner et al. (1993) have reanalyzed data previously reported by Hock et al. (1992) and argued that the in-phase/anti-phase coordinating modes described above are the basis for Johansson's (1950) observations regarding the vectorial decomposition of motions into common (in-phase) and relational (anti-phase) components.

### **Cooperative Interactions and the Perception of Causal Impact**

As indicated earlier, the question that is unsatisfactorily addressed in both the Gibsonian (KSD) and cognitive accounts of causal launching concerns the perceiver's *phenomenal experience* of forceful impact. It is argued below that the experience of forceful impact is due to the impression of inertia in the launched

spot of light, and further, that this impression arises as a result of cooperative spatial interactions among the two motion components of Michotte's previously described sequential motion stimulus.

According to Newton's first law, an object will maintain constant velocity in the absence of external forces. This constitutes the condition for an inertial frame of reference. Newton's second law then specifies that in an inertial frame of reference, an object accelerates (changes velocity) at a rate proportional to the applied force ( $a = F/k$ ), where 'k' measures inertia, the *reluctance* of an object to change its velocity (large masses have more inertia than small masses). On this basis, forces are not observable in the physical world in the absence of inertial masses.

The implication of Newton's second law for the *perception* of causal launching is that the experience of forceful impact is inseparable from the experience of inertia. For Michotte's sequential motion stimulus, perceiving the forceful impact of the first spot of light (A) on the second (B) means that there is an impression that B is reluctant to move (i.e., to change from its initial, zero velocity).

Reported below are the results of a preliminary experiment which examined the perception of causal launching (and the competing perception of tunneling) for Michotte's sequential motion stimulus. The cooperative spatial interactions proposed by Hock and Balz to account for the self-organization of competing oscillatory and unidirectional motion patterns constituted the conceptual basis for the experiment. It was hypothesized that the perceptual impression of inertia (and thus the perception of causal impact) for Michotte's sequential motion stimulus is the result of the same inhibiting spatial interactions that are the basis for the formation of the oscillatory motion pattern for Hock and Balz's counterphase row-of-dots stimulus. That is, the impression of inertia results from an in-phase stimulus configuration (the two motion components are in the same direction) being perceived in the context of an anti-phase coordinating mode. As a result, the perception of the second motion component in the sequential motion stimulus is 'resisted' by the persistence of inhibition following the perception of the first motion component (it will be recalled that in Hock and Balz's differential-gradient model, inhibiting interactions predominate over facilitating interactions for relatively large interactive distances).

In our preliminary experiment, the perception of causal impact was studied in an apparent motion paradigm in which each trial was composed of a series of rapidly presented 'frames' (as in Gordon et al. 1990). On each frame, two spots of light (A and B) were presented against a dark background for a specified duration, and

apparent motion of the spots of light was seen across successive frames. During frame 1, A and B were simultaneously presented for either 120, 180, or 240 milliseconds; they were horizontally separated by 1.25° of visual angle. During frame 2, the position of A was shifted closer to that of B, which retained its frame 1 position; A was presented alongside B for either 120, 180, or 240 milliseconds (this constituted the first motion component of the sequential motion stimulus). The spatial gap between A and B during frame 2 varied randomly from trial to trial (between 1.5 and 16.5 minutes of visual angle). Finally, the position of B was shifted on frame 3 while A retained its frame 2 position; B was presented 5.0 degrees away from A for either 120, 180, or 240 milliseconds (this constituted the second motion component of the sequential motion stimulus). After each trial, the observer reported whether or not causal impact was clearly seen. When causal impact was not clearly seen, the observer either saw 'tunneling' (A appeared to move through B), or tunneling and causal impact were not perceptually distinguishable.

The results, which are presented in the lower graph of Figure 1, closely parallel those obtained by Hock and Balz (1994) for the counterphase row-of-dots stimulus (upper graph of Figure 1): longer frame durations and increasing interactive distance favored both the perception of the oscillatory motion pattern and the perception of causal impact. The formation of the temporally coherent oscillatory motion pattern for the counterphase row-of-dots was attributed to the persistence of the anti-phase (inhibiting) mode across stimulus frames. That is, the effect of this bias against seeing the same motion direction on successive frames was for motion to be seen in opposite directions on successive frames, resulting in the oscillation of perceived direction. In a similar manner, the perception of causal impact could be attributed to the anti-phase directional bias arising from the first motion component persisting over time and resisting the second motion component (i.e., sensitivity to the second motion component is reduced by the inhibitory effect of the first motion component). The decay of this inhibitory interaction during the course of the second motion component would provide the sense of acceleration associated with a forceful impact overcoming the effects of an object's inertial mass.

Although further experimentation will be required, these preliminary results lend credibility to the idea that the perception of causal impact comes from the impression of inertia, or 'reluctance' in the second motion component (analogous to Newton's second law) that arises through cooperative interactions among direction-

ally selective motion detectors. It need not be due to the presence of information in the optic array specifying causal impact, and it need not be due to the experience of causal impact being constructed by experience-guided cognitive mechanisms.

### Visual Syntax

Saint-Martin (1990) characterizes the fundamental problem for the semiotic analysis of visual information as the determination of meaningful visual units (i.e., a lexicon, like Biederman's geons), and the development of a grammar comprising the rules that constrain the ways in which these units can be combined (i.e., a syntax). It has been argued in this chapter, at least insofar as motion patterns are concerned, that the nature of the units is not as important as the pattern of relational motion among the units. In a sense, meaning is carried syntactically rather than lexically by motion patterns. Furthermore, the idea that linguistic syntax constrains how words are combined to form meaningful sentences translates nicely into the parallel view that visual syntax constrains how visual units are organized to form meaningful, coherent patterns. However, instead of a set of syntactical rules, it is more likely that perceived patterns are constrained by the structure of stimulus information and the cooperative processing structure of the eye and brain. Gibson (1966) has argued forcefully that the physics of how objects reflect light constrains the configurations of light energy reaching the eye, and the number of coordinating modes arising through cooperative interactions is surely very small. Our shared visual experience of relational motion patterns is therefore the result of living and developing in physically similar environments and sharing neurophysiologically-determined cooperative processing structures. The generalizability of this approach to patterns for which the nature of the units is important remains to be determined.

### Note

1. I am grateful to Gunther Balz, Kathy Eastman, and Lewis Shapiro for their careful reading of this chapter and for their valuable suggestions.

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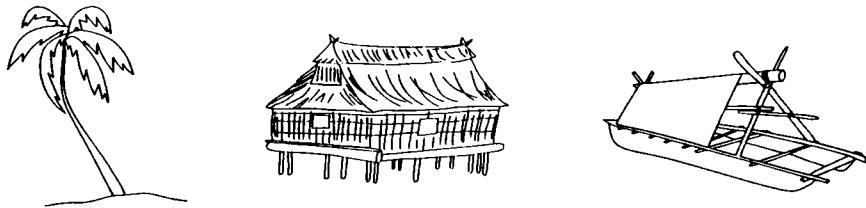
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## **Picture Perception**

John M. Kennedy

Usually, a picture is a surface that has been treated to make it possible to perceive a scene that is not actually present. Surfaces have been treated in this way for about 30,000 years—pictures being a hallmark of *Homo sapiens sapiens*. Designs and intricate abstract patterns daubed and incised onto surfaces have been dated to about 50,000 years ago, half of the reign of *Homo sapiens sapiens* (100,000 years). Rock faces on every continent contain these ancient graphic works, and recognizable pictures are as widespread. Cave walls of Altamira (Spain) and Lascaux (France), for example, provide instances of pictures that are immediately recognizable today without the need of hints or captions. The Cosquer cave (near Marseille) shows the auk, a bird now extinct in the Mediterranean. In the dry mountains of Northern Africa, readily identifiable pictures reveal the flora and fauna of their era, indicating the climate of the time was much wetter than today. The recognizability of cave art from every region of the world indicates that pictures call on a faculty that is universal, not restricted to a few peoples or to recent centuries. Indeed, researchers in psychology have unequivocal evidence that children and adults unfamiliar with pictures can recognize objects depicted in outline drawings and photographs without training in any convention of picture interpretation (Hochberg and Brooks 1962).

The Songe of Papua New Guinea are a tribe who have no pictures in their culture. Nevertheless, young members of the tribe (10-20 years old) and their elders (30-40 years old) recognized pictures like those in Figure 1 without difficulty, on first being tested (Kennedy and Ross 1975). There are many records from travelers of pictures requiring a few moments inspection before tribespeople unfamiliar with pictures were able to identify them. This could be due to extraneous factors—e.g., the pictures may have been somewhat ambiguous (like Figure 2), involving background detail difficult to distinguish from the central object. The same records often report that when the observer takes some time to complete an inspection of the picture, the result is spontaneous recognition of the figure.



**Figure 1.** Pictures recognized by the Songe of Papua-New Guinea (from Kennedy and Ross 1975, with permission)

Theory of pictures has taken extreme positions at times. One general theory is that pictures are based on ‘conventions’, practices that change from culture to culture. Another account has it that pictures are based on perceptible ‘information’—meaning that a display that represents anything is specific to that item, following laws of perceptible energies. A third position is that pictures rely on elements that trigger perceptual impressions, and when the elements are judiciously patterned the picture portrays objects and scenes. The evidence from cave art and non-pictorial peoples such as the Songe weighs against the extreme ‘convention’ theory, though it must be granted that sophisticated pictures use emblems such as cornucopia or hourglasses to mean things only some cultures appreciate. The idea that pictures rely on natural perceptible information accounts for the recognition of detailed sketches, specific to a species, like the objects in Figure 1. But, as will be seen shortly, elements of pictures can function without the overall object being recognizable or familiar. The contours, lines, and junctions of pictures have propensities that do not depend on recognition. However, the elements are often ambiguous, having several propensities. The configuration in which they are found selectively activates one propensity at a given time, as will be shown.

Many of the propensities of pictorial elements, the influences on them from configurations, and the cultural, emblematic functions of pictures, are not purely visual or rooted in basic visual responses to brightness and color. They are abstract, and available to cognition and perception via touch as well as eyesight. Consequently, in the concluding section of this survey of picture perception, a brief description will be given of raised, tangible pictures that are intelligible to the blind.



Figure 2. A picture that is often not recognized on first inspection. It is a frontal view of a duck, floating on a pond. What is often taken to be 'eyes' of a donkey-like animal are actually the duck's nostrils. From the Ministry of Natural Resources, Ontario, Canada, with permission.

Most pictures are made to be examined visually, and they consist of colored regions or areas of differing brightness. Psychology and philosophy debate the physical properties and mathematical and cognitive bases of pictorial representation. The debate has been stoked in recent decades by the arrival of new technolo-

gies for making pictures, particularly in medicine. Image makers need practical advice on how to make X-ray, ultrasound, magnetic-resonance and other images as universally and rapidly perceptible as the best primitive pictures in the art on cave walls—‘parietal’ art as it is known, from the Latin *paries* for wall. Also, advertising images and political drawings use images in rhetorical ways that need to be understood, for instance to ensure that they conform to laws on libel and misrepresentation.

Pictures are to shape and color as records are to sound. As representations, they sample from the physical information about a three-dimensional layout of surfaces, and typically they display the same information via a two-dimensional surface. In an account of pictures, first the physical basis for pictures needs to be described. How does the physical distribution of contours on the surface of a picture relate to the distribution of features in the portrayed scene? Second, the perception and comprehension stimulated by the physical substrate needs to be described. How do the perspective and rhetoric of the picture function to allow the observer to recognize objects receding in depth, or the purpose in a caricature of a politician, for example?

### Distributions of Contours

Pictures are often said to resemble what they portray. A theory of depiction has to explain the basis for the similarity. The elements on which pictures are based are the contours—abrupt borders or gradual transitions between one region of the picture and another. The contours in the picture generate perceptual effects like the effects caused by the boundaries of solid objects. Therefore, the picture’s contours can substitute for an object’s boundaries. The perceptible shapes of objects are made of convexities and concavities of their surfaces, and the shapes perceived via pictures are dependent on the twists and turns of contours on the picture surface. The contours on a picture surface can appear to show a foreground region set against a background—yielding an apparent difference in depth, often called the figure-ground effect (see Figure 3), a term coined by Rubin (1915).

Contours on a picture surface are chiefly color or brightness borders (technically, changes in the reflectance on either side of the contour). Other borders can be provided by shadow and illumination boundaries on a uniform screen (as in lantern-slide shows), texture differences (Figure 4) between regions, and binocular differ-

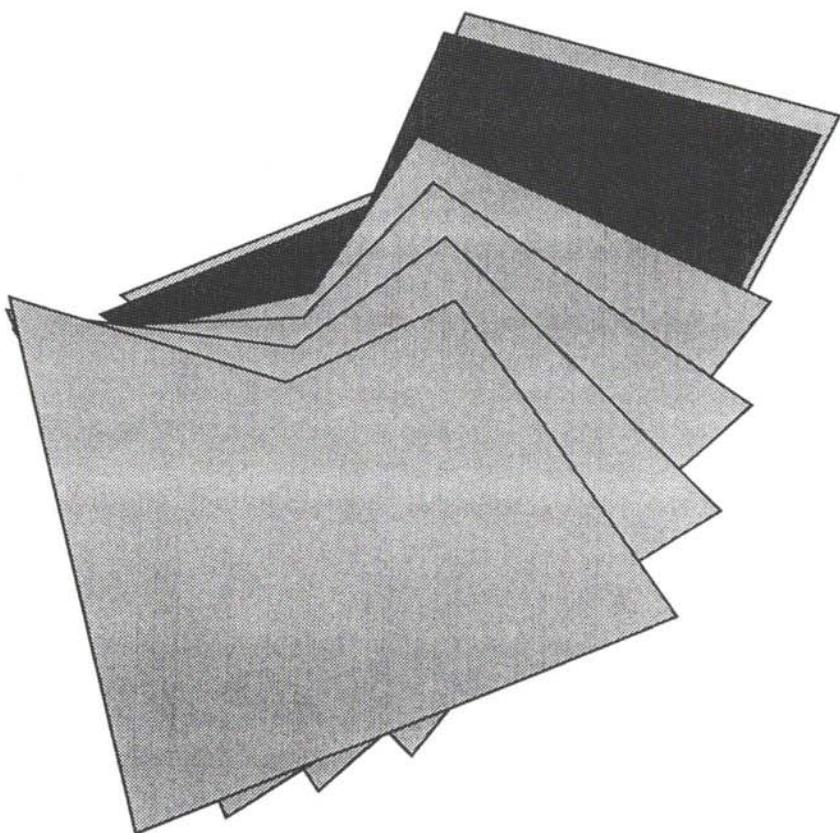


Figure 3. Irregular, unfamiliar flat shapes that appear to overlap. The edge of each foreground surface is a 'figure' against a 'ground'. The figure-ground effect is one of the possible features that can be depicted by a contour or line. The figure contains T-junctions to show the edges of near surfaces going behind frontal surfaces.

ences (as in stereoscopic viewing). Also, motion can be a basis for the appearance of a perceptible contour. Two regions in which texture elements move in opposite directions can appear to have a sharp contour at a border where the elements of one region vanish as though going behind the texture of the other region. The motion-defined border caused by the deletion of texture elements can appear to cross

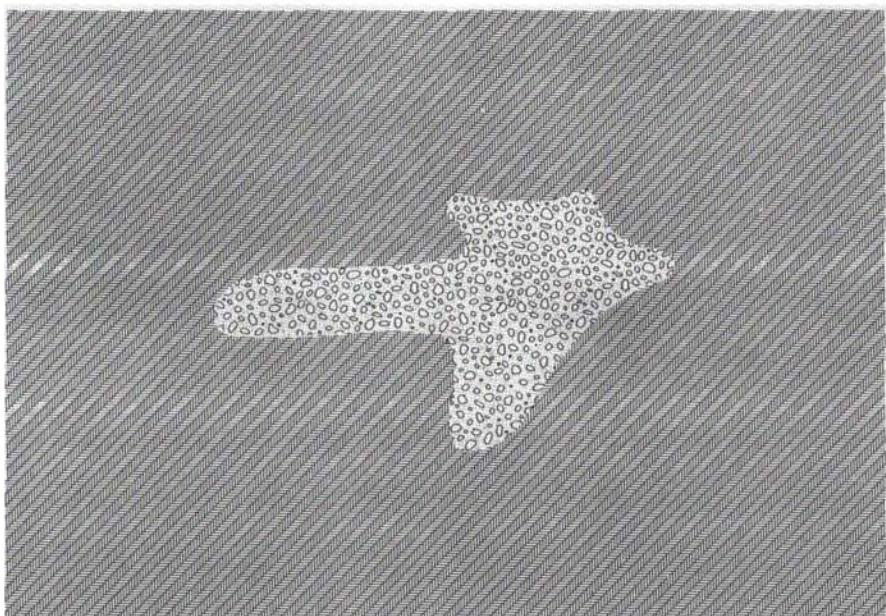


Figure 4. A figure with texture differences helping to define its contour.

uniform expanses of the display. The same kind of contour—vivid in perception, but actually cutting across uniform expanses—is evident in monocular viewing too. An ‘illusory’ monocular contour often results when two stretches of contour are perceived as connected, across an expanse of uniform surface (Figure 5).

As Figure 5 shows, the uniform areas divided by an illusory contour can even appear to differ in brightness or color, and one can appear clear while the other looks milky or diffuse, depending on the characteristics of the inducing contours. The apparent depth of the figure-ground effect and the illusory monocular contour share an important characteristic. The observer can perceive vivid effects but simultaneously detect that the apparent depth and the subjective contour are not real. The observer sees the effect, but notes that the depth and the contour are only ‘pictorial’, not genuinely, physically present—i.e., the display is actually flat, and the region cut by the contour is actually uniform. Characteristically, pictures marshal these apparent effects to give an impression of a scene without deceiving the observer into taking the scene to be real.

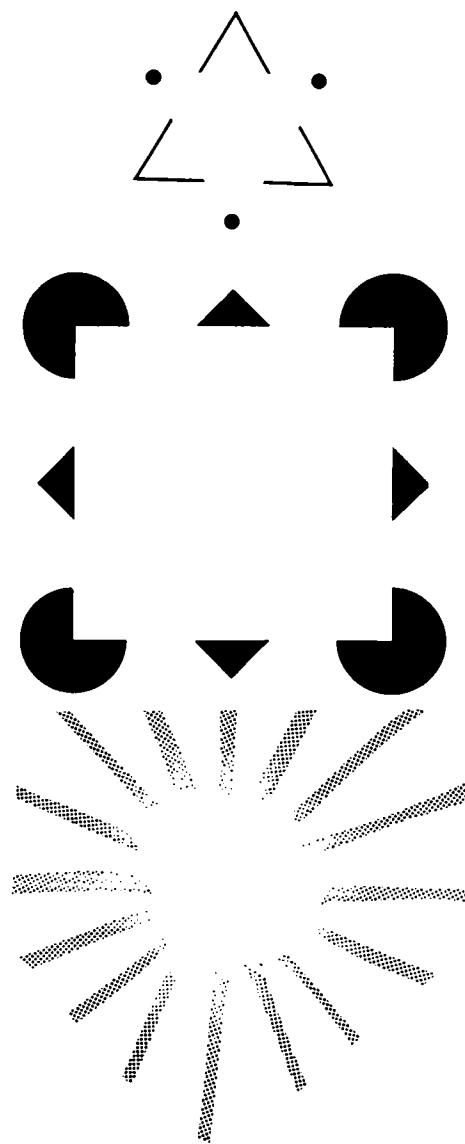


Figure 5. Subjective or 'illusory' contours cutting across regions that are physically uniform.

Not only can contours be caused by a variety of perceptible differences; they can also depict several kinds of object boundaries. The surfaces of objects can be flat or curved. The perceptible boundaries of curved objects such as spheres can be defined by the tangents from the object's curved surface passing through the observer's vantage point (like the brow of a hill). A rounded object is said to have occluding boundaries for the observer. Likewise, a flat-surfaced object like a roof of a house has occluding edges. An object such as a cube may be turned so that two of its flat surfaces face the observer. In this case, there is a convex corner in front of the vantage point. All objects composed of flat surfaces show convex corners to most of the vantage points around them. Two flat surfaces may also meet at a concave corner, enclosing a space containing the observer's vantage point. A concave corner, unlike a convex corner, cannot become an occluding edge by rotating in front of the observer.

Contours can show all of these features of surface relief—occluding boundaries, occluding edges, convex corners, and concave corners. Hence, any contour in a picture is ambiguous. It is the set of contours that indicates what any particular contour is representing. In examining a real occluding boundary or edge or corner of a solid object, the observer can look from slightly different vantage points (e.g., by making small head movements). The results will indicate what the feature is, since an occluding edge of a solid object will then reveal more of the background and cover it again. But in front of a picture, these tactics will not reveal and occlude the background, since the picture is flat. This is why pictures are especially dependent on the shape formed by the contour to reveal what is foreground and background, or concave and convex in depth in the depicted object.

Outline drawings are closely related to pictures formed by abrupt contours. Indeed, most outline drawings such as those in Figure 1 are composed, simply enough, of two abrupt contours close together. In Figure 1 the white page surrounds the black lines. The interior of any one of the drawings also contains white space. The black line therefore has an exterior contour (where the white surrounds change to the black of the line) and an interior contour (where the black lines change to the inner white space). The lines in outline drawings can show all the surface relief features that can be depicted by a contour (i.e., the line can portray occlusions and corners). But lines can also show cracks between two surface regions (e.g., when two fence posts adjoin) and wires, such as the telephone wires in Figure 6.

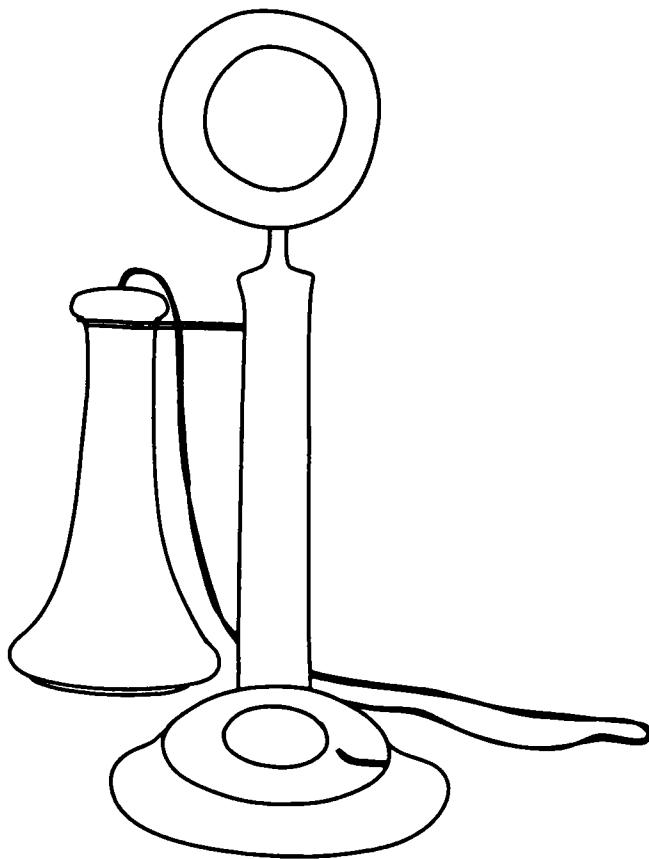


Figure 6. Outline drawing containing lines depicting figure-ground occluding bounds of rounded surfaces, concave corners in the interior of the object, and wires

While lines formed by double contours can show cracks and wires, and single contours cannot, contours have abilities not shared by lines. Lines cannot engage in scission of a single enclosed region (a Jordan curve), but contours can, in generating subjective contours (Figure 7).

Also, contours can show a shape overlaid with shadow, and outlines cannot. That is, when a contour shows a shadowed area on a moulded, rolling surface such as a face, using dark areas on the picture to show the shadowed area, vision readily detects the scene—it makes out the sculptured surface and the play of chiaroscuro

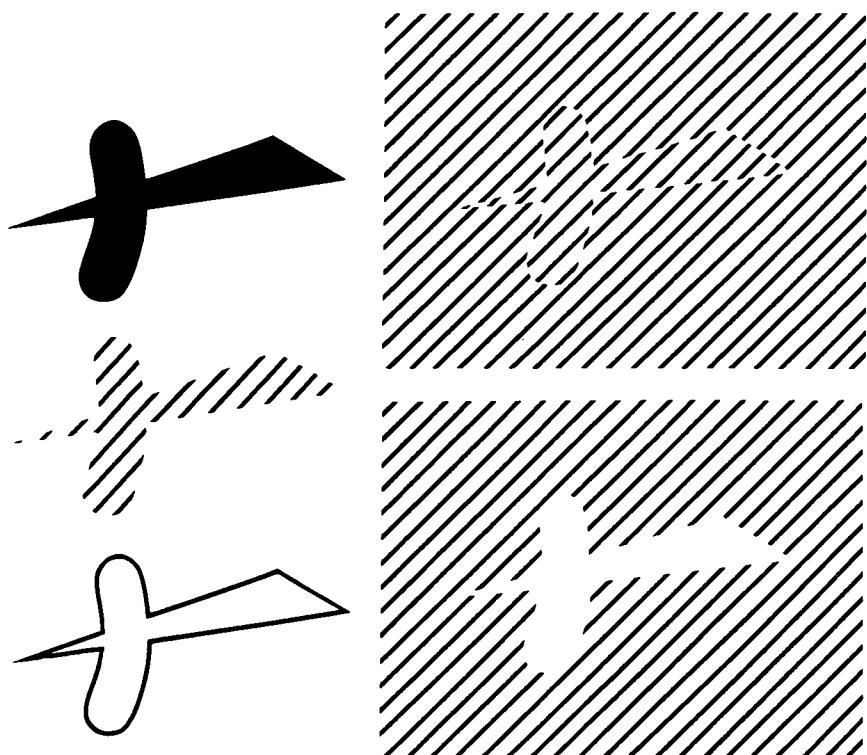


Figure 7. Various ways of defining a border of a region. The solid figure readily splits into two overlapping figures with a subjective contour completing the top form. The outline figure which has the same shape will not split spontaneously.

on it. A line version of the contour picture cannot show the same shape in shadow (Figure 8).

The relations between surfaces, illumination and shadow, contour and outline suggest the standard order in which the processes underlying vision analyze pictures. Vision reacts initially to raw energy—photons of light affecting regions on the retina. Next, the differences between regions, responding to different levels of energy, become significant in vision. These differences are analyzed as contours. The contours are then analyzed by vision to detect shapes in shadows, dealing with the dark areas on a picture as shadows, and bright areas as strongly illuminated. At this juncture in visual analysis, lines are treated as two contours.

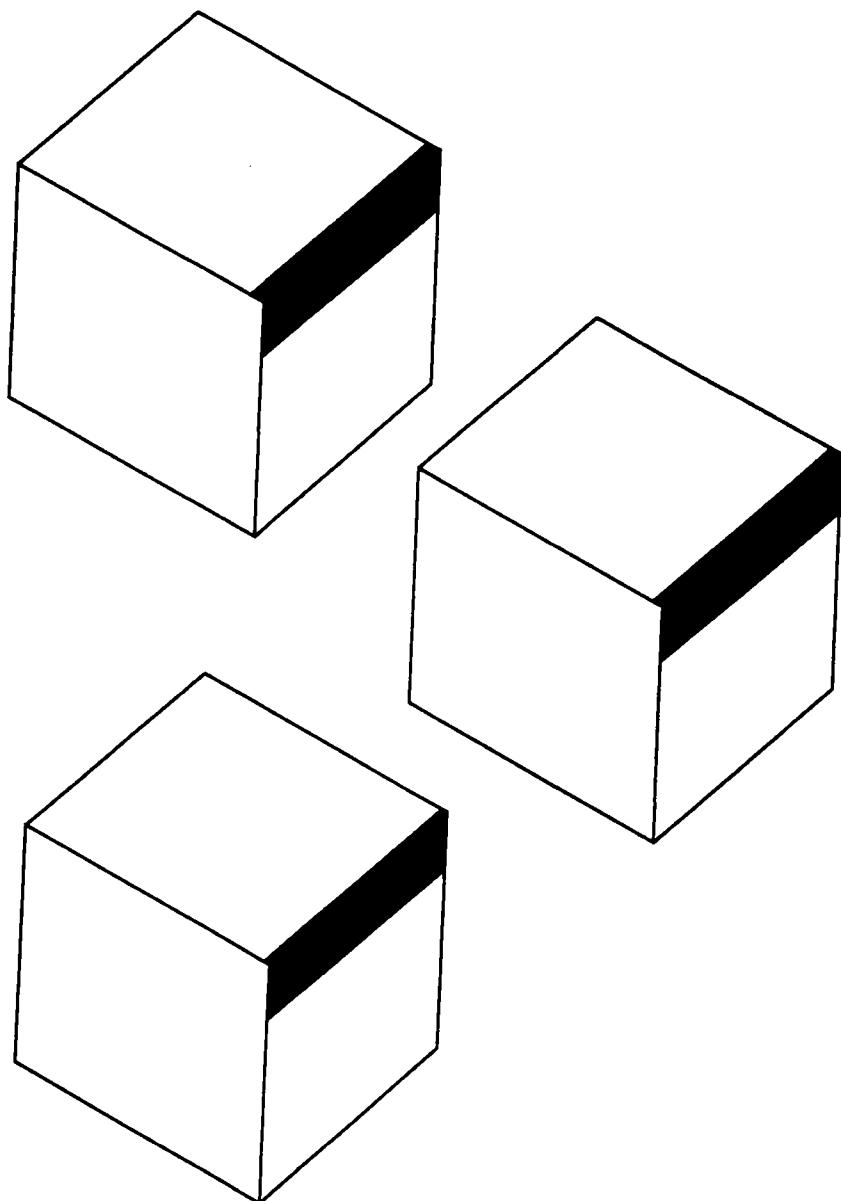
This stage in visual processing enables the viewer to perceive the picture surface—its flatness, its white and black patches, its true location.



Figure 8. A shape in shadow. The form of the line figure (with two contours) is the same as the form of the figure with one contour. Vision can see the face in the figure with one contour, but not in the line form. If the two figures are fused stereoscopically, the face in the single-contour figure vanishes. Outline drawing from Kennedy (1993), with permission from Yale University Press. Contour drawing from Mooney (1957), with permission.

A later stage then ensues. In this stage, the two contours of a line are treated as one change. The line is often taken as showing one corner of a cube, for example. The location of the corner of the cube is an ‘axis’ of the line. The axis need not be exactly aligned with the middle of the line. Indeed, it can be much closer to one contour than another, as shown in Figure 9.

It is the axis of the line that depicts features of relief. Since the axis is only a location—often midway between contours—it does not contain information about brightness or darkness differences. It cannot stimulate the shape-in-shadow visual



**Figure 9.** In each cube one convex corner is shown by a line that is not placed symmetrically on the corner.

analysis used in inspecting Figure 8, which requires information about which region adjoining the line is dark (Cavanagh and Leclerc 1989).

A schematic model of cells extracting axes from a line is shown in Figure 10. The first layer of cells responds to brightness levels e.g. to detect shadows. A later layer, labelled 2, responds to brightness differences. That is, it responds to contours. An intermediate layer, labelled H for 'hidden,' acts as an editor, preventing the layer 2 cells from firing when layer 1 cells are equally bright. Next, layer 3 cells respond when two contour-detecting cells, in layer 2, are responding. That is, they fire to a line, not just a single contour. However, several adjoining layer 3 cells respond simultaneously. An additional level of analysis is needed to extract the single axis of a line that will be used in a particular case. Layer 4 cells accomplish this task. The normal or default option is that the middle of the line is used as the location of the axis. But other influences can move the dominant firing at this layer from the default cell to a neighbouring cell. Layer 4 cells are the axis cells. These cells support the perception of surface involving occlusion (figure-ground effects), corners and the like.

The axis cells have extracted a location, in a display, but they have no information about brightness. The result is that, in principle, shape-in-shadow cannot be observed when the perceptual system is relying on axes. A striking demonstration of this principle can be obtained by stereoscopically fusing the two parts of Figure 8. The black line will overwhelm perception's use of the black-white contour showing a person's face, and the face will vanish. (Stereoscopic viewing of Figure 8 can be achieved by 'crossing' one's eyes while maintaining Figure 8 in focus. One way to do this is by fixating on a finger held several inches above Figure 8, which effectively 'crosses' one's eyes so far as Figure 8 is concerned. Figure 8 will then produce double images. When one of the double images from the line figure is exactly superimposed on one of the double images from the contour, it will be impossible to see the person in the shape-from-shadow contour picture.)

## Configuration

Individual lines and contours and irregular figures—particularly closed ones—can stimulate noticeable pictorial effects. A complex picture arranges lines and contours so that the configuration can use influences from perception's skills with

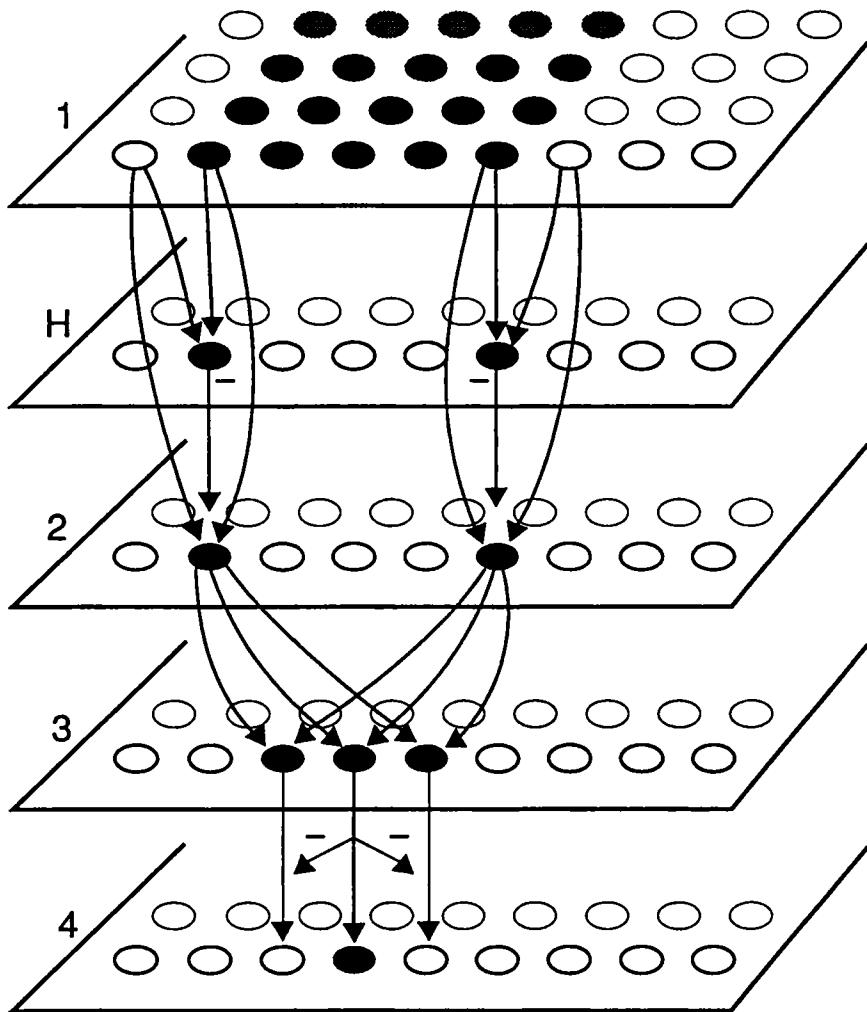


Figure 10. A scheme for turning a layer of cells containing borders between 'bright' and 'dark' regions (layer 1) into a contour-sensitive layer (layer 2), using a hidden layer, H. Layer 3 responds to pairs of contours. Layer 4 selects a single axis out of the several responses evident in Layer 3. The result is that a dark line, at Layer 1, which could be analyzed for brightness levels, activates a single axis, at Layer 4, where brightness information is absent.

patterns. The end-product can be a complex scene—a terrain full of recognizable or strange objects.

There are many kinds of patterns that can influence perception. Traditionally, pictures have been said to use a set of cues—interposition, aerial perspective, shading and lighting, and elevation. In addition, a powerful geometry is an ever-present influence on perception—perspective—and it can be used in several ways in pictures. Also, the orientation of a picture can affect its perception. The structure of the environment is an ‘ecological’ or ‘realistic’ constraint on pictorial representation, defining some scenes as normal, some as unusual, and others as impossible.

**Interposition:** When lines and contours meet, they form junctions. T-junctions—such as those in Figure 3—are readily seen as representing two surfaces, one in front of the other, partially concealing the near one. The cross-bar of the T defines the front surface’s edge. The stem of the T defines the rear surface, which appears to go behind the front surface. X-junctions are readily seen as one surface crossing-over (and hiding) another. In interposition, one contour of the T is seen as extending across the region where the T’s stem meets the cross-bar. The result is a small subjective contour, completing the cross-bar’s contours. Similarly, at an X-junction, subjective contours can be seen completing the contours of the nearer bar. Figure 11 is a schematic representation of a T, highly enlarged, with the cross-bar completed. Figure 11 also shows an alternative way of severing the cross-bar and the stem, with the stem completed and lying on top of the cross-bar. Perception cannot adopt the alternative, it seems. That is, junctions operate in interposition in highly constrained ways, though in principle there are many ways perception could be using junctions.

Aerial perspective or clearness is a useful guide to depth in a picture of a scene where the medium for transmission of light is not perfectly transparent. In hazy or misty conditions, the more distant the object the less clear it is. The effect is dramatic underwater, where the suspended particles in the water, and the comparatively large, densely-packed molecules of the water medium itself, lower the transparency of the medium. The effect is evident at great distances in the normal atmosphere, where distant hills or buildings have their light scattered to some degree by the air. The shorter wavelengths of light (blue) projected by the distant objects are scattered more than longer wavelengths (red), which accounts for the purplish, dim appearance of mountains on the horizon, and the deep red of the set-

ting sun, particularly when the observer is at a low altitude, viewing in muggy or polluted conditions.

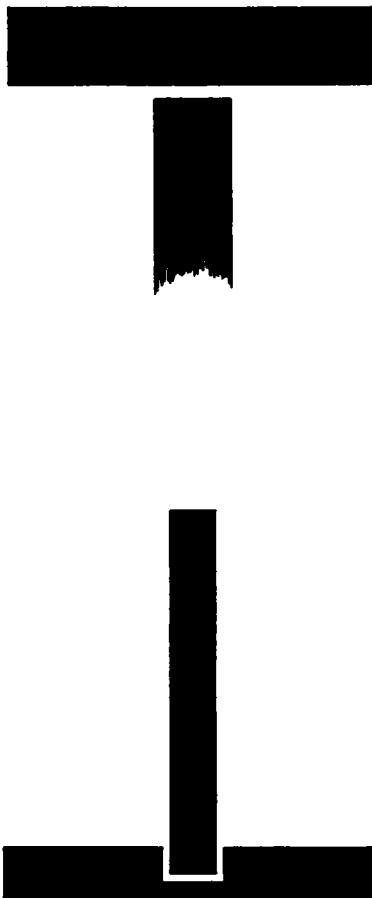


Figure 11. Enlarged versions of T-junctions, showing alternative ways of splitting the stem from the cross-bar. Vision uses only one method for the split. It completes the cross-bar, and the stem appears to go behind the subjectively-completed cross-bar.

Shading and lighting (evident in Figure 8) involve directional illumination and cast and attached shadows. As Figure 12 shows, shading and lighting are effective on the visual periphery, not only in the central region of fixation. Lighting inter-

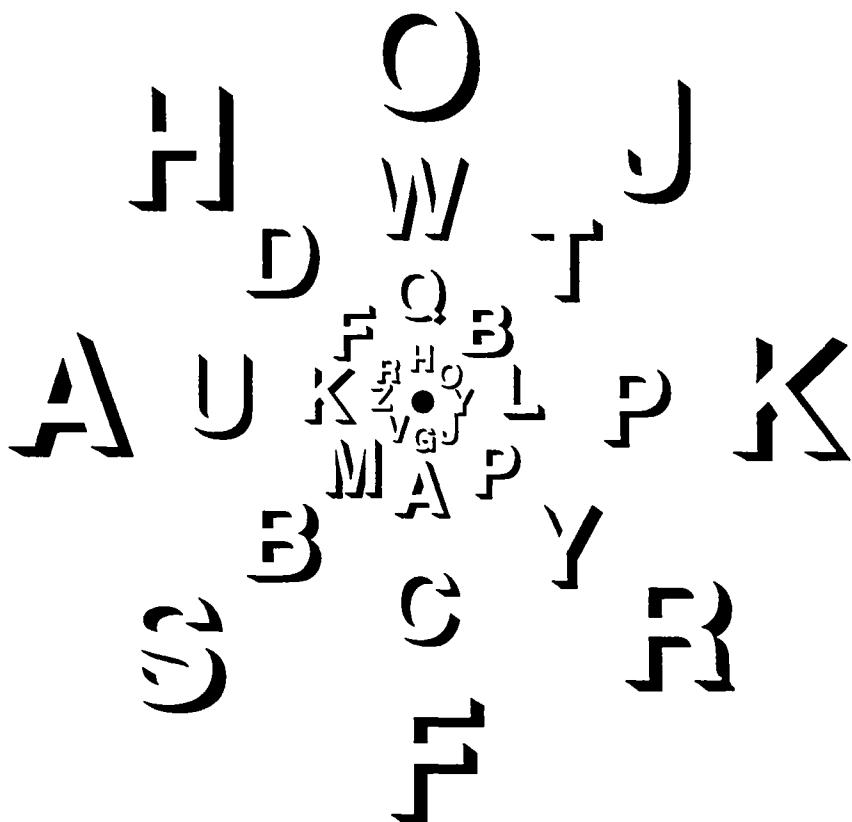


Figure 12. Shadow letters. Fixate the center of the figure, and all the letters will be approximately equally legible. The size of the peripheral letters is increased to compensate for low acuity levels in the visual periphery. The demonstration shows that shadow shapes can be processed on the periphery. (After a design by S. Anstis)

acts with the basis for aerial perspective—particles suspended in the medium—to produce ‘beams’ of light apparently radiating from the source of illumination: e.g., shafts of light from a window into the dust-mote-filled air of a room, shafts of light into a forest glade where the air is misty, snow falling into the cone of light from a street lamp, sunbeams peering through clouds. These reflections from particles showing the path of a beam of light can be photographed. They are

present in the scene, and are independent of the viewer. Blur and points of light forming a cross around an intense star-like source of light are, in contrast, dependent on the observer. Blur and star-crosses occur in the observer's eye. Similarly, camera lenses may produce several images of an intense source of light (such as the sun). The lenses have two surfaces, and faint images are produced when the rear surface acts as a mirror, reflecting an image to the front surface, which reflects it back again, at which point the cycle can continue or the image may emerge from the lens to impact on the film and create a secondary picture of the source of light.

The elevation of an object in a picture can be effective information about its depth, and its size, when its relation to the horizon is evident. Objects below the horizon, on level terrain, are more distant the closer to the horizon they are positioned. Above the horizon, objects such as clouds are also more distant the closer they are positioned to the horizon. The object may project partly above and partly below the horizon. The 'horizon-ratio' is the proportion above and below the horizon: e.g., 10 percent above, 90 percent below. Any object on a level plain that is entirely below the horizon, from the observer's vantage point, has a height less than the observer's eye height. Any object sitting on a level plain whose top is exactly at the horizon level has a height exactly equal to the observer's eye-height. And any object on the level plain that projects 10 percent above the horizon has a height equal to the observer's eye height plus 10 percent of the observer's eye height. Thus, the horizon ratio can be very useful in a picture of a scene. It can indicate the heights of objects positioned at a variety of distances. An object that subtends a small angle at the observer's vantage point (and is drawn as tiny, on the picture surface) can be shown to be vast in size, if most of its bulk is above the horizon—e.g., 10 times more of its size is above the horizon than below (Sedgwick 1973).

The horizon ratio is a mathematical invariant that arises because of the observer's vantage point, and the variation in angular subtense of parts of the terrain that define the terrain and the horizon. It is a polar perspective effect—polar perspective being the mathematics of projection or direction from a vantage point. The parts of a terrain—its texture elements—project smaller angles to a vantage point as they recede in distance. The change in angle follows a tangent law. An object of height  $h$  subtends an angle  $\theta$  at distance  $d$ , if it is set vertically on a plane. If the vantage point is on the plane level with the base of the object:  $\tan \theta = h/d$ . Small changes in distance change the angular subtense greatly when  $d$ , the distance, is small, and the same changes in distance have very little effect when  $d$

is great. The result is a ‘gradient’ of changes. Texture gradients are effective ways of showing receding surfaces in pictures (Gibson 1979) and a change in the gradients is excellent at showing two distinct surfaces, forming a concave corner (Figure 13).

Perspective geometry governs the appearance of pictures to a considerable extent, but not perfectly. Not all perspective principles are used faithfully by perception, and there is still considerable uncertainty about the role of some perspective effects in perception.

Figure 14 shows three drawings of cubes. One has the correct proportions for a polarperspective projection when the cube subtends 15° at the eye, one is correct at 36°, and the other is correct at 0°. When all the drawings subtend 36°, the true 36° drawing looks correct and the 15° cube looks highly acceptable as a drawing of a cube, but the 0° cube looks distorted. It appears to have divergent sides, although the lines on the page are in fact parallel. When the drawings subtend a very small angle (below 1°), the 36° drawing looks distorted, the 15° drawing is still highly acceptable, and the 0° cube looks correct. At 15° subtense, the 15° drawing is markedly superior to the others. Evidently, vision obeys the laws of polar projection. The eye notices the appropriate proportions for each angular subtense. However, there is an additional factor. The 15° cube is highly acceptable over a wide range of angles. Indeed, each drawing has a ‘correct’ subtense, where it looks best, and a range of angles around the correct subtense where it appears highly acceptable. The 15° cube has the widest tolerance range of the three drawings.

The 15° drawing is also robust in appearance when the picture is viewed from an angle other than directly in front, with the picture surface frontal-parallel and the observer’s gaze-line normal to the picture surface. That is, when the picture is tilted, and the gaze line is not normal to the picture of the cube, the 15° drawing is still highly acceptable (up to angles where the gaze line departs from the normal by 65-70° or more). At about 65-70°, the 15° drawing begins to look distorted. If the observer tilts the drawing backward, so that the vantage point is below the drawing, the portrayed object begins to look like a flattened cube. If the vantage point is to the side of the drawing, at 65-70° from the normal, the portrayed object looks too thin to be a cube.

Perspective predicts that portrayed objects will appear distorted when objects drawn in polar projection are viewed from incorrect vantage points—wrong angular subtenses, or from glancing angles rather than on the normal. However, exact perspective does not predict the robustness of cubic objects drawn with proportions

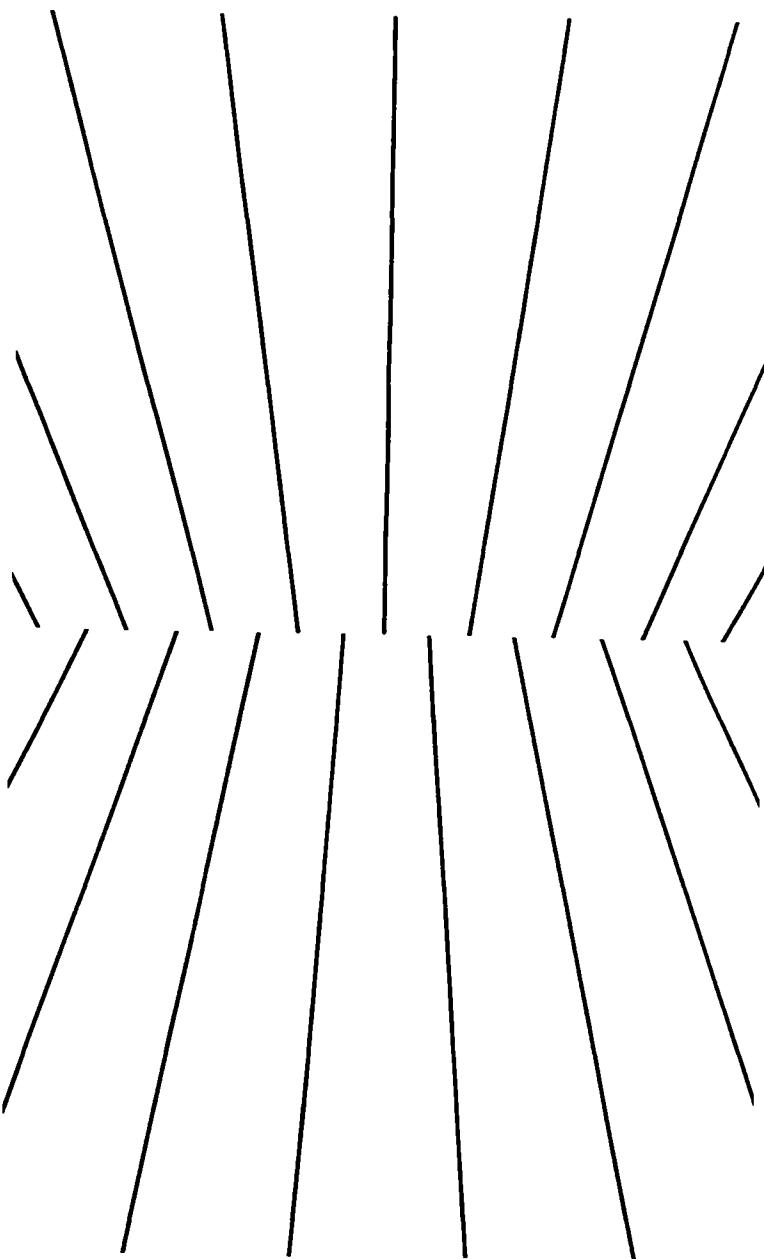


Figure 13. Texture gradients showing flat surfaces, and a concave corner.

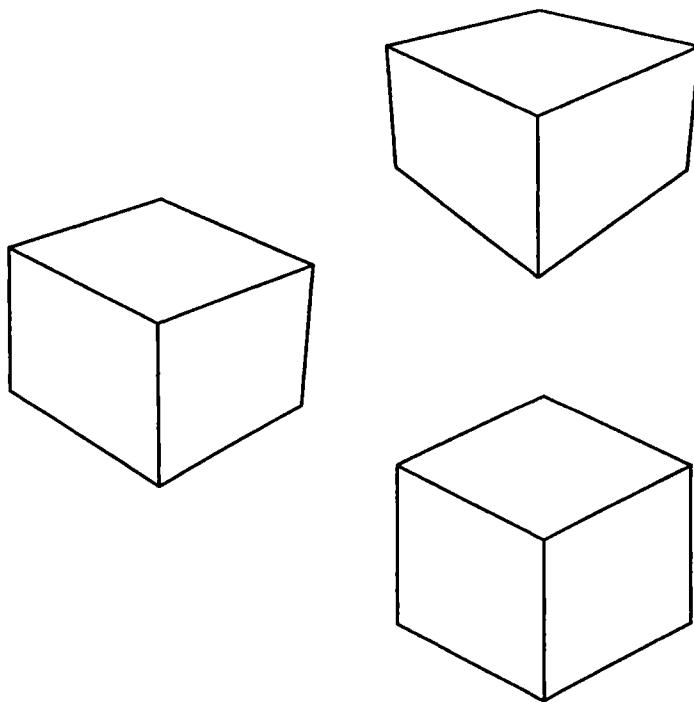


Figure 14. Three cubes: One drawing shows the proportions for a cube subtending 36° (strong perspective), one is correct at 15° (moderate perspective), and one is apt at 0° (parallel sides)

correct for 15°. Departures from correct projection are very readily detected by vision for rounded objects, but exact perspective does not predict a difference between rounded and cubic objects. An additional twist to the tale is provided by the fact that there are some projections of rounded objects that are especially robust! Raphael represented a sphere in ‘The School of Athens’ (1510-11) by painting a circle on the picture surface. The sphere is on the far right side and below the center of projection of the picture. Its correct projection would have been elliptical with the long axis of the ellipse pointed toward the center of projection. Yet the circle looks correct, despite its incorrect projection. Evidently, vision finds circles to be robust representations of spheres, highly acceptable from a range of incorrect vantage points. Again, if the viewing angle is 65-70° off the normal, the appearance does begin to fit with exact perspective, and the circle

begins to look like an elliptical solid, with the plane containing the short axis oriented toward the viewer, and passing through the vantage point. The history of perspective is a history of discovery of exact laws, and acceptable, but strictly speaking incorrect, compromises that depend on the tolerance ranges of vision (Arnheim 1974; Kubovy 1986; Pirenne 1970).

The 0° drawing of a cube in Figure 14 can be described as a polar projection of a cube at a small angular subtense. Or it can be described as a parallel projection of a cube. Parallel projections are also robust in certain circumstances. Parallel projection is highly acceptable to vision for showing an extended scene—a landscape (Nicholls and Kennedy forthcoming). The landscape can contain objects such as fences, walls, streams, and roads that have a much longer dimension in depth than in height or width. These extended objects can be drawn in parallel projection, apparently receding in depth without appearing to grow in height or width as they recede (polar projection predicts parallel lines showing receding walls should appear as a wall increasing in size in depth). The picture can be viewed from a wide variety of angles and still appear highly acceptable as a rendering of an extended object with a uniform height or width. Oriental landscape painting takes advantage of vision's ready acceptance of parallel projection for extended objects with invariant heights and widths. Objects such as people, trees, and houses can be portrayed in these landscapes close by an extended item, and vision will scale their size by comparison to the extended item.

Foreshortening is an important aspect of perspective, despite vision's tolerance of parallel perspective for extended objects. In a drawing of a cube with a square showing the front face, and two quadrilaterals adjoining the square to show the receding top and side faces of the cube, foreshortening is favored by vision. If the drawing is made in polar perspective, the two quadrilaterals show convergence (much as do the 15° and 36° drawings in Figure 14). Vision finds the quadrilaterals should be foreshortened to 65-70 percent of the length of the sides of the frontal square.

If the cube is drawn in parallel perspective, the same foreshortening ratio holds. That is, if the drawing is made so that the two quadrilaterals have sides the same length as the frontal square, the drawing seems to show an object that is too long in depth to be a cube—a kind of city block (Figure 15). Vision's requirement for foreshortening is unequivocal when the object has cubic proportions, and the requirement is gradually relaxed as the portrayed

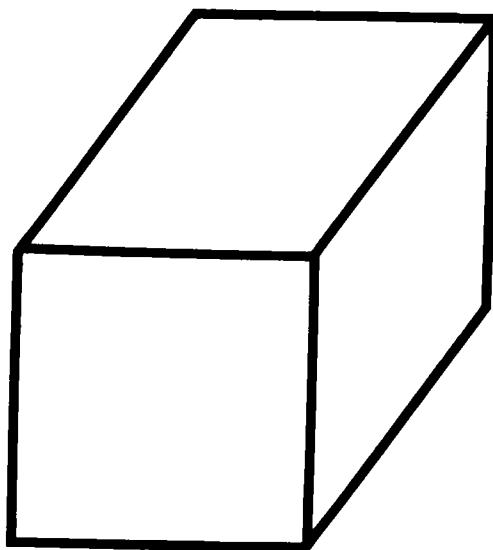


Figure 15. A square with two quadrilaterals drawn with parallel obliques. The length of any side of the square equals the length of each parallel oblique. But to vision the obliques look longer. To portray a cube, the obliques should be foreshortened to about 65-70 percent of their present length.

object is more extended. While a drawing of a cube may require 65-70 percent foreshortening, one of a city block with a length 5 or 6 times its frontal dimension can be drawn in parallel projection without evident distortion.

### Rhetoric

A picture can faithfully replicate the structure of the environment, and simply show a scene. Or it may involve a particular purpose, and it may invoke a 'trope' or kind of metaphor. For example, Figure 16 is a computer graphic of Shakespeare cut open rather artificially, revealing Shakespeare intact within; the whole event takes place with the background being a Shakespeare too big to fit into the picture frame. This might serve as a poster for a course on 'The Computer as an Aid to Shakespeare Scholars'. The implication would be that the computer provides a tool to assist analyses, while revealing Shakespeare faithfully intact,

but there is something grander about Shakespeare than this aid can capture. The picture uses irony, gently undercutting the avowed aims of the course. It uses understatement, or anticlimax, presenting the discovered Shakespeare as smaller than the Shakespeare being dissected. It uses contradiction (actually ‘contrafiguration’) by showing Shakespeare within Shakespeare on top of Shakespeare.

The full set of tropes can be used in pictures. Pictures can indeed use irony and understatement (Arnheim 1974); they can also show events in which the present and the future are in the same scene (prolepsis). They can also involve hendiadys—one by means of two—as in a picture of a drunk who has become multiple images. Hyperbole—exaggeration or caricature—is common in pictures, for instance of a child with a giant hot dog. Pictures commonly represent something incompletely—the trope of synecdoche—without the viewer thinking for example that a picture that only includes a head shows that the head has been severed from the body. Oxymorons—combining oppositions—are frequent in pictures: e.g., the charismatic religious leader radiating sunbeams to the public, while a devil’s tail is evident to the viewer who can see behind the priest. Personification is a staple in political cartoons and advertising: the President as an eagle for one, a smiling hamburger for the other.

In the Renaissance, an important movement in illustration called Emblematica involved combinations of text and pictures, with the intent of conveying abstract ideas via pictures. Mazes, for instance, implied not just hedges but the complexities of life. Falcons indicated ‘eternity’ (Vicari forthcoming). A goose meant ‘son’. Curiously, a vulture meant ‘mother’—since male vultures were thought not to exist! A hare, oddly enough, meant ‘what is open’. Clearly, the rhetoric of emblems involved some fairly straightforward references—and some arcane knowledge which was often built on very odd ideas about nature, and indeed at times on quite deliberate fantasy. Nevertheless, the devices became incorporated widely in icons, crests, and badges of many kinds. Traces of the movement are still with us today, but it has fallen out of fashion, perhaps largely because the device and its rhetorical meaning were often connected arbitrarily so far as the casual viewer was concerned. Today’s rhetorical pictures in politics, advertising, and texts tend to use familiar characters or events (like winning a race, getting stuck on a spider’s web, being shepherded, being feted, being tied down or run over).

Rhetoric involves an object being used non-literally, and in irony the very opposites of standard meaning are intended. Superficially this suggests that mean-



Figure 16. Shakespeare coming out of Shakespeare against a background of Shakespeare: A metaphor for a course on computer aids for Shakespearean analysis? (Design by Tony Westbrook)

ing is not fixed, and anything can stand for anything else. However, there is an important distinction between literal and non-literal communication. Irony comments on a pre-existing state, self-evidently, although it uses opposites. It can only be effective when there is in fact a standard meaning. The same holds true for all tropes: e.g., hyperbole can only be a distortion when there is a standard size to flatter. Thus, rhetoric's success is evidence for two standards—one a standard meaning, and second a standard set of types of tropes. The standard meaning allows a violation of the standard to be noticed as a distortion. The standard types of tropes allow the distortion to be interpreted as a particular kind of distortion, rather than simply a random error.

What governs the set of types of tropes? Tropes use *dimensions* of meaning: e.g., lower-order classification (showing the U.S. by something included in the U.S., such as the White House) and higher-order classification (a particular military figure shown rather vaguely, looking simply like a soldier). On the dimension of size one can exaggerate, understate, or even reverse size relationships, ironically. On the dimension of time, one can show past or future mixed with the present. In a metaphor, a person may be drawn as a shark—sharks occupy the same place in the scheme of fishes as this person does in society, on the dimension from predator to prey.

There is a notable failure of correspondence between rhetorical communication in words and pictures in one instance—tautology. A rose is indeed a rose, in language, but a picture of a rose does not convey the same sense. That is, a picture of a rose does not make observers aware that 'A picture of a rose is a picture of a rose' is the intended message. A picture can show 'nesting' of one thing within another metaphorically (Shakespeare is within Shakespeare in Figure 16). But the copula 'is' in a statement of equality, asserting 'This category X is equal to this category X', has no direct parallel in depiction.

The past hundred years have seen the proliferation of metaphoric devices in pictures. For example, figures showing motion are often drawn in deliberately distorted poses, or with extra limbs, or with lines suggesting extra profiles left behind in the rush, or with 'speed lines' trailing behind the figure. These devices were largely unknown until the first two decades of the nineteenth century. Now they fill the pages of comic books, for example. While there was a steady increase in their use by graphic artists in Germany, France, and Britain, for example, throughout the nineteenth century, in the two decades 1890-1910 there appears to have been an explosive increase in their availability. Evidently apt, observers do

not need formal instruction in their use. They can indicate the speed, direction, and type of motion in an event (Rosenblum et al. 1993). They even convey a lively impression of subjective motion, while leaving intact the percept that the picture is static. They are another universal of picture perception, albeit one discovered only recently.

### **Tangible Pictures and the Blind**

Recently it has been found that raised-line pictures of simple objects can be identified by the blind. Also, if blind people are asked to make raised outline drawings of objects the result is much like drawings by the sighted. This finding emphasizes the universal basis for depiction. Lines in outline drawings mean the same kinds of features to the blind and the sighted, whether the drawings are in tangible raised form for the blind or ink-print for the sighted.

The blind readily identify frontal and top projections of objects. Three-quarter 'views' or projections prove more difficult, but can on occasion be appreciated correctly by the blind, and are occasionally drawn spontaneously by adult blind volunteers. Aspects of perspective are understood by the blind. Overlap (occlusion) is sometimes apt for the blind, and can be explained correctly. Convergence and other forms of diminution with distance are understood spontaneously by some congenitally, totally blind adults without instruction in perspective. Figure-ground effects are evident in some studies on tangible pictures. The orientation of the picture surface influences pictorial recognition by the blind as it does the sighted. For example, Figure 17 is taken by the blind and the sighted to be 'upright' when examined with the figure lying horizontally on a table, so long as the 'chin' is closer to the observer than the forehead. When rotated 90° on the table, so that the nose points toward the observer, the profile suggests a person facing downward, to the blind and the sighted—and the nose pointing away from the observer indicates the profile is facing up to the sky.

The blind understand metaphoric pictures that show the shapes of objects in intentionally distorted ways, including devices to portray motion, for example. The kinds of devices for motion first used widely in pictures for the sighted in the nineteenth century are invented and understood by the blind. Devices to show softness and hardness, such as a texture of wavy lines and a texture of angular

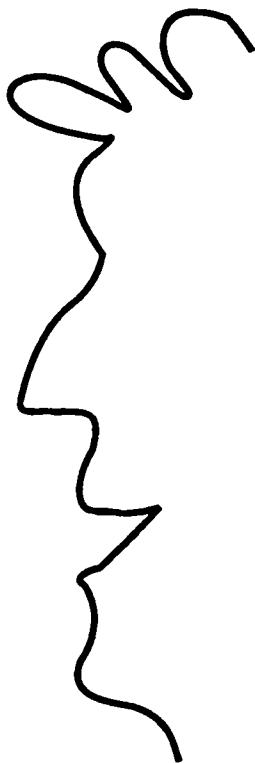


Figure 17. Profile. The drawing should be examined at several orientations while lying horizontal (e.g., on a table). At different orientations the profile appears to be erect, upside down, facing down to the ground or up to the sky. Blind observers report the same phenomenon, in the same orientations as the sighted, when given a tangible raised-line drawing of the profile.

lines, are understood by the blind. The symbolism of shapes (Arnheim 1974) also appears to be common to the sighted and the blind. For example, if sighted people are asked ‘which is better for symbolizing mother and father?’ and the options are a square and circle, the sighted pick circle for mother and square for father. Symbolically, ‘warm’ is a circle and ‘cold’ is a square, and ‘good’ is a circle and ‘evil’ is a square. Blind people select a circle and a square to symbolize the same referents as the sighted (Liu and Kennedy forthcoming).

### Universality of Pictures

There are some cultural overlays on picture perception; allusions to fairy godmothers and Sputniks are bound to the culture of a time. But picture perception's ability to accept cultural baggage arises from universals that are effective without training in particular conventions or a stock of cultural items such as Deep Space Nine Stations. Universally, pictures use elements such as contours that have perceptual affinities with edges and with color and brightness borders, and also elements made of contours such as lines that have affinities with spatial layout. The elements generate impressions of depth and orientation when set in patterns, which can be simple like a junction or more complex like a pattern governed by geometrical principles, applying to projection to a vantage point. Many of these pattern-making principles are universals. The patterns can be realistic or metaphoric, in which case there may be deliberate misrepresentation, evoking a particular kind of trope. The tropes of pictorial representation are a universal set, following dimensions of categorization that are universal. Picture perception is successful in vision, but many of its universal principles apply to touch as well as vision, since it calls upon matters such as contours, junctions, patterns, orientation, and vantage points that belong to a common abstract spatial sense, accessed by touch and vision. Misrepresentation can be evident via touch as well as vision, and the universal scheme for tropes is as applicable to a misrepresentation detected via touch as to one registered via vision.

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## **Polysensoriality in Plastic Symbolic Discourses**

Jocelyne Lupien

One never sees reality as it is but as we are.

*Talmud*

Iconology, as Panofsky bequeathed it to us, entreats us to view the art image ‘as one sees an old acquaintance whom one meets in the street and who, upon recognizing us, would politely tip his hat’ (Didi-Huberman 1990: 218), thereby supposing that the image should be regarded principally as a unit of knowledge. Yet, before being a cultural artefact, pictorial language is first an aggregate of sensory stimuli which solicits not only our vision, but every other sensory modality at our disposal as perceiving and feeling subjects. The History of Art has been criticized quite justly for having too long ignored the role of perceptual mechanisms in the formation of—and as the foundation of—aesthetic experience, to the benefit of an iconological approach whereby the work of art is treated from the perspective of its narrative representation, without regard for the way these iconic forms are anchored in our perceptive-cognitive experience. While it is undeniable that our cultural heritage intervenes in the process of reading a visual image, it is no less true that the pictorial object first of all presents itself as a particular organization of perceptual experiences, not only visual in character but also ‘polysensorial’. This subjective perceptive-cognitive experience can display a universal character, despite the cultural and ideological differences that separate individuals.

### **The Plastic Work: A Model of Cognition**

In order to understand the world of symbolic plastic discourses (which include painting, sculpture, drawing, etc.), the semiotics of visual language must situate itself within the study of the modalities of perception. Among the countless theories dealing with perception and cognition, a certain number have proposed models of the functioning of cognitive processes and of human intelligence in general that

can permit us to approach the question of how we elaborate and apprehend nonverbal semiosis. Fernande Saint-Martin, who is a major exponent of this approach, has remarked that the semiotic analysis of nonverbal artefacts 'has to be linked to a theory of perception' (1987: 243). Yes, but which one? Of the type expounded by computational (modular or connectionist) theories? Or a theory that advances an exclusively neuronal explication of behavior and mental processes? Perhaps a phenomenological theory that interrogates not the object but the relation subjects entertain with things? A theory of perception based on both the physiological and thymic relations we establish with the perceptible world?

A visual semiotics that endorses one or the other of these theories also has to assume the epistemological consequences. Thus a semiotics of the image that posits a computational hypothesis, showing how diverse cognitive phenomena, such as verbal and visual language, are connected to underlying cerebral mechanisms, consequently presupposes that the putting into discourse of plastic (and literary) works depends exclusively on a biological substratum. In practice, such a semiotic would likely enfeoff plastic symbolic discourses to the neurophysiological mechanisms regulating the visual apprehension of an image, or of an auditory or olfactive apprehension of a musical sequence or smell. As Michel Imbert has remarked, along with other scholars currently studying the epistemological consequences of the cognitive sciences, we are opening a debate which is 'difficult, passionate, full of snares, and clouded by ideological quarrels' (1992: 51) when we posit the hypothesis (of the *bottom up* sort) that it is by means of an understanding *firstly* of neurobiological modalities that we will find the key to the functioning and semantic import of our symbolic discourses.

To avoid the pitfalls of various 'neuronal man' theories, increasingly decried by theoreticians of aesthetic discourse, would it not be preferable to formulate global cognitive theories based on the empirical observation of plastic discourses and on the basis of what their forms might reveal to us about human thought? We see the possibility of two types of plastic semiotic, both equally interested in describing how perceptual experience is imprinted in the image: the first approach would base itself on a cognitive model and would then seek to disclose its traces and manifestations in images; the second approach would begin with the image in order to formulate a general theory of cognition relevant to the worlds of aesthetic discourses. In both cases, an understanding of the mechanisms of perception is fundamental: it is evident that a close link exists between the universes of discourse and our perceptual activity. M. Pinol-Douriez, for example, has recog-

nized that there exists a ‘dependence of presemiotic and semiotic constructions in relation to the specificities and constraints of “receptor-effector” systems’ (1975: 45). In the same spirit, the Groupe  $\mu$  has advocated that the semiotic description of visual signs be supported by a knowledge of the properties and specific constraints of our sensorial channels, for the simple reason that plastic substance ‘must in effect, in order to become semiotic substance, be perceived, and must pass through one sensorial channel or another’ (1992: 59).

While not going so far as to reduce visual languages to their biological substrata, we maintain that ‘aesthetic facts’, as Greimas would say, rely in a profound way on our perceptive-cognitive experiences. As a consequence, we believe that a semiotics of cultural objects has to understand the physiological and psychological mechanisms of perception. It thus becomes indispensable to consider each of the perceptual modalities as well as the types of spatial and thymic experience to which each of these gives us access. A visual semiotics has to understand the nature not only of our visual apparatus (the last one to appear in man), but also of the other exteroceptive (sensory-perceptual: i.e., tactile, auditory, olfactory, gustatory, kinesthetic, postural) and interoceptive (imaginary, mnemonic, thymic and phoric) systems, since, as Merleau-Ponty maintains, ‘there are as many spaces as there are distinct spatial experiences’ (1945: 337).

Thus, rather than preoccupying itself with measuring the degree of resemblance or iconicity between a sign and its extra-semiotic referent, a semiotics of perception endeavors to uncover, through the multiple aspects and modulations of visual space, the different perceptual points of view and their thymic/semantic content and significance.

### **Sensation, Percept, and Concept in Plastic Discourses**

A distinction has to be made between *sensation*, *percept*, *concept*, and *semiosis*—or, in other words, between the perceptual immediacy of plastic signifiers, which constitute the ‘substance of plastic expression’ (texture, color, etc.), and the concept or semiosis (plastic semiotic discourses, for example) which is the result of a cognitive processing of sensorial data. Though we do not find the origin and generative principle of cognitive processes in sensation *per se*, there is nonetheless, as Wallon points out, an ‘indissociability’ (Piaget speaks of ‘continuity’) between the rudimentary givenness of situations and semio-cognitive operations.

Thus in the case of the image, visual and perceptual variables such as color, dimension, depth, thermic values, vectoriality, texture, closed/open forms, and relations between background and form constitute the basic core of ‘perceptual indices’ that can be organized into discrete plastic signifiers which themselves provide the signified(s)—that is to say, the ‘schemata that exceed the sensory datum’ (Piaget and Inhelder 1968)—while always remaining fundamentally grounded in the sensorial level. In other words, the symbolic significance of the plastic work of art is profoundly linked to sensory-perceptual experience, but this significance is not reducible to elementary sensation.

The works of Francis Bacon portray individuals whose sensory organs very often appear atrophied or in some way dysfunctional; but if this narrative representation alludes to a perceptual activity in conflict, the symbolic content of Bacon’s works refers to something more complex than mere sensory deprivation. His works are symbolic representations anchored in a perceptual semantics (cf. Rastier 1991) that is common to both the enunciator and the receiver of the work. This common semantic basis, or shared perceptive-cognitive ‘knowledge’, provides the ‘substance of expression’ for the edification and apprehension of the work’s meaning, the symbolic significance of which cannot be reduced to its perceptual (plastic) indices.

As Norman Bryson remarks:

When I look at an image, there may well occur in my mind a set of sensations which I can obtain only when I look at this image, and no other; sensations which need not only be, so to say, retinal, but may involve the most private recesses of sensibility. (1983: 41)

But prior to semantic representation there is the percept. The problem is to know in which way these diverse sensory spaces are implicated in the semantic perception of the image. In order to understand the nature and import of these sensory instances in symbolic plastic discourse, one must first define these diverse perceptual spaces and their respective fields of competence. This will eventually lead us to postulate (and here is our basic hypothesis) that for each of the plastic signifiers of an image or painting, there is a corresponding aggregate of stimuli and sensory impressions that conditions perceptual and symbolic operations (cf. Sperber 1974). In effect, if we can contend that color, among other qualities, is affect (Schilder 1942: 13-15), then for the producer the work corresponds to a ‘notation’ or a ‘representation’ of multifarious perceptual and affective experiences, the meaning

of which can be apprehended by the receiver only by recourse to his own perceptual, mnemonic, and sensory percepts. Far from concluding that the plastic work acts only to instigate a recall of past perceptual experiences, we are rather affirming that works of art produce novel forms of representation that are themselves always anchored in polysensorial perception.

### **Plastic Signifiers and the Narrative Representation of Perception**

Two levels have to be distinguished in the image: a purely *plastic* level which is the locus of visual, tactile, and kinesthetic perceptual stimuli (textures, colors, etc.); and an *iconic* level charged with the narrative representation of perceptive-cognitive events. By making the distinction between iconic and plastic levels, we wish to point out the fact that a non-figurative work—one of Ad Reinhardt's large monochromes, for example—can sometimes present an assemblage of plastic stimuli (visual, tactile, and postural, among others) without however presenting an 'iconic narrative representation' of a cognitive event. On the other hand, another type of image, figurative in character, can for example represent perceptive-cognitive events. In Bacon's works this representation can take the form of wrestling matches between two characters; or it can take the form, as in the self-portraits of Arnulf Rainer, of an explicit figuration of the human body, whose sensory receptors appear deformed and bludgeoned.

In so-called 'abstract' painting (Rothko, Pollock, etc.), the code that enables the recognition of the work's diegesis is no longer based predominantly on literary or iconographic knowledge, but on what we could call the *ipseic dimension* of the 'perceptual' reading that I for example can effectuate when confronted with the work: that is to say, the consciousness that I have of myself in the process of perceiving this particular plastic space, a space that exhibits chromatic as well as textural and formal disjunctions, which separately or together are capable of provoking affects like pleasure/pain, comfort/discomfort. Bryson confirms the importance of the ipseic character of the perception of non-figurative art when he writes that '...in the case of non-representational art, perception and cognition form the basic mode in which viewer and image interact' (1983: 43).

It is consequently possible to study the representation of perceptual spaces as much in works that describe a cognitive event iconically as in non-mimetic works, where the plastic signifiers create proxemic or Euclidean sensible spaces.

Rothko's paintings, for example, offer a chromatic and formal organization that creates strong tactile, thermic, and kinetic effects precisely because the plastic signifiers of 'texture, gestuality and evanescent/nebulous topological forms' that one discovers in his paintings all belong to the common register of individuals' proprioceptive and interoceptive experience. The heavy texture and distinct coloration of Rothko's paintings evince a perceptual space that is closest to the immediacy of sensory contact: the sense of touch and an algetic sense provoked by the texture and sensation of heat/burning (cf. its antonym '*an-algesia*': insensitivity to pain). Furthermore, Rothko's very distinctive superposition of chromatic bands appeals directly to kinesthetic experience (more or less strong compression of masses, sensations of confinement and of suffocation). The 'vagueness' and the evanescence of the chromatic masses that are also very typical of this artist seem to arise directly from a kind of peripheral visual experience, of the kind produced when we are too close to a given stimulus (fewer than 15 cm) or, inversely, so far way that the contours of the object become blurred (7.5 m or more)—an experience that is consequently opposed to the reassuring precision of foveal vision (representing the central area of the eye where sight is clearest). These effects of vagueness, decentering, too close/too far, and of thermic intensity and heavy texture are all representations of perceptual points of view that activate a process of semantic categorization and instigate reactions of pleasure or pain.

Of all the perceptual systems, it is evidently vision that is not only the most frequently solicited by art objects, but the most often 'represented' by them. If direct and proximate (i.e., foveal), vision is able to discern the color and minute details of things; and if peripheral, it can detect movement even in semi-darkness. Many works ranging across very diverse periods have depicted these various phenomena of visual perception, either iconically or by specific selections in design, material, and emphasis. E.T. Hall (1971 [1966]) gives the example of Rembrandt's portraits and self-portraits in which one very often finds tripartite compositions copying the retinal structure of the eye (foveal, macular, and peripheral, each of these corresponding to a different degree of visual precision). *The Man in the Golden Helmet* is in effect very luminous and richly detailed in its center area, as if to invite the 'foveal' eye to focus longer on the zone that the artist painted with great precision, whereas the periphery of the painting becomes dimmed and blurred, as happens in peripheral vision where the colors and fine details disappear, leaving visible only the silhouette of things. The diverse spaces

represented in this painting correspond exactly to the three points of view just mentioned: foveal, macular, and peripheral.

The perceptual system is also the subject of Giuseppe Penone's *Turning One's Eyes Inside Out* (1971), which consists of a manipulation of his own body, photographed by the artist himself, in which opaque but reflective (mirror-like) contact lenses are worn. Once in contact with the eyes, these lenses will render the artist momentarily blind, blind to the world but paradoxically able to return every image emanating from the world around him. An anti-narcissistic mechanism, Penone's work also renders him blind to his own image while he remains visible for others, visually consumable by the spectator without the artist's visible 'me' ever exposing itself. What this art proposes, by means of a representation of sensory deprivation *in praesentia*, is an experience charged with affect, because the unique disposition and aspectuality of this work seem to affirm that it is by way of sensory deprivation that the borders between *me* and the *other* are abolished. On the symbolic level, the particular aspectualization of Penone's work seems to suggest that 'I can only be an other' by means of an obliteration of this subjective and sensible-perceptual filter that is called vision.

### **The Image: Confluence of Intermodal Data**

Even though it seems to address itself exclusively to our vision, not everything in the image is visual. Although it is difficult to establish a chronology of intervention for each sense involved in a given perceptual act, it is nonetheless their respective fields of action and competence that together modalize plastic semiotic discourses. To look at a painting engages not only a visual activity but a poly-sensorial activity as well, since, even if the process seems to be exclusively visual, we actually decode information that is being addressed in a very direct way to our tactile and kinesthetic senses, and even to our thermic sensibility. There is an abundance of literature on how the senses 'communicate' among themselves: for instance, how our sense of touch goes about 'feeling' such perceptual signifiers as the texture of a painting without the hand ever coming into physical contact with the textured surface of the canvas. This phenomenon is at the heart of the perception of the worlds represented by plastic semiotic discourses which are, not always but very often (when the interdiction 'Do not touch' applies), objects 'to be read with one's eyes'. Paradoxically, tactile space is hypervalorized by the

painting of the second half of the twentieth century, especially in the work of the abstract American expressionists of the 1950s (Pollock, Still, Kline) and of Québécois artists of the same period such as Borduas and Riopelle. The painting of European lyric abstraction (Fautrier, Staël, Tapiès, Dubuffet) abounds in textures and real haptic depths; in short, it has a ‘thickness’ to it. This style of painting not only engages the perceiver’s vision, but summons us to draw from our tactile memory in order to grasp its semantic and discursive significance.

But how is this tactile-visual process experienced, given that we are only looking at the surface of the painting? Certain writers have spoken about intermodal relations (Hatwell 1985) and of a sort of simultaneous translation of what is seen into tactile qualities, going beyond the idea that our perceptual systems are restricted to perceiving and processing only those qualities for which the common-sense attitude says they were designed, each sense being circumscribed by its own narrow field of competence. Yet if this were the case we would never manage to relate and make sense of sensations and percepts of polymodal provenance.

Phenomenology affirms that it is unnecessary to translate into a visual language what has been perceived by touch. Merleau-Ponty argues that ‘this translation and unification are performed once and for all within me: they are my body itself’ (1945: 175). Merleau-Ponty prefers the term ‘immediate intersensorial equivalence’ to ‘translation’ in order to describe the intermodal sensorial process that precedes and presides over all perceptual activity. But the acceptance or rejection of the process of intermodality in no way excludes the potential specialization of sensory ‘receptors’. This specialization would be excluded only if we accepted Fodor’s computational thesis, according to which only the mind, and not the sensory modules, is recognized as being capable of semantic processing.

It is difficult to isolate those elements of our environment that are apprehended exclusively by our visual apparatus, since vision intervenes at every level of our motor activity. Vision would seem to hold sway in the *perception of colors*, the *immediate perception of large distances*, and the *immediate perception of spatial relations* between two objects separated by a large distance. Berkeley accorded to vision the unique faculty of being able to discriminate light, colors, and forms, but he denied it the capacity for the immediate perception of distance. If we now know that sight plays a predominant role in the perception of spatial positions, we also know that this ability is not unique to the visual domain; what is unique to vision is the immediate perception of large distances between objects, the sense of touch being able to perceive immediately the distance separating two objects only by

touching the two simultaneously. The ability of touch to perceive the spatial relation between two distanced objects will depend on the body's ability to displace itself between the two objects, and the consequent spatial percept will not be immediate, but cumulative. Despite this, Piaget and Saint-Martin describe vision as an essentially sequential (rather than simultaneous) mode of apprehension because it is the sum of visual focalizations that generates the global perception of the image.

It is untenable to suppose an experiential cloistering of our diverse sensory modalities, each relatively independent and with its own area of expertise: vision on the one hand that perceives, the hand that informs of the configuration of objects that it touches, the thermic receptors, and of course the ear and the nose. These distinct perceptual modalities help each other mutually to 'build' our understanding of the environment by putting into relation their respective data. This is basically what Gibson (1966) affirms; for him there is no need for a transformation of perceptual data from one code to another because it is the nature of cognitive processes to effectuate an extraction of *relational invariants* that specify the properties of the objects seen, touched, felt, heard, etc. For Gibson, a relation is not attached to a particular modality, but in fact transcends it. This hypothesis is important because it supposes that perceived data are 'amodal' and therefore detachable from the transmitting sensory channel, capable as a consequence of being transferred from one modality to another without the necessity of a translation.

Here we find the common point about which two groups of contemporary cognitivists are still debating. On the one hand, there are the supporters of the theory of double coding (Paivio 1971), who contend that we produce two types of mental (semantic) representation from the foundation of sensory data, either in *imagistic* form or in *verbal* form. On the other hand are the adherents of a propositionalist theory, who accept the existence of only one type of semantic representation, amodal in nature. We believe that the sensory systems possess specific fields of competence, and that they are capable of intermodalization as well as a certain semantic processing, effectuated on the basis of the sensory, or conceptual/functional, quality that controls the perceived object. We are equally opposed to propositionalist theories, and believe that the *form* of semantic representation depends on the form of the stimulus. Context and the subject's prior experiences also play an important role in the processing of the percept.

Within the field of the perception of art and abstract painting, for example, the subject can be understood as effectuating a semantic categorization on the basis of

chromatic data which derive predominantly from visual perception, but which also possess thermic values. The same is true of textural data, which belong to the tactile-perceptual space, of movement communicated within the tactile-kinesthetic space, and also of sound, taste, and smell, all of which can be actually or virtually present in the pictorial or tridimensional work of art.

Monet's *Cathédrales de Rouen* and *Meules de foin en plein soleil* offer good examples of polymodal visual and thermic representations. The abundance of light that bathes these scenes eats away at the architectural configuration of the cathedrals and haystacks and creates a vibrational and thermic effect that is very close to the effect of form dissolution brought about by the luminous intensity of the sun. Other works experiment with the thermic level—notably those of Dan Flavin, which are made of luminous colored neon, or of Sigmar Polke's large heat-sensitive murals, which are capable of changing color under the effect of heat. Though integrated into tactile space, thermic receptors possess deeper thresholds and are, strictly speaking, slower in registering data than tactile receptors; as well, thermic sensation is capable of eliciting powerful affects.

In certain videos and films, auditory percepts play as important a role as the one assumed by the visual dimension. The videographic productions of Bill Viola deliberately transgress sensory thresholds (notably auditory) with the aim of provoking unexpected emotional reactions. Thus, the initially weak thymic coefficient of an installation designed principally around visual and auditory features might find itself intensified considerably if the personal space of the spectator is compromised or even violated in some sense by the wearing of headphones that accompany Viola's installation and that add to the auditory percept an unusual proxemic force. The algetic potential of sound is evoked in a work of the American Pop artist Lichtenstein entitled *As I Opened Fire* (1964), in which a gun is depicted discharging; this image evokes an intense auditory percept (sharp and repeated bangs, impact of the gun's firing near the ear, etc.) and consequently an effect of very close proximity. The auditory *rhythms* can also be applied to creations that present linear and chromatic sequences (periodical or not, or with aspectral variations) as we see in Vasarely's op art works, in the large surfaces of Barnett Newman, and in Morellet (France).

### **The Thymic Coefficients of Plastic Signifiers**

To each perceptual modality—and as we have said, all of them can be represented in the plastic work of art—can potentially correspond an ‘affective’ coefficient. In other words, more or less intense responses of pleasure or pain can be produced simply by the stimulation of any of the sensory receptors. C.H. Piéron (1959: 183) once undertook a comparison of the perceptual and affective coefficients of each of the sensory spaces, and arrived at the interesting conclusion that the thermic, gustatory, olfactory, postural, and algetic spaces—those senses whose receptors are ‘affected’ on contact with a stimulus—possess an affective potential (pleasure/pain) clearly more intense than is the case with vision or audition, which, as we recall, are receptors that operate at a distance from their perceptual target, which do not ‘consume’ their objects by direct perceptual contact. What follows, as a general rule, is that the sensory spaces that by definition encapsulate very fine perceptive coefficients (vision, audition) curiously have less affective potential.

These observations concern a visual semiotics interested in evaluating the affective ‘content’ of the perceptual spaces represented in the plastic work of art. If a given work encompasses a large concentration of real or virtual gustatory or olfactory perceptual signifiers, its affective coefficient will be very large, whereas a work that plays on a predominantly auditory coefficient will possess a correspondingly lower affective value. The work of the Canadian Yana Sterbak, which consists of a dress made of red animal flesh rotting with the passing days, possesses a powerful affective coefficient because it displays *in praesentia* signifiers belonging to the olfactory domain. On the iconic level, and therefore at the level where a real gustatory or olfactory percept exists *in absentia*, the icons of animal flesh that one finds in Rembrandt but also in Soutine would be equally capable of communicating strong affects.

### **Sensory Thresholds Activated by the Image**

The concept of ‘sensory threshold’ provides precious insight into the functioning of the perceptual apprehension of works of art. In some works, the plastic signifiers can attain such a degree of chromatic, textural, or formal intensity that the surfaces are felt as almost ‘unbearable’. Inversely, other works offer such minimal

chromatic or textural contrasts (e.g., Malevitch's *The White Square on White Background* [1918]) that the observing subject is hardly capable of perceiving the plastic disjunctions that animate the surface of the painting. The majority of individuals who, face to face with these works, feel uncomfortable without knowing exactly why do not generally spend very much time affirming that there is 'nothing to see': what in fact is making them feel uneasy is the intensity of the perceptual threshold these objects are obliging them to experience. It is as though these works enact representations of perceptual thresholds above and below which the perceptual receptors are really (or metaphorically) understimulated or hyper-stimulated—with the affective consequences of pleasure (for a minority of spectators) or discomfort.

### **Plastic Language vs. Verbal Language**

If our internal and external sensorial percepts continually nourish and modify our mental representations and images, it is also true that the images of art enable the subject to have perceptual experiences that engage him in novel affective and intellectual experience. One might ask if the same holds true for literary works of art. The literary text is able to represent the most complex and contorted of perceptual acts; this complexity has been the focus of many recent studies that have approached the representation of perception from a linguistic-phenomenological perspective, sometimes with a more restricted interest—verbs of vision, for example—and other times by focusing on the syntactic dimension of the phrase in order to reveal how the author's perceptual 'point of view' is represented.

Verbal language constrains the perceptual experience of the text to the recognition of syntagms and paragraphs which are composed of conventional signs, decodable in their linearity. On the other hand, nonverbal language, by reason of the concrete spatiality of its material, stimulates the primary cognitive levels, sensation and perception, in which one finds mixed together the richness of the past and the acuity of the present. By making this distinction between verbal and plastic language we are not denying the possibility that the verbal medium can represent and transmit complex perceptive-cognitive experiences; authors like Pierre Ouellet (1992) have demonstrated this hypothesis in great detail. But it is important to point out once again that while the word 'red', for example, effectively permits the reader to conjure a visual semantic content (and thus perceptual), it does so only by

means of a decoding process operating on a conventional verbal signifier; in contradistinction to this process, the visual perception of a red area (within or outside a pictoral composition) constitutes a perceptual experience that is *direct and unmediated by natural language*. We are not downplaying the importance of cultural factors in the perception of images: the red patch in question can certainly generate diverse semantic interpretations according to whether the perceiver is, say, Russian, Japanese, or Indian, etc. Moreover, a number of researchers (see in particular Davidoff 1991) have established that form is perceived before color; consequently, the more or less iconic configuration of this red patch will have an effect upon the semantic perception of the sign.

In a manner somewhat similar to the learning of a natural language, we also learn to read perspectival systems. These systems (atmospheric, linear, etc.) are superstructures which have a conventional character and which, like verbal language, bear an arbitrary relation to the structure of the natural world they are supposed to represent. But this 'figurative space' (perspectives, icons, recognizable and describable motifs) is, as Fontanille has remarked (1989: 84), 'under the dependence of figural space', a space Saint-Martin designates as *topological* (colors, textures, lines, non-iconic masses in non-Euclidean relations). Like verbal language, perspectival superstructures presuppose a specific competence and cultural knowledge on the spectator's part, whereas what we have called the 'substance of plastic expression' requires for its comprehension no competence other than the subject's sensory apparatus. It is often said to be impossible *not* to hear a sound that is surrounding one's corporeal space; likewise it is impossible *not* to perceive this red patch that is before me, whereas I may well perceive the word 'red' visually, but my 'semantic perception' of it, to borrow a phrase from F. Rastier, is only possible by virtue of my knowledge of the English language. To extend this idea we might ask ourselves hypothetically whether an individual who has never before perceived the color red would really be capable of having any sense of the meaning of the lexeme 'red'. What is certain is that the word 'red' could very well contain two very different semantic representations, depending on whether the subject was blind from birth or sighted (again, to the extent that the sighted subject knows the language in which the color term is expressed). We can conclude that the percept of the color red must be encoded in the sensory semantic memory in order for the reader in question to have a 'perceptual' mental representation of the word 'red'. In other words, we believe, along with Kosslyn (1980),

that the perceptual content activated in the reading of the word ‘red’ is conditional upon and isomorphic to the percept of ‘red’ stored in memory by the subject.

It could be argued that cognitive events are in some way ‘represented’ in the image by means of perceptual signifiers *in praesentia*, whereas in verbal language cognitive events are always represented *in absentia*. In other words, in order to signify the ‘color red’ the language of visual art uses a form of presentation that constitutes a *direct* chromatic percept; in order for verbal language to represent the same percept, it has to be mediated by a conventional code (i.e., natural language). If verbal language represents cognitive events, it is in the syntactic organization of phrasic elements that one can find aspectualized forms (focalization, point of view, creation of perspectives, etc.) that present, somewhat as in the mental image, a structure that is isomorphic to perceptive-cognitive experience. With respect to its *mise-en-scène* of perceptual experiences, the immense advantage of art, and especially of non-figurative art, lies in its independence from the constraints imposed by codified linguistic mediation. Color is present, it solicits the percept directly and activates a meaning effect directly linked to the percept without the necessity of recourse to an arbitrary code. We should not forget, once again, that it is the dichotomy of the double-coding ‘verbal/iconic’ that is in question here, and we are of course taking a definite position when we affirm that perceptual experience is more direct and richer in the case of symbolic plastic discourses than in literary discourses, precisely because of the direct character of the plastic signifier. The only exception to this rule in verbal language would be a type of ‘lettriste’ poetry (like Iliazd’s work, or Italian futurist or Russian constructivist poems) in which the form of expression of the verbal language is non-linear and consequently more spatial—and one could say ‘plastic’—because of the typographical and chromatic variations, but also, and predominantly, because of the consistent transgression of the linear convention of reading from left to right. In this type of poetry, the unusual ‘implantation’ of signs into the pictorial space of the page endows the linguistic characters with spatial perceptual qualities that do not belong *a priori* to the functional system of language. In other words, it is on the level of *plastic expression* that verbal language possesses no perceptual potential, despite the fact that we apprehend linguistic signs visually. Verbal language can represent perception semantically only by appealing to the *content* level of words; thus perception verbs like ‘see’, ‘look’, ‘ogle’, ‘taste’, and ‘feel’ possess modal values that permit them to signify different perceptual states and events. Perceptual experience can also be modulated and conveyed by the syntactic

arrangement of verbal utterances: one need only consider the oft cited *incipit* of Proust's novel, 'Longtemps, je me suis couché de bonne heure', where the retentive point of view is altogether different from what it would have been had the author written 'Je me suis longtemps couché de bonne heure'.

The foregoing distinction between verbal and plastic language has highlighted the distinct spatiality of plastic language, a language that presents on a single surface myriad components for the foveal eye to select and scrutinize in whatever order it fancies. But while plastic symbolic discourses provide the spectator with incredible freedom to isolate and fix on certain aspects or zones of the object, the overall effect these qualities have on us, and the interpretation we make of these aesthetic universes, will always be intimately linked to the double sensory/affective process these formidable conglomerates of perceptual stimuli trigger. Semiotics can now read these spaces no longer from an iconological perspective, but on the basis of their polysensorial substance. To this end, the contribution of the cognitive sciences is important; but on the other hand, the singular and sensible aspectualization of these objects may well succeed in constituting a model that will contribute to a better understanding of the universe of discourses in general.

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## **Visual Perceptual Organization**

**Richard D. Walk**

This chapter will discuss visual perceptual organization under four main subheads:

- (1) some general principles of perceptual organization, starting with the gestaltists;
- (2) neurophysiological findings related to perceptual organization;
- (3) biological principles of adaptive coloration; and
- (4) research on instinct, visual patterns, and affordances that relate to perceptual organization.

### **General Psychological Principles**

This discussion, which could be extensive (Beck 1982 is a good overview), will be limited to a note on gestalt psychology, a discussion of Anne Treisman's research on features that 'pop out', a few words on James Gibson's theory of perception, and a few remarks on pattern and art.

The gestalt psychologists, writing in the early 1900s, formulated a number of principles of perceptual organization and are now considered 'classical'. These principles are: (a) nearness or proximity—things close together are seen as belonging together; (b) sameness or similarity—similar things are seen as being together; (c) good continuation, meaning that interrupted lines are seen as being part of a larger whole; (d) closure, meaning that incomplete figures have a tendency to be seen as a complete and good figure; and (e) symmetry, a tendency to see figures as symmetrical to the utmost extent possible. Along with these principles of general perceptual organization are those of figure and ground, the tendency to see enclosed figures as the 'figure', with the texture belonging to it, and as being closer to the observer. Rock and Palmer (1990) have recently reviewed the legacy of gestalt psychology.

The notion of visual properties that 'pop out' is an exploration of distinctiveness. As a beginning, one should note an expansion of gestalt properties of grouping by Beck (1966), who dealt with textural segmentation. Subjects judge a

T to be more similar to a tilted T than to an L, but a field of L's is harder to differentiate from a field of T's than is a field of T's from a field of tilted T's. The texture of the tilted T's differentiates itself easily from the upright T's, but the upright L's are easily confused with the upright T's. The overall difference is one of texture.

Treisman (1986; Treisman and Gormican 1988) has investigated a number of other properties of visual texture that 'pop out' easily. Easily discriminable features are dark grey compared to light grey, the quantity of two rather than one of something, properties that are curved among straight lines, tilted lines among straight lines; forms like circles with gaps and colors are also easy to distinguish. One notes certain asymmetries. Curved lines are easy to spot among straight lines but not straight lines among curved lines; a circle with a gap is easier to find in a field of circles than is a closed circle in a field of circles with gaps. A negative is difficult, meaning that a search for something that is not there is harder than a search for something that is—as Neisser noted long ago (1963), it is harder to search a line of print to find that it has no 'a's than to search the line for the presence of 'a's.

The experiments of Treisman on visual search are particularly relevant to the study of adaptive coloration and visual display, which will be considered shortly.

James Gibson's theory of perception (Gibson 1950, 1966, 1979) focuses on the movement of an observer in a textured, patterned world. The key terms are texture and motion. The motion of the observer gradually uncovers the features of the environment, an environment that varies in coarseness or definition as a function of its distance from the actor. Coarse textures are close to the observer and fine textures are distant. An abrupt change in the texture of the environment might specify a cliff or drop-off place, while an expanding, coarsening texture might represent an object thrown at the observer or a sudden approach to an immovable surface, such as a wall.

Gibson's concept of 'affordance' refers to the possibilities of the environment—a road affords walking or driving, a lake affords swimming, a wall affords no passage, an apple affords eating, etc. The concept of 'affordance' will be taken up again in a review of its research potential, research by Eleanor Gibson and her colleagues, to be discussed later.

Gombrich's book on decorative art, *A Sense of Order* (1979), is an elegant demonstration of ordered perceptual principles in art over human history. Illustrated are Persian carpets, Medieval tapestries, Chinese dragon robes, mid-nine-

teenth-century wallpaper designs, a cathedral rose-window from the thirteenth century, pilasters on walls from the Renaissance, the geometrical designs of snow crystals, never the same, and complex designs of primitive art.

### On Neurophysiology

Findings in neurophysiology during the last 30 years have altered our view of how the nervous system processes visual stimulation. Lettvin et al. (1959) discovered cells in the optic tectum of the frog that responded to complex types of visual stimulation, ranging from sharp edges, moving or stationary, to the onset or offset of illumination, and, most interestingly, to small moving objects, known as 'bug detectors'. Hubel and Wiesel (1962) discovered cells in the visual cortex of the cat that responded to lines in particular orientations, and they found that many cells responded better to movement in one direction than to movement in the opposite direction. Cortical cells are often 'end stopped', meaning that cells respond best to lines of a particular length, and some cells will not respond if a line in a particular orientation is too long. Some cells in the visual cortex of the monkey respond well to color, though not for the cat, which is color-blind.

Zeki (1974) found cells in the visual cortex of the monkey that respond to movement toward or away from the eyes of the animal, cells one might call 'zoom cells'.

Visual texture may also be important in driving visual cortical cells. Hammond and MacKay (1977) have shown that textured visual stimuli drove visual cortical cells they classified as 'complex type hypercomplex cells' and not simpler visual cortical cells, though Hubel has written that 'how our brain handles textures is still not clear' (Hubel 1988: 87).

More recent research by Hubel and Livingstone (Livingstone 1988; Livingstone and Hubel 1988) divides the visual system into two parts: the parvo system and the magno system. The parvo system is sensitive to colors and to fine details, while the magno system is sensitive to movement and to stereoscopic depth.

The research by neurophysiologists has changed the way we view perceptual organization as we begin to understand the way many species encode the textures and colors of the world. Even insects have orientation detectors. O'Carroll (1993) has shown that dragonflies have two types of visually receptive cells, which respond to small moving targets and to bars respectively, 'essentially identical to

those published for hypercomplex I (S) cells in the cat striate cortex' (O'Carroll 1993: 542).

Two commentaries on visual processing have appeared in *Science* as I write this: one on insect vision (Flam 1993) and one that is more general (Eichenbaum 1993). The lesson seems to be that the brain encodes the complex visual world we know, and we should look forward to the continued collaboration of many scientific fields.

### **Adaptive Coloration**

Ecological principles overlap with principles of perceptual organization, both for the concealment of forms and to show their distinctiveness. This account is derived from Cott, *Adaptive Coloration in Animals*, a book published in 1940 during World War II. Cott himself worked for Great Britain in camouflage during the war, and is responsible for our present patterned field uniforms, which use a principle he terms 'disruptive coloration' after hundreds of years of more distinctive military uniforms in the field.

Biological principles apply to both concealment and distinctiveness. The principles animals have adopted for concealment are those of color resemblance, obliterative shading, and disruptive coloration. With color resemblance, the color of the animal matches the color of the environment, which is why polar bears are white, deer and rabbits are brown, and frogs are green. Obliterative shading means that the sun strikes the top of the animal first and spreads shadows below. Most fish are dark brown or dark grey on top and shade off to light grey or white on the belly because the shadow of the sun darkens the lower part of the animal, making it, overall, of similar color and harder for an enemy to localize. On the other hand, the Nile Cat fish swims upside down and has a light back and a dark belly—as does the Eyed-Hawk-moth which feeds on plants upside down and has a dark belly that shades off to a light back-side (Cott 1940: 43-44). Disruptive coloration is illustrated with the patterning of the copperhead snake, very distinctive on a plain surface but hard to see in a broken field or in the woods. It is also illustrated in the eggs of ground-laying birds, which are speckled, while the eggs of birds that nest in trees have a less conspicuous plain color, as in robin's-egg blue. Disruptive coloration is a recognition of the importance of texture in the environment. In different ways, principles of concealment apply the gestalt principle of good

continuation. To make the above most effective, the animal must remain still—lack of motion enhances concealment.

Perceptual principles also guide animals that are conspicuous and meant to be seen. The black and white stripes of the skunk make it unforgettable, especially if the skunk couples its appearance with its nauseating odor. Conspicuous colors are red, yellow, white, orange, and pink, often set off with black. A conspicuous form is that of eye spots. These are common on butterflies, and in addition to being memorable, they serve to direct attention away from vulnerable parts of the body. A species of fish has 'eye spots' near the tail, far away from the vulnerable head.

Poisonous species may have unforgettable patterns and colors. The Gila Monster, a lizard, is pink and black, and another poisonous lizard, *Heloderma horridum*, is a conspicuous black and yellow. The Fire Salamander of Europe is a vivid black with unforgettable yellow patches on the back and legs. These are 'warning colors' that keep predators away.

In another vein, the conspicuous male duck may serve to direct attention away from the duller-colored, but biologically more important, female.

Visual motion is an important protective attribute. Attack is represented by forward motion, and this may be accompanied by an increase in size or apparent size, as in the erection of the hair of dogs, baboons, civets, and mongoose, or the bodily bloating of the giant toad or the appropriately named puffer fish. The game bird that acts as if wounded is engaged in an act to draw a predator away from her nest of young. Some insects, though stingless, engage in movements where they seem to prepare to sting.

Animals can use optical illusions. Some insects seem to have the shape of a dangerous wasp. Their sturdy trunk is white with a black, wasp-like pattern on the interior, making them seem to be wearing corsets. Cott cites the use of illusionary stripes by some fish and squids. They wear horizontal stripes when swimming and vertical bars when they are immobile, resting against a broken background.

If one were to sum up the biological principles of perception represented by animal coloration, one would note that the gestalt principle of 'good continuation' is used by species to blend in with the environment, and is thus particularly suited for species that are preyed upon. But for species that want to be noticed or to surprise an enemy (as in the use of eye spots), the notion of 'pop out' seems to be more appropriate.

## Perceptual Principles and the Study of Instinct, Research on Visual Patterns, and Research on Affordances

### *Ethology and Perception*

Research by Niko Tinbergen and his co-workers (Tinbergen 1958, 1972) has revealed perceptual aspects of behavior in wasps, bees, and gulls. The digger wasp, *Philanthus triangulum*, stings bees and brings them back to its underground nest where they serve as food for its larva. The wasp orients itself to its nest visually and digs from its memory of its nest. Pine cones, solid and irregular, are good landmarks. When offered the choice of two false nests, one ringed by a circle of flat black rings, the other with a circle of pine cones, the wasps chose the pine cones. But flat black rings with 64 one-centimeter yellow and black checks were chosen over a flat black ring. And small checked patterns were chosen over larger checked patterns. Three-dimensional black rings were chosen over flat, patterned rings, large objects over small ones, and objects that contrast with the background over objects that match it. Thus, solidity, patterning, size, and contrast are important factors for the digger wasp to use as landmarks by which to find its nest.

Flowers often have a center that contrasts in color with the flower petals around it. One of Tinbergen's co-workers, Manning, investigated the use of both the contrasting color of the center and the lines that radiate toward it. Manning constructed paper flower models; some had lines radiating toward the center, termed 'honey guides', and some others had a dot in the center. Both attracted the bees. Thus, both radiating lines and a contrasting center dot are perceptual guides for bees searching for the nectar of a flower.

Some species of gulls prefer wooden eggs that are grossly larger than their own eggs—wooden eggs up to twice the size of their own. Size (bigger is better) as a favored perceptual attribute means that cuckoo eggs, never raised by the true parents, and larger than the eggs of the host, survive at the expense of the host's offspring.

### *On Visual Patterns*

The experiments on visual patterns are divided into two types. The first type concerns preferences for types of patterns: patterns the subject chooses either by

going to them or by looking at them. Differential visual depth is not a factor. The second type varies patterns on a 'visual cliff' to investigate the perception of visual depth.

As part of our first studies with the visual cliff (Gibson and Walk 1960; Walk and Gibson 1961), some patterns were placed under a layer of glass. The subject was placed on a center board, with a visual surface directly under the glass on either side of the center board. With a grey homogeneous surface on one side and a textured pattern on the other, laboratory rats descend to the textured pattern side. The rats also descend to larger checks (about 3/4") rather than to finer checks (1/4")—a preference we ascribed to an association of largeness with closeness, since rats reared in the dark had no such preference. On the other hand, baby chicks chose the 1/4" over the 3/4" checks.

Subsequent experiments have examined preferences for various texture densities in rats, chicks, and, through looking behavior, in human infants. Schiffman (1968) found that 7-day-old chicks chose to descend to the finer of two textures until the textured pattern was of very small checks (smaller than 1/8"), and then they descended to the coarser, an overall preference over both smaller (1/16" and 1/92") and larger (1/4") checks. A follow-up study (Schiffman 1969), using a nontextured gray and other textured checked patterns, also found a preference for the 1/8" checks over other patterns and surfaces.

Karmel (1966, 1969a, 1969b) tested hooded rats, chicks, and human infants to investigate regular compared to random complexity in patterns that varied in their amount of contour. A checkerboard of 1" checks, black and white, is regular and predictable, but a checked pattern of 1/2" checks is more 'complex' than is one of 1" checks. A black and white checkerboard of 1" checks has less contour than a pattern of 1" checks where the black and white checks are put together randomly, but the randomly paired checks are judged as more 'complex' by human observers because the randomly arranged pattern is less predictable. Karmel had a number of such patterns (see Figure 1) and tested to which pattern the rats or chicks descended and which pattern human infants looked at more.

'Complexity' as defined by lack of predictability did not define descent choices for animals or looking preferences for infants. Rather, choices were based on amount of contour, though chicks preferred more contour and smaller element sizes than rats, and human infants shifted their preferences toward greater amounts of contour as they matured and visual acuity improved.

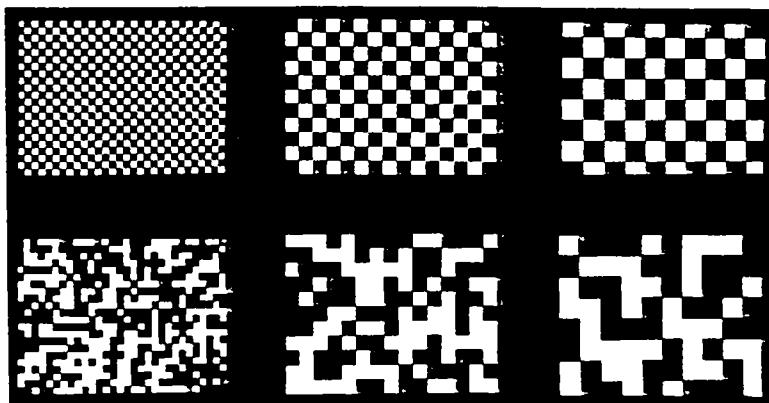


Figure 1. Examples of stimulus patterns used by Karmel. The upper row contains redundant patterns of different element size. The lower row has patterns of the same element size arranged randomly. (From Karmel 1969a)

Nevertheless, these results fit in well with the studies of Tinbergen in showing the importance of optimal contour stimulation.

These studies showed the importance of texture in a simple choice situation. The textures were either directly under the glass below the animal and presented a choice of where to descend, or, for human infants, a choice of pattern for visual looking.

The importance of texture and texture arrangement is also demonstrated in studies with the visual cliff. Here, a visual surface is directly under the glass on one side of the center board and some distance below it on the other, the 'deep side'. Both animals and human infants go to the 'shallow' side and avoid the 'deep' side (Walk and Gibson 1961).

One can increase the size of the elements on the deep side so that the textures project approximately equal sizes to the eye of the subject. Both animals and human infants still go to the side with the texture right under the glass, the shallow side, meaning that the choice is based on motion parallax. But if the surface below the glass is grey, then the subject cannot localize the surface in space, and about half of the infants will be coaxed to the mother (Walk 1966). Because the depth of the grey surface is difficult to localize, the number of infants coaxed to the mother is about the same regardless of the distance of the grey below the glass. A definite checked pattern attracts infants to cross the deep side to the mother as a

function of visual depth, meaning that the closer the pattern is to the glass the more infants are coaxed over the glass to the mother.

But pattern and texture relationships in this situation have not been fully explored. Doris DeHardt (1969) placed 3" checks directly under the glass and the same checks 10" below it. The rats descended from the center board predominantly to the deep side, the one with the texture some distance below the glass—a preference, she maintained, for texture over motion parallax. We repeated the experiment with both rats and chicks (Walk and Walters 1974) and essentially confirmed her results with both species.

We secured similar results with human infants. Small, 1/8" checks are 'preferred' by human infants in the sense that they will crawl to them rather than to a nonpatterned grey when both are directly under the glass and the infant, called from a center board that gets progressively narrower, must leave the center board to one side or the other to get to the mother. But, if a pattern of 2" checks is placed 10" below the glass, with the 1/8" checks remaining on the shallow side, many infants will go to the deep side in the bisection condition, and almost all are later coaxed over the glass of the deep side to the mother. Thus, the 1/8" checks seem adequate compared to the grey, but they are inadequate compared to large checks at a visual depth the infants usually avoid (Walk et al. 1978). Thus, the 'DeHardt effect' applies to human infants as well as to rats and chicks. Some checked patterns can overcome the effects of motion parallax.

Similar problems attend the use of stripes rather than checks. A checkerboard pattern is full of stimuli that are 'end stopping', stimuli that change direction. Stripes are continuous boundaries, and infants are coaxed over them whether they are parallel or perpendicular to the center board (Walk et al. 1979). The stripes were both directly under the glass on the shallow side, and some distance below the glass on the deep side.

The visual cliff results show that contour adequacy differs between species and is a function of developmental age. Some projected textures at a distance are more 'appealing' than are closer projected textures. Continuous contours, as in stripes, are not as adequate as contours that change direction. Regan (1972) showed that contours with corners have larger evoked electrical potentials than stripes. Hubel (1988) found that cortical cells in the cat will respond to short lines but not to longer, continuous lines that do not change direction. The gestalt principle of 'good continuation' protects some species from predation, as ethological studies show, and it may reveal inadequate stimulation for visual depth.

*Perception and Affordances*

Much research related to James Gibson's concept of affordances has been reviewed by Eleanor Gibson (Gibson 1988). Neonates look at moving objects, and they retract their head from an approaching object but not from one that will miss them (Ball and Tronick 1971; Bower et al. 1971). An approaching aperture, though, which opens up rather than occludes the environment, is not avoided (Carroll and Gibson 1981). While the visual cliff presents the infant with a solid tactual surface that appears visually to be a drop-off, surfaces of the environment that appear to be stable may be uncertain. A classic example is quicksand. Gibson et al. (1987) presented crawling and walking infants with a plywood surface or a waterbed, both covered by the same fabric. Walking infants clearly differentiated the two surfaces, hesitating more and sometimes crawling on the waterbed but walking on the plywood. Crawling infants, on the other hand, treated the two surfaces very similarly except for longer visual exploration of the waterbed.

Infants who are at the crawling and early walking stage are at a very dangerous stage of human development, as every parent knows. They offer Eleanor Gibson and her associates fine opportunities for research. Adolph et al. (1993) studied crawling infants (8-1/2 months old) and early walking 'toddlers' of 14 months in the presence of various inclines. The inclines varied from 10° to 40°-45° would be a rise of 3 vertical feet in 6 linear feet, steeper than most roofs. The crawlers were the most dangerous, and had a tendency to plunge down the steeper slopes, while the toddlers hesitated and explored more for the steeper slopes. The authors conclude: 'infants must learn about affordances for locomotion over sloping surfaces' (Adolph et al. 1993: 1173).

Studies where the environment surrounds the individual show that it may influence locomotion, and, again, maturity is a developmental factor.

Lee and Aronson (1974) built a small room that surrounded newly walking infants. When the room itself moved the infants staggered and fell, though adults were not so adversely affected (Lishman and Lee 1973).

A dramatic example of the way affordances may control the action of an individual in the environment is given by Koffka in his classic work on gestalt psychology (Koffka 1935). A German legend concerns the horseman who arrives at an inn on a winter's day and is told, when he tells the innkeeper from where he has come, that he has just ridden across a frozen Lake Constance. On learning this, the horseman has a heart attack and dies. The affordance of the plain over which he

had ridden permitted locomotion, but in his mind the lake did not. The notion of affordance blends appearance with reality, and it will clearly inspire more research.

### *Closing Remarks on the Selected Research Examples*

The research examples show the importance, and sometimes the ambiguities, of visual perceptual stimulation. The ethological studies show the importance of perceptual contours for the guidance of killer wasps and honeybees and the deceptiveness of visual size for gulls, well characterized in another context by the folk phrase 'the eyes are bigger than the stomach'. The visual cliff and pattern preference studies show that contoured visual stimulation guides preference behavior for both animals and human infants, and some contours may override visual depth in some situations, showing possible dangers from the perceptual environment. The studies of perceptual affordances likewise demonstrate the ambiguities of the visual environment, ambiguities that must be understood by the infant as it matures.

### **Conclusion**

The contours and textures of the environment guide the behavior of animals and human infants. The gestalt psychologists' perceptual principles are stronger on the continuities of the environment than on its discontinuities, stronger on 'ground' than on 'figure'. The principle of good continuation is a gestalt principle that is well adapted to describing the principles of adaptive coloration and pattern in the environment, but gestalt principles are less well adapted to describing the principles of distinctiveness. Here Treisman's principle of perceptual properties that 'pop out' seems particularly appropriate.

Neurophysiologists have shown us that the visual system responds to the ecological properties of the environment, lines, colors, and textures. Optimal textures are the basis of stereoscopic visual depth, as Julesz (1971) has shown.

The research on textures is highlighted in studies of art over the ages, a fascination with finely textured forms, often in depth, as documented by Ernst Gombrich. Fine textures attract insects to their nests and proper contours orient bees to flowers. Human infants and animals orient to optimal contours, and both animals and human infants may disregard visual depth to approach optimal contoured visual

stimulation. Recent studies of perceptual affordances by Eleanor Gibson and her colleagues show the ways young children respond to perceptual ambiguities of the environment.

One has the impression, in reviewing research conducted in recent years, that researchers are finally paying attention to the visual environment that guides behavior.

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## **The Subjective Processing of Visual Structures**



## **The Two Sources of Cognition**

Rudolf Arnheim

There have been many impressive opportunities to observe differences in the responses to world events of persons who derive their information mostly from television and those who rely mostly on the political reports of good newspapers. These differences are due to a multiplicity of causes, one of the most important of which is the difference between visual images and spoken or written language. Television, although by no means lacking in speech, is dominated by vision. When, for example, the audience listens to a speaker or the performance of a pianist, the image of the performer on the screen is experienced as dominant. He or she appears as the generator, of whom the speech or the music is merely the product. This switches the emphasis from what a person has to offer to the person him- or herself. It has greatly contributed, for example, to the personality cult that has had such a pervasive and detrimental effect on our political and cultural life.

The cognitive difference between things seen and things read or heard is evident when one listens to how people respond to catastrophic events such as wars, acts of terrorism, or earthquakes. The television audience is impressed by the symptoms of the disturbances, the violence of the attackers, the suffering of the victims. By contrast, those who listen or read are led to the causes of the events, to judgments on who is to be credited or blamed and what should be done to remedy the damage. Obviously, the latter response is intellectually superior and more conducive to the sensible conduct of human affairs. But any neglect of what the direct evidence of our senses tells us about the impact on human experience may lead us to overlook the practical consequences of the political and social forces at work.

In what follows, I will not deal with the broad social ramifications of the problem; rather, I will limit myself to some aspects of what can be learned from a comparison between acts of cognition derived mostly from perception and those controlled mostly by the intellect. I must begin, however, with an apology. I have written as though nobody else has worked in this well-trodden field of research, because I am writing for readers who know this field much better than I ever will. My only excuse is that my work in the psychology of art and visual thinking may

make for an approach unfamiliar to the specialists in the field. I shall proceed on the following assumptions:

- (1) All comprehension of reality derives from two sources: namely, the totality of sensory experience and the media of representation. Both sources rely on conceptual structures.
- (2) All media rely on perceptual as well as intellectual concepts. Visual media are more perceptual, verbal media are more intellectual.



Plate 1. Michelangelo Amerighi Caravaggio, *Judith and Holofernes*. Galleria Nazionale d'Arte Antica, Rome.

As an introduction, the following example will compare a narrative painting with the story it represents. When visitors to the Palazzo Barberini in Rome come across Caravaggio's painting of *Judith and Holofernes* (Plate 1), they are struck first by the gruesome scene—the decapitated man and the contrast between the

composed determination of the heroine and the horror on the face of the maid. They may notice details of shape and color to flesh out the presence of the event. The story is condensed in time and space. A single highlight has been selected from the temporal sequence of action. The dreadful episode is frozen and made permanent. As such, it will monopolize the memory of visitors. Spatially, the setting is limited to the narrow tent of Holofernes, where the relevant elements of the story are assembled. The maid, who in the traditional story is made to wait outside, is brought in as a witness, clutching the bag in which she will collect the head of the dead man.

If a visitor happens to consult the Book of Judith in the *Apocrypha*, he or she will find that in that version the moment of the assassination is also the climax, but is embedded in a chronicle that extends in time and space. The visual concreteness of the happening is replaced by an enumeration of the actions performed. The reader learns of a political struggle between the king of Assyria, who insists on being not only the ruler of the whole world but also its only god, and the people of Persia and the Near East resisting him. In the text of the story, Holofernes, the king's general, displays a complex state of mind, by no means limited to the brutality of the enemy. He is outwitted by Judith, who saves not only her hometown, Bethulia, but the highest sanctuary of the Israelites in Jerusalem. The story acquires its emotional drama in the imagination of readers, who develop lively mental images based on what they have been told.

The comparison between the painting and the chronicle illustrates the difference between an essentially visual and an essentially verbal medium. What needs to be stressed here in a more generally theoretical way is that all cognition of reality derives from perceptual experience, which provides our only access to reality. Perception, however, is not simply the mechanical absorption of received material. Perception, as distinguished from mere staring at the world, always involves the imposition of a network of concepts derived from the sensory raw material. Concepts are congealed generalities, whose nature depends on the medium that happens to generate them.

Every act of cognition requires such a network of concepts, regardless of whether it applies to a purely perceptual object such as a painting or to a verbal text. To decipher the painting, the viewer must first derive and impose a network of organized shapes and colors, without which the picture would not be comprehensible. This formal image is seen as the representation of the subject matter, which must be understood as an organized network of relations. How does the

stark parallelism of Judith's arms relate to the crooked arms of Holofernes, how the upright head of the heroine to the falling head of the victim? How does the stance of the maid echo that of her mistress? How does the abstract symphony of fabrics comment on the behavior of the humans—the descending cloud of the tent's curtain, the squeezed bag and blanket, the free swing of Judith's gown?

Readers of the chronicle, on the other hand, must first decipher the verbal text by resorting to the network of syntactic structure and by grasping the relations between the various agents of the story. How does the ruler of Assyria relate to the more local assault on the Israelites? How does the private life of Judith relate to the political events in her country? Furthermore, because verbal language is a referential medium, the words of the text must be made to evoke mental images of the story; and these images call for the same kind of conceptual structuring as does the viewing of a painting.

Broadly speaking, every act of cognition is located somewhere on a scale between two points of departure: namely, the exuberant complexity of perceived reality, which supplies substance, and the intellectual structure of a medium, which supplies form. Both are indispensably involved in every case. The mental development of cognition, phylogenetic as well as ontogenetic, begins with a need for practical orientation. It endeavors to single out and identify isolable facts and happenings. One needs to tell humans from animals, trees from water. In consequence, early cognition conceptualizes a few significant items and builds the world from them. As an example, I mention the cosmology of the pre-socratic philosophers, who derived physical reality from the elements, such as air, water, earth, or fire. Something similar is true of early pictorial representations. Plate 2 offers a particularly beautiful example of such an early stage of cognitive development.

It is as elementary as early thinking, and equally remote from naturalistic detail. It is a sample of folk art created by the Warli tribe of India. Such work is highly abstract, in the sense of staying close to the abstractness of perceptual concepts. All shapes of the painting cling to basic geometry. The house is composed of right-angled units, parallel relations, and overall symmetry. A similar simplicity describes the tree, whose structure is revealed as the hierarchy of trunk, branches, and leaves. The figures of a man and a woman threshing rice or grain have only minimal distinctions to indicate their sex or costume, and the three dimensions of space are reduced to two, so that the bundles of straw lying on the floor look as though they are floating in the air.



Plate 2. Folk art of the Warli tribe, India. Courtesy Walter Spink.

Such early abstractions, however, by no means diminish the immediacy of life-like action. On the contrary, the powerful expression tends to be weakened by the complexity of naturalistic representation. The violent action in Caravaggio's

*Judith* painting is brought to the fore essentially by what it preserves of the basic perceptual features of dynamic shapes. The further a description is removed from the structure of basic concepts, the later and more rarely it will occur in pictorial or verbal description.

It follows also that the simpler levels of representation are not inferior in quality. All levels rely on the virtues of both sources of cognition. At every level of complexity, works of representational and aesthetic excellence can be created. Together they make up the whole, precious range of human vision and thought.

It is at the extremes of the scale that problems exist. The most radical conceptual world-views hardly do justice to reality. A universe built on nothing but fire or water leaves out too much, whatever the majesty of its idea. Atomic physics reveals the very foundation of the material universe, but it does not pretend to enclose in its world-view the immediacy of human experience. And nonobjective visual art or mere ornament risks losing its relevance to what we can see and touch. At the other end of the scale, the intricacy of, say, a detailed argumentation or a narrative account may lose its structure of guiding forces, and thereby interfere with its intelligibility, similar to what happens with 'photorealistic' paintings.

What is the particular place of language in this system of cognitive media? A language is a stabilized set of signs that serve as referential concepts by being assigned to known facts of reality. Nonverbal examples of such sets are sign languages, musical systems, or the multicolored sets of chips used to test the intellectual abilities of primates and other animals. Verbal languages share with these nonverbal sets the quality of being almost purely referential. They receive their meaning from convention. Although these meanings are derived from perceptual experience, they are products of their medium and partake in the preferences of media in general and the idiosyncrasies of their own medium in particular.

All media work with segregated entities and refer only indirectly to the structure of the perceptual raw material, which presents a more or less coherent tissue. Within the precinct of the media, verbal language is the most comprehensive instrument of cognition. It embraces the sensory world in space and time as well as mental images, motivational forces, emotion, and rarified intellectual abstractions; but even the references of language to the world of experience remain indirect.

As far as the differences between verbal and nonverbal language are concerned, I will cite only the obvious example that many verbal languages treat things and actions as separate entities, whereas the directly perceptual media—especially

those which present movement, such as pantomime or film—display them as aspects of an indivisible experience. This creates obvious problems for the translation of perceptual experience into words or vice versa. An even more fundamental difficulty arises from the fact that verbal statements are sequential because they describe temporal happenings or logical trains of thought, whereas spatial simultaneity, such as the structure of a painting or a panoramic situation such as the state of world affairs at a given time, yields only reluctantly to a translation into sequence.

I have tried to show that all cognitive exploration, whether it takes place primarily in the intellectual realm, as in science or philosophy, or in the perceptual realm, as in the arts, must rely on organized structures of concepts, which are derived from the congealing of sensory raw material. Both means, the resources of experiences and the instruments of concepts, are needed—whether by scientists or artists, or indeed any person curious about the world in which we live.

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## **Enunciation**

Gianfranco Bettetini and Chiara Giaccardi

### **Origin and Scope of the Concept**

The term ‘enunciation’ was introduced in 1959 by the linguist Emile Benveniste, in an article called ‘Les relations de temps dans le verbe français’.<sup>1</sup> Benveniste drew the crucial distinction between history and discourse as two different levels of enunciation, characterized by the use of different linguistic shifters (personal and demonstrative pronouns, adverbs, verbal tenses) in relation to the spatial and temporal dimensions defined by the speaking subject. ‘History’ is a form of presentation where the events seem to speak for themselves, rather than to be presented from the point of view of a narrator (in other words, enunciation is dissimulated); in ‘discourse’, on the contrary, the enunciation is made explicit by textual elements referring to the communicative situation, to the subjects involved in interaction, or to the discourse itself (deictics, reflexive elements).

In more general terms, Benveniste defined enunciation as a linguistic phenomenon—namely, the realization of the paradigmatic system (*la langue*) in a syntagmatic object (*la parole*). In respect to this general definition history and discourse are two subcases. Enunciation is then a structure of mediation, a form of appropriation of the virtualities of the linguistic system by a situated subject who produces a discourse, the traduction (in Chomskian terms) of the linguistic competence in performance, the passage from a virtual instance (code) to a real instance (utterance).

In Benveniste’s perspective, the role of the linguistic system is paramount in defining the possibilities for the individual subject: in fact, it is only by assuming the place of subjectivity indicated by language, by saying *je*, that one is able to call him/herself a subject.

The question of enunciation as appropriation, as passage from virtuality to reality, as well as the two levels of enunciation within the enunciated are then strictly connected, in the linguistic perspective, to the issue of subjectivity: the subject is a ‘coder’, inasmuch as he/she uses language to say something, but is at the same

time ‘coded’ because, in order to say something, he/she must assume the role assigned to him/her by the linguistic system.

### *Linguistic Imperialism*

From a structuralistic perspective, based on the modeling power of language and on its superiority to other systems because of its ‘double articulation’, Benveniste suggested a further distinction, which had a great influence on the analysis of visual texts: the distinction between semiotic and semantic systems of signification. The former (like language) are based on a system of signs, and can be used metasemiotically, as interpretant systems; the latter (like painting) only exist as ‘singular’ discourses, and have to be ‘translated’ into a system of the first type in order to be analyzed. There is no such thing as a language (system) of painting; there can only be the language of an individual picture: each work is a system *per se*. From a structuralistic point of view, natural language is the primary modeling system for all other language systems (and for culture itself).

Like Benveniste, Ducrot stresses the linguistic nature of enunciation; they both define the subject of enunciation as the one indicated by the linguistic elements of the text (which is not necessarily the same as the actual speaker). The distinction between real subject and textual (semiotic) subject is universally shared, but the same is not true for the strictly linguistic perspective: for instance, in the speech act theory of Austin and Searle, and in the subsequent attempts to apply it to the analysis of nonlinguistic texts (for instance, media texts, as in Bettetini 1985), the subject of enunciation not only ‘says’, but ‘does’ something, and is qualified by linguistic as well as nonlinguistic elements.

For those who accept the superiority of the linguistic system, a number of questions arise, among which is the attempt to find, in nonlinguistic systems, the minimal ‘units’ (like phonemes). A more general attitude within this perspective is the attempt to explain any other system in relation to the linguistic system, by outlining similarities and differences.

For those who question linguistic imperialism, as well as Barthes’ subordination of semiotics to linguistics (Barthes 1964a), each system has to be considered according to the specific traits of its objects (texts and intertextual relations).

### *Enunciation as a Translinguistic Phenomenon*

Since Benveniste, in fact, the term 'enunciation' has been used to characterize the realization of the virtualities of whatever system, considered according to its specific characteristics, and the focus has been shifted from the nature of the system to the production of texts, and to the presence of discourse within texts (in the reflexive aspects and/or in the institution of textual subjects).

At present enunciation is considered as a translinguistic rather than merely a linguistic phenomenon: in fact, the concept of enunciation has been assumed by semiotics, and extended beyond the linguistic scope, as semiotics is the study of signs, whatever form the signifiers might take (sounds, images, clothes, buildings, and so on).

Inasmuch as it is a translinguistic phenomenon, enunciation has been considered according to the specific features of the various languages, as the realization of a specific set of possibilities, rather than being evaluated against the linguistic form of enunciation. According to Calabrese (1985b), for instance, enunciation cannot simply be translated from natural language to painting, as painting has its own theory of enunciation which on the one hand is independent (and even earlier: the theory of perspective is a theory of enunciation, even if it is not named explicitly), and on the other hand can provide an original contribution to the understanding of linguistic enunciation itself.

### *Enunciation and the Pragmatic Turn*

Moreover, the study of enunciation has determined a new direction in semiotics: from sign to text, from signification (and related questions of semantics) to communication (and pragmatic issues). In particular, the emphasis on the constitution of subjects within the text as a whole, and the exchanges of knowledge and power between them, have been crucial in establishing new directions both in pragmatic theory and empirical research. This aspect will be considered in more detail in the sections below on the different visual languages.

In the 1970s the issue of enunciation was dealt with by critical theory: in mass communication studies, for instance, the construction of 'hegemonic' relationships within the texts was especially emphasized, as was the link between reading and social (subordinated) positions. The idea in cultural studies of a 'preferred mean-

ing' that closely fits the dominant ideology has been very influential; yet recent studies in actual viewing practices have to some degree brought into question the textual/social determinism of this position.<sup>2</sup>

In the mid-1980s, as a result of the cultural and philosophical trend emerging in Europe (especially France, Italy, and Germany) and labelled 'postmodernism', there were attempts to weaken the idea of 'subject' as well as those of reality, truth, origin, and any universal, strong, metaphysical concept in the name of more local, weak, and contingent processes.<sup>3</sup> The notion of enunciation (especially the related emphasis on subjectivity) has been partially eclipsed by postmodern theories that emphasized aspects like code, autoreferentiality of language, free-floating play of signifiers (especially in literary criticism and media studies), etc., but it has never disappeared completely, and has been revealed to be more solid than cultural fashions: in fact, it is still on the agenda of semiotic studies, even if now they tend to give preeminence to the 'other side' of subjectivity (the side of reception and interpretation rather than production) and to the interaction between the texts and their audience.

### *Enunciation and Enunciations*

Two major questions face the semiotic analysis of enunciation in visual languages:<sup>4</sup> is enunciation a linguistic phenomenon which has to be transferred to visual languages, or is it rather a translinguistic (semiotic) issue which has to be approached by any visual language according to its specific traits? The two positions, although mutually exclusive in their formulation, tend to be merged in the majority of actual analyses of visual texts: on the one side, in fact, authors tend to formulate an operative definition of enunciation for the analysis of visual texts which considers some 'general' aspects, but is actually modeled on the linguistic definition; on the other side the authors who explicitly reject 'linguistic imperialism' in the name of the specificity of visual languages often define the specific characteristics of enunciation upon the refusal of linguistic heritage (especially the 'I-you' distinction based on deictics), then assess specificities against the model of the linguistic system (which is a disguised form of linguistic imperialism). The linguistic origins of the term cannot be ignored, and ought not to be opposed, but rather to be considered as *one* formulation that can be influenced by the analysis of the visual text, as well as influencing it: between the attempt to find visual

unities corresponding to phonemes and the refusal of any reference to the linguistic system, there is a wide range of possible attitudes, which arise from interdisciplinary studies (as opposed to disciplinary segregation).

Bettetini, for instance, formulates a definition of enunciation that draws on the linguistic background, but looks forward to the media texts:

Enunciation can be broadly intended as the phase of actualization of discursive potentialities of an enounced, brought about by a ‘speaking’ subject, under specific circumstances of time, space and relationship with the receivers.... It is possible to say that any enounced bears the marks, the tracks of possible actualizations, and it is upon those tracks that the study of enunciation can be based. (Bettetini 1979: 5)<sup>5</sup>

The different theories of enunciation can be grouped according to the emphasis they put on the two crucial aspects of enunciation (or, better, on the two ways of approaching the phenomenon): enunciation as an *act* and enunciation as a *fact*. As an act, enunciation presupposes an intentional agent (the subject), a purpose for the act (communicative project, illocutionary aspects), and a situation in which the act takes place (space, time, subjects involved), together with a set of semiotic possibilities to be actualized. Theories of enunciation focused in this direction consider enunciation as a logical precondition of the enunciation, and tend to cross the boundaries of the text both by looking backward, to the intentionality of enunciator, to the project that brings the text to life, and forward, to the receivers and their impact on the project coded in the text (Bettetini 1984; Casetti 1986): the pragmatic aspect of interaction between non-simultaneously present subjects through the text is here paramount.

Enunciation can also be considered in its effect (the enunciation), as a fact rather than an act (what Greimas calls *énonciation énoncée*). The textual dimension is paramount here, and the focus can be on subjectivity (and its dislocation within the text in order of reception, as in the narratological approach) and/or on the way the text speaks about itself (rather than the way subjects speak within the text and to the viewer): enunciation is, in the last case, the reflexive presence of discourse, rather than the result of the act of a subject (as in the semiotics of cinema of Brani-gan 1984 and Metz 1991).

It is according to these criteria for mapping the different theories of enunciation that the specificity of individual visual languages can be approached; given the

impossibility of dealing with the topic of enunciation exhaustively and within all the main sectors of visual language, we will focus on the act/fact, subjectivity/reflexivity dimensions of enunciation in the fields of painting, cinema, TV, and computer graphics—leaving aside, for the sake of brevity, forms such as sculpture, architecture, and photography, although these are important.

### **Enunciation in Painting**

As Calabrese (1985b) emphasized, there are many semiotics of painting, the choice among them depending on the main perspective adopted in the analysis: psychological (Arnheim), psychoanalytical (Lyotard), logical (Goodman, Petitot), linguistic and narratological (Marin), to mention only a few of them. We will not try to give an account of all the different perspectives; rather, we will focus on those aspects that shed some light on the phenomenon of enunciation.

The following sections are then structured around the three main questions sketched above: the specificity of the form of expression; enunciation in the enunciated (enunciation as a fact); and enunciation as an instance of communicative interaction (enunciation as an act).

#### *Painting as a Language*

To summarize a long-standing debate which can only be mentioned here briefly, there are two main questions to consider: (1) is the possibility of a semiotic approach to painting dependent on a sort of ‘equivalence’ between painting and the linguistic system? and (2) if not, is it possible to speak about enunciation (a concept which originated in linguistics) in painting, and to define the phenomenon according to the specific characteristics of this form of expression?

According to Benveniste, as we have seen, painting is not a language, but a semantic system, which is confined to each individual work and depends on the way in which the artist uses the range of techniques, styles, and genres to express himself (again, a strong emphasis on subjectivity). Only those communicative sectors presenting the two main characteristics of the linguistic system (namely, a given set of conventional elements and a corpus of rules for connecting those elements) can be called languages. The issue of whether painting is or is not a

language (as in the linguistic system) has been on the agenda of critics and semioticians for a long time. After a first attempt in the 1960s to find visual equivalents for linguistic morphemes and phonemes,<sup>6</sup> and the attempts to formulate a general theory of the visual from which to deduce the analysis of singular examples, a different trend has developed, toward the consideration of the productive character of painting, on the construction of signification through the text. Moreover, much attention has been paid to codes that are not confined to the individual work, but belong to a series of texts, and allow for a more general theory of painting (the notion of intertextuality being crucial for semiotics).

There are authors who stress the autonomy of painting from linguistics more forcefully (like Garroni 1977), and others who tend to find similarities in the difference, like Marin (1975, 1978). Marin (1978) has suggested, unlike Benveniste, that ‘semantic systems’ like painting can also be autorepresentative and auto-referential, inasmuch as they expose the rules of their constitution: in this respect, pictorial works are self-interpretant systems, and can offer a privileged point of view for the analysis of the mechanisms at work in other paintings.

Painting, then, is neither a language, a system, nor a mere collection of individual works: every individual work can tell something about another, at least within the range of specific genres and ‘families’ (Marin [1975], for instance, formulated some considerations on the genre of historical painting starting from a single work). Intertextuality is, then, a crucial issue in the analysis of pictorial texts (Calabrese 1980, 1985a; Marin 1975), which can allow the possibility of a (semiotic) theory of pictorial art, through the identification of ‘noticeable places’ of pictorial production (among which enunciation figures prominently).

As for the second question mentioned above, the specificity of painting as a form of expression lies in the bidimensional and static nature of the signifier: this is at the same time a constraint and an opportunity that has stimulated the constitution of models of representation to overcome it and to create the illusion of the third dimension—e.g., the system of perspective.

Greimas uses the term ‘planar semiotics’ (Greimas and Courtés 1979) to indicate the field of visual semiotic which has a bidimensional signifier, in a wider sense than ‘semiotics of image’ can allow (inasmuch as ‘planar’ refers to the surface of signifiers, rather than to a presumed similarity to reality, as in theories of iconicity): a semiotic of this kind includes paintings, photographs, posters, and even handwriting, as it is based on the nature of the support, rather than on the content represented (see also Greimas 1991: 33–51). The term ‘plastic’ also indicates the

'artificial', constructed character of visual semiotics, as opposed to the semiotics of natural worlds.

While there is general agreement on the nature of the signifier, the debate is still open on the question of iconicity (similarity to the real world) and referentiality: Marin (1975), for instance, maintains the 'ontological argument' of historical painting and the impact of referential temporality on the spatial organization of the painting.

### *Figurative and Abstract Painting*

Both figurative and non-figurative (abstract) painting bear the marks of enunciation. On the one hand, in fact, there is the abstract dimension of figurative: 'Figurative is also (and especially), the domain of abstract, conventional, arbitrary organization of lines, colours, surfaces that have the task of simulating reality' (Calabrese 1985a: 3).

Figurative is not (as only a naive spectator could maintain) a kind of representation that simply tries to resemble reality closely.<sup>7</sup> There are rules that are not dependent on the content represented, but belong to the pictorial discourse itself: this is the autoreferential, metalinguistic side of enunciation (a text not only says something, but speaks of its own speech). Figurative painting, then, is not the site where the discursive character of painting is absent, the site of pure 'history' without discourse; rather, it is the site where enunciation is dissimulated behind the effect of iconicity.

In non-figurative painting, on the other hand, the theory becomes explicit to the detriment of verisimilitude; discourse prevails, although it is possible to establish, at least in some cases, a kind of link to natural forms (as in Floch's analysis of Kandinsky), and to speak about a 'poetics' of abstract painting. According to Floch, for instance, Kandinsky uses signs that are in a sense in between images and concepts, and constructs a kind of 'deep figurativity' according to a semi-symbolic system: enunciation then becomes a sort of *bricolage*, a mythical discourse based on a figurative semiotics (Floch 1991: 155). In general terms, in non-figurative painting enunciation is grasped especially at the level of syntactical relations among the elements of the surface.

History and discourse are then always mixed, even if one of the two forms should almost disappear.

We will now consider in more detail the two aspects of enunciation mentioned above: enunciation within the text (*énonciation énoncée*) and enunciation as the act that, giving existence to a text, constitutes a kind of communicative project, an addresser and an addressee, an exchange between subjects through the text.

### *Diegetized Enunciation: Space, Time, and Subjects*

An intrinsic feature of painting is that signification (even the signification of time) is essentially based on the organization of space. The act of enunciation institutes, as a preliminary step, the text as such, the boundaries of the semiotic object, the portion of space in which signification takes place, the frame within which, through the operation of *débrayage*, spatial, temporal, and actantial relations can take place. Enunciation as a fact, then, is the externalization, the objectification in the enunciated of an instance that is, at any rate, *hors cadre*.

Enunciation in painting is first of all organization of space (or, as generative semiotics puts it, 'spatialization'). Thürleemann (1981) distinguishes between two main dimensions of space in figurative painting: namely, surface and deep spatiality. Each figure occupies two positions simultaneously—one in the simulated space and the other in the 'planar topology' of the painting. The former is the space corresponding to the view in the natural world, constructed according to the rule of perspective (as we shall see below); the latter concerns the network of relations between the elements of the painting, bearing no relation to their figurative character (distribution of elements on the surface according to categories such as high-low, horizontal-vertical, central-peripheral, and so on).

Calabrese adds two further aspects of spatiality, and suggests a grid of four items: (1) the space behind the frame (the space simulated by perspective, the frame as a 'window on the world'); (2) the space in front of the frame (the over-hanging space, the illusion of prominence, the *trompe l'oeil*); (3) the surface of the painting, with its geometrical and topological relations; and (4) the thickness of the painting, depending on the material used by the artist (Calabrese 1991: 162). Different schools tend to highlight only certain of these aspects at a time: abstract painting, for instance, tends to emphasize spaces 3 and 4 (though there may be 'traces' of 1 and 2), while figurative emphasizes spaces 1 and 2 (even if enunciation can make irruption into the enunciated through space 4, the brush work). Space 2 will be considered in the next subsection, as it has to do with the interpel-

lation of the viewer, the irruption into his/her space, the institution of a 'you'. We will focus here on spaces 1 and 3: in the former the illusion of depth is given by the rule of perspective, a rule that has little to do with the content represented and is instead a mark of enunciation, inasmuch as it involves both metalinguistic and subjective aspects; the latter has to do in part with pictorial conventions (the intertextual repertoire that enunciation actualizes in a particular work), in part with a mechanism of signification the individual work establishes. *Perspective*, in Panofsky's classical definition, is the technical procedure that enables us to overcome the spatial constraints of the two-dimensional support and to obtain the illusion of the third dimension. There are two aspects of perspective that are particularly significant in relation to enunciation: the 'artificial' nature of perspective and its 'epistemological' relevance. As for the former, perspective is universally considered as an abstract model for a verisimilar representation of reality, rather than the result of a faithful reproduction of reality: it is a pattern of textual organization that has to do with the discursive character of pictorial language (reflexive aspect of enunciation) rather than with an expressive or communicative intentionality. But perspective is not only a metalinguistic mechanism that produces the illusion of referentiality; it is also an 'epistemic' model, the construction of a privileged point of perception which becomes a point of cognition. Inasmuch as it presupposes a unique (and unifying) gaze, perspective involves the issue of subjectivity: the subject who sees is an abstract 'he' (or 'she'), whose location is given by the specular projection of the vanishing point of the lines in the painting. According to Marin (1975), who applies a linguistic model, perspective is the formal structure of enunciation, the iconic transposition of the third person, the visual equivalent of the deictic 'he' that characterizes the narrative mode of enunciation (the presence of enunciation is signalled by the concealment of its tracks in the enunciated). Perspective shows, then, two crucial patterns of enunciation: reflexivity and institution/dissimulation of a point of view (subjectivity).

On the one hand, the organization of space in painting allows the signification of temporal relations; on the other, it is the condition of the presence of subjects, and their cognitive roles. Enunciation is at the same time objectified in the enunciated and absent from it, or, better, its presence is both presupposed and signalled by the enunciated and by particular mechanisms within it. Greimas defines *débrayage* as the procedure of externalization of enunciation in the enunciated, which is also a dissemination, a distribution of the enunciative force in a series of

textual aspects: the objectification produces the space(s) of the text, as well as the cognitive status of the subjects.

As far as time is concerned, painting only allows the representation of a simultaneous present, where figures and actions coexist; the effect of temporality, as Marin (1975) suggests, is given by the logical organization of the surface of painting as a whole (which creates relations of subordination, presupposition, and entailment) and by the rules of human perception (namely, linearity from left to right). In historical painting, according to Marin, history is converted into *exemplum*, in a framework of intelligibility through the atemporal organization of space. Two further dimensions of temporality are at stake here: referential temporality (which guides the organization of places and positions in the painting) and the temporality of reading, which ‘narrativizes’ the atemporal (logical) structure of painting—a time that is not confined to the immanence of the text, as is not the case in the Greimasian model.

### *Enunciation as an Act*

Enunciation in painting is revealed by the irruption of codes, rules, and conventions in the enunciated, by the emphasis the enunciated puts on the rules of its constitution. This is the impersonal, metalinguistic side of enunciation as actualization of a repertoire of rules and manifestation of the discursive nature of the enunciated.

Moreover, a painting reveals the act of its constitution by saying ‘I’ and ‘you’—by coding, as Calabrese suggests, the gazes of subjects in the picture toward the *hors-cadre*, toward ‘space 2’:

The gaze toward the specular projection of the vanishing point means gaze toward the spectator, who is presupposed to occupy the same spatial site as the author of the painting. This means that at the same time a ‘you’ is posed. Which in turn means that somebody says ‘I’, namely the subject represented in the painting. The gaze that follows the vanishing point laterally is, on the other side, a gaze caught by somebody, a stolen gaze. Then there is a character who says ‘he’ in the painting, although absent as a figure. This is the main difference between history and discourse. (Calabrese 1985a: 34)

Enunciation is not only 'actorialization', construction of subjects of the enunciated through a mechanism of *débrayage*, but also construction of space and gazes that come out of the painting and make an irruption into the viewer's space, while constructing a common arena for a (symbolic) interaction. Semantic (space 1) and syntactic (space 3) relations make possible a pragmatic space of reception, besides providing a modalization of the observer.<sup>8</sup>

Even if painting is not a *langue* in the sense linguistics intends, some general considerations on enunciation in painting are possible, starting from single works or from genres of painting. The linguistic distinction between history and discourse, as the analysis of historical painting by Marin testifies, can provide an insight into the phenomenon of enunciation in painting, provided it is not simply transferred, but considered within the peculiar features of painting. Enunciation can be disguised, as in historical painting, or manifested metalinguistically within the painting; it can be recovered through the syntactic links among the elements in non-figurative painting, or it can be explicitly expressed by a discourse posing an I-you relation.

### **Enunciation in Cinema and Television**

In painting the bidimensional signifier is also static, achronic (inasmuch as time has to be constructed through space); in audiovisual language, however, the signifier is intrinsically temporal. Time, even more than movement, is the distinctive feature of audiovisual languages (Bettetini 1979), as the illusion of movement is given by the succession of frames (or pixels in TV) over time. Even the construction of space requires the temporal dimension, the sequence in time (editing) of the different shots. As Aumont puts it, cinema is 'ontologically' of the order of narrative, as time enters in its constitution as the succession of points of view. In painting the point of view is that of the singular image, but in cinema the point of view depends not on the single shot, but on the ordered series of shots; moreover, whereas in painting the point of view can be undecided, and contradictory points of view can coexist (as in historical painting, as Marin [1975] has shown), in the cinema there is no image without a point of view—the camera has to be placed somewhere.

Both point of view and space are then constructed through time (Aumont 1983: 10).<sup>9</sup> According to Aumont, the basic question of the cinema is that of point of

view, and to this a whole set of other issues are related. It is a point of view which is both representative (inasmuch as it constitutes and shapes the reality shown) and narrative (inasmuch as it is related to someone who is looking, who knows, who tells the story), and tends to become 'predicative'—that is, to add to the first two a kind of mental attitude, a judgment of the narrator on the narrated events (Aumont 1983: 11): to show means also to make intelligible, to give to understand. It is in the relationship between the representative, narrative, and predicative points of view that the presence of enunciation can be envisaged.

### *The Audiovisual Language(s): From Codes to Enunciation*

In the late 1960s and early '70s semiotics of both cinema and television were concerned with the issue of the linguistic specificity of audiovisual languages (Bettetini 1968; Garroni 1972; Metz 1971). According to Metz (1971), the specificity of cinematic language lies in the codes and their structure within the text (pluricodicality); the specificity of TV language was instead considered the practice of live broadcasting (as opposed to editing in the cinema) (Bettetini 1968). Both aspects suddenly come under question: while the structure of codes reduces to a static grid the dynamic character of the cinema, by excluding temporality we run the risk of disregarding the discursive, constructed character of live broadcasting, which selects a portion of reality and puts it 'on stage', with ideological effects (Bettetini 1985).<sup>10</sup>

The focus of semioticians has then shifted from the nature of the language *per se* to the different languages within each medium, according to the different genres—a trend analogous to that of the semiotics of painting. Moreover, the emphasis on the structure, the (static) organization of elements within the text has been abandoned in favor of a consideration of the text as 'process' (dynamic aspect) and as 'event' (situated aspect).

The perception of the importance of the temporal dimension on the one side and of the constructive nature of any TV discourse on the other opened the way to the issue of enunciation. The specific character of audiovisual texts, in fact, is that they produce signification through related aspects of temporality: (1) the time of representation (time of discourse); (2) the time represented (time as content); and (3) the time of reception (Bettetini 1979, 1991). In audiovisual texts, times 1 and 3 overlap, as the French term for duration (that is, *durée*) powerfully suggests: in

fact, the temporal length of the enunciated becomes a constrictive grid for reception, and the development of the discourse in time involves the construction of a compelling itinerary for the viewer (in still images, on the contrary, the reading process has no temporal constraints). This involves a pragmatic issue: that is, enunciation as a construction of discourse in time and as parallel construction of an itinerary of reception, of an implicit receiver, the 'enunciatee'.<sup>11</sup>

Besides being an object (or, better, a process) that develops in time, the audiovisual text is also an object that becomes part of a specific situation, within the flow of the events of everyday life in specific contexts (which is the main concern of the ethnographic approach to media texts). As this latter aspect involves an analysis of the actual contexts of reception and cannot be derived from a mere textual analysis (even if a link between marks of enunciation and aspects of the context can be established, as in Casetti 1986), it is mentioned here only briefly.

Metz (1991) summarizes four main aspects of (or ways of considering) enunciation in audiovisual languages: (1) enunciation as production (based on generative structures like the semio-narrative constructs in Greimas); (2) enunciation as actualization (conversion of a repertoire of virtual possibilities into a real instance); (3) enunciation as conversation between two symbolic subjects, corresponding to the linguistic deictics 'I-you'; and (4) enunciation as reflexivity, as semiotic act (but better called a fact, as we shall see) through which certain parts of a text call our attention to the text itself, which is the 'impersonal' definition of enunciation given by Metz (1991: 20). These four aspects are not mutually exclusive, as some authors (including even Metz himself) have tended to suggest.

### *Enunciation as a Fact: Textual Reflexivity*

Enunciation cannot be grasped as such, as it does not exist apart from the enunciated (although it logically precedes it); as a condition of the presence of text and of its constitution as text and as *this* singular text in a precise situation (Casetti 1993: 263), enunciation forges the text, gives a shape to it, and in so doing leaves marks of its presence (even if there are no parts or elements of the text that do not bear the effects of enunciation: enunciation is coextensive to the text). A study of enunciation has to start from the fact of enunciation—that is, the text and its organization. The analysis of the point of view (Aumont 1983) and of the role of the 'narrator' as instance of enunciation (Branigan 1984; Jost 1983), and the forms of

irruption of enunciation into the enunciated (Simon 1979) are all mechanisms that reveal enunciation in the text.

Both the textual subjects that ‘incarnate’ enunciation and the figures of reflexivity (mirrors, windows, *mise en abîme*) are ‘facts’ of enunciation: when the text declares (or suggests) its discursive and textual nature, enunciation is at stake. Authors who put particular emphasis on enunciation as a fact tend to focus on the text and on the mechanisms of actualization of filmic language within it; at the same time they tend to refuse any reference to the linguistic system, especially to the subjectivity implied/constructed by the use of deictics. For this reason, for instance, Branigan speaks about an ‘impersonal narrator’, a point of view which is ‘a symbolic process, not a site for consciousness ... is part of the generative capacity of a text and is one aspect of a reader’s general competence’ (Branigan 1984: 21). Points of view ‘are epistemological boundaries inscribed within the text’ (1984: 178). To call the narrator a character, then, ‘is only a shorthand for naming a textual process; or, more exactly, for naming the reader who calculates the underlying structure of a particular text (=meaning) by applying abstract rules’ (1984: 178).

According to Metz, ‘filmic enunciation is always an enunciation on the film. Metadiscursive rather than deictic, it does not inform us on some *hors-texte*, but on a text which contains in itself its focus and its goal’ (1991: 30).

Filmic enunciation is strictly textual: as in Branigan (1984), it is the construction as a whole that assumes an enunciative ‘value, and it is not necessary to involve the presence of subjects. Speaking of enunciator/enunciatee is, according to Metz, forcing an analogy with verbal language. Metz, on the other hand, criticizes the multiplication of subjects, and maintains that there are no subjects, but only textual orientations; that there are no bodies (or roles to be invested by bodies) on the side of enunciation—‘*L’enunciateur c’est le film*’ (1991: 26)—there are only two (real) elements: the text and the viewer. Metz defines enunciation as a ‘semiotic act through which some parts of a text speak of that text as an act’ (1991: 20), an act in which the text folds upon itself (enunciation is a ‘layered structure’—1991: 184), and in so doing reveals its textual nature. But in spite of the criticism of anthropomorphic metaphors, like those involved by the use of deictics, Metz speaks of an ‘act’ of the text (terms that require an ‘actor’). The emphasis on the reflexive dimension of textuality is better expressed by the term ‘fact’, as Metz himself acknowledged (‘What could enunciation be, if not the fact of enunciating?’—1991: 178). On the other hand, Metz is well aware of the

linguistic origin of the term, and opportunely stresses that to use a linguistic concept is not necessarily the same as to apply it: the linguistic concept of enunciation can be enriched, can be made more comprehensive through its use in other ambits (1991: 182-83). This is a good reason to avoid an overly rigid opposition between deixis and metalanguage: the two terms are not mutually exclusive, as Metz presents them, even if one of the two can be brought to the fore with more emphasis. Let us now consider the other side of the question.

### *Enunciation as an Act: Subjects and Purposes of the Action*

According to Metz, enunciation is a monologue, dissociated from interaction (1991: 200): the textual instances do not involve any extratextual 'plus' (1991: 199), but correspond to a function in the enunciated. This is what Bettetini means when he defines enunciation as 'the indicative emergence of the enunciated' (1985: 87), a definition which does not exclude another way of seeing enunciation: the proposal of an interaction, the construction of a communicative situation (1985: 87). Many authors insist on the pragmatic dimension of enunciation as an act that institutes a text, and in so doing calls for a receiver and prefigures the way of reception in its own constitution: in other words, audiovisual texts say 'I' and 'you'. Simon (1979), Bettetini (1984, 1985, 1991), and Casetti (1986) insist on the construction of a communicative situation by the audiovisual text. Bettetini defines 'textual conversation' as the relationship of

symbolic interactivity immanent in any text, even closed and monodirectional texts like the media's, between two symbolic subjects ... the enunciator—the source and origin of textual discourse, who is the producer of the text and produced by it—and the enunciatee—the projected image of the behaviour of the empirical receiver, an image which is produced by the enunciator and by the text. (1991: 123)

To define enunciation as an act means to be able to identify other elements, as well as the symbolic subjects: action is purposive, is aimed at a goal and tries to find the most useful means to reach it. Inasmuch as it is action, the audiovisual text contains a plan for the receiver's behavior (represented symbolically by the enunciatee) and is structured according to a strategy consistent with it. This way of

intending audiovisual texts allows us on the one hand to consider them as ‘speech acts’, and to analyze their locutive, illocutive, and perlocutive dimensions; on the other hand, it provides a framework for understanding the mechanisms within the text that are aimed at reinforcing textual credibility (i.e., veridiction), as well as the ‘pragmatic unveiling’ (Bettetini 1985: 122), the aspects of linguistic reflexivity or the elements that explicitly signal the project inscribed in the text by the enunciator. Enunciation is not only the ‘result’ of the bending of the text upon itself (an impersonal instance does not act), but is the reason why in the text there are precise elements that call for the viewer’s attention and are offered as pieces of the jigsaw of interpretation. Inasmuch as it is a purposive, intentional act that invests and modalizes the whole enunciated, enunciation in audiovisual texts can also be submitted to ethical evaluation, according to the role the text prefigures for the enunciatee: the enunciatee can be led toward false evidence, or even cheated; or, on the contrary, the enunciatee can be placed in a situation of ‘balanced’ interaction (Bettetini 1985). When the viewer is given all the elements needed to understand the communicative project, the option of refusing the role of the enunciatee as prefigured by the text becomes feasible.

### **Enunciation in Computer Graphics**

Computer graphics is a field in which some of the considerations on the factual and actual aspects of enunciation can be substantiated. In fact, the new technologies make possible as an interface a real interaction on the basis of text.

On the one hand, the ‘factual’ aspects of enunciation seem to prevail, as there is an ‘activity’ of the codes, and a capacity of auto-generation: in fact, unpredictable iconic forms can appear on the display which do not depend on any project, but only on algorithms, on mathematical structures. An activity without a subject, an impersonal activity seems at stake here, but the presence of the subject (the programmer) cannot be removed completely. There is a subject who acts; but in contrast with what happens in the cinema and on TV, what the viewer sees is not totally prefigured by someone’s gaze. The question of point of view is tantalizing in computer graphics: the image is here a ‘nobody’s shot’ (in Nick Browne’s expression, applied to a different field); there is neither a real world to refer to, nor an eye with which to identify. The organization of the image no longer depends on somebody who saw, but on the mathematical language itself upon which the

process of visualization is based. Nevertheless, there is still a principle of organization, which is no longer internal to the image, but is rather an external presence which imposes the rules, a sort of ‘metagaze’. The enunciator, then, is not completely coded in the structure of the text, but is a mix of structured and potential strategies that have to be actualized. Yet the main specificity lies in the role of the enunciatee—a role which is not merely symbolic, as it involves the possibility to enter and modify the communicative project, to be at the same time receiver and co-transmitter (Bettetini 1991: 125). The presence of a communicative project (as prefiguration of the different itineraries of reception) is not a sufficient condition for the realization (even if implicit) of the project itself: the ‘action’ of the enunciatee becomes a necessary condition of the productive process that gives rise to the text, a text that only exists as the result of the interaction, and that carries the traces of the action of both subjects. Enunciation as interaction between subjects becomes the conditions of textuality itself.

## Notes

1. Now in Benveniste 1966: 237-250.
2. Stuart Hall himself has partly revised his own position: his recent theory of articulation (Hall 1986) maintains a balance between the text as a producer of meaning and the text as a cultural resource open to a range of productive uses.
3. Postmodernism is a label for many different phenomena, including various disciplines (from architecture to literature to history and philosophy), and pursues different strategies. A common trait, related to the focus of our attention, is the weakening of the notion of subject as a willing agent, and the parallel growth of the power of codes (as matrices capable of reproducing and creating reality with no need of human creativity or natural models). Rules, conventions, artificial models become the real sources of objects and meanings (which Baudrillard calls '*la précession des simulacres*'). Trends in literary criticism (like deconstructionism) and in the analysis of the fine arts and media programs are deeply affected by this cultural climate.
4. We use ‘visual’ rather than ‘iconic’: the former is in fact more comprehensive, while the latter is confined to the visual forms that bear some resemblance to natural objects. The study of enunciation in abstract painting, for

instance, is part of the semiotics of visual language, but is not pertinent to the semiotic of iconic languages.

5. When original editions in languages other than English are indicated in the references, the translation into English is ours.
6. For more detailed information on this point see Calabrese 1980: 7-12 and 1985: 111-120; and Corrain and Valenti 1991: 8-12.
7. Fontanille 1989, for instance, stresses that pictorial mimesis is not primarily grounded on the resemblance between signs and the real world (resemblance, he says, is at most established *ex post*): in the Flemish school, for instance, there is an abstract chromatic principle that rules the representation: brown tones in the foreground, green in the middle and blue in the background. A semiotic space is thus created where brown means close and blue means far, which is not so in the real world (Fontanille 1989: 83-84).
8. A very interesting analysis of the way in which the painting constructs the reception of the external observer can be found in the study of Mantegna's *Compianto* by Thurlemann (1989). In non-figurative painting the modalization of the observer is achieved through syntactic relations ('space 3').
9. Aumont (1983: 5) acknowledges that all theories of painting from the fifteenth century onward are theories of constitution and regulation of the point of view.
10. For instance, a strong critique of the presumed neutrality of TV live broadcasting stems from the British trend in cultural studies.
11. For the English version of French and Italian semiotic terms we have referred to Greimas and Courtés 1979.

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## **Perspective, Point of View, and Symbolism**

Marie Carani

Part of this paper originated from a desire to assess the place of visual semiotics as a multidisciplinary methodology relevant to the problematic of pictorial signification. This avenue of research was explored and judged in relation to the emergence of a 'new art history' devoted on the one hand to the exploration of ways of conceptualizing the various dimensions of pictorial organization, and on the other to the systematic study of these mechanisms of plastic language and meaning. I have also discussed Renaissance perspective and other perspective systems as ways of seeing, perceiving, and structuring the picture.

### **Toward a New Model of Art**

A great many contemporary scholars in the field of semiotics have long taken it for granted that the problem of the pictorial sign has been basically how to define and codify resemblance. The value of the picture lay in its Aristotelian verisimilitude with the natural world, in its fidelity and objectivity. That is why most studies of the pictorial image by visual semioticians have not gone much beyond thematic meanings alone that refer to the strongest intellectual tradition of modern art history—that is, iconographical studies of the figural image. As a descriptive and classificatory method based on the systematic grouping of particular themes or given motifs through many centuries (Panofsky 1939), these iconographical studies have dealt exclusively with representational (i.e., figurative) art as their conceptual horizon.

This unifying, all-embracing, and most general logic has been applied since the 1950s to both art-historical and semiotic trends, which have similarly sought to investigate and understand the origin, as well as the significance, of the subject matter represented allegorically or symbolically in artistic creation. Strongly anchored in verbal sources, the figural approach has thus intentionally marginalized twentieth-century non-figurative and abstract art, as the very definition of the word 'picture' has coincided with mimetic boundaries and contents (Carani 1992d). In

effect, iconography—which has developed to such an extent since the end of the second world war that it has become a discipline of its own within the larger field of art-historical studies—and the semiotics of iconic signs (either of Peircean or Saussurean orientation) have been strictly limited in the past 30 years to an investigation of the visual image in terms of direct and/or indirect figural meanings.

This arguably has also indicated from the start an overwhelming predominance of general linguistics within the method of visual semiotics. As a recurring process that falls back on verbal statements and on the conditions of their utterance, this discursive bias has resulted in part in correlating a number of key semiotic concepts (connotation, denotation, signifier/signified, form/substance, iconicity, etc.) with the analogous concepts of secondary languages such as structural linguistics (Greimas and Courtés 1979; Hjelmslev 1963), Chomskian linguistics, or sociolinguistics (Halliday 1978). This is most apparent in French semiotics (Barthes 1964; Groupe μ 1979, 1992; Lyotard 1962; Marin 1971; Schefer 1969) and in the semiotics of the Paris School (Floch 1984; Thürlemann 1982) that refer *hic et nunc* to rhetorical positions. Consequently, the models of visual language inherited from linguistics have turned out to be rather inadequate, insufficient and even irrelevant in their segmenting of the picture into delineated linguistic parts or units, and in their subsequent inattentive categorizing of pictorial dimensions (Sonesson 1989; Carani 1992d). In some cases, however, the linguistic pull has brought with it spatial analogies between human language and forms of representation, between language's internal order and the art-historical notion of artistic style, as contemporary linguists like Langacker (1986) and Lakoff (1986) have supported the notion that spatial relations are the basis of verbal syntax and semantics, and as visual semioticians like Sonesson (1989) and Saint-Martin (1990a) have coopted this challenging view. But these are very recent developments (Manovich 1992) that nonetheless signal an important shift toward spatialization in linguistics and visual semiotics alike.

On the problem of how visual signs produce meaning, one great exception to the logocentric rule was Meyer Schapiro's famous article on field and vehicle as image-signs (Schapiro 1969). His subsequent essay, *Words and Pictures* (1973), further pursued this critical approach that helped us to guard against the assumptions of fixed iconographical and rhetorical meanings. Before that, Umberto Eco's semiotics (1965) had already stressed the importance of non-figurative as well as figurative codes of pictorial representation in visual communication. But Schapiro's theory involved more than formal aestheticizing qualities, as he tried to

escape the traditional and rather unproductive distinctions between design and subject matter, form and content, or figural form and iconic representation that were stated as long ago as 1876 by Konrad Fieldler or by British formalist Clive Bell (1913) at the turn of this century, and that were restated by Eco (1965, 1968) as iconic prerequisites of visual signification. Stretching Eco's model of artistic communication to include contours, pictorial masses, vectorializations, peripheral (*vs* focal) activity, etc., Schapiro explicitly called in each artistic style for culturally-based 'rules of representation' of actions and represented objects, and focused on the role of noniconic devices in the visual field. Unfortunately, though he provided the basis for a new, ground-breaking syntax of visual language, Schapiro still defined a semantic procedure that remained for the most part within the disabling ideological confines of iconic imaging, with its imposed frame of limitations, with its propensity ultimately to seek the meaning of a work of art in meta-representational concerns.

Therefore, by emphasizing over and over the value of the 'essential copy' (Bryson 1983)—that is, the mimetic relationship between a picture and the depicted world—Eco, Schapiro, and their followers on both sides of the Atlantic did not proclaim *grosso modo* dimensions of pictorial language that went beyond the verbal terms. They disregarded among other things the basic fact that visual semiosis is specific and that painting differs in its form and content from other semiotic systems in the natural world and most notably from verbal language. A new analytical procedure thus involves a thoroughgoing semiological critique of Western imagery past and present in painting, from ancient Egyptian art up to contemporary artistic trends, as it has developed along optical and perspectival lines.

Accordingly, for some years now, in the GRESAV<sup>1</sup> and in the GRESAC<sup>2</sup> the semiotics of the Québec school have primarily been dealing with the broader issue of pictorial language as it is central to our experience of space and spatial relations. Keeping in mind that these relations are the privileged means of our conceptual thinking, understanding, and deciphering of reality, semioticians of the Québec School like Saint-Martin (1987, 1990a, 1990b) and Carani (1989, 1991a and b, 1992a) have recognized that the illusion of the dimension of depth (either far-distance or proxemic) has historically been and is still today the most distinctive characteristic of visual language. Thereby, as pictorial organization, they have given prominence to and investigated pictorial signs such as lines, dots, colors, or shapes, as they can be assembled and combined according to colorematic sets of

Gestaltian and perceptual syntactic rules. Also, as a strategy of seeing and perceiving, recognizing the static character of linguistic models, with references to the work of Piaget (1952, 1956), Merleau-Ponty (1945), Ehrenzweig (1953, 1967), or Passeron (1962), they have identified at the same time material properties or variables of the picture field, such as its shape, size, texture, Basic Plane (elaborated by abstract painter Wassily Kandinsky in an effort to produce a 'grammar of vision'), angles of vision, areas of contrasting color, tonalities, energetic infrastructural orientations, topological grammar relations reminiscent of the drawings of young children, etc. All these particular pictorial values are treated independently of the subject-matter of the picture, rather as combined sets of essential visual and plastic topological elements of perspectival structuring, of codified viewing or distancing from the object depicted by the artist and the perceiver alike, as well as of symbolic production of visual signification. This results in understanding figurative and non-figurative painted images as expressions or statements of a purely visual language.

The final theoretical outcome of this research has been a distinct articulation of spatial structures and of representations recreating unique human experiences of space that becomes especially pressing for present-day art historians who systematically apply (or want to apply) semiotic theory to pictorial analysis. With the increasing formalization of (traditional) semiotics, as this area of research as consolidated into a field of its own (i.e., visual semiotics), the Québec School's studies of the topological mechanisms of pictorial signification have disregarded representational, mimetic, or iconic content and stressed the need to break the surface image into its constitutive parts and then to correlate syntactically each and every one of these variables. Such a recognition of spatiality or spatialization underlying visual expression permits the description of a multitude of distinct perspectival spaces and devices known as systems of thinking and behavior, as opposed to a singular, universal one like Renaissance perspective. Moreover, such a relativist, pluri-perspectival approach follows a nonstandard, anti-traditional idea (ideal) of spatial systematization or structuring that was first anticipated in the field of modern art history from the late nineteenth century onward by Riegl (1963), Wölfflin (1950), Panofsky (1961), Francastel (1951), and Schapiro (1953). As all of these art historians were concerned with understanding the depicted images (representational, but also nonrepresentational) as expressions of plastic meaning, they established pictures in one way or another as unique vehicles of human thought. Furthermore, with respect to the graphics involved in representing

figures and/or objects of the world, under the more or less ambiguous rubric ‘perspective(s)’, they directed attention to these kinds of unique image-processings that have allowed organizationally, from antiquity to the present day, for the description of spatial continuities. They singled out for analysis these pre-coded, programmatic, reprogrammatic patterns of spatial change of different pictorial qualities. As restated recently by the semiotics of Saint-Martin and Carani, this kind of structuralist (re)ordering cannot be bypassed when visualists go in search of a semiotic model of perspectival systems in painting.

### A Semiotic Analysis of Perspectival Representations

By critically falling back on some of the descriptive metanotations that emerged in the modern discourses on art, the resultant morphology or basic syntax of a topological semiotic system of pictures is coincident conceptually with a descriptive metalanguage, with a systematic process and practice of decoding signs to make the visible legible that works simultaneously to define the nature and construct syntactically the very morphology of these objects (Carani 1989; Saint-Martin 1990a). In this sense, revealed through central/peripheral Ehrenzweigian scanning of the picture surface, appearing from the start as constant syntagmatic junctions of concrete, observable, and distinctive traits or visual marks, modalities of perspectival representation developed in different cultures and in different epochs are defined as grammatical categories of this visual syntax.

Since each perspective system designates the presence of a specific point of view or point of distance from the object depicted, and carries a particular symbolic meaning through spatio-temporal intuitions and resulting modelizations of space that correspond as fictional discursive representations to an exclusive spatial, sensory, and conceptual framework, these perspectives establish the inescapable presence of dominant and less dominant world-views. Inasmuch as they thus indicate a fundamental level of ordering and grammatical organization, these spatial modes, structures, propositions, and interrelationships (which have been subsumed historically under the notion of artistic systems of perspectives) refer dramatically in the dialectics of picture perception to fixed and precise operating schemas which become, through the intermediary of a code, supersyntagms, supersigns, translating unique or multiple conceptions of our visible reality.

Dubbed falsely by Western critical tradition the only legitimate system of representation, the linear, ‘artificial’ or central perspective of the Renaissance is one such supersign of the visual field. As it has often been taught or seen, rightly or wrongly, by post-Albertian theorists and artists alike as the only perspective that is true to reality (an idea that was documented by John White [1957]), this syntactical megaorganization even today holds the key to understanding the history of Western art and thought. Accordingly, over fifteen years, French art historian Hubert Damisch (1972, 1989) studied how this new perspective of the Renaissance appeared in its time an important, successful, and revolutionary break with medieval spatial renderings. Taking his cue from Panofsky’s representational and symbolic theories (Panofsky 1961), Damisch describes the long time it took for this new world-view to be looked upon by artistic as well as popular sensibilities as the dominant and sole way of representing, even if, during the years immediately following its formulation, other perspectival systems or traces of systems could be found annexed to it.

Before Damisch’s recent theorizations, cultural sociologist Pierre Francastel (1951, 1967) had also conclusively showed that Renaissance central perspective was often modified as early as the fifteenth and sixteenth centuries to take into account the exploration of different points of view, as well as of multiplied distance and horizon points, and above all to absorb Leonardo’s introduction of atmospheric perspectival regulations. Da Vinci is further singled out by Francastel for his recognition of the decisive role played in illusionistic practices by greater (as opposed to lesser) distances from the object depicted in the field of representation. But more importantly, Francastel acknowledged Paul Cézanne’s early recognition of the anti- or counter-perspectival fact that objects in close proximity to the eye do not follow the optical laws of Renaissance perspective. This fact has since been exploited by many twentieth-century modern and modernist artists, and has contradicted the pseudo-rules of ‘scientific perspective’ in depth. In effect, in this century, non-Euclidian geometries have put forward, in a spatial continuum, multiple and correlated notions of points of distance that are infinitely close and points of view that are proxemic, elaborating thereby new visual hypotheses on two-dimensional *vs* three-dimensional characteristics of the pictorial plane. Thus it is safe to proclaim that, well into this century, under High and Late Modernism, pictures have continued aesthetically to develop *ipso facto* within the Renaissance’s epistemological gap according to creative deviations, departures, transmuta-

tions, or total negations from classical, normative perspectival ideologies (or credoies).

In this semiotic system of art, to sum up, for representational and nonrepresentational paintings alike, effects of points of vision, of distances, and of perspectives are paramount as signifiers of specific organic or practical spaces, and hold the key to grammatical networking and its signification. It is through the structuring of the pictorial plane that elementary visual and plastic variables contribute in effect to various forms and contents of visual representations as material data, and acquire at the same time metalinguistic modeling functions within different value-systems. Numerous points of view and points of distances in (relative) depth in the field of vision, spatial strategies, perspectival devices, compositional elements and visual meanings can thus be legitimized through the structuralist general notion of perspective. Therefore, the basic premises of such a discursive machinery include metatheoretically both a syntagmatic means of visualizing the object produced and/or perceived, and a paradigmatic powerful instrumentality for its interpretation. The result is a descriptive and classificatory typology of far distance perspectives, middle or intermediate distance perspectives, and proxemic perspectives as syntactical codes, that opens the door to semantic interpretations and reinterpretations of mediated artistic realities.

In this sense, this grammar or syntax of art is not just a compositional level revealed to us by formal, crypto-formalist analysis permitting us to read the characteristics of a system once its (visual) language has been learned. It is above all, in the realm of their own spatiality or spatialization, the structural re/construction of real and virtual spaces consequent both to predisposed, precoded, simulated, perspectival patterns of human experience and to representational notions of arch and hyper-conventionality that are understated by such a methodological approach.

### **Renaissance and Pre-Renaissance Perspectives as Structures of Vision**

In the semiotic prehistory of perspective, the starting point to which we must always refer is its central episode, in Renaissance Italy. The paintings of the fifteenth and sixteenth centuries by Mantegna, Leonardo, and Uccello, to name but a few, bore witness to the emergence and fulfillment of a spatial and visual paradigm, to a new discursive, sign-manipulative activity, or rhetoric of persu-

sion, that signalled a mutation of symbolic thinking. The depiction of measurable space as faithful representation of the natural became a burning issue. This truth to nature and the painstaking rendering of it aimed at convincing the onlooker of the reality of the object and the event described. The manipulative factor was therefore given primary value. It was also essential that imitative artistic skills that involved the mimetic axiom for depicting reality were bound to narrative ends. History, mythology, and allegory thus provided grand, dignified subjects for Renaissance artists.

Rationalizing the representation of space on the basis of the science of mimesis was in effect a great triumph of the Early Renaissance. For art theorists and painters of the fifteenth century, the picture was a surface in depth; it represented an outside, natural world from a single, centralized point of view, and it was similar in all respects to what it represented. Furthermore, the doctrine *ut pictura poesis* was invoked in order to explain and legitimize images executed precisely according to perspective specifications (Lee 1967). This revival of optics in the West coincided with the affirmation of Euclidian dogma. Also, the aesthetic connection with perspective finally placed the plastic arts within the rank of liberal disciplines. To this end, geometric linear perspective became its principal aid. Before, during medieval times, symbolic fantasy in representing the natural elements, and illogical placings of persons and objects against imaginative backgrounds, had been for the most part the artistic sublimation of a religious attitude. The reversed or inverted perspective of icon painting thus represented the ideal sign-vehicle for such a hieratic attitude, and the common rule in pre-Renaissance paintings for the representation of rectangular foreground objects.

Generally, such primitive attempts at perspective painting had been practical and intuitive—i.e., ‘natural’ (thus the older science called *perspectiva naturalis* or *communis*) rather than scientific. Spatial inconsistencies were a common feature. But as the work of art developed into a scientific study of nature, the Renaissance artist sought to arrange all the depiction logically into one organized comprehensive whole. From then on, by claiming scientific status while at the same time declaring the illusion of its fictional world, the technique of perspectival rendering achieved ontological value to order and give form *via* modes of perception, reception, and interpretation (White 1957). Persuading and directing attention were in this sense the avowed aims of the principles of perspective. A logical and methodological solution had to be found in painting to the problem of creating space in depth, of putting something ‘in perspective’ behind but within the frame

of a unified, self-enclosed space. As this man-made solution and procedure, centralized, single-point perspective or artificial perspective—so named because it was created by man's mind to render the effects of angles and distances, such as making things smaller the further they were from the producer—illustrated from man's point of view a natural world of which he was the center and the measure, and reinforced the 'classical' notion of art as a lifelike copy of reality.

In addition, one of the most important features of artistic production during the Renaissance was the perceiver's new involvement in meta-artistic meaning. Unlike the primitive and medieval pre-Renaissance perspectives, such as the so-called spherical or herringbone perspectives (Carani 1989; Saint-Martin 1990a), as well as the oblique perspective noticed in Giotto by Kristeva (1977), which were primarily concerned with aspects of the syntactic level of painting, and where the painter could often take a stance within the painting itself—as Uspenskij (1976) documented at length in his description of Russian icons—Renaissance one-point perspective touched significantly upon this syntactic level and upon the pragmatic level as well, as the artist stood outside the painting, his position fused with that of the viewer. The key orientation point here for explaining Renaissance artistic theory is the unique correspondence theoretically proclaimed between these two points of vision, that of the artist and that of the viewer. For the first time in Western art, illusionistic Renaissance painting made perspective a new 'subjective' quality, dependent in part on the viewer.

The impossibility of separating the syntactic from the semantic is apparent in this correspondence, and depends on a new linkage between three categorial properties used within our topological system of the work of art: perspective, point of view, and symbolism. This opinion is not new; Uspenskij (1976) found an important parallel between perspective and point of view on the spatial-temporal level of the medieval artwork, and Panofsky (1961) had already stressed in the 1920s the symbolic import and meaning of this interrelationship. It does, however, account for and suppose a new awareness of the role graphic and semantic properties play semiotically as spatial and conceptual hypotheses.

### **The Seminal Viewpoint of Albertian Renaissance Perspective**

A scenographic logic of perspectival realist rendering emerged during the first half of the fifteenth century with the architect Brunelleschi, who formulated the rules of

single-point perspective and can claim credit for the invention of the method, and the artist, writer, and critic Alberti, who, borrowing the lay terms of ancient Greco-Roman optics (intersection, pyramid of vision, *compositio*ne or disposition of perspectival elements, *optike* or horizontal view, etc.), presented and popularized them in his treatise *Della Pictura*, dated from 1435, as a correct way to analyze, structure, order, and receive natural objects within the structure of the work according to the physical laws of appearance. Alberti agreed, in effect, to define painting as being nothing else but perspective. The effect was both rational and consistent.

Spatially, Renaissance perspective put forward a system of order and framing that itself depended upon certain canons of representation (Carani 1989, 1991a). Through a basic checkered plane or scalar grid such as a pavement, a bedcover, or a ceiling, a mathematically calculated system of spatial projection aided painters by graphically organizing objects in relation to each other to produce a notional and singular position from which the scene was intelligible. Just as this arrangement of the scene *via* the point of vision indicated the distance factor of the perceiver (or viewer) from the action described by the artist, the producer indicated his own body's distance from the scene through different compositional techniques such as the central, monocular view of the Early Renaissance that will be my main concern here for its paradigmatic potential, or for that matter the bifocal or distance-point method of the sixteenth century as studied by White (1957) and Klein (1981), the bird's-eye view with a raised horizon that presented the *istoria* more clearly or the worm's-eye view with a low horizon that was proper for representing celestial apparitions (Damisch 1972; Klein 1981). In all these perspectival methods of the Early and High Renaissance, *a fortiori* in the centralized perspective, the distance from the object depicted is affected by the position of the beholder, by his viewpoint. Robert Klein (1981: 106) has argued convincingly that this statement constitutes the key to the relations between *istoria* and Renaissance perspective. Symptomatically, Schapiro (1969, 1973) has also showed that graphics and directionality in a classical painting are a direct function of viewpoint, and are congruent structural relationships between a paradigmatic perceiver and what he perceives.

Certain specific conditions of observation were further prescribed in order that the Renaissance producer might obtain a mirror image of the scene in front of him. The object to be depicted had to be observed from a given angle and distance, and with a single unmoving eye. The picture put in(to) perspective had also to be viewed by this beholder through a peephole at the focal point of the composition, face on, from a certain distance, with one eye closed and the other motionless,

holding a mirror on the far side so that the painting was reflected in it. The center of vision opposite the eye was then called the principal vanishing point, being the apparent meeting point of all the orthogonals, the point at which all the receding parallels ended in the picture. Accordingly, the beholder would be able to see all the constructive elements of the composition as they appeared to the artist.

A complex system of point of view or point of vision was thereby introduced, the perspectival eye of painting as a single centrality in the Albertian 'pyramid of vision'. In this model of representation, the picture was seen as being identical with the cross-section of a given point of the visual pyramid of rays drawn from the object, at its base, and extending to the observer's eye, called the point of sight or point of vision, at its apex. The cluster of rays formed a cone; the intersection of these rays with the picture plane (i.e., the plane of delineation), usually placed between the observer and the object, reproduced the object as seen 'in' perspective. Correct pictorial representation (i.e., simulation) would otherwise not be established; the picture could not be defined as an intersection of projection lines. The light rays of the cone of vision would not match and would not convince the spectator of the reality of the pictorial representation. In this sense, the persuasive Renaissance technique for projecting the picture served as and provided a functional model for the formulation of an aesthetic code of behavior. From the fifteenth century onward, the picture in perspective came to mean the view, 'the gaze', and to direct vision.

Renaissance norms of monocular vision, chiaroscuro, outline, gravity, directionality of light, angle of ocular vision, and position of the producer in relation to the field, as well as convergence of parallel lines in depth, orthogonal lines converging toward the principal vanishing point located on the horizon line, far distance recession from the eye toward infinity, and other means of suggesting three-dimensionality on a two-dimensional medium such as integrity, size and position of objects, foreshortening or the diminution in size of objects at a distance, anatomical precision, etc. emphasized over and over the ideological premise that the painted canvas as spatial configuration presented one atemporal moment of vision by a perceiver standing in a fixed, immobile position—the immobile eye situated at a given point facing the object and orienting its gaze toward a main vanishing point on the horizon line.

Passing back and forth between point of view and vanishing point, subject and object were therefore captured and fixed along the Renaissance's visual pyramid and centric rays. In other words, with Albertian perspective, the positioning of objects

on the picture plane and their relative size became a function of their distance from the imaginary viewer of the scene. Perspective became an artistic method for the visual determination of distances and dimensions. As Panofsky substantially clarified (1961), the *costruzione legittima* described by Alberti thus owed its very existence to the necessary distance between man and the objects in his world, between the eye and the world of things in accordance with the principle of projection. The ‘distance between’ at the same time objectified the object and personalized the viewing subject, since, while Renaissance painting displayed an allegorical scenography, it put the viewer in his proper place as the ideal spectator.

To sum up, as a cultural phenomenon concerned with conveying an impression of spatial extension into depth on a flat surface, the invention of Renaissance perspective reconfigured the whole artistic process profoundly, even the most reticent and tentative allusions to the representation of space, along the lines of a complete, focused system of perspective. Alberti’s particular conception or ‘point’ of perspective (Procaccini 1981) prescribed a clear and transparent technique of mimetic representation that served phenomenologically through a scalar method involving the use of the Cartesian axes to codify the postulates of so-called ‘classical’ perspective. All this could now be taught and learned as practical problems in the depiction of space. As a way of relating the perceiver to the painting, Albertian perspective staked a claim to revolutionize the very issue of artistic creation; it implied the imperative presence of this viewer and projected a scene from a specific viewing standpoint to achieve organization. Accordingly, the *istoria* should move the soul of the beholder, wrote Alberti. In other words, Renaissance perspective signalled a radical transformation of symbolic thinking as it established the viewer as both absent from the painted scene, and also its mastering eye. Its adoption from the Italian early fifteenth century onward was widely accepted as a great stride forward. It initiated a tradition of art production that was grounded in its claims to be scientific; its perspectival laws provided (or rather, seemed to provide) absolute standards.

### **On Competing Models of Representation**

From our semiotic perspective, this system of rectilinear propagation of light rays established as Alberti’s ‘window on the world’—i.e., as the window metaphor or sectioning of a pyramid—was a fully articulate discursive and cognitive model of

art incorporating the gaze, the artist standing outside the painting, his position fused with that of the viewer, that gave a new meaning to the intervals posited in the Euclidian void between pictorial representational figures. They became signs of a continuous three-dimensional space, whereas pre-Renaissance space had been discontinuous and fragmented (Schapiro 1973). From then on, the principles of one-point perspective that defined the convergence point as the perspective of a point at infinity lay the foundations for all succeeding theories of art. Albertian perspective became not only a particular fifteenth-century type of picture, but rather a general and lasting model of metaphysical value that was interpreted as a correct and adequate mode of outlining and defining reality in terms of visual representation (White 1957).

This kind of thinking was to last almost five centuries, as paintings were predominantly governed by Alberti's *logos* or credo of optical perception: on the one hand by the need to equal its 'objective' visual norms, and on the other by ways to conform to its cardinal rules of representation. Pictorial practices, reinforced by the science and graphic technique of Renaissance perspective, confirmed pictures as the way to a certain knowledge of the world; they marked what persisted and was sustained, not what was circumstantially changing or deviating in Occidental culture. Apparent and inventive spatial distortions from this point of vision were condemned as major aesthetic faults or blunders, even though exceptions and local variations on the restrictive Albertian model were always experienced by major artists across Europe (Carani 1989). For instance, after the Early Renaissance, starting with Vasari's developmental and evolutionary model of art, Leonardo's inventiveness that went beyond the mathematical intransigence of his predecessors, Michelangelo's Mannerism, the Baroque's sensuous upheaval, Ingres's playfulness, Romanticism's subjectiveness, and through the onset of Modernism in the second half of the nineteenth century when painters for the sake of purely subjective factors began disputing, disrupting, deliberately distorting, dismantling, disowning, or transcending mere naturalism to destroy the representational basis of that tradition, other models of representation were periodically discovered and put forward as particular alternatives to one-point 'scientific representation'.

Consequently, in its broad sense, the term 'perspective' can be legitimately extended theoretically to include in our analysis these conventional systems and methods of representing or signifying space other than Renaissance central projection. By the end of the sixteenth century, some localized refinements and improvements had been made on Alberti's model, but these did not include a return

to cylindrical or spherical Greco-Roman perspectives (Panofsky 1961), or preclude favorably comparing a painting to a ‘transparent window through which we look out into a section of the visible world’ (Alberti). Dürer’s mathematical experiences with networks of squares (Panofsky 1955b); Gauricus’ bifocal perspective system, outlined in his *De Sculptura* printed in Florence in 1504; Piero Della Francesca’s use of a ground plan in formulating perspective; Jean-Pèlerin Viator’s (Brion-Guerry 1962) improved method of measuring distances by using a plan of squares with connecting diagonals known as the *tiers-point* or *perspectiva cornuta*; Vignola’s simplified perspective drawing; Andrea Pozzo’s studies of parallel perspective; nineteenth-century examinations of binocular vision and various psychological factors affecting visual impressions on the eye and perception; as well as G. Desargues’s, A. Bosse’s, and B. Taylor’s Theorems, were all subsequent methods of perspective that nevertheless still adhered, *in fine*, to central perspective’s underlying principles of representation.

Often these ‘improvements’ on the Albertian model remained annexed to it and served to enhance its perspectival effects. For instance, the device called, since the High Renaissance, aerial or atmospheric perspective, which relates to atmospheric effects on objects in space—that is, to the variation of far distance colors of the horizon from blue into white (for example, the change in color of distant mountains) as the effects which the air (or atmosphere) and distance interpose between our eyes and the objects depicted, thereby reducing chromatic properties and precision of contours and stressing both blurred effects and tonalities—was always associated structurally in Leonardo’s painting in its dual aspects of color and diminishing clarity of vision with the centralized, one-point perspective (Carani 1989). The same was true at times of Raphaël’s conjugate use of multiple, far distance perspectives such as the single-point Albertian perspective, Leonardo’s atmospheric perspective, the angular, bifocal or two-point perspective that has two vanishing points placed symmetrically on the margins of the picture, the oblique or three-point perspective with three vanishing points, the bird’s-eye view perspective, the staggered perspective or the perspective in height. In Raphaël’s famous *School of Athens*, this shifting of viewpoint and the producer’s requirements for an integral spatial composition are particularly observable as a practical and original solution to the perspective problem (Carani 1989).

Throughout the eighteenth and nineteenth centuries, the applied teaching of Albertian perspective remained one of the bases of the Academy. In order that illusionism might achieve effects as convincing as possible, the ability to proportion

foreshortenings by this logical process was a necessary requisite of the figurative painter. Until modernism, all other types of representation were not seen as having their own aesthetic value. The first modern systematic denials of central-projection perspectival methods were found in Cézanne's still lifes, in which the horizontal surfaces and the objects depicted were tilted toward the observer by what is now commonly called the cavalier perspective. This lay the groundwork for Cubism's theories of significant distortion in representation, and for its radical rejection of Renaissance perspectival devices. Notwithstanding, for a long time, popular sensibilities reacted strongly against Cubism's multiple viewpoints—that is, its assemblages of fragments of views or partial views of objects or parts of objects considered separately—even though this behavior to some extent implied at least a recognition that classical Renaissance perspective existed and was still a predominant visual force to be reckoned with. Because Cubist (and Post-Cubist) strategies could thus be traced back to this classic notion of view and, moreover, to the survival of a number of its key compositional elements, this highlighted Renaissance perspective problems as premises and prerequisites to be attacked.

It can therefore be stated that the Renaissance reached a phase of perspectival development toward which previous generations had groped for some time, and toward which subsequent generations modeled themselves. That is why, even after modernistic explorations in art broke the realist barrier and gave us finally in this century new ideas, new materials, and major new insights into ourselves and our world, insights that seemed non- or anti-perspectival to most artists and analysts, Renaissance single-point perspective remained over five centuries and remains today the inescapable condition and definition of art, a paramount mode of artistic excellence and of behavior that addressed subjective and objective structural as well as modal dimensions. Accordingly, Renaissance perspectival science has acquired in our historical culture overriding theoretical and practical authority, and it is on the basis of this paradigmatic supremacy that it has been understood and regarded semiotically as the 'scientific norm' of Western pictorial representation (Carani 1989), even though it only arose as a specific and artificially induced measuring device.

### Perspectives as Symbolic Forms

Although most art theorists from Alberti onward have generally agreed that Early Renaissance perspectival imaging was (and is basically) synonymous with our

retinal imaging, which grants it a certain sensory and conceptual primacy, Panofsky (1961) closely studied this way of perspectively seeing the world in a box and challenged some of its representational claims—namely, its visual restrictions to the cyclopean view of one fixed, motionless eye. Leaping from ancient curvilinear perception to changing styles of spatial rendering in his famous article, dated from 1924-25, on the plurality of systems of perspective from antiquity to the seventeenth century, north and south of the Alps, Panofsky attempted to link these changing methods of representation, which he identified locally before and after the Italian Renaissance, both synchronically to the culture of which they were part and diachronically to the visual development of one symbolic form. In other words, he linked perspectives to changing symbolic modes of intellectual expression, thereby weaving a complex textual web that harnessed the work's internal structure or intrinsic formal meaning and content, as well as interrelated notions of perspective and point of view.

For the founding father of iconological studies, form in art was generally the outward expression of an idea, of not-so-hidden symbols in visual images. Panofsky adhered to Riegl's (1963) cultural *Kunstwollen*. A systematic consistency of forms and their historical treatment enabled him to recognize a style, for instance in its perspectival novelty or continuity. Panofsky conducted his investigations of figurative art by following the Warburgian method of telling visual motif through history, from antiquity to the Renaissance, in order to watch and describe its post-Renaissance transformations. Ernst Cassirer's (1955) full-fledged philosophy of symbolic forms the human mind uses to comprehend reality and to connect itself with the world of objects—in other words, his philosophy of world-views and symbolic renderings in a variety of phenomenal fields, namely language, religion, art, myth and history—was also the basis for Panofsky's notion that art, like any other symbolic form with structural integrity, is not an imitation but a discovery of our commonplace reality, and of a fundamental identity between the objective and subjective spheres.

With Panofsky and with students of iconography, symbolism thus provided a general aesthetic conception that saw the whole of (figurative) art, from its processes to its true essence, as symbolic form. For instance, Friedlaender (1957) proclaimed the fundamentally symbolic nature of art and signaled its special relevance in the transmission and modification of images. He emphasized that symbolism always involved the substitution of signs and had its roots therefore in visual experience and in the dimension of artistic expression. For iconologists, symbolic

representation was thereby a reciprocal correspondence between the chosen symbol or sign and the object or thing signified. After Panofsky, as witness the history of its intellectual success in the second half of this century on both sides of the Atlantic, symbolic form construction of perspectival relationships opened the door to a debate on the conventionality or the symbolic nature of systems of perspectives. Spanning the traditional art-historical distinction between form and content, using the seminal notion of 'distance' to suggest that its system of representation reconciled metaphysical opposites (subjectivity of point of view and objectivity of order), the Panofskian concept of perspectives as culturally symbolic (conventional) forms elevated its particular systematization of space and its dependence on certain canons or credos of representation to the level of a visual super-code.

For instance, in the tradition of neo-Kantian models of perception and of Ernst Cassirer (1955), this concept of the symbolic form of perspectival representations became, for Panofsky, an 'ambiguous organon', as mentioned by Holly (1984), being at once a pictorial and logical form, an expressive and creative interdependence of the mind and the world, a formal system, a device of representation and framing, a convention of both seeing and transcribing the scene (seen) and the object it purports to represent, and a transthistoric form of expression. The emphasis was placed on the function of the perspective systems of painting as a holistic formal structure that systematically engendered certain ways of viewing the world of objects and that depended in turn on deeper formal codes of knowledge or underlying systems of formal conventions providing new and broader meanings.

If we seesaw back and forth between the discipline of art history and the methodology of semiotics, it is thus quite apparent that Panofsky's idea of symbolicity seemed to mirror in many ways Charles Peirce's pivotal notion of symbol (or convention), as Peirce defined it in correlation with those of icon and index, since the fundamental purpose of the manipulative power of Renaissance perspective and of all other perspectival systems is to programmatically transform and direct natural signs into painted visual signs that can achieve the value of Peircean symbols by bestowing philosophical and conceptual ideas on figures and objects. For Peirce (Deledalle 1980), the sign relation with respect to both object and interpretant was triadic, each sign of the second trichotomy icon/index/symbol bearing a different relation to this interpretant as well as to the object: the icon signifying by virtue of a resemblance or qualitative similarity to its object; the index by virtue of a causal connection or physical bond between itself and its

object; and the symbol by virtue of a contract or rule. Some Peircean visualists, like Margaret Iversen (1986), have consequently seen in this latter function the equivalent of Saussurean arbitrariness of the linguistic sign.

This can be explained further. For instance, the conventional relationship established between sign-vehicles such as visual perspectives and the object, a relation that is characteristic of the symbol according to Peircean semiotics, must rely first-hand upon codes known to the interpretant, so there can be any relation at all. The tenuous and intrinsic dependence on the interpretant's will, mind, or world-view further stresses the ideological implications of symbols in modes of representation. In this sense, the notion of symbolic aspects of visual images is particularly helpful in a semiological critique of painting like the one developed as 'new art history' by Iversen (1979, 1986). Referring to the aesthetician John Berger's insightful analyses on past and present ways of seeing, Iversen (1986) emphasizes from a symbolic point of view the orientation of perspective constructions and the scope of perspectival devices that have pervaded our modern history of representation.

For Iversen, and for other researchers like Eco (1976) or Schapiro (1973, 1982) before her, this is true *a fortiori* of the Renaissance organization of the *istoria* as described by Alberti's perspectival model, which from the standpoints of the artist and the observer has seemed the fixed and systematized mode of representation that the painted picture itself has long promoted in our cultural sphere. In relation to other perspectival systems, it has had an epistemological primacy as the copy theory and has appeared to function, erroneously, as an absolute given. There is no innocent eye, as Gombrich (1961) put it. Renaissance perspective selected, rejected, regulated, organized, constructed. Through it, perception, reception, and symbolic expression were not separable operations, but were thoroughly interdependent; through it, artists were trying to simulate reality in a painted image in such a way as to deceive the observer's eye. Semiotically speaking, central perspective remained for a long time, and remains *ipso facto* to this day, a revealing and powerful theoretical 'construct', a Panofskian symbolic form, a primordial interconnection between producer and perceiver, this perceiver and the perceived.

### **The Debate on Perspective/s in the Discipline of Modern Art History**

In the last twenty years, building upon art-historical evidence or theoretical deductions by Riegl, Wölfflin, Krautheimer, Mukařovský, White, Klein, Francastel,

Schapiro, Uspenskij, and most significantly upon Panofsky's 1924 essay on the relativity of vision and perspectives, contemporary visualists have put forward very attentive analyses of the philosophical and psychological signification of Albertian illusionistic perspectival devices and of other past and present perspectival systems. Looking back methodologically on these heroic interpretations of perspective/s can be extremely helpful in understanding the outlooks and recent inquiries of contemporary art historians turned (reluctantly or not) visual semioticians (Carani 1992).

In the discipline of modern art history, turning their backs on historiographical traditions inherited from cultural archeology, both Riegl (1963, 1978) and Wölfflin (1950, 1961) tried to better understand and appreciate works of art, particularly those of the High Renaissance in Wölfflin's case, by looking at them not in terms of technical merit or subject matter, but in terms of purely formal concepts. These formal presemiotic analyses, based on the differences between styles of production, from which have been coined the generic terms 'formalism' and 'formalist method', have provided us with such important symbolic notions as *Kunstwollen* or will-to-form (Gombrich 1961), and with objective, analytical categories. As such, this formal approach constituted *in fine* a systematic, prestructuralist model. Escaping very general and imprecise intuitive observations, its concepts were comparative, not absolute, and often came for purposes of analysis in contrasting pairs, as was the case for Wölfflin's stylistic analysis of Renaissance vs Baroque art. His first pair of concepts was linear as opposed to painterly; the next pairs were planar and recessional, closed form and open form, and finally multiplicity and unity. These various characteristics that Wölfflin attributed (rightly or wrongly) to the Renaissance were interrelated structurally and formed an efficient network or web. The principal value of these categories thus lay in their capacity to help us argue, perceive, and outline the structure of a work. In semiotic terms, they had in effect syntactical, sensory, and conceptual qualities relating to perspective structuring, such as luminosity, intensity of light, quality of atmosphere, outlines, modeling, spatial elements, objects, and colors.

This new methodological development did not escape as astute an art historian as Erwin Panofsky. Perspectives as mapping methods were first discussed by Panofsky in his fundamental study 'Die Perspektive als "symbolische Form"', which remains the mainspring essay for all later research and debate on the construction and conventionality of structures (or systems) of perspectives. Without claiming to represent space optically as we actually see it, but rather with a

relative accuracy or objectivity that reveals the ways in which the perceiver determines the perception, perspectives as structures and symbols could play such a role, according to Panofsky, by binding together optics and intellectual dispositions, iconography that focused mainly on the identification and interpretation of mythological or Biblical subjects, and iconology that took account of all the features of the work. In Panofsky's view, as I have argued, perspectives resembled one of the symbolic forms of Cassirer's theory, according to which a particular spiritual value was associated with a palpable symbol and became its specific attitude. Subsumed in his late North American work (1939, 1955a, 1960), Panofsky's three-stage iconological model of interpretation was a clever, quasi-structuralist, presemiotic attempt to unite motif production, perspectival picturing, and seeing and decoding processes of the image.

Before and after the second world war, in America and abroad, the rediscovery by the intellectual community of this essay on perspective opened up a long-winded and ongoing debate among art historians and art specialists (like Gisela Richter, Miriam Bunim, John White, Robert Klein, Pierre Francastel, Meyer Schapiro, etc.) on the issue of recognition and convention-making. Richter (1937) reconsidered from Panofsky's and Schapiro's relativist points of view the issue of the existence of visual perspectives in Greek vase painting. Beyen (1938) took the opposite view, proclaiming retrospectively the existence of central-projection in antiquity. Bunim (1940) studied the treatments of space in medieval painting and the precursors of scientific perspective. White (1957) systematized the curvilinear perspective outlined by Panofsky and produced his own theory on constant alternatives to artificial perspective in Western art. Klein (1981) zeroed in on the paradigmatic value of the Renaissance and on its spatial propositions. Extending Emile Durkheim's theory of social space and attempting to interpret twentieth-century Cubist spatial experiments, Francastel (1951) tried to define a modern (as opposed to traditional) semantic concept of space relations.

Seeking also to demonstrate the impossibility of ascribing fixed values and meanings, Schapiro's analysis of the use of frontal and profile as symbolic form in the closing chapter of *Words and Pictures* (1973) attempted to define the role played by Saussurean binary oppositions or contrastive pairs in visual signification, as in verbal metaphors, and exposed the logic of their working. Moving from signifier to signified, insisting on the reversible character of conventional symbols, Schapiro sought to demonstrate that these systematized symbols did not imply arbitrariness. Another pillar of Anglo-American contemporary art history,

Ernst Gombrich, responded to these fundamental problems of visual representation, and by providing us with a psychological theory of how recognizable images are produced and perceived, in parallel with Schapiro's constant efforts, seemed finally on his way to reducing or bridging for the first time the (assumed) gap between art history and visual semiotics.

### Some Critical Semiotic Inquiries

In the mid-1940s, Mukárovský's later essays (1976) on contemporary art's intrinsic contradictions investigated the structuration of the work of art through dialectical oppositions inherent in all arts, and dramatized the question of the rapport between the work of art as an autonomous sign and as a referential one. Since then, Gombrich, Goodman, and others have addressed the way we see and depict, and have amassed enormous documentation on these visual experiences and practices. However, two contradictory semiotic views have emerged in this epistemological debate in the last 30 years: an orthodox and an unorthodox one.

Making the point repeatedly that there is something like a 'linguistics of the visual image', therefore a language of pictorial representation, Gombrich (1961, 1963, 1966, 1972) emphasized throughout his early and mature work the conventionality (as opposed to arbitrariness or naturalness) of imitative codes. From 1950 onward, Gombrich gave an extensive treatment of problems concerning Peircean iconicity, iconic convention, and the analysis of vision in art, and broke new ground in defining the concepts of 'similarity' and 'difference' more carefully. According to Gombrich, human vision is historically conditioned by the Renaissance perspectival dictum, which becomes not merely a convention, but an unchallenged representation of the world as it looks and of our own visual cognition of it. This has allowed the human animal to survive, function, and communicate. Therefore Gombrich stressed repeatedly that the message from the visible world must be coded by the artist, and reaffirmed the efficacy, if not the necessity, of linear perspective as canon of representation for creating the two-dimensional illusion of space.

Arnheim (1954, 1971) also described Renaissance perspective as the fascinating problem of the human mind groping for the solution of a visual problem. For Arnheim, it is a cultural signifier and a unique expression of an effective rendering in depth. A similar position was put forward by the psychologist James J.

Gibson. Calling for a ‘science of depiction’ concerned with discovering general facts that inform us about pictures generally, rather than about individual works, Gibson (1950, 1966) has asserted that the use of perspective in paintings was not merely a conventional code to be used or discarded by the artist as he chose, but a geometric credo born of necessity. From the start, visual art is thereby construed by Gombrich, Arnheim, and Gibson as a set of interlocking meaningful features or configurations that permit recognition according to some principles of equivalent meaning and various acts of choice between given alternatives, such as visual perspectives. But this orthodox position has been challenged by more recent inquiries.

In an essay inspired in part by Cassirer’s world-view, Goodman (1968) was intrigued by reality remade or denotation in painting, and by perspective construction as emblematic of this distinctly human propensity to represent, to imitate, and to symbolize through systems of relationships. Linear perspective is seized upon by Goodman (1968: 10-19) as an artificially induced framing device, whose specified conditions of observation are ‘grossly abnormal’ and had to be stage-managed optically through a peephole to achieve faithful representation. Contradicting the orthodox position on the basis of Panofsky’s (1961) and White’s (1957) discussions of the relativity of perspectives, Goodman questions Renaissance perspective as a durable and constant way to locate man in his world, in his cultural space, and states categorically that the rules of pictorial representation and the standard Renaissance laws of geometrical optics are not inexorably intertwined.

On the contrary, taking into account that scanning is necessary for normal vision, as was repeatedly proven by modernist painter Paul Klee, Goodman has asserted heterodoxically that defiance of the pseudo-laws of perspectival geometry was (and is) an artistic necessity for the present-day Western eye and for its rendering or comprehension of our universe. In effect, Goodman’s central thesis is that works of art are symbols, symbols that refer, and which exemplify (serve as samples of) what they refer to. Paintings are replete symbols that refer to visual properties of color and shape which they possess, and which can be identified by interpretation. Involved in a reconstruction of our use of the word ‘reference’, Goodman has opted therefore to understand perspective systems as a transcultural frame of reference dependent upon philosophical principles and characteristic modes of being that unveil formal and symbolic worlds within worlds and resulting intertextual homologies as semiotic devices.

Eco (1965, 1968, 1976) emphasized further the precise role played by cultural and artistic codes of recognition, and isolated minimal schemas of and for iconographic recognition. The result is a multi-coded world of seeing and meaning, of denotation and connotation, of the necessary and the gratuitous or creative bent. Through numerous postscripts and developments (Eco 1978) added to supplement his initial stance, as well as through opposite views put forward by his many critics, like Sonesson (1989) or Saint-Martin (1990a), Eco has explored Peirce's iconicity at length as a super-code of art that works both as reference for and as structural identity of the picture. Other contemporary visualists like Baxandall (1979), Bryson (1983, 1985), Wollheim (1987), and Fried (1988) have shown recently how arbitrary are the classical principles of space and fixed vision and their protocol of right recognition. Isolating stylistic consequences, spatial taboos, formal vocabularies, and grammatical operators that were infringed upon by pre- and post-Renaissance perspectives, they have especially dealt with Modernist intermediate or middle distance perspectives such as the cavalier perspective of Cézanne, the analytical and synthetic perspectives of Cubism, and proxemic ones like the frontal perspective of Mondrian and North American formalists, which made the non-imitative side of art paramount.

Also recognized and discussed in non-figurative and abstract art have been other strictly proxemic systems of representation like Strzeminsky's unistic perspective (Strzeminsky and Kobro 1977), the arabesque perspective (first documented by Schapiro and Gombrich) used by Jackson Pollock for his famous drips of the late 1940s, the tachist perspective of post-war French lyrical abstraction, the reversible perspective of the late Mondrian, and the checkerboard perspective that corresponds *grosso modo* in American abstract painting to the bidimensional surface of the Modernist grid defined in the early 1970s by American art critic Rosalind Krauss (Carani 1991b). Parallelling the notions of convention and conditions of art in that they are historical and subject to change, Fried (1988) in particular has interpreted these various perspectival orientations as historically configured, mediated, and articulated with respect to a particular kind of beholder and to the time and place for which these perspectival imaging devices are made.

Further reducing the methodological rift between art history and visual semiotics, these 'unorthodox' theoretical options have set in motion new correlated avenues of research, analysis, and interpretation. For instance, the perceptual and pragmatic constraints imposed on the spectator by non-Renaissance perspectives as well as particular twentieth-century spatial conceptions have become an important

topic of discussion for visualists and for the ‘new art history’ that has emerged in the 1980s to propose alternative approaches to art because traditional ones are now considered dead ends.

Drawing a powerful metaphorical analogy between the analytical theater of the discipline of art history and the scenographic logic of Renaissance perspectival realism, Preziosi (1989: 54-58) has noted the social and methodological costs for art practice and art-historical inquiry of such fixed, classical centrality and the resulting marginalized distortions when the observer’s eye is not correctly positioned in the center of this perspectival projection. But at the same time, Preziosi has argued that such curious liberations from the fixities of central-point Renaissance perspective as anamorphic art nevertheless constantly turned to this rational and stable visual system, and continually reconfirmed the spatial as well as conceptual importance of effects of perspectives, positions, and distances in depth.

Focusing on the stylistic import and features of differing representational methods used culturally under the general heading of ‘perspectives’, coming from either the current methodological crisis in the history of art or from visual semiotics, Saint-Martin (1987, 1990a, 1990b) and Carani (1989, 1991a, 1991b, 1992c) have studied and analyzed past and present spatial subsets (i.e., pre-Renaissance and post-Renaissance perspectives), with their particular graphics, formal vocabularies, and symbolic rhetoric of space and vision. Moreover, by insisting on the fact that Renaissance perspective was studied by painters who pretended to imitate nature scientifically on the basis of ‘verisimilitude’ biases, and who thereby fundamentally deceived the human eye, Carani (1989) has reasserted the role played by ‘convention’ (i.e., ‘symbol’ according to Peirce’s trichotomy of varying degrees of distance between the sign and its referential world) in this erroneous learning process which tried its best to root out any potential distortions of Euclidian dogma. Acknowledging the role of signifiers and signifieds in the active production of meaning on the Hjelmslevian levels of expression and content (Hjelmslev 1963) and the Panofskian idea of symbolic forms, Carani has also addressed the issue of spatial ordering within paintings, and has recognized that it was always possible to represent space by more than one functioning convention even during the heydays of classical norms or diktats.

Going one step further, by developing the idea of spectrum, or of a sliding scale toward (+) and away (-) from classical mimetic resemblance against which the different perspectival systems are then compared, Carani (1989, 1992c) has remapped as semiological metastatement the hieratic doctrine of this sign-system

that is said to reproduce natural reality, lifelikeness, or high mimesis, while others before and after the Renaissance, as purely perspectival conventions using data concerning space, atmosphere, light, texture, color, and reflection, are formed as copies of, at a distance from and partially or totally anti-nature. This way of looking at and interpreting pictures is in essence to ask how realistic they are. In other words, the idea of a sliding developmental scale or scale of increasing distance from the syntactic and semantic Renaissance imaging requirements is retained by Carani as an analogical approximation toward and away from which a given society or culture calls ‘the Real’ (world), that is perspectival distances from the classical paradigm, socially constructed and meaningful codes of recognition, and individual consensual symbolic activity. It encompasses codes of a certain artistic vocabulary, as well as super-codes of being and meaning as facts of common experience. Therefore, the semiotic systems or languages of perspective representation are not only the end products of historical developments, but are also, for Carani, epistemological starting points, ways to convey symbolic and semantic knowledge, interests, or meanings, with full awareness of the preeminence attributed by this position to the structural and conventional elements inherent in these pictorial constructions regardless of whether they are based on a geometrically accurate model of linear perspective or anti- and counter-perspective models.

Invoking both Peirce and Saussure on the formula of ‘motivation’, as mentioned by Bryson (1983), as well as the topological reconstruction of the painted surface, this kind of semiotic model moves from the pseudo-goal of universal mimetic visual experience at its ‘objective’, far distance end (revealed, for instance, in Mantegna’s art—Thürlemann 1980), to its negative end, a Modernist force of proxemic counter-cultural perspectivism whose field of vision combats and spatializes the centralized pushes and pulls. There, as in the case of the checkerboard perspective (Carani 1991b) used periodically by American formalist painter Ad Reinhardt and by Canadian abstract painter Paul-Émile Borduas, periphery counts over center, peripheral viewing over centralized inputs, cruciform centrifugal energies over centripetal, outward-bound ones.

In effect, instituted syntactic, semantic, and pragmatic modernistic differences point to an official perspectival system of realism—that of the Early Renaissance—maintaining its power through the 1900s, but losing its epistemological grip on things over the past 100 years, which may explain its paradigmatic textual persistence over the centuries as representation in depth, but at the same time its disappearance since the end of the last century with the advent of other, non-Euclid-

ian effects of perspectives, points of view, and distances, with their own particular symbolic meanings.

## Notes

1. The GRESAV (Groupe de recherche en sémiologie des arts visuels) of the Université du Québec à Montréal was founded in 1980 by Fernande Saint-Martin to coordinate the research activities of art historians and visual semioticians participating in the Ph.D. program in Semiotics of that university who are concerned with understanding images as expressions of purely visual language.
2. Under the leadership of Marie Carani, the GRESAC (Groupe de recherche en sémiotique de l'art contemporain) has been active since 1985 in the Art History Department of Laval University in Quebec City. The Group is devoted to the study of the mechanisms of pictorial signification and to modernist vs post-modernist issues of artistic representation.

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- 1992c La perspective comme code syntaxique. In *De l'histoire de l'art à la sémiotique visuelle*, Marie Carani (ed.), 113-56. Sillery: Septentrion.

- 1992d Histoire de l'art, théorie de l'art et sémiotique visuelle: Pour une nouvelle approche de l'art passé et contemporain. In *De l'histoire de l'art à la sémiotique visuelle*, Marie Carani (ed.), 8-25. Sillery: Septentrion.

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## **Subject in Structure: A Comeback?**

Michel Costantini

As this contribution aims at scrutinizing the present situation of visual semiotics in Europe, and making out the outline of its near future, it seems appropriate to me to start with a short historical summary, however subjective it must be, of the discipline, and to begin my essay with brief remarks about recent developments. For a more detailed account, I refer the reader to Calabrese (1985) and Sonesson (1989), both of whom are quite well informed in that field.

Since the dawn of mankind (or at least since the dawn of commentary), comments on pictures have been countless: Simonides from Keos is a forerunner of the tradition, and from Horatius to Cesare Ripa, from Giorgio Vasari to Roman Jakobson, the flow of commentary on pictures has been constant. Indeed, Roman Jakobson initiated the history of iconic proto-semiotics, which would later become visual semiotics: he had written fine articles in this area before World War II. Around 1960, when the works of Jakobson began to be known in Western Europe, various contributions (e.g., Damisch 1957; Passeron 1962; Zemsz 1965), in spite of the differences in their viewpoints, laid the foundations for a rigorous approach to the picture, turned toward a quest for meaning. The same period saw the birth and development of the Barthesian rhetorics of the picture. In the 1970s, things suddenly began to move faster—although work toward a structural approach to visual objects remained quite limited then in its functionalist semiology version (Martinet 1975; Mounin 1970), more open with Mounin (1974) and Martinet (1980), and although the historical bibliography in French of semiotics (whether one prefers to call it visual or iconic or of the picture) of the Paris school starts with a German-speaking Swiss, Felix Thürlemann, who published his book on Klee in 1982, research by the school had been undertaken and even partly published several years earlier (e.g., Costantini 1978; Floch 1978). Thus the 1970s did mark a turning point in that history, which was symbolized by the writing in 1978 of the founding text as far as Greimas's approach of the question is concerned: *Figurative Semiotics and Plastic Semiotics* (Greimas 1978).

The decade that followed was basically pledged to the model of that semiotics, and looked into the generative course, then the modalities and then the pathemics

side of things—if we leave aside the Peirce school of semiotics, whose major applications in the visual field only came about in the mid-1980s with Caruana (1986, 1990) and Deledalle (1986), for instance, even though the first article of the Perpignan school dates from the previous decade (Deledalle 1976). For the time being we will also leave aside the development of research in Italy in the wake of Umberto Eco (1968).

### A New Deal?

In the late 1980s, the development of research in the field of visual semiotics is obvious, but what we are chiefly interested in is the beginning of a turning point. A revolution in the general semiotics of the Paris school, whose initial steps took place in the late 1970s, began to be reflected in iconic semiotics at that time. As regards the precise date, let us quote Jean-Claude Coquet (1987):

Hjelmslev and Greimas elaborated outlines of what a general semiotic theory might be. The scope of their work left all the attempts to set up a semiotics of discourse for some time. It was only with Benveniste and the slow taking into account of his suggestions by researchers, especially from 1970 onward, that subjectal semiotics could and as a matter of fact did come forward.

Analysis is no longer merely interested in a structure that is disembodied and deprived of its physical implications, whether it be the enunciator or the referent (see Greimas 1966: 133); on the contrary, Paris school researchers now look into who is speaking, who is spoken to, and what the speech aims at, and by so doing find a common ground, at least as far as theory is concerned, with the interests of the Perpignan school of semioticians (Deledalle, Caruana, Réthoré, Marty) and the Bologna school (Eco, Calabrese, Bonerba, etc.). This turn of events can be described as the comeback of the Subject (of the enunciation)—both enunciator and enunciatee—and of the Referent. Needless to say, the utmost epistemological attention is required here, and the utmost care in the choice of vocabulary. For the actors cannot be let in again from a psychological point of view—otherwise the whole point and meaning of Saussure's work would be missed altogether. For instance, we should see to it that the result is not merely a return of that which had been inhibited—inhibited so severely and so drastically by some famous pages of

*Sémantique structurale* (Greimas 1966: 153-54). In short, people used to say: without the text, there's no salvation! (see Greimas 1983: 311). From this point on, after the prerequisite ascetic approach to the text in and of itself, finding a subject faced with the World cannot be ruled out. On that score the chapter by François Dosse—appropriately titled 'The comeback of the inhibited, namely the subject' (Dosse 1992: 408-23)—should be read again. Thus we answer the partially justified objection of Peirce's followers, who strongly oppose the would-be binarism of the Saussurean tradition. It is true that a few dogmatic standpoints may have given an impression of unrestrained binarism. But such is not the case if one is willing to refer to Saussure's clear teaching, which sets up (as can be seen in Eco 1968) a triangular structure of signifier, signified, and referent, and even, as is stressed by Eco, a far more complex relationship, in the form of a polyhedron rather than a triangle.

Thus we would like to show that, within the framework of the thoughts in progress of the Paris school, it is possible to analyze the picture and to go beyond standard semiotics, more specifically the systematic and indeed restrictive use of the semiotic square. The latter—whose efficacy in many areas we do not doubt (see Costantini 1992)—is unsuitable among other things to give an account of the continuity of reality. Although it does seem to be an illusion to try to imitate that continuity, it is no longer unthinkable to make sharper measurement tools that might follow the sudden changes of the Object and its relationships with the Subject step by step. Models have been suggested to that effect in general semiotics—we might mention Jean-Claude Coquet's founding approach (1984) and Kim Young Hae's cyclical representation (1991)—and also in the very application to the picture (Costantini 1991; Kim and Costantini 1993). The challenge for visual semiotics in the decades to come will consist in going deeper into that vein. For the reading of pictures through the standard system—that is, the setting up of semiotic squares for interpretation of a given body of data, the cutting up of speeches into their syntagmatic and semio-narrative units—has become mere routine work nowadays. It may be necessary in limited cases to do the spadework on this or that field that has not been explored thoroughly yet, but it has no theoretical efficiency. Besides, subjectal semiotics is all the more suitable in such a case, as it affords a far suppler approach than the whole set of Greimas's tools, and as the picture usually features far suppler and vaguer systems than verbal language, for which subjectal semiotics was originally set up.

### The System of Enunciation Levels

Let us consider Laocoön, by El Greco: *Muerte de Laocoonte y de sus Hijos*, a work in his later style, which is the more elaborate and not far from his *Vision of Apocalypse*. Although we can admit, for the time being, that a notion of something ‘tortured’ (as opposed to ‘serene’), on account of the skies which echo the general appearance of the bodies, is conveyed to all viewers by the signifiers /shapes/ and /colors/, things will be different as regards the signifiers /town/ and /group/. If we use the *a priori* categories ‘cultivated’ and ‘semi-cultivated’ (see Costantini 1990) we can in a first stage assert that

antiquity: modernity :: Laocoön: Toledo

implies an enunciatee endowed with ‘culture’—culture meaning here the ability to identify geographically, which implies stating ‘this city is Toledo’, and to identify historically, which implies enunciating ‘that group mimes—which doesn’t mean slavishly imitates, quite on the contrary—the ancient *Laocoön*, a set of statues from Rhodes which had been rediscovered some time before’. Any semi-cultivated person, and *a fortiori* any uneducated (non-cultivated) person, would of course miss the semantic play which develops on that basis.

Those first categories, however, soon turn out to be too vague; the meshes of their nets are too wide. The question can be asked another way: what is the minimum prerequisite for people to become aware of the comparison between ancient and modern? For the message to be effective, the enunciatee does not have to be able to state that objective truth which belongs to the world of the true IT (Coquet 1984: 176-77).

(A)

- p1 a Toledo, a modern Castilian town
- p1 b Laocoön, an ancient set from Rhodes.

He just has to be aware of the two messages:

(B)

- p2 a a modern town
- p2 b an ancient set

On the other hand, on the level of the semi-cultivated, the message may be, among other possibilities, either somewhat as follows:

(C)

- p3 a an unidentified (rather modern) town
- p3 b Laocoön, an ancient set of statues (possibly from Rhodes)

or

(D)

- p4 a Toledo, a modern Castilian town
- p4 b an unidentified scene

In the latter case, the lack of culture is more critical, more of a hindrance than in the former case, for being unaware of the antiquity of the scene mentioned is a more difficult handicap to overcome than missing a modernity that is rather clearly suggested by the painting. The uncultivated viewer, meanwhile, will not go beyond

(E)

- p5 a an unidentified (rather modern) town
- p5 b an unidentified scene

It is easy then to set up a classification that punctuates the continuity of the enunciatee's knowledge: level E will completely fail to decipher the painting; level D will make out only one of the terms of the semantic axis; level C will perceive some sort of comparison with antiquity; level B is enough to be aware of the elementary meaning; but only level A, a few strata of which have to be examined more closely now, grasps the full scope of the signifying basis of the painting.

Semiotic analysis differs from iconological analysis in this respect: that it will consider only the esoteric meaning, only that true I which becomes a true YOU in the perception of the painting; it will not consider the specific. Iconological analysis rests not on semantics, but on referents. It will imply, for instance, specific knowledge concerning the archbishop of Toledo, who was a reformer and who had died a few decades before the painting was made, and as for the ancient set, a more

accurate knowledge than what we have taken for granted so far—i.e., that there is a reference to the mythical story of a priest serving Poseidon,

*Laocoön, ductus Neptuno sorte sacerdos,*  
Laocoön, whom fate had made a priest of Neptune,

punished by the god. But which god and what for? For some, it would be for throwing a javelin at the enormous horse forsaken by the Greeks and proving that it was hollow on account of the sound it made. No god being named, people sometimes come to the conclusion that it was Poseidon. Others suggest that the reason for punishment would be breaking the law forbidding marriage and begetting children, the god in that case still being Poseidon for some and Apollo for others. In the latter case, by the way, Laocoön serves not Poseidon, but Apollo, and the two characters on the right are Apollo and Artemis, whereas in the former case they would be Poseidon and Kassandra. But others have thought of Epimetheus and Pandora, and others yet of Adam and Eve. As for Bartolomeo de Carranza y Miranda, locked up in the cells of the Inquisition from 1559 to 1576 for holding reform-minded views inspired by Erasmus, is there any proof that his fate is being alluded to? As we can see, there are so many interpretations, each so doubtful, that we find ourselves in a blind alley. Our interpretation, however, can go still further by leaning on recurring elements and so bringing into play other assets of knowledge within level A. Socrates shows his young and ambitious disciple, in Plato's *Alcibiades*, that to know something one must find it by oneself or be taught by someone. Thus the learner<sup>1</sup> will make comparisons with other paintings by El Greco which feature the same types of characters and will infer their value. He corresponds to Socrates' inventor.

The semi-learner (see note 1), who goes halfway and then waits for someone's answer, corresponds to the pupil in Plato's text. When confronted with the death scene we are considering here, the semi-learner, without going out of his way to try to identify referents, will notice the nakedness of the figures, their type of nakedness, which will remind him of other nudes by El Greco. Indeed, the *Purification of the Temple by Jesus Christ*, the famous painting which was discovered in December 1914 in San Ginés's church in Madrid and which El Greco devoted toward the end of his life to a theme he had already dealt with earlier, features an enigmatic nude that can provide us with an approach by means of which to understand the problem. That nude can be located from a syntagmatic point of view: it

is above the relief in which Adam and Eve are seen being expelled from Paradise. It can also be located from a paradigmatic point of view: it is freely inspired by the Apollo of the Belvedere, and historians rightly underline the fact that it is also closely related to the Apollo or Poseidon who is supposed to witness Laocoön's death in the painting in the National Gallery of Art in Washington on which we are commenting here. Now this double relationship is meaningful: this naked youngster is asexual, or perhaps it would be more accurate to say he has few distinctive sexual marks, just like our two characters in *Laocoön*, since the man seems to have a slightly prominent chest—whatever the technical reason and the referential value of that may be—and the woman does not show any swollen breasts nor any plump hips. And though this asexual youngster remains a stranger to us, it does not really matter: if his identification is doubtful (Gudiol 1983: 277), it may be because what is to be identified is not an individual but actually a type. The vagueness, the partly dreamlike quality, the lack of distinction between the narrative character, who is supposed to be alive, and a statue or, as in the *Burial of the Count of Orgaz*, an embroidered nude, are typical of all the nudes of that kind.

The nude of San Ginés is standing steadily in a sacred place, in a niche where statues of saints are usually found: he is thus likened to an inhabitant of the ultimate heavenly Paradise, explicitly contrasting with our first forebears at the moment when they were forced to leave the original earthly Paradise. Should we then, on account of this example, describe that nude as a mystical one, and could this nakedness express holiness? Several difficulties would undoubtedly arise if we granted that value to nakedness in El Greco's paintings, since at least two of the characters that belong to the type—namely, Stephen's executioners in the *Burial of the Count of Orgaz*—are definitely not holy; and on the other hand the two standing nudes in *Laocoön*, whether they be pagan gods or Adam and Eve, can hardly be described as such. Our 'semi-learner' will no doubt stop there, but another painting by El Greco, *San Juan Evangelista que ve los misterios del Apocalipsis* (our *Vision of Apocalypse*), will enable the 'learner' to redirect his quest. About that painting Gudiol (1983: 268) wrote that

to paint this vision El Greco didn't have to lean on the many iconographic details that the descriptions of the Bible could have provided him with. He just had to show the evangelist saint, mankind undergoing the ultimate ordeal (to our mind, the righteous on the left hand side and the sinners on the right

hand side, if we are to judge by their attitudes when faced with the ultimate catastrophe of the world), and the raging fury of the elements.

In other words, those who are painted with their clothes on have not reached the eschatological moment (namely, St. John, who is alive and can see), but those who reach the ultimate ordeal at that moment, whatever their vices or virtues, take on—or still have—that vague nakedness that is so idiosyncratic. That is quite unlike what the Bible says: Chapter VI, 9 of the *Apocalypse* (Cossio first suggested the reference) only mentions white clothes, whereas yellow, green, and even red appear in the painting. But contrary to John's text, nakedness prevails. Thus what is considered is the moment at which a tangential contact takes place between those characters and another world, a world in which differences no longer exist. Over there, according to St. Paul's word in his *Epistle to the Galatians*, there is no Jew and no Greek, no master and no slave, no man and no woman. If Apollo and Adam and Laocoön's son as well, the butchers of Stephen and our statue of the Temple are likewise naked and undersexualized, it is because they are on the borders of a world where—if we may generalize—there will no longer be either martyrs or executioners, but only chosen ones and reprobate, which is another matter altogether. That type of nude is eschatological. From a syntactic point of view it plays about the same part as the aureola in Byzantine painting. Serving as a correlation element, it connects the world of narration, which can be represented (a martyrdom, a smothering by snakes), with the world beyond: it shows that the world beyond half-opens and lets the truth appear, at the moment when the truth of fate shines forth, the moment of the great unveiling, which is precisely what apocalypse means.

This then is the finer stratification we suggest for the ‘cultivated’ level, at the end of an analysis which, we must emphasize, is no more than a mere outline:

(A)

- p1 a Toledo, a modern Castilian town
- p1 b Laocoön, an ancient set from Rhodes

Let us be more accurate and introduce the ‘semi-learner’ level:

(A1)

- p1 c undersexualized nudes: holiness?

therefore

- p1' a Toledo, a modern Castilian town (Christian)
- p1' b Laocoön, an ancient set from Rhodes (pagan)

Let us complete this with the level of the 'learner', who gets rid of p1c:

(A2)

- p1' a Toledo, a modern Castilian town (Christian)
- p1' b Laocoön, an ancient set from Rhodes (pagan)
- p1' d undersexualized nudes: eschatological moment

It will be noted that this is where speculations and interpretations about the allusion to the archbishop of Toledo or the personality of the two spectators can be justified. And this is the moment when such remarks as recognizing in Laocoön's face what is normally St. Peter's head in El Greco's paintings become relevant. We begin to realize what is at work here: a complex parallelism between pagan myth and Christian accounts; a specific relationship with death, the divine, and truth; a diffuse relationship with Adam and Eve and their original closeness to God. Starting from a minimal axis

antiquity : modernity :: Laocoön : Toledo,

we now come upon a more complex articulation in which the terms on the left, in quotation marks, represent the signified, and the terms on the right, between solidae, point to the signifiers:

'antiquity : modernity' :: /Laocoön : Toledo/  
'paganism : Christianity' :: /foreground : background/  
'world : eschatological border' :: /clothes : nakedness/

and so on.

To sum up, we can no longer content ourselves with one ideal enunciatee who is supposed to perceive and decode a whole meaning that would have been consciously encoded by an enunciator, who might hastily be regarded as one and the same person as the painter. Now we have six enunciatee levels at our disposal,

defined by the elements of knowledge each one has available (E, D, C, B, A2, A1). Those levels of the Subject are the starting point for the development of a whole intersubjective game (see Flahault 1978).

### Intersubjectivity

The return of the Subject necessarily implies the consideration of intersubjectivity, since the subject we are talking about can be both the enunciatee and the enunciator, and since a theory of that level of enunciation subsuming the whole process of transmitting an object—in this case a picture—still remains to be worked out. The process of transmission involves, besides the abstract unifying centers just mentioned, flesh-and-blood beings who fall into categories. But before complying with those classifications, we must note that the process of transmitting a picture—iconic communication—attempts to turn the radical otherness between beings into a differential otherness. The concept of radical otherness, to which we can refer as EGO / OTHERS, implies a gap that can be bridged only by some sort of mystical outburst, whereas differential otherness, which is the foundation of communication, considers a co-presence of I and YOU, the centers of intersubjective correlation. The co-presence of I-YOU contrasts with the radical difference in the pair EGO / OTHERS. Since gaining access to others beyond the gap implies leaving one's territory for another territory that is radically strange, the latter pair can be compared with the *Umfassung* (embracing) relationship as studied by Martin Buber (see Levinas 1958).

The former pair, through which communication comes into being, appears as something stratified. In order better to understand those strata, subjectal semiotics uses a scale of intersubjective relationship and interactorial interaction, a first formulation of which was suggested by Costantini (1991). From disjunction, in mutual ignorance, to conjunction, a first route was set up in standard semiotics in a classical way, starting from Greimas's square endowed with four terms. But before that, the zero degree of meeting—i.e., non-meeting—required consideration, as did 'communion', which represents the position of a true WE obtained dialogically. That position can extend to the top degrees of communication, and may be equivalent (or nearly so) to Buber's *Umfassung*, the place where, instead of standing in contrast, the levels EGO / OTHERS and I / YOU would meet in a *tangential* way, to take up Jankelevitch's word. Moreover, between the first and the last

degree, several intermediate positions had to be added: Costantini's scale (1991) consists of seven strata, and so does Kim's (1991), but some of the strata are different. If we take up Coquet's suggestions (1984: 765) and combine them with ours, an attempt to keep as close as possible to the continuous is likely to lead to a scale that might consist of a dozen or so degrees to assess abstract proxemic relationships between Subjects.

Mentioning the first encounter with the Other, Kim Young Hae states that the immediate reaction consists in describing him (Kim 1991: 54). At that stage, communication proper has not yet begun, even if the centers have been distributed: an I describing an object HE that may potentially become a YOU. From a modal point of view, some kind of initial non-knowledge gives way to some kind of knowledge, whatever its degree of truthfulness: Marco Polo's or Father Ricci's descriptions cannot be taken at their face value, nor can those of Bartolomeo de Las Casas's or Herodote of Halicarnassus, but nevertheless they are items of knowledge.

After *description*, the next stage in the history of that interpretation of the Other will be *comparison*. This stage can easily be exemplified by Montesquieu's *Lettres Persanes*: it implies not only a double knowledge, but also a specific desire to stake, question, and even challenge the Sameness which is the starting point, to acknowledge the fact that the Other can exist as another Subject, not as a mere He, as an object that can be described from the outside. That other being is not yet a YOU, but it may become so: in Greimas's terms, it may move from virtual to actual. Beyond the practical modalities which transform it into a genuine dialogue or leave it a fictitious one, the HE of comparison is alternately seen as YOU—when I show myself to him—and as I—when he reveals himself to me or when I try or even pretend to make him speak. Thus the description, which turns the *strange* into the *familiar*, gives way to comparison, which hauls the familiar to the level of the *mutually beneficial*.

Involving the I even more in its welcoming of the YOU, *adaptation* nevertheless implies a master power, namely the I, which admits the values of the YOU but subordinates them to its own; the I appropriates the YOU by turning him into a sort of fellow. But, however paradoxical it may seem, the stage Kim Young Hae calls 'creation', in which the I integrates the values (or at least some of the values) of the YOU into his speech, seems to us to imply that he has made them his own, which corresponds to the highest stage fully developed communication can reach: the I and the YOU then appear somehow as accomplices.

We will not consider here the other two suggested stages (Kim 1991: 55), alteration and disparition, which in a way make up the next episode of a story whose ending takes us back, roughly speaking, to the beginning—‘disparition’ has the same disjunctive aspect as the era before the meeting, but happens to be loaded with a different past—at the moment when the latter enters the area where communication is a failure.

On that basis, we can work out a systematic reading of intersubjective relationships between differentiated ‘others’, who may be characters of the enunciation or enunciating levels. Considering as data Giotto’s *Life of St. Francis* (Assisi upper basilica) and simply picking out our examples there, we will conclude by describing the seven degrees of the scale as they now stand. The zero degree (indicated by  $xVy$ ) is the one that obtains before the meeting between the EGO and his other. The overall relationship is one of disjunction, and the characters are in a position of mutual ignorance and lack of desire (not knowing, not desiring), of nonexistent interaction (not having any power). That is the case with Francis and the monk in fresco XIX, which features the saint’s stigmatization. Indeed, whereas the saint is intent on his encounter with the seraphic Christ, whose rays beat down on him, his retreat companion in La Verna is engrossed in reading the Bible. That trebly negative situation is also typical of the dozing chamberlain in fresco VI, or of the monks who are still asleep in their hut while Francis is on his way back to heaven on his burning chariot (fresco VIII). At this first degree, a first sort of meeting takes place, but a meeting in which disjunction still prevails, since the process of opening oneself to the other has not yet begun (that relationship is referred to as  $x$  vs  $y$ ). A specific mode of knowing, of /knowledge/, is at work there: the ‘commentators’, whether bourgeois or monks, to be found in frescoes I, XIII, and XIV among others provide a good example of that stage of description. The other does remain other, a stranger because he is strange, since he acts or is affected in a way that is radically different from that which is normal, which defines the Same; so the commentary is one of astonishment.

But the repetition of that type of encounter, the deepening and sharpening of description which is called for by the *curiositas*, perpetual quality of mankind, makes the process move on toward a more explicit encounter, in which a narrative conjunction now surges, although the modal disjunction still remains: in the guise of confrontation or conflict, the Subjects are both displayed for the Other to see, and thus we are at the stage of comparison—between forces, values, appearances, etc. This second degree rules over the core of narrativity as derived from

Propp, and of reformulation as derived from Greimas, since it includes as its main relationship something agonistic—what is described as the polemic structure of the narrative. We will refer to that as  $x \rightarrow\leftarrow y$ . In fresco V, when Francis and his father are confronting each other, it is precisely that type of encounter that is involved, among other things: what we get is a comparison of two views of fatherhood. Coquet has suggested two forms of recognition (1984: 76).

We shall use the conjunction relationship to describe that situation in which the actants regard themselves as complementary parts of a harmonious whole:

$$x_1 \Lambda x_2$$

Antagonist actants may also at times, out of mutual fear or desire for balance, agree or choose to maintain their respective fields apart from each other.

That latter position, 'being close to', Coquet refers to as  $x_1/x_2$  (1984: 79). We are in the field of non-disjunction there, since the two entities, although they maintain a specific territory and keep a definite distance between them, have moved beyond ignoring each other. Some examples in the interactorial relationships of the *Life of St. Francis* can be found in the waking Franciscans of frescoes VIII or IX, among others, while cooperating actors such as Brother Silvester (fresco X) are a perfect example of the first form of recognition mentioned by Coquet.

We can now examine the fourth degree, which involves some bridging of the gap between the two Subjects, as they begin to establish contact with each other, and the fifth degree, when that distance takes on a complementary value. But that recognition may be just an outside and unilateral one, and the acquaintance with the other may cause repulsion or refusal on the part of one or the other party. From a modal point of view, that stage then is characterized by the presence of a 'power', but also of a 'non-desire' or a 'desire not to'. That is why it corresponds to the stage of *adaptation*. In St. Francis's life as painted by Giotto, an encounter of this kind can be seen in fresco XI, for instance, when the Islamic doctors are confronted with the suggestion of an ordeal endured by the saint, a suggestion taken up by the Sultan of Babylon, and shrink away from it terror-stricken. That is the third degree on our scale, which we propose to refer as  $x \leftarrow\rightarrow y$ .

Beyond those degrees where conjunction prevails one way or another, there is an area of more intimate union, which can be described as communion, and in which

I think we can make an empirical distinction between two positions. If we consider St. Anthony's relationship with Francis (fresco XVIII)—not the physical relationship but the likeness to the other's being—we can notice that Anthony appears here with an attitude that was characteristic of Francis in the previous frescoes: an attitude of 'solicitude', a variant of which is predication. Moreover, Anthony is the only character in the whole cycle to be characterized exactly like Francis: he is wearing a frock, he is endowed with an aureola. Since at this stage of the story Francis has not yet received the stigmata, the two characters are thoroughly identical in their actorial definition. However, as soon as we turn to the next fresco a difference arises, and a radical one at that: it is precisely the fresco of stigmatization. The sixth degree of the scale, in its two variants, corresponds to the moment of *creation*: the other is assimilated by the one, so much so that he appears again in the definition of the one's being—in a provisional way in the first case ( $xy$ ), for good in the second case ( $x=y$ ). A new being is created through the 'absorption' of the other. Indeed, this is the sense in which stigmatization is considered as the ultimate stage of the process of the coming into being of a *novus Christus*, Francis. It seems to us that a sharpening of the scale by considering other bodies of data as well as other kinds of images, and a systematic study (once the instrument has been refined) of the repartition of the types of encounter within a set of images would lead to a better understanding of the way meaning unfurls through the position of the subjects and their intersubjective correlations, and would thus contribute to a deeper understanding of the meaning of pictures.

#### Note

1. The French terms 'cultivant' and 'semi-cultivant' have been translated here as 'learner' and 'semi-learner' (translator's note).

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## Synesthetic Effects

Herman Parret

### Forms of Sensory Experience

Undoubtedly, vision is, whether rightly or not, the queen of the senses.<sup>1</sup> The visible forms the component, the domain of reality that is most strongly *present* to us. The very presence of things in the world is defined on the basis of their visibility. The sensible world, in aesthetic experience, prefers to exhibit itself as a visible world: pure opticality is often considered to be the ultimate goal of the artistic pursuit. Vision, it is said, is the most *objective* of all senses, and therefore the most *ethical*: visual acuity exalts clarity and precision, lucidity and distinctiveness, all of which are moral qualities. From Plato to Husserl, intersubjectivity has been grounded in the world's objectivity: human communication, togetherness through word and action, hinges on the convergence of looks. Togetherness is a feeling rooted in vision, is communion resulting from common vision, from two looks bound up and immersed in worldly appearances.

The supremacy of vision is based on the substantial competence it grants the subject. To see is to be in power. It is also to gather knowledge. The eye that pays attention to the world's prose is sure to be knowledgeable: it goes straight to the universe of conceptualizations, to the universalizable, to the epistemological, to hidden but legible forms of meaning. The eye derives its knowledge from its power to give shape. It is vision that confers with light and articulation. What is legible to the eye is precisely the shape of meaning, *eidos*. The purely visible is in reality the ideal space of mobile intelligence: vision thus allows for the imperceptible shift from matter to form, which gives us order, clarity, and distinctiveness. The body's eye unnoticeably transforms itself into the mind's eye, which is capable of seeing the essence of things. Vision thus mediates between body and mind, between reality and ideality. The mind is set into motion by the eye. The mind's eye, however, is only the extension of the body's eye. The body's eyes have to 'touch' the world's flesh before they can become instruments of intelligibility. Without this merger with the world's carnal texture, eyes could not think.

With or without due reason, I have said, vision is the queen of the senses. Where do the power, the knowledge, the ethics of vision come from? Maybe from the eye's multifunctional complexity as an organ. The eye is vivid and active: it exerts its powers of intelligent structuring with piercing mobility. The ear, on the other hand, a stiff and static shell that one fails to notice when scrutinizing the face of one's speaking partner for expressivity, remains passive: it is a shell-hole that channels sound inward. No aggression is ever felt to come from the ear, as it is from the eye. It must also be added that the hand, which touches, is as discreet as the ear. But an important restriction emerges here: touch brings about proximity, and since the one who touches and the one who is being touched are copresent, no distance nor real power can ensue.

The eye's physiology, then, would seem to be clearly responsible for its phenomenological specificity. It must further be noted that, moreso than the other senses, the eye has become an instrument. Technology has increased its reach: glasses, lighting, telescopes, cameras. The power of the eye is only restricted by one thing: the presence of light and color. It is true that vision stagnates in absolute darkness, but that is a liminal case. Even in the darkest night there is always a star that shines, and when I close my eyes, there are effects of retension and protension during the day and dreams at night. Actually, perfect continuity can be established between what is visible in the real world and what is visible in imaginary worlds. The imaginary is visible, too. Even there, vision has the upper hand: imagination, which is so crucial to artistic activity, creates something visible, and the artist, therefore, is a visionary. Moreover, dreams do not consist of sounds or 'tangenes', but of images. Reasons to spare for Western civilization and its metaphysics to have given age-old priority to vision, and to have created ontologies as if reality and objectivity were equivalent to visibility.

It would of course not be possible to dismantle the hypostasis of vision in our culture. Let us nevertheless, under Roland Barthes's sophisticated guidance, turn to *listening* and its correlate, the *audible*. Barthes distinguishes three types of listening (see 'Ecoute', in Barthes 1982: 217-30), and in the process adds a phenomenological richness that will be taken into account in what follows. The first kind of listening, Barthes writes, leads living beings to focus their hearing on *indices*: just as wolves listen for the sound of their prey, people in love listen for the approaching footsteps of their beloved. The second kind involves an act of deciphering: what one tries to capture are no longer indices, but *signs*. And finally, the third kind of listening does not focus on or wait for determinate signs

at the level of what is being said, but at the level of *who* is speaking in an intersubjective space or a game of transmission: it is the act of listening to *significance*.

Listening for indices is, for man as well, an animal act *par excellence*: it is motivated by the need to protect one's territory and create a secure environment. Listening to signs, however, is a purely hermeneutic act: it means hearing the secret, obfuscated and muffled, it is the kind of listening that deciphers. The antique peoples thus listened to nature shivering and the leaves of oak trees murmuring when delivering their prophesies. The kind of listening that probes is the hermeneutic perception of divine language, signifying discourse, of the Text to be transposed. The act of listening to significance, however, is the most attentive one. The injunction to listen involves the complete interpellation of one subject by another. Calling out for someone to 'listen to me' has a phatic function: 'be aware that I exist'.

Even though psychoanalytic hearings dramatize the transmission of meaning, in daily life it is the telephone that symbolizes more than anything else this *mutual act of listening*, this reciprocal calling out of subjects to one another. The phone joins two partners in ideal and pure intersubjectivity, for it is an appliance that abolishes all of the senses but hearing. The pure sound on the other end of the line, moreover, is a *voice* embodying a whole system: my ear and the voice on the other end, the ear on the other end and my voice—the telephonic interchange of hearing creates meaning transmission. Hearing the voice of an invisible body with the ear is putting two subjects in place whose mutual corporeality necessarily escapes visibility. No doubt a community is being established between two invisible bodies: it is the texture of the voice that the ear listens to, Barthes tells us, 'the materiality of a body emerging from the throat' (see 'Le grain de la voix', in Barthes 1982: 236-45), the body that only exists by virtue of the voice, the audible body.

Barthes enthusiastically talks to us about the call of hearing in an effort to dethrone the prestige of vision. That is because Barthes enjoys 'anarchizing' sensoria. Indeed, every sound creates disorder to the extent that it escapes consciousness's separation of meaning. Every sound contains something wild and untameable—one's only defense often being to block one's ears. Even when a sound is cut off (in a musical composition, for instance), the noise has not been fully mastered. The ferocity of musical sound evidently does not correspond to the thunder's rumble, but it is wildness all the same: Bach's organs and Mozart's

voices ecstatically spill the sound that involves all of our being, surrounds us, draws us into the ecstasy and terror of the sublime. Indeed, sonority is naturally chaotic, whereas visibility is naturally cosmic. The cosmic virtue of visibility imposes itself on us, since it is the eye that projects order onto the world surrounding it. Sound, on the other hand, remains chaotic, even when we are being referred back to a source, like a voice or an instrument. Sound only reveals the direction of its source, maybe of its movement, never its location. In short, sound, much more than things visible, invites us to join an orgy—rock and electronic amplifiers are the body's rapture: sounds invade and resound in us, and in this resonance we exhibit the intimacy of our own flesh. Sobbing, crying, laughing are sonorous, too. We can say that the body of hearing is denser, more opaque and erotic than the body of vision, which is always more structured, more transparent, more cerebral. The magnificence of the voice and its texture, of the throat's contribution to vocal sonority, as Barthes puts it, helps us understand why sonority is much closer to the body and the rustling of life: the audible carries the silent bodily rhythm, the tempo of existence, the density of affect.

### **Forms of Synesthesia**

Have I dramatized the chasm between the visible and the audible, between ear and eye? It could be objected that, like the field of hearing, the field of vision has its indices, signs, and significance, and that even the visible side of the natural world leaves a great many secrets to decipher and indices to follow. Some will object that in the plastic arts, which are all the more visible, the deeper meaning that is worthy of interpretation resides in the margins, which are only a *virtual* presence. It is true that what is visible stands out against the horizon of the invisible, which is to be represented like the unrepresentable. It is as if the eye listens (as the title of one of Paul Claudel's works goes), *as if vision is listening* for the invisible. It seems that one can put one's ear to vision, as well as put one's eye to hearing. It was Rousseau who wrote, in his entry on 'Imitation' in the *Dictionnaire de musique*: 'Music seems to put *vision into hearing*; and the greatest miracle of an art form that only works through movement is to be able to create so much as the *image of quiet*. Nighttime, sleep, solitude and silence join the great *tableaux* of music' (1826 edition of Rousseau's *Dictionnaire de musique*, p. 446; quoted in

Dufrenne 1990). The eye joins hearing, as the ear joins vision when ‘the eye is listening’.

But what exactly does it mean to say that the eye is listening; what is understood by the *as if* implied in that statement? Aren’t we dealing with a simple metaphorical relation here, or even with fortuitous and gratuitous analogy? Metaphoricity is a possibility, not so much because hearing replaces vision as a sensory channel as because a range of predicative properties belonging to the auditory domain start to prevail. In this case, undoubtedly, polysemic words are being exploited, which mean something different at each level: that ‘the eye is listening’, then, would be a mere question of linguistics. But are metaphors to be taken *literally*? Do we really have to take Messiaen seriously when he condemns the juxtaposition of the color purple and the chord of G major? The analogical *as if* seems to take on existential reality for the composer.

This was already noted by Aristotle, and later by Kant, who opposed metaphorical (discursive) analogy to sensible analogy by appealing to synesthesia, which Aristotle (1986) called *aesthèsis koinè*, or ‘common experience’. The specialized senses—vision, hearing, touch, taste, and smell—can combine into one sense when the experiences of the different senses meet in one object, that is, as a conglomerate of several sensible properties, such as the experience ‘of bile that it is bitter and yellow’ (Aristotle 1968: 425b3-5). But there is the other, more enigmatic instance of true synesthesia that occurs when a sensible quality is transposed from one sensory level to another. Aristotle’s own example is that of the *sharp sound*, where ‘sharp’ is being transferred from the domain of touch (a sharp knife) to that of hearing. *Cold* or *warm* colors are another example. Aristotle explains that this is not a predicative but a *sensible* transposition: the sharp sound is *felt* to ‘cut’ us and hurt the ear just as the knife cuts and hurts the hand (1986: 439b22-24). We can speak of analogy in these instances, but the analogy largely transcends the semantics of words: it relates to our very *sensibility*. How is *aesthèsis koinè, sensus communis* applied to sensibility to be understood? What is the status of an *as if* that is being felt, hence being lived?

A conception of synesthesia in terms of metaphoricity has just been rejected. We will also have to reject the minimalist conception claiming that synesthesia is a mere synthesis of sensations elicited by one and the same object in the various senses: the object in question can be seen and heard and felt without triggering more than an association of the different sensations. According to this option, nothing more than a conjunction of sensations has been established, and there is

no *as if* relation intrinsic to sensibility. Yet it remains to be explained why and how objects are being *looked at as if* they were being touched, *as if* they were being listened to. Experimental psychology has not come very far in this area, and a more or less exhaustive description of more complex forms of synesthesia than mere *colored hearing* remains to be found. In this respect, Rimbaud's famous sonnet will surely come to mind: 'A noir, E blanc, I rouge, U vert, O bleu, voyelles...', as well as similar equations suggested by the poets of symbolism. It is not just the vowels that call up color associations, but also notes and tonalities (the following similarities can thus be found: E is an intense and slightly lucid red; A is black and grey; G major is red, etc.—see Lauries 1908: 30).

An explanation of synesthesia can be offered by two approaches, the first of which is phenomenological, the second epistemological. Merleau-Ponty has put forward the phenomenological explanation of synesthesia in a few illustrious pages (1967: 225–42). He willingly speaks of *communication*, and not of association, among the different senses: the intersensory relation of communication is facilitated by the primary unity of touch. In Merleau-Ponty's view, the articulation of the sensory system into the five senses presupposes an undifferentiated base where the senses are blended: vision, or any other sense, has not yet established itself strongly enough to fulfill a clearly defined role. This is why Merleau-Ponty was able to write that 'the brittleness, hardness, transparency, and crystal ring of a glass all translate a single manner of being' (1967: 319). An object's unity is pre-esthetic, and it is the confusion of *feeling* that is capable of recovering the real or worldly union called *flesh* ('chair'), the presensory experience preceding sensory differentiation. Can the mode of being of a glass, the object's unity thus simultaneously be translated into a sound, an image, or a 'tangeme'? Merleau-Ponty quickly lapses into paradox because he has to admit that the subject is capable of perceiving this pre-esthetic sense, because he is no more than an undifferentiated, unconscious, and prereflective corporeal system himself. How, then, does he 'perceive' this? Through *Einfühlung*, empathy with the world's *flesh*; for my body, too, is cut from sensible fabric.

The finest analyses do not succeed in masking the fact that any reduction of synesthesia to the pre-esthetic continues to privilege one sensory register—vision in *The Phenomenology of Perception*, and touch in *The Visible and the Invisible*. The latter work suggests that the visible and the audible synesthetically 'communicate' on the basis of fundamental *touch*, the origin of the entire system of sensibility, and hence of all the senses. Both eye and voice, vision and hearing

are able to ‘touch’: communicability and intersubjectivity are to be interpreted in terms of *affect*, *affection*, *affectivity* even. Phenomenologically speaking, synesthesia redirects experience, which is produced through the specific sensory channels, to its common origin, the pre-esthetic, fundamental touch. The methodological problem is quite obvious: in this case, touch is said to be simultaneously esthetic and pre-esthetic, which is a position that is paradoxical and hard to defend.

The notion of presensory experience creates a paradox. Phenomenological thinking faces many difficulties for wanting to reside near the origin of sensibility. The epistemological—or cognitive—approach is much more modest: it abandons any search for origins to focus on the symbiosis of experience itself. This symbiosis is then said to be the product of the subject’s *imagination*. When Kandinsky refers to yellow in terms of sonority, or when Merleau-Ponty suggests *visually perceiving* the fragility and sonority of glass, it is because synesthesia has to be attributed to imagination.<sup>3</sup> In overly simplistic terms, the subject could be said to possess *sensible* competence—which is evidently rooted in experience, and therefore depends on the specific possibilities of the five senses—and of *cognitive* competence, which generates beliefs and convictions on the basis of the workings of the imagination. In this case, there would be no primary unity of the sensible: the supplementary faculty of imagination would be responsible for the *communication* between the senses.

This view can fruitfully be modified by accepting that communication between the senses transcends mere *association*. Kant already claimed in his psychology that associations, far from being fortuitous, hinge on the affinities of the various sensations. These affinities, however, continue to fluctuate depending on the specific cognitive positions of the subject: from lunacy and madness, over dreams and fantasy, to esthetic experience—all possible forms of synesthesia. In order for there to be synesthesia, the subject has to be simultaneously sensitive and capable of epistemically (cognitively) modifying his sensations. Nevertheless, the old problem of the primacy of *vision* resurfaces in the end: imagination, as the main cognitive cause of synesthesia, continues to manipulate *images*. Or could we conceive of imagination as void of images and autonomous in respect to vision?

### **Esthetic Forms of Synesthesia**

Let us now look at the specific type of synesthesia that marks esthetic experience. We are specifically referring to the symbioses of the plastic and the poetic-musical

here. That music and painting are mutually inspiring, especially in contemporary art, has often been said and studied: at times, these confrontations are superficial and anecdotal. A more substantial level of comparison has been reached by Kandinsky in *Über das Geistige in der Kunst*, which claims that no osmosis of music and painting is desirable because, he says,

Music has duration at its disposal. Painting, however, gives to the spectator—privilege unknown to music—the total and instantaneous image of a work. Since music has completely freed itself from nature, it no longer has any need for any of its forms. Painting, on the other hand, always has to be satisfied with forms borrowed from nature. (Kandinsky 1977)

Yet there are types of synesthesia involving colors and sounds whose objectivity Kandinsky confirms. Barthes, too, has questioned the all too radical dichotomization of the plastic and the poetic-musical. He refutes, in *L'obvie et l'obtus*, the idea that the temporal arts, and music in particular, should have to be especially intimate and untouchable, whereas the spatial arts, given their distance, are said to be objective, transparent, and exterior. Barthes's plea, rather, is for 'communication' between the arts; he thus reiterates one of Merleau-Ponty's concepts regarding synesthesia. Even the opposition between temporal and spatial forms of art can be subverted, as pictorial representations of time in painting can be found—pictorial *time*—as well as musical *space*.

The great artists have always conceived of a *Gesamtkunstwerk* in which all the arts were to be syncretized. Bayreuth is one of those dreams. One of the problems in aesthetics concerns the status of the syncretic arts, such as opera and dance, which impose a conjunction of the visible and the audible. The 'classifications of the fine arts' and the 'systems of the fine arts', dispersed throughout esthetic treatises, impose totally artificial limitations on the arts. Fascinating borderline cases, such as garden art, bear witness to the precarious nature of these classifications. The status of *garden art*, which since the seventeenth century has been the subject of passionate discussion, is unstable because garden art cannot be reduced to the other arts: the Italian garden is sculptural, the French garden architectural, the English garden overtly synesthetic, given its dependence on Chinese models. The great eighteenth-century theorists of the English garden extoll the *affective* garden, through which one walks awash in stimuli directed to all five senses. The French garden, the prototype of which is

Versailles, appeals only to vision. The affective garden (English or Chinese), on the other hand, offers synesthetic pleasures: the song of the nightingale, the scent of the roses, the taste of the fruits, the light touch of the walker's foot or hand caressing the surface of the lake, all experiences that are synesthetically communicated.

However, synesthetic communication takes place on the basis of the *affinities* within sensory diversity. This is not a question of phrasing, although language contains 'transartistic' metaphors that can be related to distinct sensory registers. The 'correspondence between the arts' would then be a merely semantic relation. We speak of melody and meter in relation to poetry as well as music, and of harmony in relation to all of the arts. Although the word 'harmony' can best be applied to music, designating the theory of chords within that domain, it is equally applicable to colors, and, in architecture, to volumes and quantities. A whole linguistic vocabulary has been brought into esthetics in order to characterize the esthetic object. Jakobson's theory of the functions of language—the poetic function in particular, as well as the metaphor/metonymy pair—has thus been considered capable of functioning as a transartistic language. This tendency must be rejected because it reduces synesthetic experience to a simple form of discursive experience. Moreover, the paradoxical nature of the phenomenological explanations has already been established: synesthetic experience is identified with an experience of the transsensible or the pre-esthetic. The idea that the arts, concretized as individual works of art, show *affinities* is to be much preferred; it is in this way that they 'communicate'.

It is in this light that Kandinsky must be read in *Über das Geistige in der Kunst*:

We could say that the same interior resonance can be achieved by different art forms. Every one of them, apart from this general resonance, thus produces the 'extra' that is specific to it, corresponds to its very essence, and increases the power of the general interior resonance by enriching it with possibilities that transcend the resources of a *single* art form. (Kandinsky 1977)

There is no question, therefore, of transferring or translating one form of art into another. Synesthetic experience is not possible without the power of imagination, which creates the subject-esthete by bringing the affinity of sensory diversity into being.

The relationship between Kandinsky and Schönberg informs us on this affinity, which makes possible the communication between the arts. The musical fluidity of Kandinsky's paintings has often been noted, as have the perpetual color changes of Schönberg's rare sonority.<sup>4</sup> Both artists themselves have reflected extensively on the phenomenon of the *inversion* of time and space in painting and music. The problem we are concerned with here is not the representation of time in painting, the representation of an unrepresentable margin. Rather, the question would have to be: how about the visualization of sonority, the spatialization of something as essentially temporal as musical sonority? Spatialization of sonority may be found at various levels. At the level of acoustic reception, composers like Stockhausen use spatial projection by multiplying the points of emission of the musical work. A great number of contemporary compositions are structured as a function of the environment available. Another mechanism of spatialization consists in the addition of sound recordings or synthesizers to support vocal or instrumental music. These examples obviously illustrate 'exterior' spatialization—which, incidentally, is less interesting, as it is of a less structural nature. The synesthetic experience of the receiver who 'lives' sonority as if it were visible is of a much more powerful sensible intensity.

No systematic description of musical perception can be found in Husserl's work, nor even in Merleau-Ponty's. From the philosopher of *The Visible and the Invisible* we may recall the insight that the perceptive experience of the work of art is rooted in the corporeality of the perceiving subject. It is the spatial positioning of the subject that organizes space, the natural world, and even intersubjective relations. The specificity of the object of perception, moreover, calls for a modulation of the relative importance of the senses: it is obvious, for instance, that if the object is musical, hearing will be privileged among the senses—without, however, completely neutralizing the others. When spatial qualifications, such as *clear*, *dark*, *rounded*, *pointed*, *low*, and *high*, are used for the description of musical experience, they point to the immediately synesthetic nature of musical experience by including vision, and even touch or taste. The quality of a sound (the middle range of an oboe can alternately be perceived to be nasal, clear, hollow, and harsh) is naturally being modeled by our corporeal 'attitude'. That the body 'perceives' *space* when listening to a piece of music means that register, duration, quality of sound, and intensity are recognized as objects in movement that present themselves as 'shale', as a superimposition of different layers. This is why musical duration is typically perceived as a *line*—yet another spatial form. This line has its own

solidity: it is continuous, yet able to contain ‘holes’. It is a line that rises, descends, mounts and falls; it develops in a fluid or uneven manner, it bifurcates or stabilizes, it crosses other lines, it diverges from or blends with other lines, surfaces, and volumes. Yet musical space is not geometrical: it is not equivalent to the sum of the distances between physical objects. Moreover, musical space is not just one section of a more encompassing space: it emerges from the musical work itself without ever transcending it. Musical space, to say the least, is lived space, vital movement, an area of interest. No wonder that some analysts, such as Thomas Clifton, do not hesitate to quote Heidegger on musical space, and to call upon an arsenal of concepts from *Being and Time*: being-in-musical-space or ‘inhabiting’ music. Being intent on tones of the upper register, for instance, implies the listener’s personal involvement, the intensity of a Heideggerian *Erlebnis*.

Let us distinguish, with Clifton (1983: 140ff.), among three forms of musical space: line, surface, and depth. The *line*, as we have said, is first of all perceived to be thin or thick (Gregorian chant, for instance, is a thin line, that of melody). Even in an apparently simple case, however, there are complicating factors to analyzing the perception of the musical line: outline, width, distance, timbre, rhythm. Moreover, a line gradually, and without categorial rupture, changes into *surface*. Musical surface can be undifferentiated, or it can have an unmarked or highly marked relief. The experience of musical surface usually requires the absence or suspension of movement, the absence of dynamic contrast, and the absence of tonal complexity. The surface could in fact be said to spatialize the line even more, because it seems to eliminate all temporality. The experience of musical surface, therefore, is also the experience of infinity, or eternity. This perceptive effect has been reached by a great number of contemporary compositions, such as Ligeti’s *Atmosphères* and *Lux Aeterna*, Schönberg’s *Five Pieces for Orchestra*, and Berg’s *Lyric Suite*. The perception of musical surface goes hand in hand with a certain experience of anonymity and the absence of tension. In instances where the surface is more markedly highlighted, however (Bach, Beethoven, Chopin, Debussy), it changes, again without categorial split, into a three-dimensional *volume*, thus opening up the possibility for the experience of *depth*: the Prelude to Book I of *The Well-tempered Clavichord* would be an example. The sonorous structures ‘behind’ other sounds are perceived; the surface turns transparent and allows the listener to see the more ‘hidden’ phenomena underneath the superficial layers. Naturally, we can mention Romanticism in this context (Brahms, Schu-

bert, and Beethoven—the *Quartets* of the intermediary period in particular), and note that whereas the Romantics produce musical works that resound in the listener's experience as being 'deep', most of the contemporary productions in music exhibit rather 'opaque' surfaces.

We could have referred to the status of musical scores, another aspect of musical space, and alluded to Schenker's studies, which are crucial to the theory of musical text and are well appreciated by musicologists; they relate to *Ursatz*, a kind of abstract 'text' that runs through the musical work at some profound level. But certainly it has not been claimed that the spatialization of musical time, or the visualization of sonority, might destroy the original temporality of music as a sonorous chain. In addition, the many-sidedness of music must be related to the categories of *rhythm* and *tensivity*, which are central to any semiotics of musical time. The perception of musical time as *still* and *halted*, or *fleeting* and *passing*—spatial categories—is purely synesthetic: it is the eye that listens; vision is put to hearing. The passage from one sense to another is being constructed without making the abyss disappear. Esthetic experience strongly exploits the five senses in their perceptive specificity and synesthetic 'communication'.

## Notes

1. My analyses owe much to Dufrenne's (1990) phenomenology.
2. See the interesting book by Lourdes (1908), which lists a few important instances of colored hearing in its pathological versions.
3. This is Dufrenne's position (see 1990: last part).
4. For details see Parret 1988, especially chapter 10.

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## **Relations between Verbal and Visual Semiotics**



# **Hand and Mind<sup>1</sup>**

David McNeill

Gestures are seemingly trivial, but actually they are interesting and crucial components of language. By studying them, in conjunction with language (not in isolation), we gain new insights into the nature of language itself: how we produce it, how thought and language are related, and how different languages engender differences of thinking. Basically, we discover that languages contain not purely words, phrases, sentences—languages also have imagery: they have a global, instantaneous, noncompositional component that is as defining of the existence of language as are the familiar linguistic components.

What kinds of gestures do I mean? Not all gestures provide a clear view of the imagery of language. To differentiate types of gesture, I will present what can be called—after Kendon (1988), who first distinguished gestures in this way—Kendon's continuum:

Spontaneous Gesticulation → Language-like Gestures → Pantomime → Emblems  
→ Sign Languages

As one goes from left to right on this continuum, a number of important changes take place:

- (1) The obligatory presence of speech declines.
- (2) The language-like properties of gestures increase.
- (3) Idiosyncratic gestures are replaced by socially regulated signs.

We focus on the gesticulation end (not on pantomime, emblems, or signs). Sign languages (of which ASL is a familiar example) are full-fledged linguistic systems, complete with socially established grammars and lexicons and a historical tradition. Emblems also are descendants of historical traditions, some quite deep (Kendon 1981). They tend to occur in the absence of speech, since they are language substitutes (rather than language accompaniments or components). Furthermore, they are culturally constituted and have standards of well-formedness, and thus are not idiosyncratic in their manner of production. What is meant by pantomime is difficult to specify, but generally the term describes dumb

show—again, co-occurring speech is not obligatory; to the contrary, the absence of speech is often obligatory. When we reach ‘language-like gestures’ we encounter gesticulations that are obliged to accompany speech, but do so in a special way. Such gestures do not strictly co-occur with speech, but fill a gap deliberately left open in the sentence. They occupy a defined grammatical slot and are a linguistic segment: for example, ‘but the kids are [ ]’, where the brackets mark a gesture expressing disgust (Kendon 1988).

What Kendon termed gesticulations are the gestures we study, and they differ from signs, emblems, pantomime, and language-like gestures in all important respects: with gesticulation speech tends to be obligatory (90 percent or more of such gestures occur during actual speaking). The gesture lacks language properties and is an idiosyncratic production by the individual speaker at the moment of speaking. The manner of expressing meaning in gesture and language is also different. Whereas language divides meaning into segments and combines the segments into patterns according to grammatical rules, gestures present meanings holistically and synthetically: holistic because the parts of the gesture are meaningful only as parts of the whole; synthetic because the gesture combines into a single symbolic form elements of meaning that in speech may be divided among several constituents. The hand moving forward at eye level with downward wiggling fingers is a gesture. Accompanying the utterance, ‘and he’s running along the wire’, it depicts a cartoon character escaping across overhead trolley wires, pursued by a menacing trolley. The parts of the gesture—its locus, trajectory, form, moving fingers, etc.—depict the character and his running feet. However, the depiction is holistic. We know the significance of the locus, movement, and wiggling fingers only because we know the meaning of the gesture as a whole. It is *not* that the fingers, independently and in another context, mean feet or, for that matter, anything else. The gesture is also synthetic. It gathers into the one symbol—the hand moving away in the upper space in a certain way—the several components of meaning presented by the full constituent structure of the sentence. The holistic-synthetic semiotic mechanism of the gesture is quite different from the linear, hierarchical, and segmented mechanism of the utterance. Yet despite their opposite semiotic mechanisms, gesture and utterance coexist, they are constructed at the same time, and combine into a *single system of meaning*. This is the chief lesson I will attempt to explain and defend in the paragraphs that follow.

## Procedures

First, I will explain briefly our set-up and method, and give an example of gesture transcription (for details, see McNeill 1992).

### *Experimental Setting*

Subject 1 watches cartoon (or film). The task is presented as an investigation of storytelling, and gestures are not mentioned.

Subject 2 enters room and sits down. Both subjects are told that Subject 1 will tell the story to Subject 2. Subject 2 will then retell the story to a third person (this step is usually not taken; the instruction is meant to motivate Subject 1 to render the story fully and comprehensibly).

Subject 1 tells the story to Subject 2.

Performance is videotaped.

Gestures occur spontaneously. The videotape is transcribed according to a protocol that focuses on the semiotic categories of the gestures, their timing with respect to speech, their viewpoint, and the meanings of the gesture and its components.

### *Example Transcription of an Iconic Gesture (Figure 1)*

Speech	so he's [LOOKING <u>at</u> ] Tweety Bird
Gesture type	iconic
Which hands	2 similar hands
Shape	O-hands
Palm/finger orientation	Palm to Center and fingers at body
Hand place	At eyes
Motion shape and place	H=Sylvester's hands holding binoculars
Motion meaning	M=no motion
Body meaning	B=Sylvester
Space meaning	S=space between Sylvester and Tweety
Gloss	Sylvester is looking through binoculars at TB
Viewpoint	C-VPT (Sylvester)

Beat filter

4 (highly unlike a beat)

Confidence

5 (metaphysical confidence)

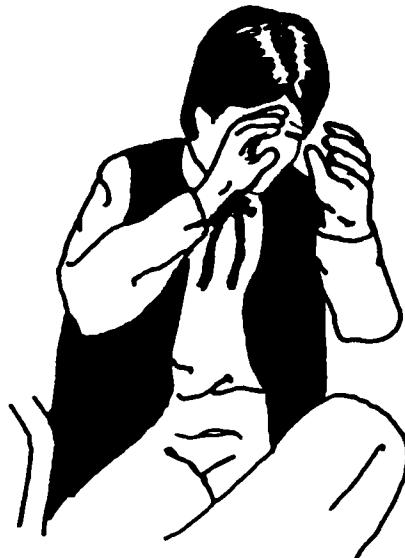


Figure 1. Iconic gesture showing a character looking through binoculars.

**What do we see with this set-up and transcription method?**

We distinguish four types of gesture in our classification system: iconic, metaphoric, beat, and deictic.

#### *Four Types Of Gesture*

ICONICS display concrete aspects of the scene.

METAPHORICS display images of abstract concepts and relationships.

BEATS mark with baton-like movements words that are significant, not purely for their semantic content, but for their discourse-pragmatic content.

DEICTICS (abstract) create locations in gesture space for abstract concepts or relationships.

### Examples of the Types of Gesture

Iconics appear with descriptions of concrete narrative content (McNeill and Levy 1982; Cassell and McNeill 1991).

#### *Iconic Gesture with Post-Stroke Hold (Figure 2)*

he grabs a big [oak tree and HE BENDS IT way back]

*Preparation   Stroke      Hold*

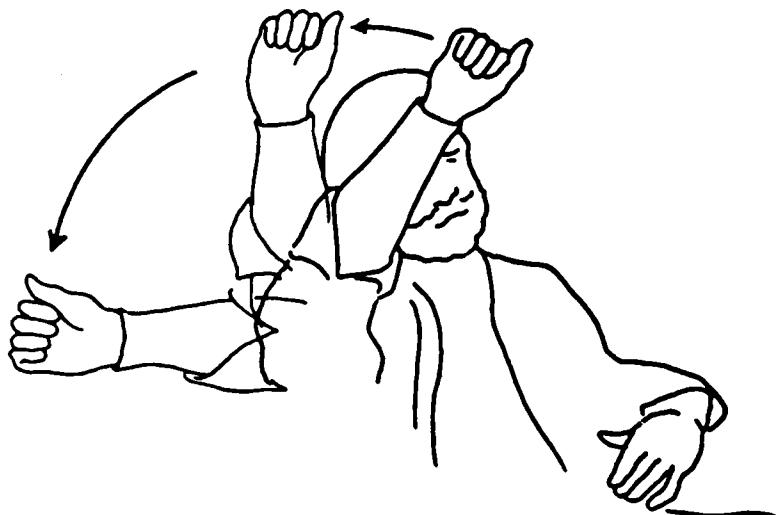


Figure 2. Iconic gesture showing a character pulling back a large tree

Metaphoric gestures appear when the speaker is making explicit not the concrete events of the story, but the structure of the story, which the speaker himself is creating. Thus, for example, metaphoric gestures appear when the speaker identifies the genre of his upcoming narration.

#### *Metaphoric Gesture at Start of Narration (Figure 3)*

it [was a Sylves]ter and Tweety cartoon



Figure 3. Metaphoric gesture showing an abstract concept (the genre of the upcoming speech)

Beats appear in a variety of places, such as when the speaker is introducing new characters for the first time or summing up the action. The next example is a summation (the speaker is not describing any specific act of looking, but summarizing a general pattern).

*Beat Gesture when Summing Up (Figure 4)*

when[ever she] looks at him he tries to make monkey noises

Abstract pointing carries with it the implication of orienting to something new. The gesture depicts orientation to a target from an origo (cf. Buhler 1934 for this term). In the case of abstract pointing, the target is not physically present, but is created by the gesture itself (McNeill et al. 1993). In this example, taken from the early stages of a conversation between two previously unacquainted students, the speaker is trying to introduce a new topic of conversation (where the other student had gone to college), and points into the shared interaction space, which now stands for some place in the past.



Figure 4. Beat gesture indexing a metanarrative reference

*Abstract Deictic in a Conversation (Figure 5)*

[where did you] come from before?

**'Language of Gestures'**

A key assertion in this paper is that such gestures are actually part of the language process. At the core of the language process, at its inception in each individual speech act, is imagery as well as a linguistic sense. A number of arguments can be cited for the claim that gestures are part of language; here are some.

*In What Ways are Gestures Part of Language?*

- Gestures occur only during the speaking turn.
- 90 percent occur while actually producing speech.
- Gesture and speech are co-expressive; that is, they cover the same idea unit.
- Gesture stroke is part of utterance; that is, it is presented at the same time as the most co-expressive linguistic component.

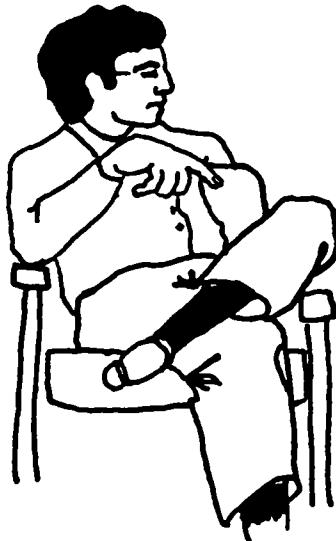


Figure 5. Abstract deictic gesture indexing a topic of conversation in space

- Gesture is not triggered by language.
- Gesture is not an alternative to language.

Yet gestures are also very *unlike* language. This juxtaposition of like and unlike modes of cognition suggests a minimal unit of verbal thought in which two representations must combine and not be reduced to one another—one imagistic, the other a language category. I will describe this kind of unit below in the section on the growth point.

#### *In What Ways Are Gestures Different from Language?*

- Gestures are global.
- Gestures are synthetic.
- Gestures do not combine hierarchically.
- Gestures are idiosyncratic.

#### **Iconic Gestures in Different Languages**

Iconic gestures are remarkably similar cross-linguistically. Speakers who are representing the same story event produce very similar gestures, despite major

differences in their languages. This is not surprising if the gestures reveal aspects of the thought processes underlying language. In the following examples each speaker is describing a scene from the cartoon where the bird expels the cat from a pipe by dropping a large bowling ball down into it. The speakers all perform a downward thrusting gesture. The gesture is timed to coincide with the element that most closely describes, in each language, the downward thrust. The meaning of downward movement is thus presented at the same time in both speech and gesture, and this phenomenon of co-expression exists in all three languages—English, Georgian, and Swahili.

*English (Figure 6):*  
 [and ØTweety drops IT DOWN the drainpipe]



Figure 6. English-language iconic gesture showing a character dropping a bowling ball into a pipe

*Georgian (Figure 7; trans. by Kevin Tuite):*  
 da uzarmazar rk'in-is b\* [ØTweety burt-s CHA-A-GDEB-S]  
 and enormous iron [ØTweety ball THROW-DOWN]  
 'and threw down an enormous iron ball'



Figure 7. Georgian-language iconic gesture showing a character dropping a bowling ball (called an 'iron ball') into a pipe

*Swahili* (Figure 8; trans. by Karen Peterson):

[i-ka-chuku-a li-mpira fulani i-ka . . . TUM] bu-iz-a  
and take tire certain PUSHED-DOWN  
and found a certain tire and pushed it down'

Thus iconic gestures are similar and linked with speech in highly similar ways despite the radically different linguistic systems in which the speakers were constructing their verbal descriptions—in English VO, in Georgian OV, and in Swahili a single polymorphic verb into which was built a subject marker, a continuation of tense marker, a verb root (with which the stroke coincided), a causative suffix, and an indicator of indicative mood. Even though each language required its speakers to construct sentences widely divergent from the sentences of the other languages, the combinations of speech and gesture in each case were essentially the same.



Figure 8. Swahili-language iconic gesture showing a character dropping a bowling ball (called a 'certain tire') into a pipe

### Metaphoric Gestures in Different Languages

On the other hand, metaphoric gestures often appear to be cultural products, specific to a given cultural tradition, and replaced by metaphoric gestures of other types by speakers from different traditions. Idea units involving abstract meanings may thus also prove to be cultural products.

Cross-linguistic examples suggest that one kind of metaphoric gesture—a bounded entity with a substance inside that is passed to a communicative partner over a path or conduit, what can be called the *conduit gesture*—is common in the West but rare and unevenly distributed elsewhere. This cup-of-meaning image of meaning, language, thought, art, etc., is a metaphor in Europe, North America, and the Caucasus for many abstract ‘contents’ (cf. the verbal conduit metaphors described by Reddy 1979, and Lakoff and Johnson 1980). Indeed, the conduit gesture is quite old in the Western tradition. Here is a description of an entire series of conduit gestures performed by Zeno (fifth century B.C.); the description

is by Montaigne (himself sixteenth century). Zeno, according to Montaigne, used four variants of the gesture to present degrees of knowledge:

Zeno pictured in a gesture his conception of this division of the faculties of the soul: the hand spread and open was *appearance*; the hand half shut and the fingers a little hooked, *consent*; the closed fist, *comprehension*; when with his left hand he closed his fist still tighter, *knowledge*. (Montaigne 1958)<sup>2</sup>

The conduit appears in the Georgian narration, a non-Indo-European language of the Caucasus, but also a part of the Graeco-Roman cultural tradition.

*Cup-of-Meaning Conduit Metaphor in Georgian* (Figure 9; trans. by K. Tuite)  
magalitad ... uh [raghac] det'alebs  
for-example... uh [certain kinds of] details-DAT  
'for example certain kinds of details'



Figure 9. Conduit metaphoric gesture by a Georgian language speaker

In contrast, convincing examples of the conduit metaphor are not found in narratives recorded in an anthropological film, *Lorang's Way*, shot in Kenya and featuring Turkana tribesmen living in the traditional way (MacDougall and MacDougall 1977). In the film speakers produce large numbers of metaphoric gestures, but the metaphors are not the bounded entities into which meaning can be placed that the conduit metaphor introduces; rather, Turkana metaphoric gestures for knowledge and other universal abstract human concepts seem to be images of (perhaps) birds or wispy smoke:

*Non-Conduit Metaphors in Turkana* (Figure 10; trans. by R. Dyson-Hudson)

toditarite ngitunga [lu na kilna yoka ... nith!]

they-extract people [this-here knowledge our-inclusive ... pft!]

'these Europeans want to extract all our knowledge ... pft!'



Figure 10. Non-conduit metaphoric gesture by a Turkana language speaker

The conduit metaphor is not confined to the West, however. For example, Japanese speakers (living in the U.S., at least) perform conduits in abundance. On the other hand, Chinese speakers (including those living in the U.S.) do not produce convincing conduits at all (their cup-like gestures are iconic, they depict

real containers; in Chinese narratives, images of abstract meanings are *formless* substances, gesturally laid out before the speaker, and then ‘touched’). Thus within a connected cultural tradition, the tradition that includes the Caucasus, Europe, and North America, the conduit appears with seeming universality; outside this tradition the cup image appears intermittently, existing in one culture, absent from geographically neighboring ones.

Metaphoric gestures have a powerful rationale; they provide images for abstract concepts. Such images answer the same functional needs as do iconic gestures. They provide a holistic and synthetic semiotic that combines imagery with segmented language categories, and thus create the same kind of meaning system—idea units of image and word—as do iconic gestures. This fundamental fact about abstract meanings provides a *raison d'être* for metaphoric images. Metaphors are a way of meeting the need in verbal thought for imagery.

But since abstract content does not map topologically onto images, the image content must be supplied, and this is a role of cultural norms. An argument can be proposed that metaphoric gestures must be cultural products. Metaphors are images of inherently nonimagistic abstractions, ideas that, by definition, lack visuospatial reality. Images of abstract content, by the very nature of abstract content, thus presuppose input; not surprisingly, therefore, we find the conduit (and other metaphors) to be cultural products, limited to certain traditions, leaping over adjacent ones, and not universal. Even the ‘same’ abstract concept, such as human knowledge, is free to take on different imagistic forms, as we saw in comparing the conduit image to the Turkana image (in contrast, upward motion is a potential iconic gesture for climbing up in every culture).

### Gestural Coding of Aspect

As is well known, aspectual marking in English is only partial. The most basic aspectual distinctions, those between perfective-imperfective, are merged with the tense marking system—a quite different meaning dimension, locating events in time relative to speech events, rather than taking temporal perspectives on events (Comrie 1985). Only the progressive is clearly signaled with the inflection ‘-ing’, and this marks part of the imperfective, but just one variant. The main burden of aspect in English is carried by a variegated set of periphrastic and lexical vehicles. For example, in addition to the systematic use of the progressive ‘-ing’, another

imperfective variant, the durative, is conveyed with certain adverbial constructions ('while I was waiting at the stop light...'), certain periphrastic constructions ('it keeps breaking down'), certain double verb constructions ('run screaming'), and by still other forms in a hodgepodge of linguistic elements recruited for the purpose. Perfective is equally *ad hoc*, and uses lexical distinctions: 'to pummel' vs. 'to hit', or 'to eat' vs. 'to eat up'. Susan Duncan (1992), from whom these examples come, has compared the gestures of English speakers who mark aspectual distinctions in such variegated ways to the gestures of Mandarin Chinese speakers marking the same distinctions. Chinese, in contrast to English, has a fully systematic set of morphological markers for aspect. The progressive is indexed by 'zai', the durative by '-zhe', and the perfective by '-le', each a single-syllable element. Chinese gestures, too, differ for aspect. Gestures with the perfective marker are *shorter* than gestures with the two imperfective markers (0.2 sec vs. 0.7 sec), while the two imperfectives do not differ from each other in duration. More strikingly, the gestures were qualitatively different depending on the aspect. Perfective gestures were simple movements, while imperfective gestures were complex, often marking manner and often involving both hands performing distinct but coordinated movements. The manner marking was more likely with progressive gestures, and the two coordinated hands with the durative. Thus, all aspectual distinctions were registered in Chinese gestures. One can see the semantic appropriateness of short simple gestures for perfective, prolonged manner-marked gestures for the progressive, and prolonged two-component gestures (one the landmark) for the durative, the gesture depicting both what endures and the reference point with respect to which duration is reckoned.

A quite striking observation in Duncan's results was the fact that the *English*-speaking subjects also displayed these same gestural distinctions: English-speaking subjects, too, had short simple gestures where perfectivity was registered in speech, long manner-marked gestures with progressive '-ing', and long two-component gestures where some kind of durative form appeared. Thus we see, in this similarity, that conceptual distinctions can appear underlying quite different linguistic realizations. As befits a level of thought, the differences in perspective we describe as aspect appear in English as in Chinese, despite the *ad hoc* character of the English way of indexing them. This phenomenon rules out one hypothesis concerning the source of gestures, what may be termed the L → G model, meaning that gesture is sequentially and structurally dependent on language (Schegloff 1984). According to the L → G model, a gesture cannot have content that is not in

speech, since this would involve an input outside of L; but this is indeed the case when gesture has content that is lacking from the linguistic system or is marked in highly varied *ad hoc* ways, as is the case with English aspect. Gesture taps thought processes, it is not just a response to some prior verbal signal. This conclusion will be important in my later discussion. I now wish to demonstrate some of the richness of the language-gesture system.

### Dynamics at the Language-Thought Interface

By studying gestures in synchrony with speech, it is possible to uncover aspects of the dynamics of how thought and language meet. Gesture provides fresh insights into what can be termed the language-thought interface. A powerful technique is to compare descriptions of the same event in two languages by the same fully balanced bilingual speaker. This method was invented by Sotaro Kita (1991), and yields many examples such as the following. The speaker first retold the cartoon in English to an English-speaking listener, and then, separately, in Japanese to a Japanese-speaking listener. Identical iconic gestures occurred in both versions (the hand moving transversely), but the timing differed.

*Two linguistic systems interfacing with the same gesture (in the same speaker)*  
 he [RUNS ACROSS the street]

[MITI O wata te]

[ STREET ON run]

'runs on the street'

The movement (in caps) depicts the running character; the post-stroke hold, a phase of arrested motion (shown by the double underlining), suspends the gesture until speech catches up and completes its presentation of meaning. The post-stroke hold is a way of keeping speech and gesture together, preserving their overall synchrony. The interesting point about the post-stroke hold is the following: it shows that the speaker had a different sense of undischarged significance in English and Japanese when the gesture movement ended (after 'runs across' and after 'miti o'). The post-stroke hold shows convincingly that the speaker had the ability to perform on-line comparisons of speech and gesture. It is therefore

meaningful to compare English and Japanese for what, on-line, would have seemed to the speaker still undischarged. Because of the typological contrast between the two languages, their informational profiles are different and the phases of the gesture interacted with speech in diametrically opposite ways.

We see that different meanings were left over in Japanese and English at the end of the gesture movement. This difference is not mere coincidence; the speaker presents the same meaning in both languages, but is forced to create opposite combinations of gesture and speech with which to do this. In English, the meaning not yet discharged was the street, while in Japanese it was the verb designating the action of running itself, *wata te*. In keeping with these contrasting dynamics, bilingual speakers of Japanese and English describe distinguishable language-thought intuitions. The verb, they feel, is at the core of an English sentence, while at the core of a Japanese sentence are objects and locations.<sup>3</sup> (Kita reports that Japanese speakers often use mimetic words with iconic gestures when the register—casual speech—permits. This makes sense in terms of speech-gesture dynamics, since the mimetic word, which is a true grammatical constituent of the sentence, appears in preverbal positions and thus provides, better than the typical sentence-final verb, a linguistic focus for the image.)

From this difference in dynamics, we see that languages may impose different dialectics between linguistic categories and holistic images, even when the image is visually/kinesically the same. That is, even though iconic imagery may be the same across languages, the dynamics of the language-image interface are different. Indeed, a difference is an inevitable effect of gesture and speech forming a single system of meaning. If a synthesis of image and word is to be carried out, it must unavoidably be a synthesis that differs, in part, across languages. A typologically mandated contrast of surface word order was involved in the examples cited above, but other structural differences between languages could have similar effects; in principle, contrasting dynamics could include morphological processes, lexical packagings, lexical subdivisions in one language that are absent from the other, and many other features.

### **Image Affects Language and Language Affects Image**

The following compares two arc gestures—one by an English speaker, the other by a Japanese speaker (different native speakers from Kita's project, not the fully

bilingual speakers); both speakers are describing a scene in which a character swings across a street on a rope:

ENGLISH: n'...you see him swinging down [ACROSS the] rope

*Hand makes arc movement*

JAPANESE: ton[DE-KU MITAI]-na koto o yatta-ra

*Hand makes arc movement*

fly go like thing ACC did then

(the cat) did a thing like going by means of flying, then...

Both subjects performed a gesture that iconically depicts the trajectory of the character on his rope. What is striking about these examples is in fact the similarity of the gestures. For, although English has a verb, *swings*, that describes the arc trajectory of the character, Japanese happens to have a gap at this point in its lexicon; there is in Japanese no intransitive verb for arclike movements. Thus, speakers resort to paraphrases and other circumlocutions, as in this example; yet the gesture depicted the appropriate arc trajectory. These kinds of examples also rule out the L → G model, since here again gesture has content that is lacking from the linguistic system. The gesture depicts an arc while the speaker is forced to say instead something like 'by means of flying'.

However, gesture without linguistic input is not the whole story. Kita also found that his Japanese-speaking subjects often combined a *straight* path gesture with an *arc* gesture in describing this scene, whereas his English speaking subjects never added a straight gesture. Thus, in the Japanese gestures, where an accidental lexical gap existed, there was both independence from language (the arc) and a reflection of language (the straight path), but this was never the case in the English gestures. The following is an illustration from one Japanese speaker (Kita 1993):

[ano biru]	[kara biru e]	[Taazan no yoo ni]	noriutu	tte
<i>Hand points up</i>	<i>Hand in point</i>	<i>Left hand above right</i>		
	<i>moves straight</i>	<i>hand, and both arc</i>		
	<i>to left hand</i>	<i>downward</i>		
well a building	from building to	Tarzan GEN like DAT	change-location	and

'Well, (from) a building...from (a building) to another building changes location like Tarzan'

As Kita remarks of this and similar examples:

The straight gestures of the Japanese speakers show that a gesture is not simply a retrieval of a visual stimulus, nor a photographic reconstruction of an event. The shape of the gesture can change depending on the language even if the speakers 'know' the change would decrease iconicity.... This indicates that the generation of gesture is intimately related to linguistic encoding. (1993: Chapter 5)

This intimate connection to linguistic encoding is the point I wish to emphasize: image and word are in close processing contact. Traces of their contact can be found in both directions—image-to-language and language-to-image. The proper understanding of such a double influence requires some model of the mutual determination of image and word. Neither L nor G can be prior; neither dominates the combination, and they emerge together, influence one another, and ultimately combine into a single presentation of meaning.

### **Summary of the Main Points**

The examples I have discussed point to a new hypothesis about gesture and language: namely, that they are related interactively, in a dialectic that rules the emergence of speech and verbal thought viewed microgenetically.

- (1) Different languages have similar iconic images, despite wide variation in linguistic forms.
- (2) Languages differ in their imagery of the abstract, but every language creates images of abstract concepts. Thus an interaction of image and word is not restricted to topologically mappable (iconic) concepts.
- (3) Different languages have similar gestural depictions of aspect, despite the fact that one language lacks systematic means of marking aspect while the other employs fully systematic means. This observation rules out the  $L \rightarrow G$  hypothesis of gesture origin.
- (4) At the interface of imagery and language, dynamic relationships differ in contrasting languages, suggesting that dialectic of image and language is a mutual product of both sides of the equation. This rules out any simple form of a  $G \rightarrow L$  hypothesis.

(5) Finally, languages can induce changes in imagery, again suggesting an interaction of image and language.

These points can be comprehended under the hypothesis that language and gesture are in more or less continuous interaction during the microgenesis of utterances. Vygotsky, writing in the 1930s, described this dialectic in vivid terms:

The relation of thought to word is not a thing but a process, a continual movement back and forth from thought to word and from word to thought. In that process the relation of thought to word undergoes changes which themselves may be regarded as development in the functional sense. Thought is not merely expressed in words; it comes into existence through them. (Vygotsky 1962: 125)

### The Concept of a Growth Point

The *growth point* is the theoretical starting point of utterance formation viewed microgenetically—the utterance in its initial form as a psychological unit. A growth point is supposed to be a *minimal unit* of verbal thought—that is, the smallest unit that retains the essential properties of the whole. This is the concept of a psychological unit that was originally proposed by Vygotsky (1962). As inferred from gestures, the minimal verbal thought unit is an image and linguistic meaning category. Both sides of the thought unit are necessary. The image component performs an indispensable role in that it provides the *idiosyncratic content* at the moment of speaking. This content is strongly carried in visuospatial and kinesic form, as an image. The linguistic category component likewise is indispensable and locates this content within the *language system*.

The growth point thus combines the momentary context with the system of language from the start. The utterance and gesture emerge together according to a microgenetic perspective, over time, starting from the growth point. Because the utterance and gesture emerge together they intersect, combine, and influence one another. The final utterance is the embodiment of this interplay of image and the word, the continual movement back and forth of which Vygotsky spoke. The utterance is not a translation of one medium, image, into the other, language: to grasp it, we should not replace the Vygotskian minimal unit of simultaneous imagistic and linguistic poles with a succession of single poles.

The idea is that, in the microgenesis of the utterance, the growth point remains *intact* while the rest of the utterance is built up around it, as an unpacking of the implications of the growth point into presentable spoken form. Thus the gesture and maximally coexpressive linguistic segment co-occur, regardless of the linguistic system. The growth point may be withheld until a point late in the speech stream, and often is, for grammatical reasons, but it is the core of the utterance, regardless of its position.

Examples of growth points show that they come in great variety, but all are rhemes, the *least presupposed* elements in the context. They differ from the information flow emanating from *surface* starting points where the information typically starts in the theme—the point of *most* presupposed information (MacWhinney 1977; DuBois 1987). Here, to the contrary, the growth point is the locally defined point of novelty, of new information—what Vygotsky called the psychological predicate (as opposed to a grammatical predicate). This suggests a mechanism of growth point formation in which differentiation of the growth point from the background plays an essential part. Kita, in his dissertation, has proposed a succinct version of this hypothesis: the image component shows the departure of the next idea unit from the preceding context, while the language category component shows the incipient development of this idea unit into a well-formed utterance. This cycle repeats indefinitely, with growth points the linchpin of past and future in the realm of verbal thought.

The cross-linguistic studies described above suggest that growth points are identifiable in every linguistic system. We can observe the dynamics of thought units as they are unpacked into utterances in linguistic systems with quite dramatically different principles of form. However, the nature of the growth point is such that it cannot be independent of the linguistic system. It irreducibly includes language-specific meaning categories, and the concept argues against the possibility of language-independent idea units, but does so in a principled way. The growth point itself is a model of the place of language in conceptualization—namely, into the very genesis of thought language ushers culturally ratified categories.

### Conclusion

What do we thus learn? That language is (in part) image. The minimal unit, or ‘growth point’, of language and verbal thought has two components irreducibly,

only one of which is linguistic structure—‘imaginistic and propositional representations are interlinked dimensions of a message’ (comment by Steven Levinson).<sup>4</sup>

## Notes

1. The title is taken from a book published in 1992 (McNeill 1992), and expresses the close linkage I propose in the current paper and that book between thought, language, and gesture.
2. I am grateful to Josef Stern for providing me with this quotation.
3. I am grateful to Nobuko B. McNeill for this observation.
4. For more than a decade the cumulative research program on which this paper rests has been supported by the National Science Foundation Linguistics Program, The National Institute of Deafness and Other Communicative Disorders, the Spencer Foundation, and the University of Chicago Division of Social Sciences. Many details have necessarily been left out, and the book that is the namesake of the paper, *Hand and Mind*, can be consulted for extensive discussion. A large number of students and colleagues have contributed insights and ideas—far more than I can mention; but I would like specifically to thank Sotaro Kita for a preliminary look at his dissertation, from which I have quoted several examples and comments, and Susan Duncan for use of her examples and discoveries on the gestural indices of aspect.

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## **Verbal and Visual Semantics**

Fernande Saint-Martin

Whether as a positive or negative factor, the evolution of general semiotics is bound to produce after-effects in the development of visual semiotics. For example, recent trends in linguistics and the cognitive sciences render Charles Morris's division of semiotics into the syntactic, semantic, and pragmatic domains (1938), which had been adopted by visual semiotics (Saint-Martin 1987, 1990a), somewhat problematic.

Visual semiotics involves the study of visual representations which are part of a symbolic process, and not of all visible entities. The term 'symbolic function' is understood, following Benveniste (1966: 20), to be a process whereby reality is represented in the mind by signs, the meaning of which is defined as a relation of something to something else. These representations in the mind and their meanings can only be reached through their approximate translations into sensorial forms of linguistic representations, whether verbal or nonverbal.

While the habit has persisted, following Aristotle, of calling objects in the world 'natural signs' (or signifiers), they could more suitably be qualified as quasi-signs, similar to the quasi-facts described by Lewin (1936).

Natural objects cannot properly be called signs until they are used to signify something other than their own objective status or identity. A perceptual/conceptual description of natural objects has no 'meaning value' until psychic energy is invested in some of their parts so as to transform them into signifiers and signifieds in a representational world. The descriptive, causal, or functional characteristics observed by objective sciences in objects of the world, repertoried in encyclopediae, can be said to constitute a neutral body of knowledge more than semiotic meanings.

As Morris defined it, the semiotic study of signs may still find pertinent to deal with: (a) the relation of signs to what they signify; (b) the interrelation of signs within a combinatory syntax; and (c) the functions and effects of signs in a pragmatic context. But the frontiers between syntax and semantics, or pragmatics and semantics, have become extremely blurred, each domain interfering with and proliferating in the others.

Chomsky's attempts (1981: 79) to demonstrate that there exists a syntactical system of verbal language independent from any semantic preconceptions have proven vain. Other linguists have demonstrated that syntactical structures mirror underlying philosophical beliefs and carry by themselves specific semantic components (Chevalier 1968; Langacker 1983; Dervillez-Bastuji 1982).

Developments in pragmatic linguistics (Searle 1980; Fillmore 1977) emphasizing a contextualist interpretation have unsettled current semantic positions and led to new questions about subjectivity and intentionality, cognition and emotion (Jackendoff 1983; Lakoff 1980). If it is already part of syntax and pragmatics, semantics indeed appears in need of further definition (Fodor 1987).

It has been argued (Sonesson 1989) that the new discipline of visual semiotics, developed in Europe in the 1960s, has remained too subservient to verbal linguistics inherited from Saussure and Hjelmslev. But it has not been pointed out that the main handicap of these theories—which Greimas (1966) attempted to systematize—resulted from the very weakness and inadequacy of their semantic foundations.

As an example, Thürlemann readily recognized that the interpretations he was producing of several of Paul Klee's paintings (1982), supposedly through more rigorous semiotic analyses, were not different from, nor richer in content than, any spontaneous comments by art critics. But contrary to his belief, these discourses—with which creative artists are so dissatisfied—were not thereby validated. The exercise only made it more apparent that the semiotic procedure used relied heavily upon the very same restricted gestaltian perceptual processes effectuated by the common approach to visual representations. These perceptual behaviors are deeply rooted in the conventionalist, literal, or standard theory of meaning prevalent in Western traditions and imposed on the visual arts and representations (Hospers 1946). In both cases, semantic interpretations only follow the verbal identification of recognizable forms, as advocated by Panofsky's iconology (1982).

A dissatisfaction with theories of meaning offered by ancient or more recent philosophical trends was evident in the lengthy arguments in Ogden and Richards's pre-semiotic work, *The Meaning of Meaning*. They concluded: 'A study of the utterances of Philosophers suggests that they are not to be trusted in their dealings with Meaning' (1945: 185).

But no systematic effort has followed whose goal would be to produce some links or syntheses between the sixteen or so different definitions of 'meaning' these authors had recorded, originating from various points of view.

Taking a similar position, Morris later urged that semiotics accomplish some of the tasks traditionally assigned to philosophy, since the latter had been confusing in its own language the 'different functions of signs' (1938: 58). This promise, to clarify the semantic functions, has not yet been fulfilled within general semiotics nor philosophy. The challenge presented by the semantic interpretation of visual language may stimulate new efforts in this direction.

### **Philosophy and Semantics**

In his *Introduction à la sémantique*, the philosopher Tullio de Mauro deplored 'a general and troubling state of ignorance concerning the structures of the semantic universe' (1966: 199). From what he called a 'dread of meaning', he described a manifest retreat by philosophers and cognitive scientists from the consideration of a problem seemingly linked with mysticism or utopia. This negligence in the development of theories of meaning has led, in his opinion, to the pervasive contemporary skepticism—present in Croce as well as Wittgenstein—regarding the human potential for communication (1966: 138).

While failing to adequately put forward a sufficient reflection on the nature of the semiotic medium it was using and in general on the bases of signification, classical philosophy provides numerous instances of semiotic preoccupations. After the critical approaches taken by Bacon, Locke, Leibniz, or Vico, it is the 'silence of Kant' on the question of language that seems to have conditioned and reinforced a return to the Aristotelian 'order' in the twentieth century (de Mauro 1966: 62).

This theoretical absence has often been deplored by linguists as well as by philosophers. The grammarian A. Culoli states in unequivocal terms: 'Strictly speaking there does not exist yet any semantic theory' (quoted in Dervillez-Bastuji 1982: 62). The philosophers G. Lakoff and M. Johnson underlined the inadequacy of theories of meaning in Western philosophy and linguistics and their discrepancy with what human beings find 'significant' (1980: 4).

This lack of an adequate underpinning of philosophical thought in establishing semiotic foundations, both syntactic and semantic, within the universe of verbal expression reaches a peak when visual representation is called upon to clarify obscure concepts. Though dealt with superficially, considerations about visual language often play a key role in strengthening important philosophical positions.

As contrasting poles in the treatment of both verbal and visual semiotic problems, one could oppose Wittgenstein's involvement in the problem of language and Husserl's search into the origins of spatial representation and consciousness.

In some ways Wittgenstein recognized the structural role of verbal language in the construction of knowledge and representation of the world: 'The limits of my language mean the limits of my world' (1961: no. 5, 6). But this entails epistemological circularity and some nihilism, since the verbal representations of the world cannot be investigated except through the very verbal means that project them.

While Wittgenstein recognized the pertinence of the Nietzschean advice to distrust 'grammar', he denied any responsibility on the part of philosophy for the analysis of grammar or of semantics. Grammar is considered as an absolute entity, inaccessible to philosophical enquiries: 'Philosophy...cannot provide it with any foundation' (1961b). Presumably, this conclusion followed from recognition of an identity between conceptual frameworks of grammar and those of Aristotelian logic. And this form of rational logic did not appear to Wittgenstein as a human falsifiable construct, but rather as an unassailable knowledge: 'Logic is not a body of doctrine, but a mirror-image of the world' (1961: 6-13).

He went on rather hastily to identify the semantic of logical concepts with that of common speech: 'Philosophy of logic does not speak of our sentences and words in a sense different from that which we give them in ordinary life' (1980: 129).

Enormous problems arose when it came to explaining how meaning is decoded in verbal language. After stating: 'A name means an object. The object is its meaning' (1961: 3.203), Wittgenstein observes: 'Only propositions have sense; only in the nexus of a proposition does a name have meaning' (1961: 3.3). In a circular way, meaning is to be seen as based on 'primitive signifieds' linked to signs which are themselves names (1961: 3.263). Wittgenstein was in fact resorting to the same 'illicit procedure' of falling back on 'words' he had criticized in Russell and Whitehead's *Principia Mathematica* (1961: 5.452). Developing the Aristotelian ambiguous metaphor according to which language is a 'picture of reality' (1961: 4.01), Wittgenstein will comment on the notion of 'pictoriality' without noticing the phenomenon of 'dual coding' Paivio (1971) was to describe later. Lending an unwarranted spatial character to verbal syntax, he writes: 'The essence of a propositional sign is very clearly seen if we imagine one composed of spatial objects (such as tables, chairs and books) instead of writing signs' (1961: 3.1431).

This will lead him to conclude: 'The act of thinking is fully comparable to that of drawing pictures' (1980: 172).

This confusion between verbal and visual signifiers is still in general circulation. After Saussure's troublesome suggestion that the concept of a tree corresponds to a visual drawing of same (1968: 99)—which is a visual signifier—even philosophers reluctant to assert the existence of mental images wonder if the 'idea' or concept of a dog or a cat 'resembles' a dog or a cat (Dennett 1991: 454–55), thus confusing visual and verbal signifiers, and both of these with the signifieds.

For Wittgenstein, on the one hand, the primitive units of meaning attached to words could be made clearer by the use of 'elucidations which are sentences containing primitive signs' (1961: 3.263), provided the meaning of these signs is already known. But these 'elucidations' can also adopt the form of visual drawings—and not propositions—as he concludes from a schematic drawing reproducing the various stages of an automobile accident. There seemed to exist a correspondence between parts of the drawing and things in reality: 'In a picture objects have the elements of the picture corresponding to them' (1961: 2.131).

But when the philosopher attempted to specify what were the parts in the world and the visual text that were in correspondence, he was not able to do so. Indeed, he lacked satisfactory modes to syntactically segment either: 'Does my visual image of this tree, of this chair, consist in parts? And what would be these simple parts?' (1969: 47).

In other words, is there an objective point of view with which to segment a visual object or an image into its main elements? Is it color, line orientation, texture, contrast of forms? And how would these elements acquire a meaning? The iconic problem addressed here is only superficially touched on, and the more so when, later on, color is tackled (Wittgenstein 1977). Given that no concept of a pure color exists, the question of meaning in visual illustrations equated with that of verbal 'illustrations' remains unsolved. In a line of thought reminiscent of Husserl's meditations on numbers and figural entities, color is thus presented as something possessing characteristics of a signifier, but a signifier unrelated to any signified.

Recent developments in cognitive sciences have stimulated renewed interest in Husserl's phenomenology (Petitot-Cocorda 1985; Sonesson 1989; Varela 1986), leading in two rather opposite directions. Firstly, its anchoring in Gestalt psychology, amplified by Merleau-Ponty (1945), has had an important bearing on empirical research (Marr 1982) as well as on visual semiotics (Saint-Martin

1990a). But Husserl's ulterior elaborations of more idealist semiotic notions of knowledge and meaning have also contributed to the deconstructionist theories of meaning in recent contemporary thought (Derrida 1967).

Husserl's phenomenology stands in a particular place in philosophy because of his early and wide-ranging semiotic concerns about the relations between perception and mental representations and the functioning of mathematical, geometrical, and spatial signs (1962, 1972, 1989). But like most of his predecessors, he did not find it expedient to study the syntactic structures of the verbal signs he was using to construct his philosophy.

In Husserl's view the determining and symbolic role of 'sensorial signs' supersedes the function of linguistic signs in relation to theoretical concepts (1972: 297). He underlines the secondary and substitutive status of linguistico-conceptual representations in relation to the 'effective' intuitive representation emerging first in the mind (1972: 237). He held that representation by material signs was 'improper' compared to the perceptual representation resulting from an immediate and concrete relation with objects. Following the Gestalt theory propositions, these more primordial and adequate forms of representation are said to be produced through various types of perceptual groupings of sensible data.

But Husserl's reflections upon the origins of arithmetic, published in 1891, led him to discover that most mathematical signs—except the very first numbers—had no correlation with a perceptual experience. They resulted rather from an 'invisible', non-sensorially based grouping he called 'the figural'. A somewhat similar position was taken by J.J. Gibson (1966), asserting that the perception of movement—or kinaesthesia—is not based on sensorial percepts.

As if content had to be identified with a sensorial cause or referent, Husserl grants some rudimentary content to numbers ranging from 1 to about 12, but states that the other numerical signs—for instance, 20,315—are devoid of any representational content. These 'signs without content' would be manipulable only through the indirect concepts of their mode of production ( $n+1$  or  $n-1$ ). In other words, the culturally highly praised calculus operations constitute 'an activity which operates not with concepts but with signs' (1972: 296), or more precisely, with signifiers which lack signifieds.

Followers will extend this peculiarity of mathematical language to verbal language, asserting that the infinite process of semiosis does deprive verbal signifiers of specific signifieds (Kristeva 1969). An art historian (Gablik 1977) upholds that the more evolved contemporary visual art forms produce similar systems of

signs ‘without content’. In other cases, the notion of the ‘figural’ in visual representations will be made to correspond to some unconscious phenomenon that is predetermined to remain so (Lyotard 1971). In these circumstances, the question of meaning does not appear as an important theme for scientific or philosophical inquiry.

Basic phenomenological concerns have reappeared through recent developments in the cognitive sciences (McIntyre 1986). New attempts are made to establish correspondences between physical and mental realities, their modes of inscription or representation in the mind, as well as their relation with systems of material or linguistic signs (Shepard 1979). Semiotics shares the same preoccupation assigned to psychoanalysis by W.R. Bion: ‘Our problem is the following: what is the “grammar” of reality and what kind of grammar biological objects such as we are can create that come the nearest to reality?’ (1980: 91).<sup>1</sup>

While Bion deems improbable any resemblance between psychic reality and ‘articulated language’ (1980: 50), others still assume that mental representations are equivalent to verbal inscriptions adopting the form of logical propositions (Heil 1989: 345). Are both the representations of knowledge and their semantics entirely subordinated to verbal linguistics, as J.F. Katz (1971), among many others, upheld? In semiotic terms, one might ask if the content level of the signified universe is to be correlated to a syntax level similar to that of verbal signifiers?

Is the signified, as Saussure reasserted after Aristotle, reducible to concepts, or is there a first level of semantics achieved at the level of perceptual events (Dumaurier 1992: 220), and even from fragmented indices perceived before the constitution of any object (Davidoff 1991: 90)? Is the semantic universe a homogeneous construct of coordinated parts, as Rastier (1991) maintains after Greimas (1966), or does the double-coding (for instance, pictorial and verbal) correspond to a dual and heterogeneous semantic stockage (Paivio 1971)?

Some proponents of cognitive grammars questioned the validity of organizing semantic structures around the notion of concepts. They revived one of Peirce’s sets of classification of interpretants (as energetic, emotional, and logical levels) that had remained a dead letter among its main commentators (Deledalle 1978; Bernstein 1964).

Langacker (1983) suggests that the term ‘concept’ should cover anything that goes on in the head: ideas, emotions, images, movements, etc. He points out that most people who understand the meaning of the word ‘circle’ would be at a

loss to define its concept, the more so if the concept must refer to the 'essence' of a thing. To insert the word in a meaningful context, one simply relies on perceptual images of such a form—that is, on mental visual signifiers devoid of defining verbal components.

On the other hand, semantic systems based on verbal lexicology seem difficult to construct. While he outlined the great number of 'undefinable primitive concepts' Greimas's semantics (1966) must resort to as founding units for signification, J. Petitot-Cocorda (1985) emphasized the circularity introduced by the fact that those semantic bases are simply constituted by a chain of some unexplained words. The same argument could be applied against Schank and Abelson's list of primitive actions (1977), the generative semantic character of which remains unaccounted for.

Petitot-Cocorda proposed that the semantic field would be better mapped by the use of 'geometrical schemas' (1985: 274), carrying categories different from those used in the verbal philosophical tradition, namely topological configurations. The representational potentiality of spatial configurations has been exploited in Tesnière (1969) and Chomsky's (1966) parsing trees. Visual semiotics agree that spatial types of configurations—produced specifically by visual languages—offer a greater possibility of diversification than the elementalist and linear dimension of verbal logic. As Peirce believed when he evolved his existential graphs, spatial constructs would seem better adapted to describe complex phenomenal and semantic interactions .

But semiotically speaking, these propositions may still confuse signifiers and signifieds, insofar as they do not offer syntactic analyses of their newly adopted visual forms of expression and of their inherent semantics. They neglect the fact that any level of expression—be it verbal or spatial—is itself linked to a syntactico-semantic structure that should not be identified with that of the content level.

Besides the poorly developed verbal semantics—which have interfered in the interpretation of visual language through the iconic mimetism of objects—visual semiotics is confronted with an almost nonexistent syntactic and semantic dimension in the philosophical analysis of spatial phenomena and representations. In spite of the equal roles assigned by Kant to space and time as *a priori* of sensibility, space seems a notion that has been forcibly repressed in Western culture to the benefit of time (Franck 1986). Freud underlined the unconvincing character of Kantian propositions, space being in his view more 'the projection of the psychic apparatus extension' (1970: 70). Like reality itself, Freud adds, while 'psychic

reality is extended, it does not know it'. Confirming Freud's conclusion that time is the dimension of consciousness and space that of the unconscious (1980), Heidegger, a disciple of Husserl, confessed his conceptual powerlessness in thinking about space, due to 'a fear confining to anguish' (1968: 100).

To tackle its very object of study, which is spatial forms of organizations, visual semiotics will have to draw from sources other than philosophy—mainly genetic epistemology and geometric theories (Piaget and Inhelder 1956; Lewin 1936), cognitivist theories concerned with perceptive functions (Paivio 1971) and the role of affectivity in knowledge acquisition (Freud 1964; Klein 1967; Bion 1962).

### **Linguistic and Semantics**

Without openly admitting it, linguistic research was influenced by many of the contemporary philosophical trends. Since some of the major exponents of verbal linguistics have served as an inspiration and a model for the development of visual semiotics, it is worthwhile to consider in what directions their influence was felt.

Saussure's definition of a sign as a relation between a signifier and a signified still appears as semiotics' basic axiom, even if its dual nature is more often than not modulated through a deeper analysis of the signified dimension. The latter may be seen as a construct comprising a referential or denotative function, a proper signified, and a connotative meaning; or in Peirce's terms, the sign can be defined as the relation between a representamen (a signifier), an object (a referent), and an interpretant (pointing to meaning).

Saussure contrasted the verbal signifier, which is a physical, sensorial acoustical image (or percept) characterized by its discontinuity, linearity, irreversibility, and arbitrariness, with the visual signifier which is continuous, multidimensional, and spatial. The latter is motivated through a resemblance to sensorial visual groupings of variables. In both cases, while the signifier is sensorially apprehended, the signified is not, as it must be deduced from the signifier.

Unfortunately, the semiosis of visual language is often short-circuited when the meaning of its signifiers is paradoxically equated to the visual signifiers it resembles. Much confusion arose from Saussure's attempt to 'illustrate' or explicate the signifier/signified or sound/thought relation in verbal language through the image of the recto-verso of a sheet of paper:

One cannot cut up the recto without cutting at the same time the verso; in the same way in language, one cannot isolate the sound from the thought, nor the thought from the sound; one could achieve this only through an abstraction the result of which would be to deal with pure psychology or pure phonology. (1968: 157)

Though Saussure was only trying to define a proper task for linguistics, the vast majority of interpreters believed he was proposing that there could be no thought without words and sounds. On the other hand, the recto-verso image seemed to confer to the signified a material or sensorial status in some ways similar to that of the signifier. This is in contradiction with Saussure's proposition that the signified is a concept (that is, an abstract entity). But it has to be recognized that philosophical tradition has attached to the notion of concept both an ambiguous idealist and a substantializing character that is difficult to eradicate.

The pseudo-material dimension attributed there to the signified seemed to justify further identifications of signifieds with signifiers, and vice versa. An early rhetorical model presented by the Groupe Mu (1970), later abandoned (1992), but still used by Eco (1988: 161), constructed scaffoldings of signifieds becoming signifiers for other signifieds, *ad infinitum*.

This operation is more in tune with Peirce's definition of the sign—a relation between a representamen, an object, and an interpretant—which leaves the notion of meaning itself undecided. Given that the object alluded to by the sign provides a reference to physical or mental entities, it does not reveal in what sense the representamen points to it. This task is left to the third term, the interpretant, often thought of as the agent of meaning since it indicates how the representamen is linked with the object. But the interpretant is not to be identified with a signified in the Saussurean sense of the word, since it is altogether another sign, possessing its own basic triadic structure which it somehow imbricates in the first one. It does not provide any meaning of its own, since it has to be interpreted by another sign, *ad infinitum*. One could say that Peirce seems as careful as Saussure to distract semioticians from considering the 'psychological' aspect of meaning. His infinite semiotic drift of interpretants would produce a nightmare similar to that of Hjelmslev in regard to the problem of semantics, as we will see presently.

But the Saussurean recto-verso image of a sheet of paper also suggested that the union of a signifier to a signified possesses a permanent and indissoluble quality. It encourages the return to the notion of the univocality of words, as proposed by

Aristotle's stated philosophy that 'a word meaning something means only one thing' (*Metaphysics* 4, 1006 a 28).

Moreover, the apparent autonomy of the recto-verso entity fostered the study of isolated signs as against that of groups or systems of signs, and this against Saussure's definition of the 'linguistic value' of words (1968: 158). This tendency was also reinforced by an elementalist reception of Peirce's triad of signs (icon, index, and symbol), leading semiotic research to the unique consideration of isolated signs, independent of their syntactical relations.

Finally, the indissoluble link suggested by the recto-verso image gave birth to the curious belief that no sign can be recognized as such until both the signifier and its signified are known. For instance, in referring to a work by Kandinsky, J.-M. Floc'h (1985) refuses to recognize distinctive fragments whose signifieds he cannot already assess as signifiers. This runs contrary to the process of scientific research, where objective signs whose meaning remains unknown must often be dealt with for a long time.

The summary treatment given by Saussure to the semantic aspect of linguistics was accentuated by his disciple Hjelmslev (1969), who had a profound influence on the early developments of visual semiotics through his popularization by Barthes (1964).

Saussure's notion that while the signifier is perceptible, the signified is unobservable, being hidden, concealed, and having to be deduced from the signifier, was pushed to the limit by Hjelmslev. The signified is also postulated as having no 'form' by itself, and only attains one through the signifier. In a metaphor borrowed from Aristotle's concepts of matter and form, the meaning exists prior to its receiving a form, but in a 'formless' state that makes it unknowable. To say that meaning is formless is, then, to say that though it is not yet submitted to any form of organization, it is susceptible to organization by whatever form (1969: 105).

From this postulate derives the terminological cleavage between a sense or meaning that is forever unknowable and the signification where a part of the meaning has received a form. Greimas presented as one of the 'axioms of semiotics' the notion that 'meaning is transformed into signification in the measure that it is articulated' (1984: 13). Seen from a logocentrist position, Hjelmslev's possibility of meaning organizations is reduced to the verbal articulation. While he will eventually feel constrained by the strong liaison binding meaning to words—to the point that he proposed the term 'significance' to preserve more nebulous zones of

meaning—Barthes will remain faithful to the Greimasian position, and goes on to state in a radical fashion: ‘There is only meaning of what is named and the world of the signifieds is that of language’ (1964: 81).

Understandably, Hjelmslev’s concept of meaning as an unobservable and formless object prevents its becoming the subject of a scientific investigation:

This is why meaning in itself is unaccessible to knowledge since the condition for any knowledge is an analysis, whatever its nature. Thus meaning can only be reached when it has taken a given form. (1969: 108)

Consequently, instead of questioning the meaning of meaning, Hjelmslev suggested that the semantic content of verbal language is already contained within all non-linguistic sciences—that is, all human sciences that do not have language itself as an object of study. In this wide context, the possibility of semantic analysis seemed to him absurd and unrealizable, since it would correspond to the analysis of an almost infinite number of signs (1969: 93).

As Eco has more recently concurred, to equate the system of meaning with scientific knowledge—past and present, validated or discarded, accumulated in dictionaries and encyclopediae—is to present it as a system impossible to describe and analyze (1988: 159–60). Greimas arrived at the same conclusion following his early attempt to analyze the semantic structures embedded in the somewhat narrower French lexicological thesaurus.

A semiotic approach acknowledging the heterogeneity between the two universes of signifiers and signifieds would point out that lexicons are only lists of signifiers put in relation with other signifiers (as possible interpretants) within a potential syntactic and pragmatic context. While these pseudo-definitions of words, often erratically juxtaposed and arbitrarily chosen over time, may be called the *senses* of a word, they do not give any insight into the phenomenon of meaning. This has to be elaborated on other grounds.

Among other linguists, Trier opposed, in 1934, the notion of meaning ‘as being structurally formless before the intervention of language’ (Ohman 1976: 123–24). Under the influence of Gestalt psychology, he held that a form of organization of experience registered in the nervous system and the organic memory, which is the source of meaningful phenomena, exists prior to any linguistic representation. Cognitive sciences have confirmed that mental representations are structured by the

sensorial, sensorimotor, affective, and conceptual mechanisms active in the human organism as the locus of elaboration of meaning (Kosslyn 1980).

The domain of meaning becomes related to what is apprehended of the world mainly through nonverbal exchanges between the organism and its environment. Verbal language does not constitute this experience, but tries to represent it, though the larger part will remain by definition out of reach. And as Langacker puts it, the semantic domain is only a target aimed at by linguistic media without any assurance of reaching it (1983).

Thus conceived, the global semantic field is to be studied by paralinguistic disciplines (psychology, neurophysiology, etc.). These must be careful to distinguish the forms of nonverbal experience from the modeling impact provided by some forms of mental representations, as well as by various linguistic structures. This theory fully recognizes, with Whorf (1956), that linguistic structures infiltrate the organic mechanisms of apprehension of reality, often conditioning, preetermining, orienting, and moulding their relations with the world. But languages cannot supersede biological and organic processes in the production of a meaningful experience—they can only sustain, enlarge, or thwart them.

This influence of linguistic structures upon perceptual, emotional, and mental representations is not principally carried out by the literal senses attached to particular lexicons, but through the semantic connotations attached to their syntactical organizations. Among these organizations of sensorial elements constituting the signifiers in languages—obviously different from the internal and mental constituents of organic or mental representations—important differences have to be identified between those of verbal and nonverbal languages.

As mentioned by Saussure, verbal language possesses a semiotic plane of expression that is linear, unidimensional, discontinuous, sequential, and irreversible, based on discrete elements (words) separated by voids or silences. Its plane of expression, at least in most Western languages, is submitted to a vectorial positioning that reflects the philosophical preconception that the substance (or subject) occupies the first position, followed by more accidental features such as action (verbs) or so-called secondary qualities (Chevalier 1968). Each time one constructs or proffers a proposition, one not only sanctions this ideology, but constantly leads oneself to believe that reality conforms to it.

By contrast, the plane of expression of visual language is formed by dense and continuous elements (Goodman 1968), oriented in all directions in a multidimensional context, reversible and superimposable, forming by definition spatial organ-

nizations. Their structural interrelations produce syntactical spatializations analogous either to the Euclidean notion of space or to non-Euclidean spatial fields—topological (Saint-Martin 1980), projective, fractal, etc.—that correspond to so-called naturalistic or abstract forms of representation.

The basic non-elementalist character of the visual units and their propensity to form spatial structures endow them with the special characteristics of Peirce's analogical iconic quality (1978: 149, *CP* 2.277). The iconicity inherent in visual language has been narrowly understood for centuries as the production of a resemblance to objects considered in isolation, in the same way verbal language names them: a tree, a house, a person.

Some examples given by Peirce (1978) of iconic signs as being algebraic equations and diagrams reveal a more important function of iconicity. The meaning of these icons does not follow from a one-to-one resemblance between an isolated object and its representation, but from similar interrelations between objects. The analogic resemblance obtains between the structure of the signifiers and that of the signifieds. In this view, the signifieds are to be defined from a set of hypotheses independent of those constructing the signifiers.

The establishment of structural resemblances requires two sets of hypotheses: those establishing the structures of the visual signifiers—under the form of a spatial syntax—and those postulating the structure of the world of human experience from which the signifieds emerge. This notion has been taken up by experimental psychology and Artificial Intelligence, where researchers (Kosslyn 1980) propose that the mind 'generates and operates through analogic representations which preserve the spatial properties of the visual stimuli' (Eliot 1986: 151).

The fragility of semantic hypotheses surrounding verbal language might help to evacuate the restricted identification of meaning to concepts, a hypothesis which has been a major obstacle to a better understanding of visual language. Linguistic communication between human beings is not reducible to the exchange of already fixed conceptual semantic units.

Following developments in pragmatic linguistics, language can be seen as operational and factual, a performative operation through which the subject tries to modify its relation with the lived world. This was recognized in visual as well as verbal language by Searle, who pointed out that enunciations also correspond to an attempt 'to elaborate structures in conformity with what one feels in experience' (1980: 40).

In this context, if 'semiosis requires at least two actants: the observer and the observed', as stated by Sebeok (1989: 92), a theory of meaning has to deal with both the structures of linguistic means (syntaxics) and those of human beings who try to represent themselves through those means (semantics).

### **Psychoanalytical Semiotics**

Among cognitive researches, references to psychoanalysis are becoming more and more common (Goldberger 1991). Through the notion of representation, bridges have been built between psychoanalytical descriptions and neurophysiology (Hadley 1983). Psychoanalysis has even been described as cognitivist from the very start (Dreyfus 1979) and leading to production of efficient cognitive models (Sandler 1969). Relations between traditional scientific procedures and the attempt to produce an 'objective' approach to subjectivity are discussed more and more (Green 1991).

Some psychoanalysts have also established strong alliances with linguistic semiotics: 'Each of these disciplines can be utilized by the other' (Gear and Liendo 1981: 207). Semioticians also recognize the value of this interrelation: 'In some ways, the study of discourse should be akin to psychoanalysis' (Perron and Danesi 1992-93: 3).

There are good reasons for visual semiotics to resort to basic notions of Freudian contributions to the understanding of human phenomena. Firstly, even if it retains some bias toward verbal language, psychoanalysis is the only evolved theoretical construct that maintains firmly the crucial role of two forms of representation within human beings: word-presentation and thing-presentation. In both cases, the French version of these terms—'*représentation de mot/représentation de chose*'—more aptly carries over the connotation of a representative element and of something being represented.

The thing-presentation term is still ambiguous, since it refers not only to global things but to partial sensorial aspects of reality: color, sound, odors, shadows, etc. (Laplanche and Pontalis 1967: 418). Piaget and Inhelder (1956) have shown that these sensorial aspects are closely interrelated, since the child recognizes quite early the advantage of combining sensory modalities to obtain more information. This has led some researchers to underline both the affective and the action-prone elements of this representational process: 'In our view the thing-presentations are

composed of both the somatic sensation of affects and the visual images of actions' (Gear and Liendo 1981: 221).

Recent research on the polysensoriality of perception has also emphasized that tactile, thermic, olfactory, kinaesthetic, and postural sensorial experiences are usually associated with visual percepts (Hatwell 1986). As a consequence, if thing-presentation is mostly made up of visual signifiers, they are thought of as referring also to all levels of sensory organic spaces.

Secondly, psychoanalysis describes perception—which is basic in visual semiotics—with even more emphasis than phenomenology, as a crucial, continuous, and efficient factor in the shaping of human relations to the world. Finally, through their permanent integration of affectivity and mental representations in the understanding of human conducts, psychoanalytical theories offer a dialectical and unified approach to human semiotic activity, helping to understand both its syntactical and semantic levels.

For Freudian psychoanalysis, semiosis emerges simultaneously with psychic activity. Psychic life is described as starting when a representation is joined to a biological thrust or drive in some organic field (hunger, excretion, need for sleep, warmth). This representation is made up by a memorized sensorial fragment abstracted by perception from external reality and evaluated as having been an experience of satisfaction/dissatisfaction (Freud 1950: 73). These sensorial percepts, which are aspects of this experience or result from a co-occurrence of unrelated events, form the first signifiers linked to the bio-psychic experience.

Through this first semiotic activity, natural instincts and forces acquire a psychic component and become what French translators of Freud call a 'pulsion'; English translations prefer the ambiguous term 'drive'. In other words, pulsions are internal events partaking of both a physical, energetic process and a psychic representational status. Their aim is 'always a satisfaction which can be attained only by a suppression of the overtension in the pulsional source' (1952: 34).

The satisfaction of a need is problematic when there is no cognitive percept to make the nature of the release sought more concrete. In extreme cases the perceptual 'representant' may procure a hallucinatory satisfaction, but usually it will help to accept some sort of delay in the realization. On the other hand, if one cannot escape the biological needs expressed in the pulsions, the means of satisfaction are usually varied. Percepts related to them are easily substituted one for another. In any case, the energy that will generate psychic events is entirely dependent upon the economy of the biological forces.

This mental representation has the full structure of a sign, grouping a signifier and a signified process, but it is not properly a language until it is translated into a perceivable sensorial semiotic materiality.

In the mental representation, the signifieds correspond to the dynamic and cognitive elements revealed by and felt within the nonverbal experience. They may also exist in organisms as *feelings*, sometimes vaguely felt impressions always connected to some positive or negative affect.

As Gendlin (1962: 10) has argued at length, there exists a concrete, pre-conceptual experience producing a 'felt meaning' that is apt or not to be represented later by different sorts of symbolism. Everything that appears significant is enveloped by a multitude of affective-cognitive associations of elements.

The sensorial percept that constitutes the signifier stands in relation with, and will allow, the recall of: (a) a felt trace of the experience of bodily dynamic forces; (b) a memory of perceived objects in the world capable of answering needs, modulated according to the organism's means to apprehend them; (c) internalized associations between these evolving bodily experiences and fragmented objects under the form of mnemonic percepts; and (d) an emotive evaluation of regions (a), (b), and (c).

The emergence of meaning is then understood to result from the interrelations, and partial integrations, of these dynamical, emotional, and knowing experiences. Their interrelations and partial integration become manipulable in the mind through perceptual signifiers—that is, mnestic sensorial percepts that will include later some peculiar auditory ones (words). While the experiences and activities accumulated contribute to bodily and mental evolution (Piaget and Inhelder 1956), they do so through the pervasive manipulation in psychic life of a mass of memorized perceptual signifiers and signifieds linked to affective experiences.

This raises the real issue in the field of thought and representation. All these fragmented bodily, emotional, and cognitive bits of experiences of the self and the world, across time, need to be interrelated and moulded into a unifying organization that favors the satisfaction of organic needs. What is called a search for meaning, in human thought and communication, does not correspond to a simple curiosity or urge to collect 'new' meanings, as when one might wish to augment his/her material possessions. Neither can it be restricted by pragmatic, utilitarian conducts, as Petitot-Cocorda outlined in commenting on Greimas's narrative semantics:

But there also exists a *cognitive* spatialization investing with spatial properties cognitive relations between acting subjects and objects and referring to a proxemic analysis of 'the exploration of space in relation with signification'. (Petitot-Cocorda 1985: 257; emphasis in the original)

It is more fundamentally the search for some spatialized model capable of encompassing the more important of one's past organico-mental experiences, but also able to help situate their valences, orientations, and intensities and facilitate their transformations. This model cannot be achieved through the syntactic linear structures of verbal language or its too limited vocabulary as it relates to space relations (Dervillez-Bastuji 1982: 377).

From the first rudimentary dualistic structures of self and non-self translated into good and bad, idealized or rejected objects, as the early mental life is described by Klein (1967), human beings must find more evolved structures of representation that allow them to confront the turmoil of their piecemeal and contradictory experiences. As mentioned above, psychoanalysis points to two main modes of representation: through words and through things.

Piaget and Inhelder observed (1956) that at around two years of age children begin to show evidence of ability to represent the world to themselves (Eliot 1983: 105). Psychoanalysis has stressed that this early experience of reality is only organized through representations of things (Aulagnier 1975). Throughout our lives—even after representation of word later attempts to impose its own modeling 'violence' on that pre-organized world—representation of things continues to play a most important role. This is demonstrated by the function of 'figurability' in daily dreams, certain verbal descriptions, and the development of spatial, visual languages.

Aulagnier has described at length the first structural cognitive organizations of the body-world relations under the name of 'pictograms' (1975:47). These mainly visual, pictographic signifiers join, in an indissoluble way, a polysensorial bodily feeling and a cognitive relation between a part of the body and an external context. Both are endowed with an affective connotation.

These groups of signifiers-signifieds modelize the ever-changing affective-cognitive organic experiences of reality according to their peculiar sensory-spatial structures. Organic spaces of sounds, tactility, odors, warmth, or colors which possess different syntactic structures are liable to be evoked through the plasticity of spatial visual representations. Attempts to project externally these nonverbal perceptual

signifiers give rise to the spontaneous early invention of visual language by all children of the world.

Our logocentrist society will eventually compel the child to superimpose the abstract and discontinuous universe of verbal grammar and ideologies onto his or her continuous, concrete, and multifaceted representations by the pictograms constructed by his or her own organism (Aulagnier 1984: 216). An awareness of the unceasing production of thing-representations will be made easier for each through a familiarization with nonverbal forms of linguistic representation—namely, the polysensorial visual languages.

But psychoanalytical semiotics goes a step further, recognizing other (and antagonistic) functions to word- and thing-representations, which follow the iconic potentialities of their respective discontinuous and continuous elements and syntaxes (Gear and Liendo 1975). Whether in verbal or visual representations, the subject submitted to internal conflicts is able to double up his or her structure of affects and experience them in parallel by means of representations of both thing and word.

While spatio-visual structures mirror the concrete, factual, and troubling interrelations with the world, the discontinuous and conventional structures of the verbal system allow for its denial and the fabrication of an idealized self (Gear and Liendo 1975: 21). In visual language, the duplication of verbal structures follows the production of recognizable discontinued iconic units charged with a pseudo-fixed literal meaning, whatever their visual or spatial contextualizations.

### **Perceptual Semiotics**

This cognitive context recognizes perceptual constituents as key elements in both mental and linguistic representations, syntactical and semantic operations. This unsettles the traditional view of meaning, which is thought to possess only a conceptual correlative, while orienting semiotics in new directions.

Material organizations of visual representations seem to be apprehended—to a large degree—through the same perceptual processes at play in the natural world (Gibson 1966). The perceptual experience of external reality offers a conjunction and integration of many organic spaces that are usually anchored in a unique position and point of view. But the decoding and semantic interpretation of the representational visual language must also reckon with the simultaneity of multiple

points of view, perspectives, dimensions, etc. constituting diverging types of spatial denotations.

Perception is an activity dependent upon both internal, psychological processes and external stimuli. From the internal interface, percepts are constructs incorporating structural organizations of experience and thus generating meanings. This view has been demonstrated by experimental psychology research on the genesis of percepts (Westerlundh and Smith 1983).

Percepts are described as the result of an elaborate process developing from stages of ambiguity, mostly unconscious, filled with individual-specific and subjective meanings to stages of automatic consensual and conscious recognitions. These acquired automatisms, acting more like signals than full signs, carry less meaning (1983: 616-17).

Perceptual activity is still described with the basic Piagetian notion of construction. It is also seen as a series of 're-constructions' whereby the individual meaning system, formed through past experiences, is instilled progressively into the objects in order to transform them into 'psychologically effective stimulus' (Westerlundh and Smith 1983: 607).

This subjective activity is nonetheless acting upon 'physically organized stimulus within a space' from which emanates different potentialities of meanings eventually related to the historical and individual subjectivity. Since percepts differ from concepts through their unavoidably spatial nature, even object-centered iconic representations gain meaning from relations with their surroundings. This entails that syntactic and semantic analysis of visual representations is dependent on the availability of various models of spatial interrelations: 'Environment-centered space is characterized by a host of meanings, which different actions and purposes call forth' (Eliot 1983: 100).

The analogic similarities between representational spatial structures and those of various organic perceptual fields—as experienced by human subjects—are basic to visual language representational potentialities. This requires the elaboration of systematized perceptual strategies leading to consensus between observers in order to recognize the specificity of spatial structures within each representation (Saint-Martin 1990a, 1990b).

This semiotic analysis aims at the perceptual construction of contrasting sensorial fields generating different levels of meaning. Psychological experiments (Pieron 1959: 183) have revealed the heterogeneous cognitive contents and affective intensities linked to the specific use of each sense. Some sensory-perceptual

agents are more involved in distal cognitive gathering: vision, audition, kinaesthesia, etc. But they may produce less pragmatic reactions or affective effects than the more proxemic and less differentiated perceptual fields: postural, tactile, thermal, etc. (Hall 1966).

The interrelations between these contrasted spatial constructs juxtaposed within the same representation beg integration into larger spatial models. This need corresponds not only to a cognitive urge, but to the necessity of providing the mind with more suitable representational models leading to more conscious and harmonious integration.

### Note

1. Quotations from French texts are the author's translation.

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## **Ekphrasis and the Picture Gallery**

Grant F. Scott

Wim Wenders' recent quasi-sci-fi film, *Until the End of the World* (1991), explores the relationship between the word and the image in the postmodern global village. At the center of the film is a video-computer device one of the protagonists carries around the world with him in order to record images of his immediate family for his blind mother. The machine records the act of seeing, but must synthesize it with the perceiver's act of remembering in order to reproduce the images in the mother's visual cortex. In one of the film's last sequences, the character has trouble transferring the 'pure' digitized images to his mother precisely because of the interference of memory and imagination. He cannot align his re-creation of the images with the computer's mimetic transcription.

Ekphrasis is about exactly these problems of translation, transmission, and response. The word is composed of the Greek 'ek' (out) and 'phrazein' (tell, declare), and means to speak out or tell in full. In its original rhetorical sense, ekphrasis involved the vivid description of places, persons, or things; it was one of the later, more advanced exercises in the *Progymnasmata*, a handbook for budding sophists. In the third century A.D., however, with Philostratus' *Imagines*, the scope of ekphrasis was significantly narrowed and it came to designate descriptions of specific works of visual art. Although there are a number of competing definitions of the term today, several influential critics have argued that we ought to think of ekphrasis as the verbal representation of visual representation—a definition that ironically returns us to the broader categories of the term's original context.<sup>1</sup> In this sense, even prose catalogue descriptions or titles of artworks may be considered ekphrases.

My own inclination is to stress the more specifically aesthetic elements in the definition of ekphrasis, a creative process that involves making verbal art from visual art. Ekphrasis is necessarily intertextual—about citing artworks as much as sighting them—and though nature or 'the world' is no longer the nominal subject, it is always present as a problem of/for representation. The specter of mimesis haunts the subtexts of most ekphrastic literature, as do a number of key questions: Is the goal of ekphrasis to imitate the visual artwork or re-create it? Is the *objet*

*d'art* to be faithfully reproduced and recorded, or used for improvisation? Does ekphrasis serve the silent work, helping it, in Jean Hagstrum's terms, to speak out (1958: 18n)? Or does it vie with the object in an attempt not only to out-represent it, but also to appropriate it? Are the goals of ekphrasis, then, altruistic and benevolent (is ekphrasis a tribute, an homage, even an elegy to the image)? Or are they more self-serving? The real subject of ekphrasis may be its own remove from the artwork and its double remove from the world the artwork attempts to capture. Perhaps this is why the trope appears to be enjoying a resurgent popularity among literary critics, art historians, and classical scholars, who see their own separation from the world in the anxieties of ekphrastic representation.

In this essay, I hope to identify a number of the most prominent features of aesthetic ekphrasis and then turn to a discussion of two representative samples of the genre, one ancient, one modern, in order to help clarify my arguments. The domain of ekphrasis may be usefully divided into three broad, though by no means distinct or exclusive categories: technique, response, and context. The first, ekphrastic technique, includes fundamental questions about how visual images are verbalized, how they are reproduced and translated into words. An ekphrasis can make the silent image speak (a function derived from sepulchral epigrams), envoicing the *objet d'art* (prosopopoeia) and celebrating the artist's creative power; it can address, apostrophize, question or praise the image; and it can transform the stasis of the artwork's visual scene into an imaginative narrative—that is, extend the 'pregnant moment' forward or backward in time. In this sense, ekphrasis may also invent elements that are not physically present in the visual artwork, embellishing the scene and improvising on it. In addition, ekphrasis can describe the making or production of the image, as in Homer's description of Achilles' shield; or it can chronicle the destruction of the image, as Shelley does with the battered monolith in 'Ozymandias' or Keats does with the Parthenon fragments in 'On Seeing the Elgin Marbles'. An ekphrasis, moreover, typically presents a reconfiguration and reordering of the artwork: some elements are given prominence and importance, others are downplayed or ignored. Ekphrasis tiers the visual artwork in ways that subtly alter its presence and shape its meaning.

An ekphrasis may move beyond the image or move into it, or both, as I have argued. Diderot's *Salons* are remarkable for their degree of ekphrastic empathy; the speaker slides effortlessly into the canvases he surveys, treating paintings as places, conversing with the represented figures as though they were real people, sometimes even family members. An ekphrasis may strive, as Diderot's do, to

animate what is lifeless—it may provide the visual image with sound and smell—or it may resist its own urge to enliven, and choose instead to ape the frozen moment of the artwork, aspiring to its quietude and stillness. If read in the tradition of ekphrasis (rather than aesthetic criticism), the grossly overglossed aphorism that concludes Keats's 'Ode on a Grecian Urn'—'Beauty is truth, truth beauty'—may constitute the speaker's final attempt to reproduce the still eloquence of the urn in a symmetrical, circular phrase, a phrase that borrows from the urn's own shape. The epigram manages to be both profound and meaningless at the same time, a dazzling tag that operates with the imperial confidence of an image. In this sense, it embodies perfectly Krieger's famous 'ekphrastic principle', though his formulation tells only half the story of ekphrasis. 'Words become powerful by being visualized as things', as Bryan Wolf asserts (1990: 183), but they also demonstrate their own power when they quicken these things into narrative-life. Keats tries to include both conventions in his ode, and this is perhaps why the poet's meeting with the urn can only end in an uneasy truce.

Most ekphrases rely on the technique of *trompe l'oeil* to sustain the illusions of animation or stillness. Ekphrasis rests on a transformational conceit; it proposes that the image is present in the words, and sets out to blur the distinction between the mind's eye and the eye, between the figurative and the literal. The great ambition of ekphrasis is, momentarily at least, to transform words into images and listeners into spectators. If the artwork being described is itself imagined (John Hollander [1988] has called this type of ekphrasis 'notional'), then the conceit is doubly illusory. The speaker in Shakespeare's 'The Rape of Lucrece' comments on the mirage-like nature of ekphrasis when he describes the painting of Priam's Troy:

For much imaginary work was there;  
Conceit deceitful, so compact, so kind,  
That for Achilles' image stood his spear,  
Griped in an arméd hand; himself behind  
Was left unseen, save to the eye of mind:  
    A hand, a foot, a face, a leg, a head  
    Stood for the whole to be imaginéd.

(Burto 1968: 141, ll. 1422-28)

Shakespeare's description testifies to the synecdochic aspirations of ekphrasis, the desire that words have not only to 'stand in for' images, but to 'stand for' them as well.

As critics have recently begun to show (Mitchell 1992; Becker 1992), ekphrasis cannot be understood without some awareness of the role played by observers as they gaze on the image. This constitutes the second area of ekphrasis—namely, ekphrastic response. Ekphrasis is rarely as neutral an aesthetic project as critics like Leo Spitzer (1962) have determined (he defines it as 'the reproduction, through the medium of words, of sensuously perceptible *objets d'art*'—1962: 72). Instead, most ekphrases aim to reproduce an impression of the artwork along with the details of its material appearance; they include 'verbal articulations of reactions to paintings' (James and Webb 1991: 9). This is why the attempt by art historians to reconstruct ancient and Byzantine art from extant descriptions is ultimately a futile exercise. There is certainly a custodial, a preservationist impulse in ekphrasis, but what is preserved is often the subjective mind's interpretation of the artwork, further complicated by the particular culture's conventions of seeing, rather than any 'clean' mimeograph of the image. Andrew Becker has recently shown that even in the first definitions in the *Progymnasmata*, sophists like Aelius Theon treat ekphrasis as a window to visible phenomena *and* 'as a transformation of those phenomena through the experience and the language of the describer' (1992: 8).

There is no better example of such a transformation than Wordsworth's 'Elegiac Stanzas', where the poet re-imagines Beaumont's landscape, 'Peele Castle', before he has nominally described it. 'If mine had been the Painter's hand...' the poet fancies, 'I would have planted thee, thou hoary Pile / Amid a world how different from this!' (Roe 1992: 244, 13, 17-18). The speaker 'half-creates' the 'rugged Pile' at least three separate times, once as a memory-picture, once as his own imaginative painting, and once as an ostensibly direct description of Beaumont's image. By the end of the poem it has become impossible to distinguish between the scene in Beaumont's picture and the state of the speaker's soul.<sup>2</sup>

Psychological responses to artworks are not limited to Romantic ekphrases, however. W.J.T. Mitchell (1992) has identified at least three phases or moments in the experience of ekphrasis that tend to occur in all historical periods: ekphrastic 'indifference', 'hope', and 'fear'. Schooled by Lessing and others to perceive the spatial/temporal divide between the media and the essential difference between the properties of the two modes of perception, the viewer approaches the image

skeptically, with the ‘commonsense perception that ekphrasis is impossible’ (Mitchell 1992: 696). At this initial, indifferent phase, the viewer understands that ekphrasis can at best be only a figurative proposition. But the figurative realm holds out the possibility of transcending the material differences between the media by animating the artwork, lending it a voice, making its stillness move. Ekphrastic hope proposes to conjure the image not only by envoicing it, but also by simulating the artwork’s visual presence: ‘This is the point in rhetorical and poetic theory when the doctrines of *ut pictura poesis* and the sister arts are mobilized to put language at the service of vision’ (1992: 697). As Mitchell notes, this phase is utopian, and opens up the borders between the disciplines by focusing on their semantic affinities rather than their material differences.

But the duration of ekphrastic hope is frequently short-lived, and the desire for the artwork’s ‘still moment’ soon gives way to a fear that the moment will become permanent and the observer will remain trapped in the artwork. In the discourse on works of sculpture, this moment occurs when the statue—so real it appears to ‘breathe’ life—leaves the spectator ‘breathless’. This marks either an occasion of conventional astonishment and admiration, as we observe in Callistratus’ ‘On The Statue of a Bacchante’ (‘When we saw the face we stood speechless; so manifest on it was the evidence of sense perception, though perception was not present’—Philostratus 1931: 382-83), or a moment of absolute fear and paralysis, as in Shelley’s ‘On the Medusa’:

Yet it is less the horror than the grace  
Which turns the gazer’s spirit into stone,  
Whereon the lineaments of that dead face  
Are graven, till the characters be grown  
Into itself, and thought no more can trace.  
(Ingpen 1927: 298, 9-13)

Ekphrastic fear reveals itself as the dark underside of Krieger’s ‘ekphrastic principle’. The yearning for the static calm of visual art is often countered by anxiety over the paralysis and silence these representations engender. ‘Ekphrastic hope and fear’, Mitchell goes on to argue, ‘express our anxieties about merging with the Other’ (1992: 702), an other that is at first figured in purely technical terms (the graphic other), but expands to include forms of the cultural, historical, racial, and sexual other.<sup>3</sup> Although ekphrasis takes as its goal a representation of the visual

artwork, it always seems to move beyond strictly iconographic or technical concerns and into the cultural world in which the two art forms exist.<sup>4</sup>

Finally, an ekphrasis is always embedded in some larger verbal, socio-historical, cultural, or critical context. In ancient narratives ekphrasis is a kind of ornamental brooch, pinned to the epic cloak. It stands outside, at the same time that it stands for, the events and the world of the narrative. When ekphrasis narrows its focus and comes to be about artworks rather than utilitarian objects like shields and cups, it is nevertheless surrounded by the physical structure and the cultural assumptions of the museum. Philostratus' 'Hunters' appears as an ekphrastic moment in the *Imagines*, a tour of a picture gallery in Naples; Keats's 'Ode on a Grecian Urn' depicts an imaginary urn in an imaginary museum; 'The Hunters in the Snow' represents an exhibit in William Carlos Williams's private museum, *Pictures From Breughel*, a personal anthology of the Dutch master's work. Ekphrasis is also embedded in a historical context—we may speak of classical, romantic, or modern examples of ekphrasis—and a critical one: ekphrasis is the embattled arena where debates over the sister arts occur, where we encounter the clash between literary theorists and art historians, semioticians and iconographers. The critical discourse on ekphrasis is rife with metaphors of battle.

Since it concerns the 'sister arts', I suppose it is not surprising that ekphrasis is often feminized in aesthetic criticism; more curious is the pejorative nature of this analogy, especially in discussions of the epic *topos*. Ekphrasis is referred to as digressive, a device that distracts our attention from the implicitly 'masculine' nature of the primary narrative line. The second definition of ekphrasis in the OED, taken from Thomas Moore's review of writings by the early church fathers, speaks disparagingly of their 'florid effeminacies of style', which the reviewer likens to 'an ecphrasis of Libanius'. In his influential *Medieval Rhetoric and Poetic*, C.S. Baldwin marginalizes ekphrasis even further, calling it a 'perverted poetic' (1928: 294) and a rhetoric of 'deviation' (1928: 188). And most recently, Bryan Wolf capitalizes on these associations of ekphrasis with transgression by entitling his essay 'Confessions of a closet ekphrastic: Literature, painting, and other unnatural relations'. Here ekphrasis is referred to as 'miscegenat[ion]' (1990: 186), violation, conspiracy, 'the rapacity of language at the very moment of perception' (1990: 189); and though Wolf is self-conscious about his use of language, he nevertheless takes up the charged vocabulary of ekphrastic encounter with the ardor of a late afternoon talk-show host. Whether it occurs in aesthetic

theory, in a handbook, an epic, or a museum, ekphrasis appears in a cultural matrix rich in meaning.<sup>5</sup>

### **Philostratus' 'Hunters'**

After this broad overview of the domain of ekphrasis, I want to turn now to a pair of examples. One of the earliest exercises in aesthetic ekphrasis is the elder Philostratus' *Imagines*. The *Imagines* consist of 65 prose ekphrases which were purportedly written in a gallery in Naples that housed numerous marbles and panel-paintings. Philostratus undertakes the descriptions for the son of his host, whom he addresses, and assumes the role of interpreter and art critic. Here is the opening of 'Hunters', which appears in the first book:

Do not rush past us, ye hunters, nor urge on your steeds till we can track down what your purpose is and what the game is you are hunting. For you claim to be pursuing a 'fierce wild boar', and I see the devastation wrought by the creature—it has burrowed under the olive trees, cut down the vines, and has left neither fig tree nor apple tree or apple branch, but has torn them all out of the earth, partly by digging them up, partly by hurling itself upon them, and partly by rubbing against them. I see the creature, its mane bristling, its eyes flashing fire, and it is gnashing its tusks at you, brave youths; for such wild animals are quick to hear the hunter's din from a very great distance. But my own opinion is that, as you were hunting the beauty of yonder youth, you have been captured by him and are eager to run into danger for him. For why so near? Why do you touch him? Why have you turned toward him? Why do you jostle each other with your horses?

(Philostratus 1931: 107-9)

It would be hard to imagine a more energetic entrance into the fictive world of a painted scene, or a more vivid enactment of Hagstrum's definition of ekphrasis as 'giving voice and language to the otherwise mute art object' (1958: 18n). Even as the hunters themselves, Philostratus rushes into the picture without establishing an immediate context or frame. There is no transition from the previous artwork, no indication that we are now witnessing a different representation, or indeed, that this is even a representation. The opening apostrophe, 'Do not rush past us, ye

hunters', places the viewer and his eager companion directly within the moment of the picture, as excited bystanders. Moreover, Philostratus increases the animated power of the spectacle by deliberately inverting the situations of viewer and artwork: here it is figures in a painted scene that rush by the museum-goer, rather than the other way round. The hunters are so lifelike, so kinetic, that Philostratus must ask *them* to slow down so that he may pose his questions.<sup>6</sup>

The author subverts the static and two-dimensional surface of the panel in other ways as well, for example by breathing life into his description of the boar, which 'bristl[es]' its mane, 'flash[es]' its eyes, and 'gnash[es]' its tusks in defiance of the hunters. Even the boar's previous rampage—consisting of events which must have occurred in the picture's immediate past—is brought vividly to life in the participles 'digging', 'hurling', and 'rubbing'. The use of sound ('the hunter's din') to describe a silent picture, as well as the short, passionate burst of questions about the beautiful youth toward the end (reminiscent of Keats's interrogation of the Grecian urn in the first stanza of his ode) only underscore the author's breathless commitment to the world of the painting.

It comes as some surprise, then, to encounter the sudden retreat of the next paragraph:

How I have been deceived! I was deluded by the painting into thinking that the figures were not painted but were real beings, moving and loving—at any rate I shout at them as though they could hear and I imagine that I hear some response—and you did not utter a single word to turn me back from my mistake, being as much overcome as I was and unable to free yourself from the deception and the stupefaction induced by it. So let us look at the details of the painting; for it really is a painting before which we stand. (1931: 109)

Philostratus and the boy have been held captive by the picture's spell, running into the danger of its fiction in much the same way we are told the hunters pursue the boar for the beautiful youth. In fact, the two are hunters of a sort as well, though they spend their days chasing images rather than game. Here, however, the critic abruptly ends his ekphrastic reverie, pulling back from the picture and proclaiming its fictionality. The present tense gives way to the past and to a self-conscious recognition of the artist's *trompe l'oeil*; the heated exchange between observer and hunters collapses into the 'as though' of imagination. Most importantly, perhaps, the original experience before the artwork is now reduced to and figured as a decep-

tion, a ‘mistake’. In this revision of the opening response, ekphrastic empathy or hope is understood as a potentially dangerous form of bondage to the picture and the artist’s skillful illusion.

It should be pointed out that much of this danger is dissipated by the humor of the passage, particularly by the comic complicity of the boy, and the sudden modulation of tone from feigned distress (‘How I have been deceived!’) and blame (‘you did not utter a single word’) to instructional piety (‘So let us look at the details of the painting’). In ‘Narcissus’, an earlier ekphrasis, Philostratus shows a similar tendency to mock the artist’s delight in illusionism: ‘The painting has such regard for realism that it even shows drops of dew dripping from the flowers and a bee settling on the flowers—whether a real bee has been deceived by the painted flowers or whether we are to be deceived into thinking that a painted bee is real, I do not know. But let that pass’ (1931: 90-91). In this clever parody of the story of Zeuxis’s grapes, Philostratus matches the ritualized wonder of Zeuxis as he is tricked by Parrhasius’s curtain with his own form of calculated ennui; rather than awe before the mimetic fidelity of the image, Philostratus expresses desultory indifference, as if he has seen this sort of thing countless times before.

If the tone of the second ‘Hunters’ passage parodies the reverence for mimesis held by traditional realist painters, its message, addressed to the boy-pupil, could not be more serious. Behind the humor lies an important moral: a proper appreciation of the painting derives from both a temporary investment in its representation of reality and a concomitant pulling away, an awareness of its conscious artifice. Philostratus teaches the boy how to admire realistic painting without succumbing fully to its illusion. As long as the boy allows himself to be ‘overcome’ by the representation in the right critical spirit, he can control the work’s potentially stupefying and mesmeric power. This is also the message of the famous last scene in Shakespeare’s *The Winter’s Tale*, where Paulina—a Renaissance Philostratus—carefully monitors the responses of the Sicilian royal family to the animated statue of Hermione, the last ‘work’ in her picture gallery. She encourages them to believe that the statue is real and at the same time cautions them against too easily succumbing to the magic of the sculptor’s chisel. ‘Good my lord, forbear’, she warns Leontes, ‘The ruddiness upon her lip is wet; / You’ll mar it if you kiss it, stain your own / With oily painting’ (Maxwell 1971: V,iii, 82-85).

As if to make up for his initial deception at the hands of the artist in ‘Hunters’, Philostratus spends most of the rest of his ekphrasis examining and cataloguing

the minutest of details in the painting. He virtually overwhelms the boy with erudite information about the physiognomy of the riders, their clothing and weapons ('snares and nets and boar-spears and javelins and lances with toothed blades'—1931: 111), the types and trappings of the horses, and even the breeds of the various dogs ('Locrian, Laconian, Indian, and Cretan'—1931: 113). Instead of conspiring with the illusion of the portrayed action, Philostratus now plays the chin-stroking connoisseur, eager to match the vivid images with his own specific words and precise knowledge. A methodical inventory of the painting's detail replaces the galloping fury of the opening paragraph. The point, now, is precisely to *name* the world of the painting—much as Adam named the beasts in Eden—and thereby manage its emotional affect.

The last paragraph of the 'Hunters' resumes the narrative strategy of the opening, but this time far exceeds even the implied possibilities of the depicted scene. The boar leaps at the horsemen, is wounded, runs through the woods until it finds refuge in a marsh, is pursued by the beautiful youth, and is at last mortally wounded by him. The frenetic series of events leaves the painting's 'pregnant moment' far behind, exploiting its tacit story with a vengeance. Clearly, Philostratus is showing off the teleological power of the word, of narrative, placing his own wild hunt in competition with the static portrait of a hunt offered by the painting. Where the artist had initially deceived him, he now deceives *us* into thinking that we are reading a story, rather than looking at a picture. Plot has replaced composition as the focus of our attention.

In the final lines of this ekphrasis Philostratus trumps the painter by using the language of the visual arts as metaphor, by completely subsuming the rhetoric of the image within the rhetoric of the word: 'The lad is still in the pool, still in the attitude in which he hurled his javelin, while the youths stand in astonishment and gaze at him as though he were a picture' (1931: 115). The ekphrasis has come full circle, returning us to the original scene and the hunters' obsession with the beautiful youth. But now all is frozen art, stillness and attitude, rather than rampant motion. Before, Philostratus had to catch up with the picture, pleading with the hunters to slow down, asking them questions, filling in past events; now it is the picture, or more specifically, the *pictorial* that must serve the narrative. Philostratus has moved so far beyond the painting by this stage, and invested himself so deeply in his own fabricated tale, that the image has become available now only as metaphor ('as though he were a picture'). Philostratus uses the visual purely as a

device of narrative closure. One of the great ironies of the ending, of course, is that the youth *is* a picture, though by this time we have all but forgotten it.<sup>7</sup>

### Williams's 'The Hunters in the Snow'

Where Philostratus sets out to teach his young pupil aesthetic taste, judgment, and interpretation by leading him through one of the first picture-galleries, Williams creates his own personal museum in *Pictures From Brueghel*, an eclectic ensemble of Brueghel paintings that addresses questions of the artist's relationship to his materials and to his world. Philostratus' 'Hunters' runs free of the picture, careening wildly into an imaginative narrative; Williams's poem, on the other hand, represents a disciplined reflection of the image and an homage to the painter's powers of observation.

The over-all picture is winter  
 icy mountains  
 in the background the return  
  
 from the hunt it is toward evening  
 from the left  
 sturdy hunters lead in  
  
 their pack the inn-sign  
 hanging from a  
 broken hinge is a stag a crucifix  
  
 between his antlers the cold  
 inn yard is  
 deserted but for a huge bonfire  
  
 that flares wind-driven tended by  
 women who cluster  
 about it to the right beyond  
  
 the hill is a pattern of skaters

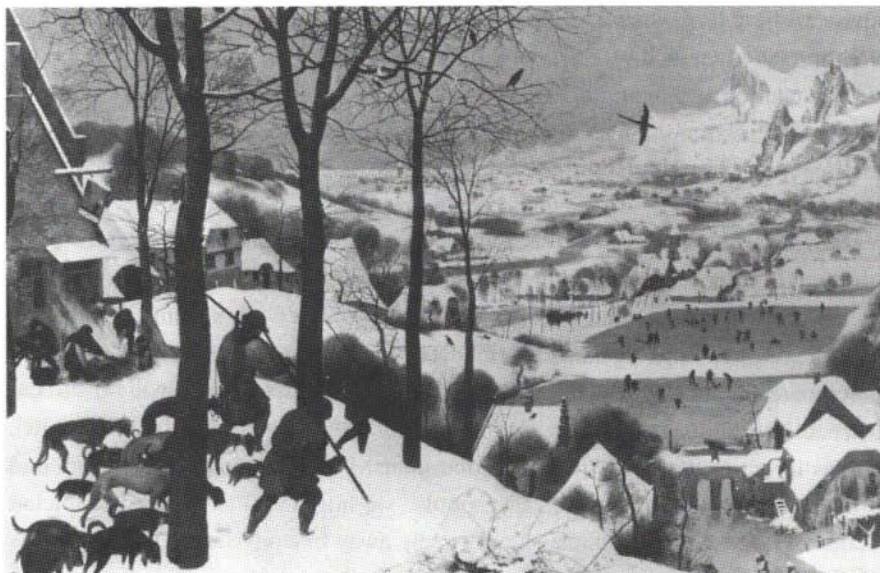


Plate 1. Pieter Brueghel the Elder, 'The Return of the Hunters' ('Heimkehr der Jäger'). Kunsthistorisches Museum, Vienna.

Brueghel the painter  
concerned with it all has chosen

a winter-struck bush for his  
foreground to  
complete the picture .

(Williams 1962: 5)

If Philostratus is periphrastic and encyclopedic, often oververbalizing the silent artwork, Williams is succinct and spare. His poem is like a little ladder perched against Brueghel's painting. Next to Philostratus's prose-sprawl, Williams' poem—shaped, lean—looks like a skeleton. Each word is hung from the page like a painted image; each sentence is juxtaposed *materially*, rather than syntactically. In fact, temporal markers such as transition and subordination are deliberately suppressed. Where Philostratus's eye is restless and kinetic, darting from one image to the next within the painting, Williams's eye is disciplined and selective, careful to isolate an image and then fix it in language. Most importantly, in his

'Hunters', as I have shown, Philostratus exploits the temporal, narrative potential of ekphrasis to the full. He uses the static elements of the picture only as imaginative material for his plot-driven description. By contrast, Williams's 'Hunters' explores the spatial impulse of ekphrasis, Krieger's paradoxical 'still movement'. His full title, 'The Hunters in the Snow', suggests this concern with stasis, even perhaps punning on the traditional frozen moment.

Unlike his predecessor, Williams never attempts to substitute a tale for the visual artwork he surveys; on the contrary, he purposefully frames his account of the landscape at the beginning and end, referring to the work's status as a picture and invoking the artist by name. Throughout the ekphrasis, Williams is careful to underscore location and direction, emphasizing his own position *vis-à-vis* the artwork: 'in the background', 'from the left', 'to the right', 'beyond / the hill', 'for his foreground'. The effect is to control our visual experience of the work and to discourage 'ekphrastic hope', the impulse we might feel to enter the depicted scene. If Philostratus' ekphrasis roams freely away from its source, Williams's is relatively faithful to the original. We are led almost methodically through the painting, encouraged to look where Williams looks. Aloof, detached, the poet acts as an observer of the events in the painting, adopting the same distance Brueghel assumes through the aerial perspective of his composition. Where Philostratus reorganizes the painting, Williams's ekphrasis is organized *by* the painting.

In 'The Hunters in the Snow', Williams challenges many of the most deeply held assumptions about ekphrastic technique and ekphrastic response. The poet refuses to animate or breathe life into the hunters, preferring instead to fix them in the snow and highlight inanimate objects—the inn-sign, the bonfire, the winter-struck bush. We begin the poem with the hunters, to be sure, but they are 'sturdy', anchored, and though they 'lead in / their pack', they are soon abandoned in favor of the broken sign, an image that reduces their quarry (stags) to a form of visual (and commercial) representation. As Wendy Steiner has observed, the ambiguous syntactical construction of the first stanza ('The over-all picture is winter / icy mountains / in the background the return / from the hunt') serves to marginalize the hunters even further. In a figurative, if not a literal sense, they are placed 'in the background' (1982: 80). Moreover, the hunters are never individualized, as the youth is in Philostratus, and remain a collective and faceless group, much like the women who 'cluster' about the fire. Everything about the scene appears 'winter-struck', an impression that is reinforced by the flat, noncommittal

repetition of ‘is’ in stanzas 1, 2, 3, 4, and 6. The narrational impulse of ekphrasis has been completely suppressed in favor of a discrete series of vignettes.

If Williams refuses either to animate the hunters or to narrate their return, he also refuses to apostrophize them or empathize with them (a technique he does employ in ‘Peasant Wedding’, which opens ‘Pour the wine bridegroom’). Neither moving them nor moved by them, he simply records their existence in Brueghel’s landscape. What narrative he does follow derives wholly from the formal structure and organization of the painting itself: his eye is led through the landscape by the visual instructions—the perspective, iconography, color scheme—provided by the artist. In this sense, Williams relies on the most fundamental and conservative tenet of ekphrasis: that of imitation. His straightforward, almost childlike description of the painting, like his refusal to improvise a narrative from it, reflects his reverence for the artist. All empathy in the poem is reserved for Brueghel, who serves as a type of the all-seeing, omniscient creator, ‘concerned with it all’.

Oddly, it is the ‘winter-struck bush’ that ‘complete[s] the picture’—not the hunters, nor the skaters (reduced to a ‘pattern’ in the distance), nor anything human; and surely what Williams means is that the bush completes his *writing* of the picture, not the picture itself. For how could we speak of a single object tying together a work that exists simultaneously in space, and exists within the gaze of individual observers? How could we discover where Brueghel decided to end it? How can we even speak of a painting having an ‘end’? The deliberate confusion of the completion of his own ekphrasis with that of the picture only reinforces Williams’s close association with the painter. By the end, Williams has imagined himself present at the work’s creation, where he oversees and applauds Brueghel’s compositional choices.

‘The Hunters in the Snow’ does not end with the bush or with Brueghel’s completion of the picture, however. It ends with a strange pair of suspended semi-ellipses that seem to undo the work of the last two stanzas. Where the conclusion of Philostratus’ ‘Hunters’ is decisive and unambiguous—the beautiful youth is frozen in the attitude of victory, encircled by a human amphitheater of admiring friends—that of Williams’s ekphrasis is deeply problematic. The curious drift of the ellipses (a rare example of punctuation in the *Pictures*) suggests an open-ended conclusion, as if the ekphrasis is actually to be completed by the reader, or as if we are now meant to return to the painting. Interestingly, the punctuation is nonstandard, idiosyncratic, a fact that draws attention to the marks as marks, to their

spatial *look*. Thus, they are allowed to function as either graphic or semantic markers; they represent Williams's attempt to retain the grammatical sense of ellipses while invoking or suggesting the form of painting. The poem, then, ends visually, continues verbally. The ellipses embody the moment when ekphrasis comes perilously close to iconic poetry, when the writer's iconophilia threatens to reduce the word to its merely graphic components. Williams eludes this problem, as Keats does at the end of his ode, by finding an imaginative compromise between word and image.

In spite of the poet's abiding affection for the painter and his work, the image does not prevail in Williams's ekphrasis, nor does it in Wenders' *Until the End of the World*, where the heroine is rescued from her addiction to visual reproductions of her dreams by reading a novel. From the hunted (she and the hero are pursued around the world by bank robbers, a private eye, and an Australian bounty hunter), she is transformed into a visual hunter who tracks down industrial polluters from outer space. In the end, both film and poem discover ways of balancing the verbal and the visual, ways of using the verbal to keep the visual honest. The film, in particular, invites us to rethink the rationale of ekphrasis in the postmodern world. The problem is no longer how to make the silent image speak—one of the original motivations of ekphrastic description—but how to speak *in the face of the image*. 'Conversation is almost dead', writes Guy DeBord in *Comments on the Society of the Spectacle*, 'and soon so too will be those who knew how to speak' (1990: 29). To forestall this outcome, we must begin to think of ekphrasis in its widest possible sense, not as a minor genre or a curiosity of ancient rhetoric, but as a way of writing and speaking about images. In a social and political, rather than a literary sense, then, the broader definition of ekphrasis I eschewed in the beginning of the essay—namely, verbal representation of visual representation—seems absolutely essential. Ekphrasis becomes a necessity if we are to survive in a culture where, in tennis star Andre Agassi's words, 'Image is everything'.

## Notes

1. See Mitchell (1992) and Heffernan (1991) for this definition.
2. Heffernan astutely notes that Wordsworth's final account of Beaumont's work differs markedly from what actually appears in the painting and represents yet

another reconstruction of the image (1993: 96). More interestingly, perhaps, in place of a fictional extension of the picture's pregnant moment constructed from elements already within the frame, Wordsworth supplies a personal narrative from without. It is the *speaker's* history, rather than the landscape's, that is recounted in 'Elegiac Stanzas'.

3. See Boyd's essay on Virgil's *Camilla*, the feminine, and the ekphrastic catalogue for an interesting application of these theories (1992). For another, wonderful example of ekphrastic fear, see the 'Dream Fugue' section of 'The English Mail-Coach', where De Quincey animates the bas-relief sculpture of the Dying Trumpeter, but at the expense of his own mobility (Perkins 1967: 755).
4. Ekphrastic response often carries with it a sense of competition and rivalry between the poet and the painter or sculptor. Behind many ekphrases lie the ongoing debates over the relationship between the arts. In the epigram 'On a Picture of Ulysses', for example, the anonymous author notes the painting's susceptibility to contingency and time: 'Ever is the sea unkind to the son of Laertes; the flood hath bathed the picture and washed off the figure from the wood. What did it gain thereby? For in Homer's verse the image of him is painted on immortal pages' (Paton 1917: 231, #125).
5. See Scott (1991) for a more detailed discussion of the critical reception of ekphrasis.
6. Though space does not permit here, the homoerotic potential of ekphrastic hope (or desire) in the 'Hunters' deserves special attention (Mitchell speaks only of the feminine associations of artworks). Philostratus' repressed desire for the boy in the context of the ekphrasis is echoed in the picture by the hunters' desire for the youth, which in turn is figured in or displaced onto the boar's aggressive and threatening sexuality (tearing, digging, rubbing, flashing, etc.).
7. Robert Wind, to whom I am indebted for his thoughtful reading of this essay, sees my interpretation of 'Hunters' as overly binary, pitting movement against stasis in a way that limits the subtlety and complexity of Philostratus' ekphrasis, which he usefully defines as 'a conflation of visual and verbal categories'. The final static pose of the youthful boar-hunter, he argues, elicits other themes in addition to those I emphasize—most notably, themes of contrariety and reversal; for example, the civilized youth as hunted (by the boar) and hunter; civilized hunters as civilized prey; the vicissitudes of nature's

blossoms (youth and apple-blossoms) sought by appetites erotic and aggressively destructive (hunters, boar). Wind's final comments are worth quoting here: 'These themes embrace most abstractly, but to the same conflationary effect, the ekphrastic responses of hope and fear, erasing in the narrative their boundaries too, and suggesting at the same time the contraries in the human faculties of perception and memory, thought and emotion. Ekphrastic fear, in formal, analytical terms a fear of deprivation of motion, of permanent arrest, is only *formally* a fear of the Other, since that other is revealed, in its expression, as Self'. Wind also speculates that Philostratus may be describing a *paneled* painting, or at least evoking one.

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## Cognitive Linguistics and Prototypes

Claude Vandeloise

Many connections have been proposed between linguistics and semiology. According to Saussure (1916), linguistics is part of semiology. In contrast, Barthes (1965) claims that any semiotic system must be translated by language. Other semioticians, such as Saint-Martin (1987), borrow their descriptive tools from the metalanguage of linguistics. The Group Mu (1992), on the other hand, criticizes linguistic imperialism and emphasizes the specificity of the visual sign. Whatever position semioticians adopt concerning the relationship between semiotics and language, they share a common point: their references to linguistics are restricted to structuralist linguistics.<sup>1</sup> This chapter is devoted to cognitive linguistics, a new approach to language which may radically modify the relationship between linguistics and semiology. My presentation will focus on the role of prototypes in this theory.

According to advocates of structuralism, language is an autonomous system. Without the structure it provides, thought would be essentially amorphous. Linguistic signifieds (*signifiés*) cannot be positively described, but must be defined through their differences from the other signifieds in the system. Cognitive linguistics challenges these two structuralist axioms. According to this theory, our conceptualization of the world is an organized system structured by concepts such as the vertical axis, the line of sight, the relationship between the bearer and the burden, between the container and the content, and so forth. Of course, this extralinguistic system does not univocally determine language; otherwise the diversity of languages could not be explained. However, this system partially motivates languages by presenting an array of possible choices on which each language conventionally builds its grammar. This anchoring of language in the conceptualization of the world spares one the necessity of differentially defining linguistic categories. Indeed, even though the *value* of a word may depend on the whole lexicon, signifieds of basic words are positively defined by the extralinguistic concepts with which they are associated. This partially motivated relationship between language and our conceptualization of the world dramatically modifies the relationship between linguistics and visual semiology.<sup>2</sup> Indeed, if language is a

representation of the world sharing some properties with its model, part of the task of the cognitivist linguist is to determine these properties. Therefore, cognitive linguistics and visual semiotics draw on the same source: our conceptualization of the world.

Since they postulate a link between language and general cognition, cognitivist linguists have naturally been interested in the connection between linguistic categorization and human categorization. Without ever having contemplated another alternative, structuralists assume that linguistic categories are determined by distinctive features, working as criteria or necessary and sufficient conditions. This type of categorization is well adapted to the aspirations of distributionalism, since this theory endeavors to model its methods on those of the exact sciences. Furthermore, distinctive features are a corollary of the differential definition of meaning. The difficulty of finding necessary and sufficient conditions to define categories as banal as *dog* or *chair* might have alarmed structuralists if not for their confidence in the progress of science. According to cognitive linguistics, this difficulty in finding semantic features does not stem from a lack of ingenuity on the part of the researchers, but rather from an erroneous conception of human categorization. Their position is confirmed by the research of cognitive psychologists, such as Rosch and her collaborators, on human categorization.

Rosch's research plays an important role in the development of cognitive linguistics. Therefore, it will be presented in the first part of this chapter. *Natural categories*, as they are defined in cognitive psychology, will be opposed to *classical categories*, often called Aristotelian categories. *Prototypes* and *family resemblances* play an important role in the definition of natural categories. These two concepts will be compared in the second section. In the third part of this chapter, I will present the role of prototypes and family resemblances in the description of language. Difficulties in applying prototypes to the linguistic description will bear witness to the differences between linguistic and visual signs.

### **Natural Categories**

In her research, Rosch deals almost exclusively with categories of concrete entities. Let us call them *perceptual categories*. First, I will review Rosch's experiments on color categories. Next, natural species and artefacts will be investigated. These

entities are grouped at three levels: supercategories, basic categories, and subcategories. The particularities of supercategories conclude this section.

### *Color Categories*

According to structuralists, color terms constitute an ideal domain to demonstrate the arbitrariness of language. Indeed, different languages cut the same physical continuum in many different ways. The work of Berlin and Kay (1969) shows that this diversity must be qualified. They asked subjects speaking languages from all over the world to identify tokens of Munsell's map of color corresponding to the basic color terms in their language. The results showed a remarkable similarity, with all subjects pointing at a few areas corresponding to focal colors. Furthermore, the appearance of basic terms in a language is fixed by strict implication rules. Whenever a language has only two basic terms to designate the color spectrum, they always separate the light (or cold) colors from the dark (or warm) ones. The third basic color term to appear invariably designates an area corresponding to red. The range of basic color terms widens in the following order: green and/or blue; yellow; brown; orange, rose, purple or gray. Kay and McDaniel (1978) claim that all these categories are centered around focal colors corresponding to areas ideally perceived by the human visual system.<sup>3</sup> Therefore, even if the description of the color spectrum by human languages is not completely predictable, it appears to be partially motivated.

The structure of color categories poses obvious problems for the differential definition of meaning and for classical categories defined by necessary and sufficient conditions. Indeed, in order to categorize *yellow* or *red*, one should fix a wavelength above which all the samples are red and below which all the samples are yellow. Rosch's research demonstrates that children learn color categories not by fixing their boundaries, but by recognizing the most representative samples, corresponding for basic colors to focal colors. Thus, the very example chosen by structuralists to establish the arbitrariness of human language turns out to be a blatant counter-example to the differential interpretation of meaning and to classical categorization according to which: (1) all the members of a classical category abide by necessary and sufficient conditions; (2) all the members of a classical category share the same status; and (3) classical categories are mutually exclusive.

In contrast, basic color categories have a best representative member, the focal color. Membership is decided by comparison with this token: the closer a shade of color is to it, the more representative it is of the category. The representativity of a token can decrease to a point where different speakers might make different decisions concerning its membership. Thus, color categories are a perfect example of *natural categories*, whose characteristics are at odds with the characteristics of classical categories: (1) all the members of a natural category do not necessarily share a common attribute; (2) all the members of a natural category do not necessarily have the same status; and (3) natural categories are not mutually exclusive.<sup>4</sup>

The first characteristic of natural categories will be better illustrated in the next section, by natural species and the categories of artefacts. On the other hand, color categories are paradigmatic examples for the second and the third characteristics. The best member for a basic color category such as red is focal red. This member is the *prototype* of the category. Membership in this category is decided by comparison with the focal color. This prototype is the best member of the category; its central member;<sup>5</sup> physiologically determined. Color categories are not mutually exclusive, since a marginal token can be dubbed yellow by one speaker, red by another.

### *Natural Species and Artefacts*

Extending her research from colors to natural species and artefacts, Rosch (1973; Rosch et al. 1976) brings out new information about human categorization. My presentation of her work will be twofold. First, I will present *vertical* connections, relating the most inclusive categories (such as animals) to the least inclusive (such as coal-tits) through intermediate levels such as birds, passerines, and tits. Second, I will deal with *horizontal* relationships, relating different members in the category to each another.

*Vertical Connections.* Rosch essentially mentions three levels of categorization: *supercategories* (such as furniture, animals, etc.), *basic categories* (such as chairs, dogs, etc.), and *subcategories* (such as swivel-chairs, boxers, etc.). Her research reveals the importance of basic categories. Notably, these categories are mastered earlier by children, and their members are recognized more quickly and accurately by adults. Furthermore, these categories trigger a mental image more easily than

supercategories. Rosch explains the advantage of basic categories by their relation with the nature of the world. Some attributes,<sup>6</sup> such as teeth and hair or beaks and feathers, usually appear together. Basic categories take advantage of these bundles of related attributes in order to represent as economically as possible our experience of the world. Of course, since supercategories are more general than basic categories, their definition involves fewer attributes. Consequently, membership in supercategories requires less verification than membership in basic categories. However, there is a price to pay for this generality, since membership in a supercategory provides little information about an object: is a piece of furniture used for eating, for sitting, or for putting away? Subcategories suffer the opposite defect: too many attributes must be met to gain membership in these categories. Furthermore, the information they provide is overdetailed for our everyday needs. Basic categories, then, realize a perfect balance between the price to pay to categorize an entity  $x$  in a category  $X$  and the information provided on  $x$  by its membership in  $X$ .

*Horizontal Connections.* The relationships between members of basic categories and members of supercategories are very different. Indeed, the members of the latter categories are themselves basic categories. I will postpone the presentation of horizontal connections in supercategories until the end of this section.

Rosch demonstrated experimentally that basic categories grouping together members of natural species and artefacts behave like natural categories. As an example, the category of chairs includes better members which are categorized more quickly than marginal members. Also, the mental image evoked by the word *chair* appears to be closer to representative chairs than to marginal chairs (Rosch et al. 1976). The best member of these categories is often called *prototype*. However, one must stress the discrepancies with the prototypes of color categories. Indeed, the latter prototypes are members of the category; central members; physiologically motivated. None of these three characteristics is shared by the prototypes of natural species or artifacts: (1) While one can point to a token of focal red, it is impossible to show a 'prototypical dog' or a 'prototypical chair'. (2) No dimension, such as the scale of wavelength, is available to determine a central member of natural species or categories of artefact. One can only speak of a central member in these categories if *central* is used metaphorically rather than *representatively*.<sup>7</sup> (3) Our brain is quite unlikely to be devised to perceive ideally the prototypical bird or the prototypical chair.

As a matter of fact, many cognitive psychologists ask themselves whether the most representative members of a category determine its structure, or whether to the contrary, effects of representativity are a superficial consequence of the structure of the category. If such is the case, which are the factors determining representativity? It is commonly thought that the more frequently a member occurs, the more representative it is. However, this factor cannot be sufficient; otherwise, chickens would be more representative of the category *bird* than swallows because they are more pervasive in our experience. Hence, another factor determining the representativity of the members in a category must be found. Representativity in a category often depends on the characteristics of its members and on the importance of those characteristics in the category. Let us call *typical attributes* the most pertinent characteristics of a category. These attributes do not behave like necessary and sufficient conditions for natural categories. Instead, they constitute a *family resemblance*. This means that any member of the category shares at least *one* attribute with any other member. However, there is not necessarily one attribute shared by *all* the members of the category.<sup>8</sup> From now on, the attributes of a family resemblance will be called *traits*. Every member of the category satisfies a subset of these traits and shares some trait at least with each member of the category.<sup>9</sup>

A first alternative concerning the nature of the categories determined by natural species and artefacts has been proposed: are representativity effects an explanation for the structure of these categories or are they rather a consequence of their structure? The role of family resemblances in the description of these categories suggests a second question: are they represented in our mind by a (mental) image of their most representative members or by a list of the traits of the family resemblance? In the former case, membership is decided after comparison with the mental image; in the latter case, membership depends on the number of traits met by the candidate. The mode of comparison between the token and the mental image opens a third alternative: is the comparison global or does it occur analytically, by comparing successively different aspects of the token with different aspects of the mental image? The second mode of comparison implies an analysis of the different aspects of the mental image. This analysis leads to a representation of the mental image very similar to the traits of the family resemblance. Depending on the answers to these three questions, our mental representations of natural species and categories of artefacts have different characteristics. Two sets of answers contrast dramatically. According to the former, the best members deter-

mine the structure of the category; the mental representation of the category is a mental image; and membership in the category is decided through a global comparison with the mental image. According to the latter, the best members are a consequence of the structure of the category; the mental representation of the category is a list of traits; and membership is decided analytically, by checking each attribute. Advocates of the former answers are consistent when they call the best members of natural species *prototypes*, as they do for the best members of color categories. Advocates of the latter answers, in contrast, should avoid using this term for natural species and categories of artefacts. Indeed, according to them, the best members of these categories share no essential characteristic with the prototypes of color categories. I will come back on the discrepancies between these answers after discussion of the structure of supercategories.

*Supercategories.* Members of supercategories (such as furniture, animals, etc.) are themselves basic categories (chairs, tables, etc.; dogs, cats, etc.). Representativity effects appear in these categories too: a dog is a more representative animal than a turtle, and a chair is a more representative piece of furniture than an ashtray. However, in contrast to basic categories such as tables, supercategories such as furniture do not evoke a general form. Since mental images are excluded for these categories, should they rather be represented by family resemblances? Two types of family resemblances, illustrated in Figures 1 and 2, must be distinguished.

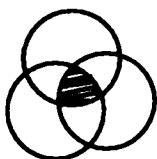


Figure 1.

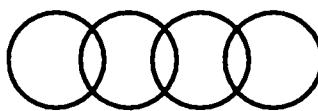


Figure 2.

In Figure 1, some members in the category share all the traits of the family resemblance. Even though whims of fate and genetic caprice may create dogs with one ear or five legs, it remains true that most dogs pride themselves on their two ears and four legs. Whatever our mental representation of the category of dogs may be, it most likely relies more on canonical dogs than on marginal ones. Figure 1 is typical for basic categories such as dogs, but very unusual for supercategories, which are best represented by Figure 2. When Wittgenstein (1953) first

introduced the concept of family resemblance, he was certainly thinking of Figure 2 rather than Figure 1. Indeed, taking the category of games for example, he made clear that no game could share all the characteristics of football, chess, and card games. While the structure of Figure 1 determines the most representative members of the category (the ones that share all the attributes), such is not the case for Figure 2. As an example, let us assume that Figure 2 is an illustration of the category of pieces of furniture, and that the functional traits of the family resemblance are: (a) objects for sitting; (b) objects for eating and writing; and (c) objects for putting away. Desks in schools possess traits (a) and (b); a secretary shares traits (b) and (c). However, they are less representative than chairs (which only meet trait a), tables (which only meet trait b), or chests (which only meet trait c). Therefore, an explanation for the representativity effects in supercategories must be sought elsewhere. Kleiber (1991) might be right when he suggests that familiarity is crucial for determining representativity in supercategories.

### Representation of Perceptual Category

The preceding section establishes that the mental representation of basic colors should be distinguished from the mental representation of natural species and artefacts. The same holds true for mental representations of basic categories and of supercategories. The role of prototypes is most evident in color categories, since focal colors are physiologically grounded, central in the category, and can be exemplified by a member of the category. The bases for representativity in supercategories, by contrast, are so different from representativity in color categories that the term *prototype* should be avoided for designating the most representative members of these categories, for fear that the polysemy of this word would make it unusable.

The mental representation of natural species and of artefacts will now be considered. This question has been touched upon in the first section. Remember that one should speak of *prototypes* for these categories only if one believes that the best members are not a consequence of the structure of the category but its cause; that the mental representation of the category is not a list of attributes but a mental image; and finally, that the comparison between the members and the mental image is not done attribute by attribute, but globally. In this section, I

will claim that the two sets of answers are not incompatible. Instead, they belong to different levels of representation.

Indeed, while a category is learned by children, best members can be both a *cause* of the categorization and its *consequence*. To be specific, at each instant  $t$ , a decision of membership is a consequence of all the preceding decisions. Once it has been taken, the decision will be part of the cause for the following acts of categorization. The evolution of the representation of a category is especially noticeable with children. However, even with adults, an extraordinary dog or an extraordinary tree may slightly modify his/her representation of the categories of dogs or of trees. Thus, with a dynamic approach to categorization, best examples in a category might be both the consequence of prior decisions of categorization and the cause of subsequent decisions. Turning to membership decision, *global comparison* and *analytical comparison* may also be compatible. Groupe  $\mu$  describes visual perception in three steps. At a strictly perceptual stage, one determines the *limits* of the image. At a second stage of organization, limits become *contours*, due to the distinction created between the *figure* and the *ground*. A *shape* is attributed to the image only at the third stage. This attribution necessitates a comparison between the contours and a *repertory*, which is a structured system of *types*, inscribed in the memory. This involves global as well as analytical comparison. Indeed, thanks to the first attribute recorded, the brain triggers globally a type with which the image is compared. If the answer is negative, the visual system records other traits which activate another prospective type in the repertory. Thus, there may be many oscillations between the perceived images and the hypothetical types before a decision of matching is reached. Therefore, the comparison between the perceived image and the type can be both global and analytical. The relationship between the *types* proposed by Groupe  $\mu$  and the *prototypes* in cognitive psychology will be investigated in the last section of this chapter.

Prototypes as well as family resemblances, as they were discussed up to now, belong to human beings' mental representations. Now, the semiotician, the psychologist, or the linguist must provide a written or pictorial representation of these mental entities. Offering a schema of neuronal activity to elucidate the nature of a category would certainly be a wonderful feat for a neuropsychologist. However, such schemata would leave semioticians and linguists both admiring and frustrated. In other words, linguists and semioticians are only interested in mental objects if they may be made explicit in writing or in drawing. The traits of a

family resemblance certainly satisfy this condition. The question I will now address concerns prototypes: how can these mental objects be represented?

If a linguist tries to represent the prototype of the category of dogs in language, he/she will probably use propositions like 'it has four legs', 'it wags its tail', etc. As far as written representation is concerned, then, there does not appear to be a difference between the representation of a prototype and that of a family resemblance. This suggests that these two concepts might be the same thing, at different levels of representation: prototypes of natural species and of artefacts are hypotheses on mental representations; family resemblances are the form of the written representation of these assumptions.

Now what about drawn representations of prototypes? A quick look at an illustrated popular lexicon will take us a long way in answering this question. First, one will notice the contrast between the illustrations corresponding to supercategories and those corresponding to basic categories. While the former are illustrated by a whole page on which a member of each basic categories belonging to the supercategory is represented, a basic category is illustrated by a single drawing. Thus, Rosch's observations according to which basic categories, in contrast to supercategories, evoke one single image are confirmed by popular dictionaries. Let us now focus on the illustration accompanying the word *sparrow*. Is it the representation of a mental image? The answer can be positive only if this mental image is very similar to a photograph of a representative sparrow. There are two problems with such a similarity: (1) even advocates of mental images generally admit that they may be very different from visual images; and (2) why should a lexicologist worry about the prototype of the category of sparrows if it looks like a drawing in a lexicon? It appears here that a revolution in cognitive psychology brings lexicology back to its most rudimentary practices.

Let us now agree with philosophers who believe that mental images are so different from visual images that they cannot be drawn. There are plenty of circumstances defying our graphic abilities. One can certainly draw a mean between a table six feet long and a table four feet long. But the mean between a prototypical dog with two ears and a dog with no ears is not a dog with one ear. A mental image may succeed in this task, but as long as it cannot be explicitly represented, this concept does not help the lexicologist or the semiotician. Family resemblances, by contrast, easily resolve this problem: if different members of a category possess incompatible characteristics, it suffices to omit them from the list of traits describing the family resemblance. Whether or not members of the

category satisfy this characteristic remains indeterminate. A graphic representation does not offer the possibility of omitting a feature. If prototypes cannot be drawn, the lexicologist must go back to propositional representations which will have the structure of a family resemblance. Once again, it appears that family resemblances belong to a level of representation different from the hypothetical mental images.

### Linguistic Categories

In the preceding section, I have been describing perceptual categories (colors, natural species, and artefacts) independently of their associated names. Thus, as far as possible, I have been concerned with the category of dogs rather than with the linguistic category consisting of the uses of the word *dog*. According to the most radical version of structuralism, this attempt is doomed to failure. Indeed, structuralists would say that the category of dogs only exists through the arbitrary division of reality determined by the choice of the word *dog*. According to cognitive linguistics, in contrast, the existence in the world of the category of dogs is partially independent of its name. This is not to say that they are completely separable. Even though Rosch's intentions were to study human categorization of natural species and not of the associated word, most of her experiments were conducted through language, be it written or spoken. However, two differences between perceptual categories and linguistic categories are beyond question. First, the domain of linguistic categories is wider than the domain of perceptual categories. Second, the representation of the world by language is *nominal* while its representation in perceptual categories is *ordinal*. These two issues will be addressed in turn in this section. I will conclude this chapter with a comparison between the *linguistic sign* and the *visual sign* as it is described by Groupe μ (1992).

#### *Prototypes and Linguistic Categories*

Cognitive psychology and natural categorization offer experimental evidence releasing cognitive linguists (Langacker 1986, 1987, 1991; Talmy 1983, 1988) from the shackles of necessary and sufficient conditions, which are ill-suited to the description of language. However, as should be clear from the preceding sections, prototypes are merely one aspect of natural categorization. In my view, their role

in language is well defined only for physiological prototypes and color categories. However, through Lakoff's work (1972, 1982), prototypes gained such a popularity in linguistics that a textbook in cognitive linguistics (Taylor 1989) bears the subtitle: *Prototypes and Linguistics*.<sup>10</sup> Lakoff (1987), however, dramatically modifies his views on prototypes. Therefore, two trends must be distinguished in his work. According to the former, prototypes determine the structure of any linguistic category. After 1987, prototypes are downgraded to the rank of secondary effects. In this section, I will try to show that both positions need to be qualified. I will especially question the relationship between *linguistic prototypes* and *centrality*.

Rosch's research is essentially limited to perceptual categories. The most abstract category Rosch deals with is that of *crime* (Rosch 1973). Lakoff extends Rosch's research to all the linguistic categories, be they concrete nouns or abstract nouns, states or actions described by verbs, spatial relations described by prepositions or logical words. Applying the same treatment to all the words, Lakoff also overlooks the fundamental difference between physiological prototypes (color categories) and prototypes of the other perceptual categories. Furthermore, he attributes to any prototype of a word a central position among the other uses of that word. For example, Lakoff (1982, 1987) graphically represents the different meanings of the polysemic preposition *over*. A network is constituted by representing each meaning of the preposition by a dot, and by connecting the meanings sharing a common attribute. The prototype, according to Lakoff, occupies the central position in the network. Needless to say, there is a fundamental difference between the center of this network and the central position of a focal color among the wavelengths of the other members of the category. Whereas the centrality of a focal color can be physically measured, the centrality of *over*'s 'prototype' essentially depends on the building of the network by the linguist. Unless the uniqueness of the network is ensured by independently motivated constraints, the centrality depends, in a completely anecdotal way, on the network. I demonstrate (Vandeloise 1991) that Lakoff does not propose the required constraints.

### *Nominal Representations and Ordinal Representations*

Lakoff (1972) considers every linguistic category as a *natural category* in which members have different degrees of representativity. Therefore, he attributes different truth values to the following sentences:

- (a) A sparrow is a bird. (true)
- (b) A chicken is a bird. (less true than a)
- (c) A penguin is a bird. (less true than b)

Realizing later that all these sentences are 100 percent true, Lakoff (1987) relegates prototypes to the rank of secondary effects. The observation on which Lakoff's turnaround is based is certainly justified. However, due to the distinction between *nominal* and *ordinal* representations, I will show that they do not concern the nature of prototypes.

To specify a representation totally, Palmer (1978) says it is necessary to define the represented world and the representing world and to specify what aspects of the represented world are being modeled. A *nominal representation* is only concerned with what is identical/different in the represented world. In an *ordinal representation*, by contrast, the order of representing objects is parallel to that of represented objects. Whereas the structure of natural categories described by Rosch is of an ordinal nature, language is, according to Palmer, the nominal representation *par excellence*.<sup>11</sup> Thus, the signifying *bird* makes a nominal representation of its signified, the category of birds. This means that it does not take into account the differences of representativeness among the members of this category. This is not to say that representativeness does not have a role in the use of language; to be sure, a speaker may hesitate longer before categorizing an ostrich in the category *bird* than he/she does for a sparrow. However, once his/her decision is made, the ostrich belongs 100 percent to the linguistic category. Thus, representativeness has only an indirect role in language. If there is a prototype for the category of birds and if a particular bird is similar to it, the speaker will categorize it more quickly. In language, though, it is not more a *bird* than the other members of the category.

### *Visual Sign and Linguistic Sign*

Groupe μ (1992) makes a distinction between *iconic signs* and *plastic signs*. A visual sign is not only related to the *referent* of the object it represents; indeed, the *type* corresponding to this object is activated as well. Thus, the iconic sign creates a triadic relationship between the *signifying*, the *type*, and the *referent*. The signifying of the visual sign and the referent are directly related by a *transformation*,

while the signified and the type are connected by a relationship of *conformity*. Groupe  $\mu$  is quick to anticipate the connection the reader will certainly establish between this triadic relationship (Figure 3) and the Ogden-Richards triangle (Figure 4). However, in the schema of Groupe  $\mu$ , the solid line relating the visual signifying to the referent indicates that the iconic relationship between them is more direct than the arbitrary relationship between the linguistic signifying and the referent in the Ogden-Richards triangle.

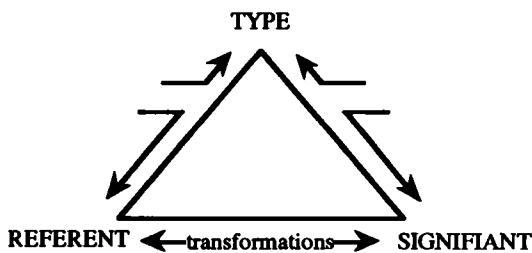


Figure 3. Triadic visual sign

Groupe  $\mu$  also investigates the relationship between the type and the linguistic signified. A first discrepancy is obvious: while any visual sign can be verbalized, a visual sign does not correspond to any particular word. Let us restrict the comparison to perceptual categories such as natural species and artefacts. These categories can be named; and, at the basic level, they evoke a general shape and can be represented by a visual sign. Groupe  $\mu$  takes the category of cats as an example. What is the relationship between the iconic type 'cat' and the linguistic signified *cat*? The authors use a structuralist argument against the identification of these two concepts: 'In the structure of the iconic sign, the type does not establish between signifying and referent the same kind of connection as the linguistic sign: the type guarantees the contract established between a signifying and a commensurable referent' (1992: 146). There is no doubt that the sounds of the linguistic signifying and the referent do not share the iconic relationship existing between the referent and the visual signifying. For structuralist linguistics, the connection between the referent of *cat* and the linguistic signified cannot be similar to the link between this referent and the type. Indeed, the latter link is motivated by our perceptual system, while according to structuralism, signifieds arbitrarily divide our conceptualization of the world. Therefore, in the structuralist framework, Groupe  $\mu$  is right to conclude that types and linguistic signifieds are different.

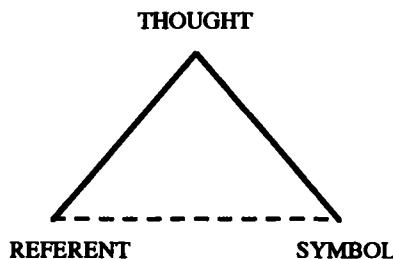


Figure 4. Ogden-Richards triangle

However, using a structuralist argument to justify the discrepancy between these two concepts may be paradoxical. Indeed, if there is such a thing as a repertory of types in our memory, the conceptualization of the world must be structured independently of language. But if thought is not amorphous, one of the basic assumptions of structuralism falls down. Types themselves, then, would certainly be challenged by a structuralist. Cognitive linguistics assumes, in contrast, the existence of a cognitive system organized independently of language. For this theory, I will try to establish that types and linguistic signifieds might be identical.

Because structuralists consider a signified as an arbitrary decision of the language, they never bother to investigate seriously its nature. They content themselves with establishing its differential relationships with the other signifieds in the system. By contrast, cognitive linguistics is interested in human categorization and attempts to throw some light on the nature of signifieds. The signified of the word *cat* can only be understood through the structure of the category of cats. This structure, depending on the authors, can be either a family resemblance or organized by comparison with a mental image called a prototype. Which relationship can be established between the types of Groupe  $\mu$  and these two concepts? The temptation to assimilate *types* and *prototypes* is strong. However, since mewing is an important characteristic of the category of cats, the question arises whether prototypes are mental images: can mental images mew? If the repertory of types belongs to the visual system, how does it represent sounds? As a matter of fact, the type of cats, as described by Groupe  $\mu$ , is not exclusively visual, since

it may be described by a series of conceptual characteristics, some of which being physical characteristics of the referent (for example, as far as cats are

concerned, the shape of the animal lying, sitting or standing, the presence of whiskers, tail, stripes), others being of a different nature (such as mewing). (1992: 137)

Whatever the nature of the type, one will note that the representation of this mental representation by Groupe  $\mu$  is a list of attributes structured as a family resemblance. The connections between the types and referents belonging to perceptual categories, then, are similar to the links between linguistic signifieds (be they prototypes or family resemblances) and referents. Semioticians and cognitivist linguists are equally interested in specifying this relationship.

Besides iconic visual signs, Groupe  $\mu$  (1992) proposes *plastic* visual signs. In contrast to iconic visual signs, these signs are independent of types. Like the distinctive features by which Jakobson represents linguistic signifiers, plastic signs are grounded in a system of oppositions. Pertinent contrasts are light/dark, simple/complex, vertical/horizontal, etc. Plastic signs establish a binary relationship between signifying and signified. For example, let us indicate that the signifieds corresponding to the signifyings *size* and *orientation* might respectively be *dominance* and *balance*. Groupe  $\mu$  defines the relationship between iconic and plastic signs in this way: 'The plastic, being phenomenologically the signifying of the iconic signs, enables the identification of the iconic. In turn, the iconic, once identified, enables one to attribute a content to the plastic elements which don't belong to the iconic type' (1992: 361). Even if plastic signs are very different from iconic signs, one cannot deny their existence if one admits that abstract paintings have a signified. Someone believing in sound symbolism might recognize in the poetic usage of phonemes a linguistic equivalent to plastic signs. From Cratylus on (Genette 1976), generations of philologists have vainly tried to establish a biunivocal relationship between sounds and signifieds: /r/ and movement, /l/ and sweetness, etc. Because of the naïveté of these identifications, structuralism has totally rejected the symbolism of sounds. Considering Sapir's experiments (1929), a total rejection might be excessive. Therefore, the relationship of phonemes to poetry may be similar to that of plastic signs relative to abstract painting. I conclude this chapter with this last connection established between language, as it is described by cognitive linguistics, and general semiology, as it is described by Groupe  $\mu$ .

**Notes**

1. Some references to generativist linguistics may be found in Saint-Martin 1987.
2. I am referring here to a *general* visual semiotics which is, as proposed by Groupe μ, interested in the characteristics common to the natural visual signs as well as to artificial (artistic) visual signs.
3. Wierzbicka (1990) emphasizes the role of the conceptualization of the world in the structure of color categories. She associates the two first basic categories (light and dark) with the day and the night, red with fire or blood, and so forth. This interpretation is not necessarily incompatible with the physiological interpretation of Kay and MacDaniel. Color categories, then, would be doubly motivated.
4. One will note the similarity between the organization of natural categories and the organization of the visual field, with its focal region perceived more clearly than the boundaries, where vision is blurred.
5. Linguists often abusively transfer this property, specific to the prototypes of color categories, to all other natural categories.
6. Rosch (1978) specifies that these attributes belong to the conceptualization of the world by the speaker.
7. Experiments by Henley (1969) provide some substance to the centrality of prototypes of natural species. These data are too scarce, however, to justify general conclusions.
8. The existence of a common attribute is not excluded. Therefore, categories like even numbers which can be defined by one criterion, and at the same time exhibit representativity effect (3 is more representative of the category than 325), are not counter-examples to the theory of natural categories.
9. The structure of family resemblances is so flexible that one might group an apple pie, a wheelbarrow, and a bishop in the same category. Indeed, both the apple pie and the wheelbarrow share a circle; and like the wheelbarrow, the bishop has two arms. Elsewhere (Vandeloise 1992) I propose constraints on family resemblances, necessary to rule out this type of category.
10. For a more critical review of the role of prototypes in linguistics, see Kleiber 1991. A more complex presentation of the role of prototypes in language is proposed in Geeraerts 1989.

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11. The function of *hedge words* such as *almost, more or less*, etc. is to overrule the nominal nature of language.

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## **Visual Semiotics, the Body, and Gestures**



# The Status of Image in the Therapeutic Relation

Ivan Darrault-Harris and Jean-Pierre Klein

## Introduction

Discussing the status of image in the therapeutic relation would require surveying a remarkably large field, a task quite incompatible with the space available here.

As far as *image* is concerned, it goes without saying that we exclude any reference to the concept of 'mental image' or 'internal image' shared by psychology, psychoanalysis, and psychiatry. We also exclude the concept of *imago*, which only belongs to psychoanalysis as a notion. In our contribution, *image* will always refer to the visually perceptible result of a signifying process belonging to planar semiotics. Theoretically speaking, it includes an unlimited number of surfaces, graphic or pictorial devices, provided the plan remains the bidimensional space of signifying forms (paper, canvas, bromide paper, video screen, etc.).

In a first attempt at elementary classification, we will draw the line between images suggested to the patient by the therapist and images produced by the patient in the therapeutic situation.

As regards the first group (suggested images whose study cannot be carried out here), it is imperative to start from two strictly different types:

(1) *Images linked to an analytic process* (therapy at large, including assessment and diagnosis)—either of a *medical* kind (here we refer to medical imagery, which has been developed intensively—radioscopy, sonography, nuclear magnetic resonance, scanner, etc.), or of a *psychological* kind (the so-called projective tests offering figurative [C.A.T., T.A.T., etc.]<sup>1</sup> or non-figurative 'boards' [Rorschach's famous color ink-blots]). Their purpose is to induce verbal production, which is subsequently analyzed as an outward sign of a possibly pathological psychic organization.

These images, as well as the patients' projective inventions, certainly deserve to be submitted to a semiotic analysis that would throw light on the link between plastic text and verbal discourse. As far as we know, this field of research has not yet attracted the interest of the image semioticians.

By the way, we must note that fixed image alone is used within the scope of psychological or psychiatric examination. The use of motion pictures is not attested in this particular field.

(2) *Images produced and/or transmitted by the therapist outside any diagnostic effort, and whose obvious purpose is to establish or support the therapeutic relation.*

This production of images on the part of the therapist is more and more common insofar as the art-therapeutic movement has been spreading for a decade.

With serious cases (speechless psychotics, for instance) and patients still incapable of creating images themselves, art-therapy is common. The practitioner draws and paints for the patient, creating a work in which the patient's inner emotions are depicted with forms and colors through the therapist's perception. In this way the patient can follow a creative process that is the graphic or pictorial translation of what he cannot yet communicate symbolically (by means of verbal and nonverbal language).

In this type of therapy, the art-therapist may resort to many other forms of image production, and work as a photograph- or video-maker.

As regards the second group in our initial classification (images produced by the patient), new techniques have given access to a whole range of possibilities, some of them still unexploited:

—*phototherapy* (dated already), including for instance photographs (objects directly set on the paper before exposure), polaroids, the printing of negatives on paper (using a wide scope of symbolic operations, such as development, fixation, toning, solarization of image);

—*videotherapy* (much more recent), mainly used with adolescents and adults and specifically for the making of self-portraits; and

—*synthesis images* (images produced with computer support).

Nonetheless, neglecting more dated forms of image creation would be regrettable—for instance, drawing and painting, which have long been institutionalized (Prinzhorn inaugurated art-therapy, analyzing plastic productions of patients).

The patients' plastic creations reveal unquestionable advantages in the scope of our study:

—The use of images is very flexible: they can be easily reproduced, which facilitates their analysis and communication.

- Their instruments of mediation are simple and reduce the corporeal distance between the creator and his work (unlike photography, and to a larger extent video).
- At the very moment of creation, they authorize a more natural combination of words and action as well as communication with the therapist.
- Ethical problems are not likely to arise (as they usually do with photography and video).

Owing to these reasons, we will choose to develop our subject (in part, yet hopefully in a significative way) by focusing the analysis on the remarkable production of an adolescent patient whose therapy was conducted by Dr. J.P. Klein. The patient's drawings played a determining role in his recovery. This exemplary case should enable us to throw new light on the status of image in therapy, as well as to understand how such a creation effects changes and what its semiotic specificities are. Finally, we will specify the role of the therapist in receiving and reading the images which crop up in the therapeutic relation.

### **Yann's Clinical Story<sup>2</sup>**

Yann's story is that of an identity quest. Straightaway, we should underline the fact that it has followed the course of various therapeutic modalities, according to the successive stages of its gradual development.

At the outset of the treatment, Yann was characterized as disconnected from the world and sometimes in danger of going into a coma (because of hydrocephalia). Now and then, he felt a vague impulse to stand as subject—'I'm sick of it' is a recurrent phrase in his further utterances. So are the terms 'resign' and 'be exhausted', that is to say yielding to non-wanting and non-being able and taking one's head in one's hand while becoming engrossed in one's thoughts. In other words, an evanescent free-will confronted with nothingness nourishes itself with the illusion of deciding to give way to what overwhelms him almost completely in confusion, where the container and the contents are indistinct. To a large extent, everything is communicated through gaps, punctuated now and then with epileptic losses of consciousness, or partial shutting of the valve, which causes brain oedema and hydrocephalia, a potential return to a cerebral void.

However, the therapist interprets this temptation to abandon in terms of 'flight', of voluntary disjunction in time and space, whereas actually it is a matter of nearly

total conjunction with the eternal, unchanging absoluteness of the big, dreamless sleep that filled the last state of coma. Here, it is less a question of interpretation on his part than a resolute choice to give another meaning to what tends to the inanimate. Favoring that aims at a bulging of identity is what we call 'partial interpretation'. This is true for Yann's chant 'hot-milk-sleep', when Yann turns to the therapist and meets his eyes. Yann responds to stimulation with a relative aptitude to take advantage of a time process where he could mend, start all over again, creating life where the only possible way was death (which was recommended by abstentionist-physicians) or pseudo-life in a state of coma.

The therapist has constantly counted on a possible identity to come in this treatment, and has interpreted facts less in keeping with Yann's current state than with what was potentially and actually there, as announcing a further step on the subject's quest. And Yann, on every occasion, has answered in his own way with his own genius, with the level of language that was used to address him (sometimes after an interval of a week). There he clearly showed the partial vision of himself as corresponding to one of his possible 'already there'. Through 'involvement' in the therapy, through 'moving forward', through 'countment', as is the rule with a psychotic or autistic child, the therapist managed to establish himself as subject in his relationship with Yann. As a start he lost himself in the initial 'one' linked to nostalgia for the original nirvana, before trying after many steps to assume a position as interlocutor.

### Semiotics of the Subject

In spite of appearances, the few opening seances include important phases in Yann's identity, as already promising signs.

After having necessarily pointed out theoretical elements—as briefly as possible—the 'prologue' (and later, the drawing phase) will be analyzed since it already contains the seeds of the further development of the subject's positive construction. In the continuum of Yann's evolution unfolding seance after seance, let us try to discover—or rather, elaborate (for a semiotician as for a psychotherapist, meaning is never given, but rather elaborated)—a route, that is to say steps, gaps, regressions and progressions, by relying on a corpus comprising the conversation with Yann and his family, and above all relying on his verbal and nonverbal (the drawings) productions. In what the semiotician calls 'the text', one comes across

the whole spectrum of discourses, confronting one another. The semiotic approach to Yann's progression in the treatment does not aim at reconstituting invisible mental process from Yann's production during the seances. This is a psychologist's typical method and there is no point in imitating it.

Indeed, our analysis does not rely on the produced discourse to reach an 'elsewhere' or a 'beyond' that eludes direct observation. On the contrary, the purpose is the discourse itself, analyzed and given a meaning (in this case, no one is there, nor is there competition). In a nutshell, the discourse is to be taken seriously without regarding it as filled with foreign elements. As an obvious consequence, the focus of attention will constantly be the subject that builds up within the discourse itself and through it (i.e., a 'paper' subject, either drawn or written).<sup>3</sup> Hence the following fundamental and intellectual discipline, seldom understood: this 'paper' subject reconstituted from utterances bearing its marks should never be mistaken for the 'real' subject of enunciation, a presupposed, biological, sociological, historical, psychological entity (endowed with an unconscious). This very subject is beyond the semiotician's grasp, outside the epistemological boundaries delimiting the field of semiotics.<sup>4</sup>

In order to avoid possible frustrations, it is advisable to state clearly that the semiotician's attention is not mobilized by Yann as a global being but by an abstract being, a kind of patiently elaborated simulation called 'actant', a semiotic being made of 'forms and networks of relations' (Coquet 1984: 9). Max Planck once regretted that 'reality was not directly perceptible'. Thus we are bound to build models, as the only reality likely to be submitted to our rationality. It should be acknowledged that nowadays scientists are increasingly able to confront models to reality—for instance, in the case of the molecular structure of crystals. But it will probably be a long time before the instrument is discovered that permits observation of psychic organization, and it is necessary in the meantime to keep on building structures without being able to say to what extent they correspond to reality.

If we analyze Yann's verbal and nonverbal utterances in relation to the therapist, we feel tempted to 'describe phases of stability and phases of transformation' (Coquet 1984: 9) on the part of one or several actants. Here is a brief presentation of a few elements taken from J.C. Coquet's grammar of discourse, originally situated in the Paris School's semiotic tradition.<sup>5</sup>

As our point consists in building up the subject and its transformation, the models elaborated by Coquet emerge as the most relevant insofar as we refer to

subjectal semiotics (said to belong to a second generation) in relation and not in opposition to another type of semiotics whose purpose (which was an obvious priority at the time) is the modelization of the dimension of enunciate and not of enunciation.<sup>6</sup>

In our semiotic perspective, the subject, as a permanent category beyond the unlimited variety of speakers and utterances, 'is the necessary and sufficient condition to actualise the verbal and non-verbal predicate' (Coquet 1984: 10). The predicates (=its qualifications) of the subject-actant imply a 'presence'. First and foremost, it should be emphasized that the subject, in order to assert his 'I' and his identity, may indeed resort to a significant posture or drawing (Coquet quotes the remarkable example of a dancer who asserts his identity through movements).

### **Psychotherapy and Autonomy**

According to Coquet, the subject is recognizable when calling himself ('I assert that I am I'). Should this 'reflected act' fail, we face not a subject, but a non-subject who is unable to summon the modality of meta-wanting, which enables the subject to define himself as such—that is to say, the presupposed grammatical support of this identity statement.

However, the subject may be taken in two distinct 'universes': whether it takes part in a two-term or three-term relation. In a two-term relation

$$R(S, O)$$

the subject is only defined in his junction (disjunction or conjunction) with an object, 'first as the second term of a dual relation' (Coquet 1984: 10), binding the partners in verbal and nonverbal discourse:

$$R(S_1, S_2), \text{ the } /I/ \text{ and the } /You/$$

On the other hand, the three-term relationship brings a third actant in, embodying a transcendental and irreversible power: we call this third actant Addresser (A):

$$R(A, S, O)$$

Following the modality of *meta-wanting*, here are the modalities of Addresser's *being able* and of subject's *having to do*. *Wanting* and *knowing* complete the group of abstract predicates (built up) that 'constitute the constant support of discourse' (Coquet 1984: 11). The actant—whether defined as autonomous (R(S,O)) or heteronomous (R(A, S, O))—is the location of a 'modal combination'. This granted, the identity (modal structure of the actant) may be perceived either instantly (this is paradigmatic aiming) or in the semiotic of identity construction or deconstruction (this is syntagmatic aiming, about which Coquet [1984: 11] suggests an opposition between 'the subject of quest' and the 'subject of right' using an acquired identity).

### **Brief Analysis of the Prologue: Semiotic Square of Identity**

During the first seances of the therapy (see Appendix I for the text of the 'prologue'), Yann, who is just over twelve, demonstrates impoverished and recurrent behavior made up of stereotyped postures and gestures and stereotyped verbal elements. The therapist either does not perceive this nonverbal and verbal behavior or understands it as an aggressive opposition or provocation. We must recognize that we are not faced here with (according to Benveniste's relevant expression) 'an acting person in possession of his act', standing aloof from his acting to the point of setting up a manipulation strategy.

On the contrary, this recurrent attitude closely fits the subject, and distance between the agent and his acts disappears. The only utterance produced, 'Ah! sleep!' (whose subject is grammatically missing), is another evidence to what we put forward. The point is to yield to sleep, to abandon oneself and lose oneself in it rather than to assume an act allowing the subject to institute himself.

Relying on elements of Yann's attitude during the first seances, the semiotician would note that the only actant allowed by Yann's discourse is an actant unable to assert himself, hence is a non-subject whose discourse does not rely on the central modality of *meta-wanting*.

When Yann answers 'I'd do nothing' to the therapist's question ('What would you do in an ideal life?'), at this precise point of the dialogue, the non-subject is replaced by a subject managing to assert himself as such. However, which subject is he actually? By referring to the second square of identity suggested by Coquet (1984: 39), by relying on 'I'd do nothing', it is possible to formulate the follow-

ing definition in keeping with the three propositions setting up any identity formula:

- (1) I assert that I am I';
- (2) This is my identity;
- (3) This identity is represented by a quantified compound series, either positive or negative. (Coquet 1984: 39)

We should note that propositions 1 and 2 are not expressed in the discourse, but rather presupposed, since they are both connected to meta-wanting.

[In the following formulas, 'v' represents the modality of meta-wanting, 'p' the modality of being able, and 's' the modality of knowing (referring to French: *vouloir*, *pouvoir*, and *savoir*: it was easier to retain Coquet's original notation).]

The modal series which seems to characterize the actant best is v-ps. Coquet reads it as follows: 'My identity is total and negative (generalizing aiming): I do not care for any valuable object; I can't do anything, I don't know anything' (Coquet 1984: 39). As Yann gets out of the non-subject position, he finds an access to the closest position from a semiotic point of view, yet there is still a risk for him of an either brief or lasting return to previous position.

When Yann passes from a profile position to a face-to-face position, which permits confrontation and communication /I/—/You/, his identity statement is radically different: 'I'm over two; I'm taller than my dog'. Yann's identity corresponds now to the following positive series:

sp-v

which can be read as follows: '...My identity is partial and positive (specific aiming): I acknowledge the value of such and such object; I know such and such; I can do such and such' (Coquet 1984: 39).

The identity in question is partial yet acquired: I am not nothing, I am something or rather someone who is no longer a baby.

In the identity square that delimits paradigmatic aiming, the actant passes from negative deixis<sup>7</sup> to positive deixis, along the diagonal linking the two ternary series (Figure 1).

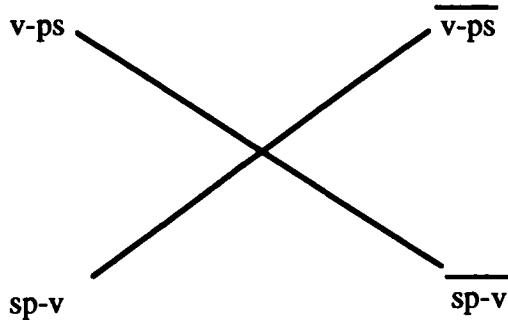


Figure 1.

The beginning of Yann's final reply ('Tomorrow I mend myself') drives us to change aiming in the analysis, passing from paradigmatic to syntagmatic: 'The paradigmatic aiming has driven us to consider identity as settled. By adopting syntagmatic aiming, the analysis takes time and space dimensions into account and finds the means to follow the ups and downs of an identity in its process' (Coquet 1984: 68).

From a syntagmatic point of view, the formula is now

vps

that is to say: 'I'll take possession of any valuable object: subject of quest' (Coquet 1984: 100).

But the position of the subject-actant is still quite delicate. 'I resign', the last word of the dialogue, can obviously be read as an ephemeral expression of the negative position *vps*: I won't take possession of any valuable object; zero-subject (present-future).

### The Drawing Phase

After the seances constituting what we have called 'prologue', the therapist, seeing the change in Yann's attitude, suggests an *alternative drawing*. The method

diverges slightly from Winnicott's classical 'squiggle' and is quite interesting. In a playful manner, with no fixed rule, the therapist prompts the child to choose a pen or a felt-pen. The therapist traces a bar and says: 'It's your turn'. The child draws on the same sheet, placed between the partners, who keep on doing this in turns. In a quasi-abstract way and often with much enjoyment, it is possible to act out all the aspects of the relationship: mirrored bars, steps ahead toward the other, scared withdrawals, accompaniment, invasion, aggression, annihilation, and so on.

With Yann, the therapist starts with a spiralled figure, a kind of corkscrew with one spiral. Yann draws upon this line. Then the therapist draws a figurative man; Yann draws upon it but adds very large ears. The therapist draws V-shaped birds and Yann completes them with rhombi; the therapist turns them into tree-roots, which heralds one of Yann's themes to come.

This seance opens a period of free drawing, in which the therapist will no longer need to make a personal and direct mark: the series is now launched. The therapist has committed himself, as he himself has taken a felt-pen. It isn't necessary to repeat this gesture. Yann knows that the therapist doesn't try to hide, that he is much more than space for projection, that he exists and shows himself and faces the child as he accompanies him in his rebuilding.

The next session, Yann draws a human figure (see Plate 1), tracing one line for the body, two lines for the legs and an irregular oval for the head. He is then asked and shown what is missing. On the therapist's suggestion, Yann adds the hair and the ears. Then the therapist suggests that Yann invent a story. As Yann remains silent, the therapist suggests 'Let us make him sleep', thus setting up transitivity.

'Let us close the shutters', says Yann. He draws red eyes and remarks, 'The problem with him is that the lock on the shutters doesn't work. That's why he can't get to sleep. He is always disturbed. We could close the shutters. [He draws them: the horizontal lines on the right of Plate 1.] He is stuck behind the shutters. His hands are stuck. He can't get them out.' The therapist asks if something can be done for him. Yann replies: 'We can get rid of the shutter. He can go out, but he will have far too many fingers. His fingers are roots. He is trapped.' The therapist asks: 'In the ground? Is he alive or dead?' Yann starts laughing: 'He is dead. The shutters are the box that is shut. He has got Death's head eyes.' Indeed, the red eyes and the horizontal shutters conjure up the terrifying image of a skeleton.

Yann adds: 'And worst of all is that we remain dead.' He finally says 'Well', which means that is all for today, and leaves.

### **Semiotic Analysis of the Drawings: The Man with Shutters-eyelids**

Let us pay close attention to the second drawing (Plate 1) that Yann did with much comment. At the therapist's suggestion, Yann agrees about making the figure sleep. It is a quite unstructured figure, with limbs bearing multiple fingers, both thread-like and inextricably tangled.

The therapist incites Yann to invent a story so that he can include this 'sleeping' and 'lying' state in a narrative and discursive chain. Once more, it is an attempt to work on the well-known stereotype. When he says 'Let us close the shutters', Yann is clearly alluding to the eyelids concealing the red eyes, 'Death's eyes'. Subsequently, the metonymy/metaphor of the house/ego will develop. Consequently we meet closure again, and as we had already pointed out, this closure formerly characterized the only verbal predicate ('sleep') qualifying the non-subject. But an incident puts an end to this situation of a sleeper seeking refuge behind his shutters-eyelids: 'One of the locks doesn't work and he can't get to sleep.' His shutters have to be closed. As the story unfolds, lack is apparently wiped out (his shutters are closed) and the man settles again in his intimate conclave. This state does not last, because the man is stuck behind the shutter, far from being contented with this at last tight closure. The man has his hands stuck and can't get them out.

The actant present in the drawing seems to be in an unsteady position, perhaps dynamic and under the pressure of virtual transformation. The subject cannot stand closure or non-closure any more, nor can he bear the impossibility of a relation with the external object. Here again we find the oscillation between positions vps and vps mentioned in our discussion of the previous dialogue, which implies at least a sensorial opening to the world: seeing, touching, taking hold of something and so on. To the therapist's question 'Is there something we can do for him?', Yann answers: 'we can get rid of the shutters, then he can go out, but he will have far too many fingers and these fingers are roots and he is trapped' (see Appendix II).

Then the therapist asks if he is alive or dead, and Yann answers 'He is dead'. The opening to the world (essential for the subject of the quest) is no solution either, since the body cannot properly invest external space: the fingers could explore and take hold of the valuable object, confirm the relation /I/—/You/. Nonetheless, these tentacular organs are capable of only a 'short-circuit', the subject being deeply rooted in his own mortal fixity. The theme of mortal rooting that paralyzes the subject and obstructs his identity quest will recur in further drawings, stories, and dialogues. And Earth (ground) will rank in a good position in Yann's cosmogony.

Finally, in keeping with a regressive pattern of the subject's modal identity, the non-subject initial position reappears, negating itself in 'lasting death'. However, one should bear in mind that Yann's discourse is located on another level, as it uses plastic representation. Here we reach the metadiscursive dimension. In plastic expression, the enunciator casts a non-subject actant who tries to assert his identity in vain at the moment. The drawing enables Yann to represent and thereby to build up the semiotic story of his identity quest. Thus he grows rich thanks to previous phases, however painful they might have been.

We must note that this drawing, 'Man with shutters-eyelids', retrospectively throws light on the very end of the dialogue we have already analyzed: 'Tomorrow I mend myself, my hands are cold, I resign.' First, the subject of the quest (vps) is set in the present-future relation. Then come the cold hands. As a matter of fact, as previously remarked in the drawings and the commentaries, these hands are the mediating instrument of the conjunction with the object, the other. As a consequence to us, the hands are the figuration of *being able* and *wanting* modalities; the 'cold hands' should be regarded as the manifestation of negative modalities. Indeed, the compound series becomes entirely negative; and there is a logical return to position vps expressed through 'I resign'. This apparently enigmatic, incoherent fragment of discourse can retrospectively be subjected to a semantic description.

### **The Tree-man: Starting Point of the Quest for the Self**

The following week, Yann comments on his drawing (see Plate 2), 'This is a tree deciding whether it's alive.' What does it decide? 'Starting from where he was at the beginning. Say he is alive, blood flows in his arteries. He is alive. He decides to start it all from scratch.' With a touch of humor, the therapist remarks

that he has good feet to make a good start (actually his countless toes may root him). The tadpole-man is quite vertical, with three or four pairs of 'hands' with countless fingers like suns darting short rays (see Appendix II).

The emergence in the comments of an intended movement is essential first as it is strongly opposed to the mortal rooting in the previous drawing (due to the failure of the quest), and second because departure is a constant sign of a beginning identity quest in oral literature. Indeed, the vps position is reasserted with the converging notation of 'life' and 'blood flowing in his arteries' (remember: 'My hands are cold').

Everything happens as if the point were to deny the whole chain of operations leading to the dysphoric and mortal state of non-subject while 'running it back'. In the further series of fictional narratives, Yann will resort again to the vegetal theme ('grass'). It wishes to uproot itself in order to transplant itself. Disappointed, it resigns itself to immobility.

Throughout the treatment, we can pick up (sometimes very indirect) references to fragments of discourse dating from the very origin of the therapy; this is a common anaphoric operation which is essential in the production of any discourse. On the other hand, what seems more specific is the cataphoric<sup>8</sup> process enigmatically producing a form of discourse whose meaning will only be cleared up much later. From these 'metastases' of discourse, regardless of linearity, it becomes possible, in a privileged way, to build up the deep architecture of discourse.

### **The Heavenly Fight of the Sun and the Rain: The Subject Frees Himself**

A few seances later, the sun is introduced as a topic; it will reappear periodically.

'The fingers decide there be grass in the house. The sun gets in the house and in the boy's head. [Yann uses the words 'head' and 'house' indifferently.] There are clouds. It's raining. Grass is growing. The house is open to the winds. There is a door in his head, it can be opened. Everyone can walk in. Everyone can walk out. The door has to be broken through.... If the door is broken through or opened, one can't no longer tell his thoughts from someone's else' (see Plate 3).

Drawings follow one another, most of the time upon first ritual solicitation. 'It tells that the man has far too long fingers, they almost dig the ground. The sun

darts its rays to the face and through the fingers as well.' With much empathy, the therapist says that it must hurt awfully; how can the man protect himself?

'He uses his hands as weapons', Yann says. Then he draws 'grass roots'. Whenever he finishes a drawing, he writes his name backwards, from right to left, each letter being reversed. The therapist draws his attention to the fact that he does it with the same color and the same lines as the roots.

Other drawings follow after the assertion 'I have nothing to tell you'. So 'The thing with this man is that he has too much hair. His hair touch the sun, perhaps they are burning. The sun often play tricks, it burns the hair, it gets in the head, but all the same, mind you if there was a person going on the sun. It's a ball of fire....'

So what?

'Well, that's all I had to tell you.'

Before leaving, the therapist suggests solutions such as drawing clouds and showers, or an umbrella, a sunshade in order to protect the hair.

That is what Yann will draw the following week. From this seance on, he works out possible defensive means, either in his drawings or in his narration and comments, like sunglasses, water from various sources, beard and hair shaving so that they cannot be burned, the use of wigs and umbrellas as protection.

There is nothing but fights between elements, protection being gradually drawn first against 'the ball of fire about to devastate the Earth'. 'Weeds soon join the sun rays, mind you if the grass gets burnt.' The weeds sometimes grow across the clouds and burn, or the fire is put out by a waterfall of rain.

Yann keeps on writing his name backwards as if in a water looking-glass. Thus a striking contrast arises between the persistence of this mirrored signature and the emergence, with growing clarity, of his symbolic face. This face gradually joins the metaphorical dimension of his name-monogram—just like a photographer, through his view-finder, gradually adjusts the image to the sharpness indicator.

The drawings stage mixed confusions and invasion fights as a starting point. The therapist encourages these invasions, as they imply two or three actants. Thus indifference is replaced by destruction, which is a preliminary phase in the annihilation process. To a certain extent, we recede into the steps of a destruction, tracing it back before it is possible to reconstruct. (Incidentally, that was the surgeon's method with Yann's lesions, though that was at the time reparation.)

So Yann agrees on drawing, then talks about his drawings before imagining a phantasmagoria, and finally introduces a progressive interactive action between the drawn elements.

Soon thereafter comes the suggestion to draw defenses between the actants. It is important to note that Yann often leaves a week between the indications and their realization. He is not the hand that the therapist controls at a distance. This respite permits him to start transforming the indications in his own way. The therapist provides rather vague indications, which Yann later incorporates as he becomes the subject of these imaginary defenses. It is paradoxically through obedience that he personally manages to direct and stage his own imaginary productions.

The circulation of the therapist's speech and Yann's drawing act, as well as his ability to comment, is achieved by the introduction of a third element between the two actants, which, separating them, turns them into two communicating subjects. Moreover, it is interesting to notice a homology with the content of the drawing: the introduction of a cloud or rain between the sun, which is 'ten times too hot', and the head (penetrated and burnt by the sun). Gradually, the houses become more resistant; they are now made of brick, they can filter the sun rays, and the sun starts warming up without burning. It spatially severs from heads and roofs and appears as less invasive.

### **Semiotic Analysis of the Drawings: The Subject is Set Free**

These drawings show a remarkable progression: from the indistinct chaos with the first men, a plastic universe emerges whose confusion constantly decreases.

(1) The sun, which was located inside the body at the beginning (mingling with it, and with the hands in particular) goes through a phase during which it only overlaps on the head, painfully breaking into it, yet gradually moving away to its normal position, where it is separated from the subject (see Plate 3).

(2) As a starting point, the grass (as a metaphor of the subject: one remembers the uncounted fingers which were rooting) was depicted as either inextricably tangled with the man's toes, or as extending the sun's rays to reach the ground; the grass is now clearly severed from the celestial elements.

(3) The house is shown with its roof piercing the clouds (it keeps the house apart from the sun and shelters it from the sun rays, which are no longer a threat of invasion for the subject—see Plate 4).

It should be noted that the therapist had previously suggested that Yann draw clouds, make up umbrellas and sunshades, and multiply means of protection (we shall come back to this important intervention when the sun looks threatening again).

In this important phase of the therapy, while continuing to stage the identity quest of the subject, the drawings introduce a totally new element: the subject-actant runs against the /sun/ which is a powerful Addresser and a permanent obstacle to the subject's assertion of individuation and integrity. At last the aggressor is specified, delimited and named. We have just passed from a binary actantial relation subject-object ( $R(S, O)$ ) to a ternary one ( $R(A, S, O)$ ) through the introduction of the Addresser, who first dominates and threatens the subject-actant (Coquet proposes to note this relation as

$$\frac{A}{B}$$

And the five drawings we regard as fundamental will gradually express the inversion of this hierarchic relation, as they lead to the disappearance of the Addresser:

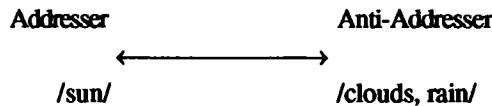
$$\frac{A}{S} \longrightarrow \frac{S}{A} \longrightarrow \frac{S}{O}$$

The anti-Addresser suggested by the therapist provides a way to escape from the devastating sun rays. In the therapeutic relation, the therapist himself takes the part of the anti-Addresser and supports the subject in his fight against the Addresser. Yann jokes about the sun. 'I hope our friend the sun will shine during next holidays.' He says he'll be dead by the end of the day before adding, wittily, 'exhausted' after a while.

By the way, let us listen to Yann as he comments on a new drawing: 'The sun is falling on the soaked grass. We should get rid of some sunrays because there are too many [he rubs them out], and let the rain fall.'

The Addresser (the sun) is no longer in direct polemical confrontation with the subject, but with his protector, the clouds and the rain, anti-Addresser, source of blessings for the growing grass.

Thanks to the setting of the Addresser, the first terms of a real cosmogony appear:



Here two fundamental elements out of four are easily recognizable. As we try to elaborate the other possible positions of the Addresser's semiotic frame, we notice that the positions of Non-Addresser and Non-anti-Addresser are still missing, as they are respectively held by /air/ and /earth/. Indeed, we bear in mind that /earth/ immobilized the subject while rooting him. On the contrary, /air/ opens out the subject's space of expansion and is located in positive deixis.

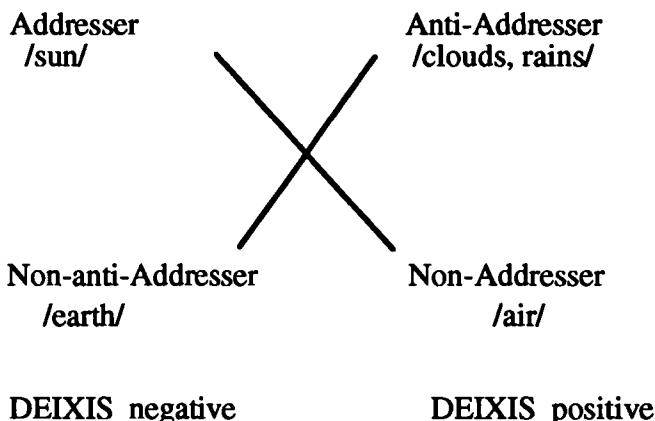


Figure 2.

One drawing is dedicated to the definitive distanciation, which is conventionally fixed in the top left corner of the drawing. Its tentative rays are even missing on the right side, looking to the other drawn figures. A wide space now separates the sun and the clouds, which are heavily pouring rain on the house and its tenants who, all standing by the windows, witness a real monsoon (see Plate 5).

Yann's comments: 'The roof is being built, those who are building it want it to be higher than the sky. I picture the roof higher than the sky.' The tenants say: 'It's incredible that the roof is higher than the sky.'

The therapist asks, 'Is it dangerous?' Yann answers, 'Yes it is for the clouds, but not for the houses, there is someone coming who sees his house about to go up to the sky, about to take off, it's a rocket-house.'

The emphasis is increasingly put on the characters who live in the house. The house (a substitute for the human body) becomes a container for the men at last, and Yann starts depicting them after having alluded to them in his comments: 'I have forgotten the tenants who wet their feet, they feel better when the clouds are gone.'

To us, this drawing is humorous. As the sun is now remote, the protective and quasi-salutary element—water—becomes a constraint (and not a sheer disaster). Indeed, feet alone are wet and the tenants just have to wait until the shower ends. Once the sun-enemy is beaten, it returns to its minor role as a decorative lamp, and the friendly water overflows in solicitude, just like overzealous firemen don't realize they are flooding a long-extinguished fire with their hoses.

From an actantial point of view, we face here the disappearance of the Addresser /sun/ and the probable obliteration of the Anti-Addresser /water/, which, so to speak, 'works in a kind of vacuum'. We should ask ourselves if the subject, once in a universe of Addressers, heteronomous, would gradually tend to an autonomous status in the binary relation  $(R(S, O))$ ?

### **The Birthday Drawing: The Acquired Identity**

The therapy has now been evolving for a year and a half (including six months without encounter). Yann will be fourteen years old in three months; he already alludes to it. Thus, for the first time a thematic drawing is suggested: how he pictures his fourteenth year (see Plate 6).

'The sun will shine and there won't be any cloud in the sky (he draws a house and grass), the roof won't touch the sun, the windows will be open; perhaps they'll be closed yet they can be opened.' Yann draws a birthday cake circled with fourteen candles.

The sun, fixed in its place, shines and doesn't burn any longer. The Anti-Addresser has vanished, too: no more clouds or rain. The house, streamlined like

a rocket, is remote from the sun. Its roof won't touch it. Bearing in mind the metaphoric relation man/house (through the instrumentality of the shutters/eyelids) in the first of Yann's drawings analyzed here, there is no further risk of intrusion for the roof/head, and the sun that shines directly is now harmless.

Finally, the windows are either shut or open, which is a relevant point in Yann's comments. Recall that in the first drawing analysis, the non-subject was faced with a real dilemma: how to choose between the fear of absolute closing and the intolerability of opening, which was actually a mere return to closing and initial immobility. Here, the subject/house is available for a possible relation /I-/you/. The subject is free to move in the other's direction or not, autonomous: the formula yps is remarkably illustrated.

Yann draws a grossly colored circle next to the house. The birthday cake is seen from above and surrounded by candles drawn higher and higher with increasing accuracy. They radiate from the circumference of the circle. What emerges here eludes the formula yps: it is the 'subject of right' who presents himself, linking his present to his past, and setting the acquisition of a precisely determinate valuable object. The ternary series which defines it in syntagmatic aiming is now:

#### spy, the knowing of identity

To conclude, we must consider a final aspect of this last drawing. The circular figure of the birthday cake with its crown of candles is an obvious and striking metaphor of the sun: we regard this figure as the outcome of the distance covered since the opening of the drawing phase. The spatial disjunction sun-house has made metaphorization possible. The fire has become a bonfire of candles. It is no longer a ball of fire breaking in, but the cake is included to celebrate a stage in Yann's growth. It is the circular dial of time back at work.

The subject's flaws enabled the sun to break in, and as a result the subject was forbidden any sensorial opening to the world, which access is necessary for the construction of the subject of a quest. The sun negated every assertion of his identity, since the subject's boundaries remained wide open and constantly invaded by the sun fire.

The sun radically changes its semiotic status, and the non-subject is turned into a subject fitting the ternary structure as soon as he is set in the position of the Addresser confronted with the positive Anti-Addresser embodied by the clouds and the rain.

We have seen how the fight of Addressers has set the subject free. He then became a terrestrial and sometimes amused witness of heavenly fights. But the air-space and the salutary water makes it possible to emerge from earth and rise with no risk of being burned up. Soundly set between sky and earth, the 'rocket-house-subject' in the last drawing is ready to take off and reveals its identity in the form of a birthday cake (looking like a dialogue balloon in a comic strip). In the space recently vacated by threats, in authentic time ('I'm nearly fourteen'), and in order to state his acquired identity, the subject of right humorously enjoys the luxury of metaphorizing his statement with the features of this very sun, which formerly prevented him from asserting himself as 'I'. Indeed, everything looks different now.

Yann soon decides not to draw anymore. A new therapeutic form should be found: something new for a brand new subject. Incidentally, Yann says to his father: 'I can see my future ahead.'

### **Epilogue: The Legend of Origins**

Taking up Yann's epic and imaginary productions, we notice that he has staged his own cosmogony. Indeed, we should recall the recurrent hydrocephalias (see Appendix I), the sun breaking into the head or the house, the open shutters where hands get stuck, the hands as organs of communication between an individual and the world, but which happened to be both paralyzed at the outset of Yann's real story. He said they were cold as he first contemplated mending himself. Moreover, there was the water, invading and sometimes overflowing, the fight of fire and water: isn't it the origin of his cosmogony that is narrated?

From his own personal story, Yann made up fiction without ever giving an explicit link between the imaginary and the reality that filled it. In his fiction, his defenses metaphorically anticipated those he established in his daily mental functioning.

His psychotic discourse was regarded as creation in fiction, which it was indeed in the given therapeutic frame. Along with his therapist, Yann created the myth of his creation within a space located between what happened to him and the present life of his body.

Through his various interventions, the therapist put his own imaginary world at Yann's disposal, so to speak, so that Yann could engage his own elaboration as he started reconstruction.

As the surrealist author André Hadellet writes in his novel *Le seuil du jardin* ('The garden threshold', 1966): 'L'unique joie réside en la rencontre du mythe avec son incarnation fortuite'.<sup>8</sup> Yann's tragedy consisted in fully embodying the genesis of the world with the four elements as well as the primary steps of the child's genesis.

Yet his incarnation proved freezing. His state was the figurative conversion of the way the child's psychogenesis is represented (through its 'psychotic' phases of fusional receptiveness to the world). The open valve (shutter?) to let the liquids flow, the urgent operations on his skull and his brain represent in reality the ups and downs of deep communication from thought to thought, from body to body between the parents and the child—a step forever repeated in pain by the psychotic child—as well as the need to shut oneself partly to the world in order to become a more impenetrable individual.

Yann was certainly not delirious, for he had repeatedly represented the frenzy of psychosis in his own story, which carried out this body life, unlimited, porous and left to a world sensed as hostile: the therapists who work with psychotic patients know it well as typical of that organization.

By turning it into a genuine myth, by including it as human imaginary production, Yann succeeded in finding his particular identity. The process from fusion to individualization is a symbolic progression that cannot be accomplished surgically. In the same way, a human being cannot really fall prey to the fighting elements; this is rather the destiny of the members of a mythological pantheon, or of legendary heroes tracing back the origin of a place or a world.

The myths Yann re-created in his drawings enabled him to come back to himself, to become his own sun, the source of his own energy, to better launch the rocket of his life into the world's space.

## Notes

1. *Thematic Apperception Test* by Morgan and Murray (first published in 1935), *Explorations in Personality*; New York: Oxford University Press, 1938.

- C.A.T.: *Children's Apperception Test*, by L. Bellak and S. Bellak (1950), New York CPS Co., PO Box 42, Gracie Station.
2. See, for more details, Appendix 1.
  3. By 'discourse' we mean not only oral and written language, but the form of any enunciation from the subject by means of one or several semiotic systems. Hence a plastic discourse (drawings, for instance), gestural, plastic discourse, and so on. At any rate, linguistic discourse appears as the simultaneous enunciation of several semiotic systems: gestures, speech, language itself, and so on.
  4. A.J. Greimas uses the term 'paper-subject' for the subject met in the discourse, as opposed to the subject engaged in real somatic action.
  5. For a synthetic and precise presentation of Paris School semiotics, see Coquet 1982.
  6. We find in general linguistics the same significative evolution: Benveniste inaugurated, in France, in 1970, the first analysis of the dimension of *enunciation* (see Benveniste 1966).
  7. *Deixis* is one of the fundamental dimensions of the semiotic square. By implication, one of the terms of the axis is linked to the opposite contrary term. Thus two deixis can be noticed: one is called positive (S1-S2), the other negative (S2-S1). However, none of these adjectives implies an axiological investment: this only appears after projection on the semiotic square of the following thymic category: euphoria-dysphoria (see Greimas and Courtés 1979: 87).
  8. The *anaphora* and *cataphora* (neol.) can be understood through the functioning of pronouns. The anaphoric pronoun replaces an anterior fragment of discourse ('John arrived. *He* announced his departure.'). The cataphoric pronoun announces a future discursive fragment ('*It* is interesting that you'll participate in the meeting.').
  9. 'The only joy lies in the encounter of myth and its fortuitous embodiment.'

## Appendix 1

Here are a few elements of this story shared by the patient and his therapist, as it begins during the first consultation. Information will be recorded in the chrono-

logical order of the therapeutic adventure. It opens with a first encounter between Yann, his father, and his mother.

Yann is aged twelve and a half; he is the son of a teaching mother and a wealthy building contractor, which lends a particular significance to his choice of the *house* as the main form of his drawings (a common metaphor among children).

Yann's birth was induced by the maternal grandfather, an obstetrician working in a provincial town hospital. At the age of two weeks, the child contracted a meningitis that also affected his mother. She was cured by a long antibiotherapy, whereas Yann's treatment was much shorter. According to the family's account, Yann was not carefully looked after during holiday time and it took epileptic convulsions, then onset of hydrocephalia followed by total paralysis (quadriplegia), to eventually send him to a large town emergency center. The father implied that negligence on the part of the maternal grandfather might have been responsible for this delay. Then a brain operation proved necessary in order to alleviate the hydrocephalia. In spite of persistent convulsions, paralysis receded to right-side hemiplegia. Yann's childhood was punctuated with stays in hospital for brain check-up and brain operations (two of which, at the age of two and three, were quite painful). They were motivated by states of coma due to a brain edema.

When Yann was five, a new valve was fixed since there was a risk of another hydrocephalia owing to unsteady discharge of cephalorachidian liquid; then came a foot operation, with the alcoholization of the Achilles tendon, Yann's leg being set in plaster, and some infected scabs. As no progress was made, the physicians repeatedly advised the family to place the child in a specialized center. The parents kept refusing. Yann received treatment from a kinesitherapist, then from a psychomotrician, without great results, according to the family. He was also in speech therapy, but didn't improve much.

### *First Encounters*

When Yann is seen for the first time, he has limited contact with the world. He can dress alone but cannot find his way: he has no bearings in time or in space. He cannot tell his right from his left and does not know the days of the week. Furthermore, he has a limited memory. He rides his bike in spite of his heavy handicap. He likes water and sometimes goes swimming. He helps in house-work.

His parents' persevering efforts as well as their social position have made it possible for the child to attend a specialized school. But Yann cannot write. He can draw bars but not circles. He likes looking at comic strips but can't read them. On the other hand, he knows a lot of words. His father thinks that he imitates them. He repeats: 'What? What? I'm losing my head!' with a look of surprise. He hasn't had any epileptic seizures for three years, and his antiepilepsy treatment consists of only one pill taken in the evening. When seen alone, he never meets one's eyes. He presents himself in profile with an air of weariness; he doesn't open his mouth other than to yawn noisily. He fiddles with the fly of his trousers from time to time yet with no intention to provoke, which testifies to his denying the perception of others. He doesn't respond to any verbal message, and we no longer insist on this point. His lack of contact with the world is such that we diagnose an infantile psychosis in connection with an organic affection. In this case, diagnosing a handicap inferred from the organic origin of Yann's pathology would be misleading. Focusing on Yann's remaining potentialities to become a subject seems to be the right solution.

The first steps of the treatment are mainly oriented toward the child. Indeed, the difficulty of seeing the father and the mother together quickly becomes obvious, and besides it is clear that communication between them is disrupted (information is not efficiently conveyed); this point will be made clear to them.

First of all, Yann perceives that his therapist does not stimulate him, does not try to get any response, either by forcing it or using seduction. He remains in profile, apathetic except when he yawns repeatedly. On one occasion, the therapist brings Yann to face someone else's presence and interprets the child's passivity as a refusal. Thus the physician underlines the 'possible danger of this particular option' and distrust in front of the unknown. One should note that the therapist's formulation is a 'neurotic' expression of a psychotic recess which amounts to more than fear in front of the unexpected. Yann says then: 'Don't touch!', with laughter. The therapist replies that 'in general people feel like giggling when they don't feel well at ease', which is an indication about the hidden meaning of his laughter rather than mere interpretation. 'That ain't easy!' Yann replies, still in profile, in a shrill voice and with mispronounced words, as is often the case with psychotic children (trouble with pronunciation in people suffering from right-side hemiplegia is different). Then Yann takes up his refrain 'Oh, sleep!'.

'Yes, sleep, and the whole world gives you a break', says the therapist, likening Yann's attitude toward the physician to the child's usual behavior.

The therapist: 'Is it possible to stay under the blankets all the time?'

Yann: 'I stop working.'

The therapist: 'What would you do in an ideal life?'

Yann: 'I'd do nothing. Ah, sleeping!'

The therapist: 'Well easy in a warm place, in bed like a baby.'

All of a sudden, Yann turns the therapist, facing him for the first time and declares: 'I'm over two now, it's mad how one grows taller, I'm taller than my dog.'

The therapist nods: 'Yes, indeed, one grows taller even if he doesn't want to.'

Thus Yann's inertia is linked to one's will, itself in close correlation with fear, by mentioning an inescapable natural law.

'Is that a threat?' adds Yann, puffing. 'Let me get my breath back.' He starts whispering then as if talking to someone. This will occur several times in the course of the first seances but it has never been possible to determine if he was suffering hallucinations.

He finally declares: 'Tomorrow I mend myself, my hands are cold, I resign.' Upon this, he walks out.

The following week, he takes a hair off his jacket and starts talking to it. This type of humanization is very common among children affected by serious identity problems. They often take up an ironical tone (for instance shouting at an object one has just dropped).

Yann says: 'Hair, stay straight, you look silly.'

The therapist metonymically refers to the present actants: 'You know, no one looks silly around here, you don't and I don't either.'

Yann: 'You were chattering in here while I was waiting for you,' he says, alluding to a conversation between the therapist and a nurse about a consultation taking place before his. The therapist insists that he is not mocking Yann, that he understands his temptation to get away but that there is no reason to be afraid of a failure.

While nothing in his attitude reveals him as the subject of his own flight, he is prompted to a movement of self-protection. Even his leitmotiv 'Oh, sleep' is impersonal; he is nothing but the object of that big sleep, tending to merge and lose himself in this inert void. The therapist's interventions may appear as interpretations, but they aim at manipulating and result in revealing possible unconscious intention, whereas he is most often felt as going beyond the denial of his own will, or rather within his self-consciousness as subject of desire.

After this consultation, with Yann still in the room, the therapist gives his mother details on the working conditions, reasserting Yann's right to say 'Oh, sleep', and to yawn, the only rule being 'the necessity of a common work.'

Thus, the therapist shows the double but paradoxical requirement of a curing process: taking the pathological expressions of the patient into account and yet including them in a dynamic process whose purpose is a possible evolution. It is also important that the work having already started should not be ruined by him. Besides, Yann may be the object of grand inertia. Like his therapist, he is nonetheless part of a project already underway.

## Appendix 2

'Je suis sale. Les poux me rongent. Les pourceaux, quand ils me regardent, vomissent. Les croûtes et les escarres de la lèpre ont écaillé ma peau, couverte de pus jaunâtre. Je ne connais pas l'eau des fleuves, ni la rosée des nuages. Sur ma nuque, comme sur un fumier, pousse un énorme champignon, aux pédoncules ombellifères. Assis sur un meuble informe, je n'ai pas bougé mes membres depuis quatre siècles. Mes pieds ont pris racine dans le sol et composent, jusqu'à mon ventre, une sorte de végétation vivace, remplie d'ignobles parasites, qui ne dérive pas encore de la plante, et qui n'est plus de la chair. Cependant mon cœur bat. Mais comment battrait-il, si la pourriture et les exhalaisons de mon cadavre (je n'ose pas dire corps) ne le nourrissaient abondamment? Sous mon aisselle gauche, une famille de crapauds a pris résidence, et, quand l'un d'eux remue, il me fait des chatouilles. Prenez garde qu'il ne s'en échappe un, et ne vienne gratter, avec sa bouche, le dedans de votre oreille: il serait ensuite capable d'entrer dans votre cerveau. Sous mon aisselle droite, il y a un caméléon qui leur fait une chasse perpétuelle, afin de ne pas mourir de faim: il faut que chacun vive. Mais quand un parti déjoue complètement les ruses de l'autre, ils ne trouvent rien de mieux que de ne pas se gêner, et sucent la graisse délicate qui couvre mes côtes: j'y suis habitué. Une vipère méchante a dévoré ma verge et a pris sa place: elle m'a rendu eunuque, cette infâme. Oh! si j'avais pu me défendre avec mes bras paralysés; mais je crois plutôt qu'ils se sont changés en bûches. Quoi qu'il en soit, il importe de constater que le sang ne vient plus y promener sa rougeur.'

Lautréamont, *les Chants de Maldoror*, Chant IV. Paris: José Corti, 1963: 264-65.

*Bringing together the themes in Yann's initial drawings is striking in many ways (mortal rooting in particular). The immobility, the legs rooted into the ground, the oscillation between the vegetal kingdom and humanity and, above all, the cruel lack of 'the water of rivers' and the 'dew of clouds', in Yann's drawings positive Addresser who will wipe out the aggressive sun. As well we should note the paralysis of the arms that are unable to help the subject to set the object relation.*

The drawing of the tree with countless arms, as well as the first drawings featuring threadlike men with unstructured limbs inextricably tangled together or with vegetation, immediately evoke Henri Michaux's drawings (he drew thousands of little beings in a quick conjunction of black ink lines: *Henri Michaux, Mouvements*, Paris: Gallimard, 1951, republished 1982), and above all the text 'Portrait des Meidosems', in *La vie dans les plis*, Paris: Gallimard, 1949: 125 et seq.

In keeping with the theme of stuck window-eyes, blinded by the shutters, with the theme of the body, of the pierced head discharging his substance and letting aggressions in:

*Un bandeau sur les yeux, un bandeau tout serré, cousu sur l'oeil, tombant inexorable comme volet de fer s'abattant sur fenêtre. Mais c'est avec son bandeau qu'il voit. C'est avec tout son cousu qu'il découd, qu'il recoud, avec son manque qu'il possède, qu'il prend. (p. 173)*

*Meidosem, à la tête habitée d'arborescences, regardant non par les yeux crevés, mais par le chagrin de leur perte et par la térebrante souffrance.*

*Une arborescence infinie...sous la minceur translucide du visage exténué, exprime une vie percée, par-dessus un autre qui se forme, qui se forme, malaisé, prudent, effilé et déjà repercé. (p. 156)*

Echoing the sun which burns the head:

*Grand, grand Meidosem, mais pas si grand somme toute, à voir sa tête. Meidosem à la face calcinée.*

*Et qu'est-ce qui t'a brûlé ainsi, noiraud?*

*Est-ce hier? Non, c'est aujourd'hui. Chaque aujourd'hui.*

*Et elle en veut à tous.*

*Calcinée comme elle est, n'est-ce pas naturel? (p. 157)*

Corresponding strikingly with the drawing of the tree with numerous arms:

*Plus de bras que la pieuvre, tout couturé de jambes et de mains jusque dans le cou, le Meidosem.*

*Mais pas pour cela épanoui. Tout le contraire: supplicié, tendu, inquiet et ne trouvant rien d'important à prendre, surveillant, surveillant sans cesse, la tête constellée de ventouses. (p. 155)*

*C'est aujourd'hui l'après-midi de délassement des Meidosemmes. Elles montent dans les arbres. Pas par les branches, mais par la sève. (...)*

*Ensuite elles descendent par les racines dans la terre amie, abondante en bien des choses, quand on sait la prendre.... (p. 138)*

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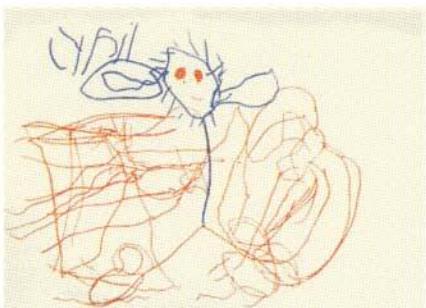


Plate 1. The man with shutters-eyelids

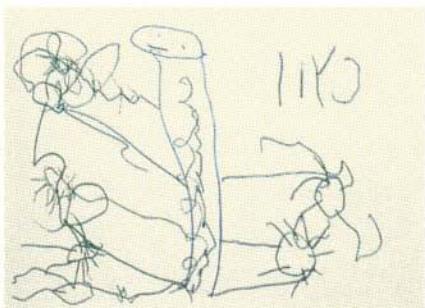


Plate 2. The tree-man

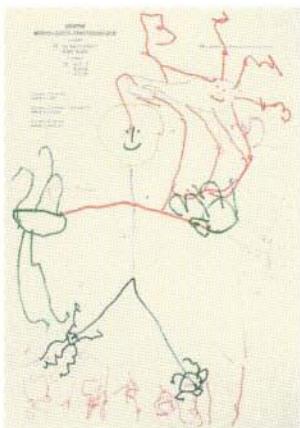


Plate 3. The heavenly fight of Sun and Rain



Plate 4. Appearance of the house



Plate 5. The rain is overflowing

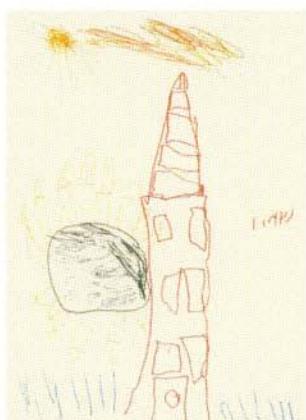


Plate 6. The advanced birthday



# **Gesture Universals: Material and Formal Constraints**

**Richard Hirsch**

## **Introduction**

Humility is the password to knowledge. My intention here is to give a formulation of our present state of ignorance concerning the subject of universals of gestures, and to attempt to give a well-developed hint as to where and how a search for universals of gestures may fruitfully be conducted. Much of what I present here is probably common knowledge, but I have not found any similar listings or tabulations in the reference literature.

I begin by trying to distinguish gestures from other closely related semiotic phenomena (e.g., general nonverbal behavior, facial expressions). I then move to the heart of the essay, where I try to present a coherent characterization of a number of material and formal constraints that apply to gestures. The formulation of the material and formal constraints will be based on my earlier research on emblematic gestures and the relationship between speech and gesture (Hirsch 1983, 1989, 1992, 1993, 1994). I conclude with some speculative consequences concerning the understanding of gestures and their communicative strengths and weaknesses that may be drawn from the constraints on gestures as formulated here.

## **Defining Gestures**

Gestures, as I will be speaking of them, are semiotic phenomena characterizable as non-conventional, non-vocal, nonverbal, non-alter contact communicative behavior produced by movements and/or configurations of the upper extremities of the body—i.e., the fingers, hands, arms, shoulders, and head. The non-vocal character of gestures distinguishes them from spoken communicative behavior. The nonverbal aspect eliminates writing from the focus of our study. The non-alter contact property eliminates handshakes, kisses, etc. The focus on the upper extremities eliminates facial expressions and gaze behavior as gestures. The non-conventionality of gestures means that they are neither necessarily conventional

nor necessarily idiosyncratic or unconventional; some gestures are conventional and others are not. Their non-conventionality distinguishes gestures from sign language and other manual-digital codes which are necessarily conventional.

This is basically a stipulative definition, but one which I hope captures a central class of expressive movements that are referred to by the general and vague term 'gesture' as used in common parlance. Many of the constraints to be discussed below will, however, apply to all expressive body movements conceived of as gestures, even those not strictly fulfilling the criteria of our definition.

Communicative behavior may be classified in terms of the level of purposeful self-awareness of the communicator. One can distinguish between: (1) *indicators* which function as a source of information for an observer irrespective of the intentions of the person exhibiting the behavior; (2) *displays* which are intentional manipulatory actions intended to make a receiver at least apprehend or attend to certain information; (3) *signals* which are intentional manipulatory actions intended to make a receiver at least apprehend a display of certain information; and (4) *symbols* which are behavioral features or any other objects which by convention are representative displays of content (cf. Allwood 1976; Grice 1957; Hirsch 1989).

The gestures to be discussed below fall into any of these categories according to the degree of conscious communicative intention attributed to the person exhibiting the gesture behavior. In other words, gestures do not necessarily have to be intentional in order to be communicative. The relationship between gesture behavior and communicative function or content is grounded in a set of what I will refer to as material and formal constraints. These constraints allow for and delimit the connections or associations that obtain between gestures as exhibited behavior and communicative function or semantic content.

This 'definition' will hopefully serve to narrow down the object of the present study enough to avoid serious confusion as to what claims are being made about what sorts of phenomena. The constraints to be explicated in the following sections are to be understood as applying primarily to gestures as they are defined above. Some (or all) of what is said below may also apply to other types of non-vocal, nonverbal communicative behavior, but there is no claim being made here that such is the case.

### **Constraints: Material and Formal**

Gestures, as they are to be described here, are conceived of as more or less dynamic behavioral processes. As processes they may be characterized according to an initial state (beginning) and change of state over time (middle) in the realization of a final or terminal state (end). In this developmental structure, the middle phase usually ends with a climax or peak of activity, after which point the body parts involved in the gesture return to a state of rest very similar to the one they assumed before the execution of the gesture. This process of determination over time may be described in terms of formal (psycho-semantic) constraints which, in interaction with material (physical-substantial) constraints, govern the developmental process of gestures.

The distinction between material and formal constraints is inspired by Kant's distinction between matter and form of any object of sensorial appearance where the matter is that which at any stage of a perceptual process is determined by the form of the appearance (Kant [1787]1965: 65-66). Kant's distinction can be traced back to Aristotle's four causes: *causa materialis*, *causa formalis*, *causa efficiens*, and *causa finalis*, of which the *causa efficiens* and *causa finalis* were more specific determinants of *causa formalis*, according to which the necessary aspects or properties of anything can be characterized as part of a process of coming to be and change (Lear 1988: 28ff).

Aristotle ascribed the four causes to the nature of things in themselves. Kant, however, discovered that matter and form are necessary constitutives of a subjective experience of an object of perception, not necessarily properties that may be ascribed to the things in themselves. In line with Kant's insight, the features of gestures to be described below will be properties of gestures in relation to the epistemic, perceptual, subjective and intersubjective cognitive, social, etc. properties of the human subject exhibiting and perceiving the gestures, rather than properties of gestures in and of themselves.

### **Material Constraints**

Material constraints are concerned with the physics of gestures. In linguistics, the study of analogous phenomena would be somewhere in the areas of acoustic and articulatory phonetics.

***Material Constraint 1:** Gestures communicate at the speed of light (in the medium).* In a vacuum, the source (sender) of the gesture and the destination (receiver) of the gesture are related to each other by a physical constant, the speed of light. The speed of gestural communication can be varied according to the transmitting properties of a medium, but gestural communication will always take place at the speed of light in the transmitting medium. Gestural communication will always be the fastest means of communication in a medium that transmits light. The converse of this universal is that gestures also fade at the speed of light in the medium.

***Material Constraint 2:** Gestures consist of a structuring of light over time.* The human experience of gestures depends on our being able to process information carried by changes in the structure of spatial patterns of light.

***Material Constraint 3:** Gestures depend (normally) on an independent light source.* Gestures are not (normally) self-illuminating. In order to communicate, a gesturer must reflect light.

***Material Constraint 4:** Gestures require (sufficiently) translucent or transparent media.* Media that absorb, diffract, or refract light (basically all normal translucent or transparent media) reduce the effectiveness of gestural communication as their properties increase the absorption, diffraction, or refraction of light passing through them. Smoke, fog, smog, etc. reduce or prohibit communication by means of gestures. Certain types of gestures utilize the solidity of body extremities (or puppet versions thereof) to create silhouette or shadow gestures through a translucent screen.

***Material Constraint 5:** Gestures are not (normally) reflected by ordinary objects.* There is no gestural echo, resonance, or amplification by objects in the environment (at least as is perceptible to a normal human observer). Windows at certain times of day (at night in a lighted room) and mirrors constitute exceptions to this general rule. The shadow gestures or silhouettes discussed above constitute a possible exception, especially when a reflective surface is utilized to produce contrast.

***Material Constraint 6:** Gestures are (normally) irreflexive and asymmetrical.* The gesturer does not view his/her own gestures as a viewer would. A gestural display has a *range* dimension which consists of a combination of direction and distance from the gesture source. The sender's up-range perspective is not interchangeable with the receiver's down-range perspective. This contrasts with vocal-verbal expressions, which are reflexive and symmetrical (cf. Hockett and Altmann 1968).

***Material Constraint 7:** A gesture presupposes a viewing perspective—not all perspectives are equally adequate or valid.* The receiver/viewer must be within range (i.e., not too far away from the gesture source), or at an appropriate viewing angle—not behind or too far to the side of the gesturer.

***Material Constraint 8:** Gestures exhibit restricted directionality.* This is due to binocular overlap, which restricts the eyes' acceptance of light to an angle of slightly greater than 150°.

***Material Constraint 9:** Gestures presuppose an appropriate distance (depth of field) to the observer in order to enable proper focusing.* Gestures must not be made too close to the observer. Closeness can make the gesture blurred or cause part of the gestural display to fall outside the observer's binocular overlap.

***Material Constraint 10:** Gestures are available to all observers within range.* Gestures cannot be directed to one unique addressee. This contrasts with vocal-verbal expressions where communicators can 'code-switch' to restrict the receivers of a message. Gesture-based codes are worse candidates for secretiveness than vocal-verbal languages. This conclusion is based on the reasoning to be found in the section on formal constraints. The chances of guessing the meaning of a gesture-based code are, according to the reasoning found there, greater than with language-based codes.

***Material Constraint 11:** Gestures require attention from the observer.* The sender or source of the gesture must be within the observer's field of gaze, and the observer must be attending to the behavior of the source. Although gestures are available to all observers within range, the observers must be paying attention in order for the gesture to be effective. The properties of restricted directionality, restricted range, non-self-illumination, etc. lead to the conclusion that gestures are

less robust or more delicate than vocal-verbal expressions. A blink of the eyes or a momentary turn of the head may be enough to eliminate the effectiveness of a gesture. A recent experience from my place of work illustrates this point. A colleague was looking for someone in a neighboring room. I knew where the person he was looking for was and said, while he was looking into an empty office, 'Arne is there', pointing to a room across the hall. My addressee, having heard me but having been looking away from me into the room at that moment, replied 'No, he's not'. He smiled when he turned to face me and saw me pointing into the other room, where we both could see Arne. An observer or receiver of a gesture must be 'locked in' on the gesture.

*Material Constraint 12: There are limited possibilities for modification to overcome distortion due to range limitations.* If an observer is too far away, a gesture may be enlarged. If an observer is very close, a gesture may be reduced. However, the risks of the gesture turning into something else as a result of this process of enlargement or reduction are great. This material constraint connects with formal constraints concerning the holistic nature of gesture to be developed below. Gestures do not allow for graduated modification—they are wholes that turn into other wholes.

*Material Constraint 13: Effective gestures presuppose an acceptable speed of movement.* In order for the visual system to retain the light pattern produced by the gesture, the gesture must be of a duration of at least 150-250 msec. This, in combination with the attentional dimensions of gestures (Material Constraint 11), makes the movements of magicians, illusionists, and pickpockets non-gestures.

*Material Constraint 14: Gestures must be distinct in contrast to the background environment—i.e., they must be visually salient.* Even though a gesture may satisfy all the previous constraints it may fail to stand out against the background in the perceptual field of the receiver. The 'articulators' of a gesture must exhibit properties of solidity and enough brightness and/or color contrast to make them stand out against the background environment. 'The hand' in a house of horrors can be effected by a person wearing a white glove, dressed otherwise totally in black, in a dark room. The background environment must not 'hide' the gesture in excessive glare or reflection. Gestures may also exhibit temporal redundancy (i.e., repetition of movement) in order to enhance the visual salience.

*Material Constraint 15: Gestures are impractical—i.e., they have no direct perceptible physical effects upon the environment.* Gestures share this property with vocal-verbal language expressions (cf. Hockett's 'specialization'). The movements one goes through in order to make an omelet (e.g., breaking eggs, beating eggs, etc.) are only gestures insofar as they are not aimed at actually making an omelet. This distinguishes gestures proper from instructive demonstrations which are practical—actually doing what is demonstrated and thereby bringing about perceptible physical effects on the environment. With gestures, a perceptible physical effect on the environment is considered to be a mere by-product and not an intrinsic goal of the movement as a gesture.

*Material Constraint 16: Gestures must conform to the physiological and anatomical limits of movements of the human extremities.* This constraint is really a whole family of constraints which have to do with what parts of the human body can be moved, rotated, swung, bent, etc. in which directions. Normally these movements are also subject to gravitation, but in exceptional circumstances (outer space) the only limitations to gesture movements are those set by the limbs (bones) and joints. These constraints make certain combinations of movements, configurations, or articulations of extremities less likely candidates for gestures than others. A yoga position is, for instance, less likely to be a gesture as we are speaking of them than, say, a hand wave or a head nod.

*Material Constraint 17: Gestures as processes are embedded in interactional processes (courses) of information development.* A gesture is part of a historical process of information development within the interactional context—Involving the source/sender and the destination/observer of the gesture—in which the gesture occurs. This constraint relates to Formal Constraint 8 discussed below. There is, in communicative interaction in general, an incremental development of information from indicative to display and from signal to symbolic. Initially, information tends to be more indicative and nonrepresentational, and becomes more symbolic and representational as the development progresses. There is a cyclical progression in the development going from indicative to display to signal to symbolic information, and terminating with a return to more indicative or display information (Hirsch 1989: 54).

### Formal Constraints

The material constraints on gestures presented above focus on the physical and substantial aspects of gestures which affect the appearance of gestures as objects of sensory perception. The formal constraints focus on the potential of gestures to convey a meaning. The formal constraints would be part of semantics and pragmatics in modern linguistics.

*Formal Constraint 1: The form of a gesture is related to a field of semantic/pragmatic content via a set of gestalt features for the gesture.* In Hirsch (1993) I present a proposal for how to account for the intuition that there is a complex yet systematic relationship between the form and the content of a gesture. Gestures are shown there to exhibit certain tendencies along sets of scalar gestalt features: e.g., more rising than falling, more symmetrical than asymmetrical, more checking than flowing. A set of such tendencies constitutes a gestural gestalt for a gesture. The gestural gestalt is related to an emotive-conceptual quality category which serves as a bridge to a field of content for the gesture. The proposed thesis allows for the fact that one gesture—for instance, the ‘index finger-thumb ring’—can have a variety of related meanings in different cultural contexts, and that one meaning can be conveyed by a variety of gestures within the same culture or across cultures: for instance, the different ways one might express ‘don’t know’.

*Formal Constraint 2: Gestures allow for (if at all) only relatively limited semantic modification or refinement.* Gestures are understood as undifferentiated wholes (see Formal Constraint 3) in which we either understand (or misunderstand) the gesture as a whole or nothing at all. Gestures cannot be semantically modified as can vocal-verbal expressions. This constitutes a basic difference between gestures and sign languages. Sign language expressions conform to morphosyntactic construction principles (Klima and Bellugi 1979; Stokoe 1980) which allow for semantic modification—i.e., they can be modified to representationally differentiate between general and/or specific as opposed to general and/or vague conceptual content. A vocal or non-vocal language, being a semantically dense representational system (Goodman and Elgin 1988), can distinguish different levels of semantic content by modification of expressions. An expression ‘loud’ can be modified semantically by expressions such as ‘very loud’, ‘painfully loud’, etc. Such modification is either not possible or at best extremely limited in gestures. In this respect,

gestures are similar to notational systems which are semantically differentiated. Gestures are dissimilar to notational systems in that they are syntactically undifferentiated.

*Formal Constraint 3: Gestures are holistic—the meaning(s) of the whole cannot be derived from the (independent) meanings of the parts.* The parts are meaningless independent of the whole. If some part of a gesture is missing—i.e., if the transmission of the gesture has been interrupted for some reason—then the whole cannot be reconstructed with any guarantee of success. This is in contrast to vocal-verbal expressions, where the structure of the whole, semantically and syntactically, can be reconstructed even if much has been lost in transmission. This constraint relates to the discussion above concerning the robustness of vocal-verbal expressions as opposed to the non-robustness or fragility of gestures.

*Formal Constraint 4: Gestures are non-constructive and exhibit low redundancy.* This relates to Formal Constraints 2 and 3. Because gestures do not conform to morphosyntactic construction principles, there is low redundancy in a gesture. Seeing some fragment of a gesture (e.g., viewing the gesture from the wrong perspective, or under less than optimal viewing conditions), we cannot ‘fill in’ or ‘predict’ what the rest of the gesture should be. With gestures, the more we see the more we know and understand, and conversely, the less we see, the less we know and understand. In other words, with gestures, seeing is understanding, not seeing is not understanding. With vocal-verbal expressions we can know and understand more than we see or hear.

*Formal Constraint 5: Gestures in interaction with speech function to determine the range of possible interpretations or understandings of a message.* Spontaneous gestures that occur in face-to-face interaction function to determine the interpretations or understandings under development in the participants by effecting either restrictions of semantic content toward the more specific and precise, or extensions toward the more general and vague. Illustrative gestures help interactants to narrow down the range of adequate interpretations or understandings as belonging to one or an intersection of these semantic dimensions (cf. Hirsch 1989: 61ff., 1992, 1994).

Example 1 is extracted from a video recording of an encounter at the reception desk of a hotel. A guest, C, has approached the receptionist, R, with a request to

search for an object that has been misplaced. The guest is a non-native speaker of English who compensates for an unsuccessful word-search with an illustrative gesture to achieve his communicative goals. The receptionist makes an educated guess at what the guest might be referring to with his combined speech and gesture when he fills in with a vocal verbal expression ‘a belt’.

*Example 1:*

- |                            |   |
|----------------------------|---|
| C: yes // it's a <gesture> | <circular motion with both hands>           |
| R: ahah <a belt>           | <look up to right + step back> <sup>1</sup> |

*Formal Constraint 6: Gestures are instrumental in fashioning the subjective intentionality of the communicators and the discovery of intersubjectively meaningful aspects of the abstract or concrete life-world objects, relations between life-world objects, etc., that are attended to in a communication situation.* Using Husserl’s characterization of subjective intentional attitudes toward life-world objects in terms of horizon, perspective, appresentation, and apperception (Husserl 1966) and Heidegger’s (cf. Olafson 1987) notion of uncovering meaningful aspects of life-world objects, the relationship between a gesture and the life-world object to which it relates will depend on the particular intentional horizons given by the actual situational perspectives of the subjects exhibiting and viewing the gesture and the subjects’ accumulated situated experiences of the apperceptual and appresentational features of the life-world objects attended to.

According to Husserl, the identification and location of a life-world object takes place within a particular intentional *horizon* which is empty without being a void—what he calls a ‘bestimmbar Unbestimmtheit’ (determinable indeterminate). The horizon of consciousness in relation to an object is filled or determined depending on the *perspective* adapted by the perceiving subject toward the object attended to. Depending on the perspective adapted by the subject, certain features or aspects of the object will be more prominent or obvious than others. Other features will be hidden from the subject. Those features that are hidden from the subject because of the particular perspective belong to the *appresentation* of the object. These features constitute what the subject expects to find if the object is attended to from different perspectives. The perception of the myriad features or aspects of an object as belonging to a complex whole constitutes the *apperception* of the object (cf. Hirsch 1994).

In Heidegger there exist pre-semiotic meanings for life-world objects for the subjective consciousness based on situated experience(s) of the objects. These meanings associated with objects must be 'enthüllt' (uncovered) by the subjective consciousness in situated experiences with the objects. What has to be uncovered are the possibilities of the object(s) in relation to the actions and purposes of the subject—whether it can be eaten, burned, moved, etc. (Olafson 1987: 114).

Under this perspective there is no need to hypothesize stable and inherent relationships between gestural representations and objects represented in order for gestures to be meaningful. Gestures are more or less non-conventional means for directing attention to preexisting meaningful objects. The way gestures or other signs are used to represent objects will depend on the particular intentional horizon given by the actual situational perspective of the subject making the representation and the subject's accumulated situated experiences of the apperceptual and appresentational features of the objects.

*Formal Constraint 7: All gestures can be misunderstood.* Because of the manifold properties of life-world objects and the manifold properties of gestures, any particular gesture may be associated with any object/content, and any particular object/content may be associated with a wealth of gestures. This connects with Formal Constraint 6, which would lead us to expect that a shift of perspective or horizon would bring about a focusing on new aspects of the many possible gestures or contents to allow for a new associative relationship. There is a basically unstable many-many relationship between gesture and the object/content signified. If a gesture can be understood at all, it can be misunderstood.

*Formal Constraint 8: Gesture meaning is determined by the history of the situated communicative interaction.* This formal constraint remedies the basic weakness evidenced by the findings in Formal Constraints 6 and 7. Gestures taken out of the interactional context may have a wide range of meanings. But in the actual context of use they are restricted to a narrow range of meanings. Consider the hand gesture by the hotel guest presented in Example 1. The circular movements with both hands could in other contexts represent 'cycling', 'recycling', 'running', 'going round in circles', 'giving me the runaround', etc. To make sense of such gestures we probably invoke an enormous amount of world knowledge that is typed according to situational context in an attempt to answer a question such as, 'what could this person reasonably be trying to communicate to me in this type of

situation given the particular course of development the interaction has taken thus far?

## Conclusions

A reflection on these material and formal constraints reveals a number of strengths and weaknesses concerning the communicative power of gestures. On the strong side, gestures (when they communicate) communicate immediately. Cognitively, gestures present the viewer with a specialized analog representation that is just one level of concretization below Kant's ([1787]1965: 180) notion of a transcendental schema, and are therefore processed faster and with less effort than vocal-verbal representations. On the weak side, gestures are much less robust and flexible than vocal-verbal representations. Gestures are easily destroyed and are semantically characterized by a single articulation where every part is meaningful only in relation to a particular whole and not as something that can recombine with other parts to form new and different wholes.

I think these strengths tell us why gestures are used as much as they are. The weaknesses tell us why they are not used more. The complications of gestural communication due to Material Constraints 7, 8, 9, and 11 especially might also explain why 'true' gesturing (McNeill 1992: 302) seems to come rather late in the development of a child's communicative skills. The demands on anticipatory intersubjective perspective-taking that derive from these constraints call for a well-developed sense of how self is viewed by other(s) from different perspectives and at different distances, and an awareness of how self is viewed without having access to visual feedback to guide the production of the gesture.

Never say never. Never say always. The first universal is that there are no universals. The constraints presented and discussed in this essay are not meant to constitute a set of absolute limits on gestures. They are delimiting, but at the same time they allow for a rich range of variations. The existence of these constraints also tells us very little about the possibilities of understanding gestures across cultural boundaries. Knowledge of how a gesture, to an observer in retrospect, can be seen to mean what it does in accordance with the formal constraints is of very little help to the hapless participant confronted with gestures from another culture the forms of which apparently differ radically from those to which

he or she is accustomed, without violating any of these material or formal constraints.

## Summary

I list the material and formal constraints presented and discussed in this essay for ease of reference.

### *Material Constraints*

1. Gestures communicate at the speed of light (in the medium).
2. Gestures consist of a structuring of light over time.
3. Gestures depend (normally) on an independent light source.
4. Gestures require (sufficiently) translucent or transparent media.
5. Gestures are not reflected by ordinary objects.
6. Gestures are (normally) irreflexive and asymmetrical.
7. A gesture presupposes a viewing perspective—not all perspectives are equally adequate or valid.
8. Gestures exhibit restricted directionality.
9. Gestures presuppose an appropriate distance to the observer in order to enable proper focusing.
10. Gestures are available to all observers within range.
11. Gestures require attention from the observer.
12. There are limited possibilities for modification to overcome distortion due to range limitations.
13. Effective gestures presuppose an acceptable speed of movement.
14. Gestures must be distinct in contrast to the background environment—i.e., they must be visually salient.
15. Gestures are impractical.
16. Gestures must conform to the physiological and anatomical facts of movements of the human extremities.
17. Gestures as processes are embedded in interactional processes (courses) of information development.

*Formal Constraints*

1. The form of a gesture is related to a field of semantic/pragmatic content via a set of gestalt features for the gesture.
2. Gestures allow for only relatively limited semantic modification or refinement.
3. Gestures are holistic—the meaning of the whole cannot be derived from the (independent) meanings of the parts.
4. Gestures are non-constructive and exhibit low redundancy.
5. Gestures determine the range of possible interpretations or understandings.
6. Gestures are instrumental in fashioning the subjective intentionality of the communicators and the discovery of intersubjectively meaningful aspects of the abstract or concrete life-world objects, relations between life-world objects, etc. that are attended to in a communication situation.
7. All gestures can be misunderstood.
8. Gesture meaning is determined by the history of the situated communicative interaction.

**Note**

1. Transcription note: The expression *<gesture>* in the transcription indicates the occurrence of a non-vocal, nonverbal expression, the realization of which is described in corner brackets in the righthand margin. Occurrences of non-vocal, nonverbal expressions that overlap with vocal-verbal expressions are indicated by the verbal expression contained in corner brackets *<a belt>*. The realization of the non-vocal, nonverbal expression is contained in corner brackets in the right hand margin.

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## **Visual Semiotics and Space**



## **Space, Form, and Substance**

Pierre Pellegrino<sup>1</sup>

At the last Congress of the International Association for the Semiotics of Space (IASSp), held in Berlin July 29-31, 1992, Martin Krampen expressed a wish to relinquish his office as President, considering that he had accomplished what he had set out to do in founding the Association. He then nominated me and had me elected as his successor. I owe him a great deal, not only for this election, but because 23 years ago he was the first to introduce me to semiology. I was fascinated by meaning; he showed me that, through form, meaning articulates with substance. Form he had questioned himself in a multicontoured approach. Martin Krampen is a painter with a scientific training, by taste for substance; he paints, and takes note of the emergence of design in the world of contemporary forms (Krampen 1974). He is a semiotician grounded in a behaviorist psychology, taking into account the weight of quantities of information in the perception of the qualities of form, color, and space. As a semiotician he is thus oriented toward an ecology that rejects entropy and understands that, this side of the information which form conveys to us, there is substance, and that that substance is not inert; the material reality of things has a temporality made up of balances and imbalances (Krampen 1973); for plants (Krampen 1981), animals, including humans, a life, an initial creation and an end; a meaning.

For the Berlin Congress, Krampen chose some significant topics, crowning his teaching career at the Hochschule der Künste. The communications topic for Part I of the meeting, 'Structure and Effect of Artistic Messages', was designed to bring together and into contact colleagues from neighboring fields, in particular psychologists (the psychology of form and environmental psychology) and philosophers (aesthetics). The topic for Part II, 'Semiotics, Aesthetics and the Ecological Meaning of Space', by drawing more specifically on semioticians, aimed in its turn to stir up a lively discussion both on defining what semiotics could be and on the very notion of space.

The discussions Krampen had hoped for took place. They revealed that, in the view of some, semiotics finds its origin in the world of animals and plants even before that of human beings; as they see it, semiotics is the study not merely of

communication but also of the information which, from a diachronic standpoint (Sebeok 1991), the environment gives to a vegetable, animal, or human organism. In the view of others, semiotics is strictly a human science, linked to the intentionality of the subject and the arbitrariness of the sign; in this way they expel all causality from the semiotic form which meaning takes in the sign (Prieto 1989). In my view, our intentions come up against the tragedy of our destiny. My body makes me animal and even vegetable in some of my behavior patterns; causality determines me, I run up against it at every step; and yet my whole being tends toward free will, without ever attaining it as fully as my desire for the absolute would wish. And then chance, like the monotonous presence of the insensate, opposes my needs as much as it does the meaning of my being to the world. Thus, in the gap that is meaningful because it is differential, I find a place to build and preserve my personality.

The very notion of space, for its part, creates an opposition. On one side are those who hold that the homogeneous expanse is primary and that the effect of space is to detach it from its intervals and boundaries. On the other side are those who postulate discontinuity as primary; a datum in the materiality of things, the distance between features of reality, when noted by the semiotic subject, is measured as a dimension of a composition that is relevant for him. I propose, for my part, to take the view that the first case is concerned with an analytical space, decomposing the material reality of things as they are independent of us, and the second case with a synthetic space composing an object from which material reality derives. If space is the form which material reality takes for us, that form may be the mode both of its construction and of its deconstruction. There is an energetics of form in which formal forces are opposed to material forces and throw open to us a space which defies causality, in which we find the meaning of our being in the world.

In the few pages that follow, I shall try to contribute some thoughts about the presence of substance in the production of meaning. I shall thus take sides, not in the sense of assuming an exclusive position, but of assuming an inclusive position; I shall thus seek to formulate some elements of a theory that is simultaneously inclusive and discriminatory. Such a theory is necessary, at least for architecture, whose object straddles that of the natural sciences and that of the human sciences. Krampen's teaching brings us to this through the questions he has taught us to ask ourselves, the openness he has always managed to give to his works, and his critical curiosity about the works of his colleagues.

### Architecture, Meaning, and Substance

At the beginning of his ten-volume work on architecture, Vitruvius (Pollio 1969) presents architectural learning to his patron (who at that time happened to be the prince, the Emperor Augustus) and says that architecture is something having to do with meaning, in a sense that may at first seem rather startling. He says that architecture is something having to do with meaning, or signification, in the sense that the signified would be the object of which we are speaking, the building; and the signifier, what we say about it armed with the knowledge we have of it. Only an architect can make such an affirmation. To the public, the terms occupy virtually the opposite positions. To the public, the building seems to be the signifier; it remains to determine whether it is the building, or a class of buildings, or a set of material facts recognized in certain forms, whether geometrical or logical, that can be called signifiers for the public. To the architect, the building is not the signifier but the signified; it is what he is talking about, what his design is aimed at, armed as he is with a knowledge that is architecture.

When the inhabitant speaks of the periphery, the perimeter of the town, he often wants it to be the signifier of a social content; it is then his wish that to one contained form, one urbanity, there should correspond one form of container and one only, an urban perimeter. We in architecture know that the form of the content does not necessarily correspond term for term with the form of the container; we know that between the two there are paths, there may be distances or lacks of fit, and that a work of art is made from precisely this. Furthermore, there are not merely possible relations, even sometimes at a distance, attractions and repulsions between the form of the container and the form of the content. There are in addition relations between the form of the container and a form of expression: relations that give rise to disputes concerning the decoration to be superadded or not to the container. Expression in architecture is a third level. From the standpoint of the semiotics generating an architectural project, there are levels at greater or lesser depth on which we proceed gradually from the architectural composition to a manifestation of its meaning.

The public, faced with what the architect designs—what he conceives when he makes his project—has at first only an expression; it does not know in advance what content the architect has put into it, hence even less what relation that content may have, in the eyes of its creator, to a very definite container.



Figure 1. M. Krampen, Algarve, 1992. Black and white fragment of a color composition

From this point on, unless care is taken, dialogue is very difficult. What is the means for the one is the end for the other. Whereas, for the architect, architectural knowledge is the means of speaking of something (namely, the building), for the other—the inhabitant—that means is not his end. The inhabitant's end is elsewhere: it is to live a certain kind of life. But if both are unaware of this discrepancy, communication between the architect and his public becomes a problem. It is no more possible in architecture than in any other field of artistic practice and invention to believe that there is a necessary process of give-and-take between what is designed, painted, or sculpted and what the other, the recipient, then expects. Between the two, the accomplishment of a branch of knowledge, a break in a culture, intervenes. If there were give-and-take, there would be no artistic inventions or architectural projects.

When the inhabitants seek such a give-and-take, they are in reality looking for relations of causality between effects and instruments, not for relations of meaning. To establish a relation of causality is the meaning of an instrument, for example a door which, on being opened, enables us to move from one space into another. There is a relation of causality between an instrument and a possible effect. But that relation is not primarily a relation of meaning. As soon as the creator designs the door in a particular way in order to prompt a particular way of moving about, a particular way of conceiving the fact of entry, he begins to work on meaning; in semiotics this is called connotation.

We should point out that form is not immediately, if it is a form, the form of something (Hersch 1946). When a form is designed, an entity is designed which does not have only one particularity; it is not merely the form of a thing, it has to do with other possible things—a form has to do with a certain universality. In architecture, therefore, while we certainly deal with forms, and with space as the form of what we are seeking to know and create, we are faced with this enormous problem: we make something specific, but we would like that specific thing to have a coloring of the universal.

It should be noted that this also depends on cultural mediation, on architecture as fashion, on magazines and on the whole show the architects put on in order to have their products appreciated—i.e., to have them recognized as being of value. But it is at the very heart of architectural form, of the design of form as the application of a branch of knowledge, that the architect, seeking something universal through the singularity of his object, may find in his project a meaning as a work of art. Anyone at all can make himself a shelter, out of stones, sand and cement,

bricks, timber or other materials; he does not have to go through an architect, an engineer, or even a mason or carpenter. Such is the anthropological foundation of architecture; but bricks, concrete, timber, and the other materials are the substances of an architectural form, not its meaning—the meaning is the building as the construction of a possible world, a project.

### Space and Substance

The first substance in which a spatial form manifests itself is the body. Following Hjelmslev (1971), we recognize levels of substance: the sensorimotor level, which is individual and physical; that of personal apperception, which is socio-biological; and that of collective appreciation, which is socio-cultural. On the one hand these levels presuppose different forms of expression and of content; on the other, their superimposability depends on their structural correspondence, and their functions fit into a hierarchical order in which, from the semiotic standpoint, collective appreciation is the primary, immediately relevant level, the other levels being screened, selected, and ‘reflected’ only in part, in a chosen sector of their expanse, the only one projected onto the level of appreciation.

In the case of a linguistic semiotics, in which the substance of the collective appreciation covers the whole field of the lower levels and in which the substance of the content of a language includes the substance of its expression—a prerequisite for being able to use that language as a metalanguage—a single substance selects the form; in Hjelmslev’s view, however, in non-linguistic semiotics there may be many substances of the content, one and the same form then being open to several interpretations.

Hjelmslev also observes that the substance can play the role of a variable only in cases in which, for immediate analysis, the syntagma alone is involved. So far as space semiotics is concerned, it will be noted first that there may be a multiplicity of substances ordered in hierarchical levels, and second that, in relations of co-presence or connectedness, substances may play the role of variables.

This being so, from the genetic standpoint the construction of space begins at the sensorimotor level. Piaget (1978) shows how, even at that level, schemata are formed in which the real can be assimilated and reduced by centering it on one’s own immediate activity—or, on the contrary, gestures and actions can be accommodated, by imitation, to the realm of the real—even before the semiotic function

itself has taken shape. Gradual adaptation to the real is effected by extending sensorimotor schemes over greater and greater spatial—and temporal—distances; in this process of extension, the need to keep certain objects of immediate apprehension constant leads to connecting up the objects in a perceptual field step by step, by means of images.

Imitative accommodation, first sensorimotor and then mental, thus engenders the image and establishes the individual signifiers which serve as support for the meanings supplied by assimilating the real to the sensorimotor and perceptual schemata; the very incorporation of the object in these previous schemata provides it with a signified.

In an initial stage of their genesis, spaces are reduced to their qualities perceptible on a scale of proximity. In a second stage, the assimilation of the real to spatial schemata and the accommodation of those schemata to the real tend to balance out, but only in the setting of certain privileged configurations. In a third stage, the coordination of spaces allowing them to be structured in their generality detaches their transformations from the presence of the subject and decentralizes them, rendering them reversible.

It should be noted further that, in spatial transformations, the image remains on the scale of the operation, since the operation is the result of an accommodation, and the balance between accommodation and assimilation is precisely what makes the transformations reversible. In the light of Piaget's works it is evident how, as regards space, between accommodation and assimilation, the relevant substance may play the role of a variable in the step-by-step progress and its extension to the most distant, and also what part bodily, sensorimotor, and perceptual activity can take in it.

At this point we may note further, after Hjelmslev, that in a categorial, especially a linguistic, semiotics the privative, exclusive opposition (between marked term and unmarked term) is a fact of substance and reflects the paradigmatic formal correlation (logical disjunction between classes). In the case of a spatial semiotics, by contrast, the substance is not made up solely of exclusive lines, of distances; it is also made up of inclusive dimensions, reflecting a syntagmatic spatial composition, an arrangement of parts in a whole. This demands that space semiotics be developed on the side of that which makes the unity of a whole, the composition of its parts—even before seeking to distinguish that whole from others in the opposition of privative differences of identity.

### Substance, Form, and Figure

Many architects, describing in their treatises on architecture the way they design a building, liken the process to the genesis of the human body. One of these is the architect Filarete (1972), who holds that 'a building resembles man', 'it must be engendered and delivered in the same way as man', 'as a child is delivered by its mother after nine months, or sometimes seven, and then raised with order and care'. The shelter constituted by the body is then the schema to which the real—the privileged configuration in an initial stage of the building's design—should be assimilated (Fig. 2).

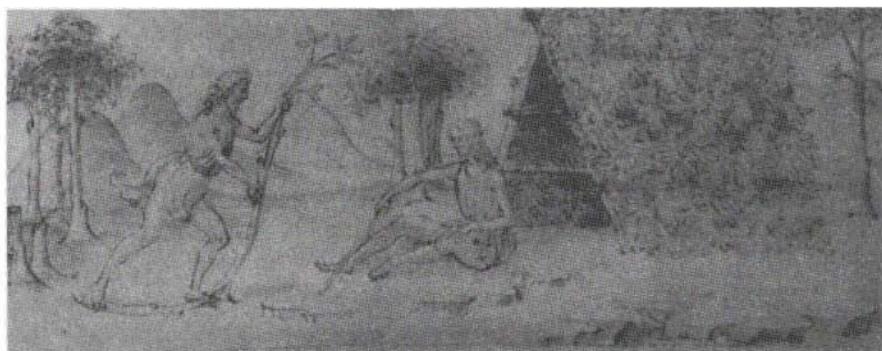


Figure 2. Filarete, *Trattato di architettura*, 1458-1464

In a second stage, which consists in adapting to the real on a scale of immediate proximity, the primitive hut is the second privileged configuration, anamorphous to the first in some of its dimensions. Then in a third stage, which consists in coordinating the spaces beyond this centering on the body proper and structuring them in their generality, the projected schema is the labyrinth (Fig. 3), the spatial schema of the path, whose reversibility is the desired outcome, emerging from a scale of composition coordinating the project as a whole with its context.

Filarete, in his *Treatise on Architecture*, addressing to the prince an invitation to be pleased to understand the fashions and measures of the art of good building, shows him how the measurements, qualities, and proportions of buildings all derive 'from the figure and form' of the human body. Rather than look for the specific differences that would mark an identity peculiar to each object, the build

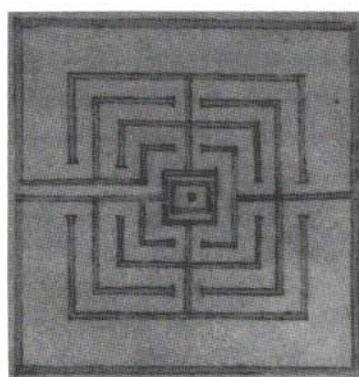


Figure 3. Filarete, *Trattato di architettura*, 1458-1464

ing and the body, the author clings instead to the relation between the articulation of the one and that of the other.

The articulation of the parts of the building, dissected in a manner anamorphic to that of the human body, is thus measured, endowed with qualities and measurements, through the relations which the parts maintain among themselves and with the whole and the part each takes in the other's existence in the project. The substance—the body of the building—is thus conceived as a variable in Hjelmslev's sense (1971), determining a form, that of the building, in the dissection and measurement of its parts (Fig. 4).

I recognize here that the body plays the anamorphic role of substance of the content exhibiting the unity and form of the content of the building. The 'form and figure' of the human body may then be likened to the concept of figure defined by Hjelmslev in order to discuss 'interstratal' units, projections of certain units from one stratum (substance of the content, form of the content, form of the expression, or substance of the expression) onto another: for example, imposition of the plane of the content on the plane of the expression, 'contents of signs' or, reciprocally, 'expression of signs'.

The 'form and figure' of the human body are thus to be understood here as interstratal projections, figures measuring the extent of the relations between substance of the content and form of the content. Other kinds of figures may thereafter be projected from the substance of the expression onto the form, and from the form of the expression onto that of the content: figures constructed like those studied by rhetoric.

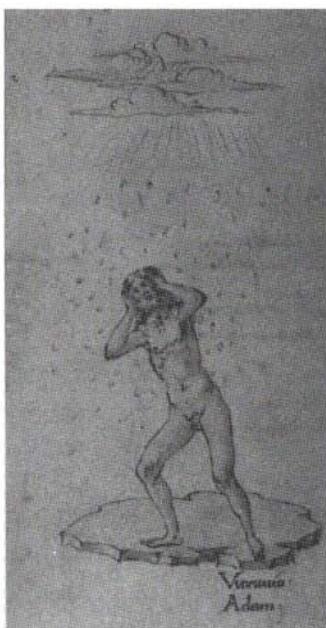


Figure 4. Filarete, *Trattato di architettura*, 1458-1464

Let us note in passing that, if the human body is the primary substance of architecture, that primacy is defined at the level of collective, socio-cultural appreciation; this hierarchy involves a selection from the other, lower levels of substance—the socio-biological level and the sensorimotor, physical level. On these lines I can affirm that, in architecture as in other modes of knowledge, our knowledge of the material reality of the ambient environment stems not only from the practice of it, in an endogenous manner, but also from the culture, constructed in a manner exogenous to each actor both in the relations he maintains with others and, above all, in virtue of the collective appreciation that forms a whole relatively independent of its parts, a social fact. This is said in order to counter the excessively functionalist interpretation put forward by certain writers who overemphasize the interdependence of knowledge and practice.

As to spatial analysis, recognizing that the form of the spatial content is manifested in a substance made up of relations of positions, we shall try to identify some positions by observing how the suppression of one of them, by merger or replacement, changes the form and meaning of the whole as the articulation of its

parts: relations between extensive terms in connectedness and intensive totality in its disconnectedness with others. From the standpoint of analysis, the position is not prior to its possible suppression; in the case of space, the suppression of two forms—that of the relation between the parts and that of the whole in its universality—manifested by a merger provokes polarity as a consequence: privative opposition between marked and unmarked terms, and not the reverse.

### **Substance and Affordance**

Here I would like to dwell briefly on the presence of substance in percept, symbol, or myth. Perception, as we have known since the works on Gestalt theory appeared (Köhler), has as its object some dynamic units whose organization precedes recognition. In Gibson's view, however, the real 'affords' to our senses (Gibson 1972), so that there is equivalence between the objects and our images of them.

From the standpoint of relevance, the notion of affordance refers us to that of constancy: if there is to be articulation of the meaning there must first be cancellation of the meaning; if there is to be a distinctive feature, the meaning must first be reduced to degree zero; the object must offer itself to us in its constancy without invading us with a full meaning (Pellegrino 1978). Such an offer is possible in a space in which the respective positions of the objects are distinctive.

The notion of affordance refers us to the notion of relevance as well as that of constancy; there can be no constancy without relevance. But it is also a notion which, seen in a wider context, links up with other dimensions of human nature: on the one hand taboos and prohibitions, on the side of the negative injunctions which human and social nature impose on the individual; and on the other the injunctions and attractions on the side of positive relations.

I acknowledge, with Gibson (1972), that the supply does not correspond to the demand, at any event not in matters of perception, and that we are not in a system of equivalence or a search for equivalence, as is the case of the balance of justice or of economic exchange. We are rather in the kind of relationship in which the offer and the offered are opposed by the prohibition: that is to say, the more that is prohibited, the less there is to offer; and the less there is perceived too, if we allow this correlation between the offered and the perceivable.

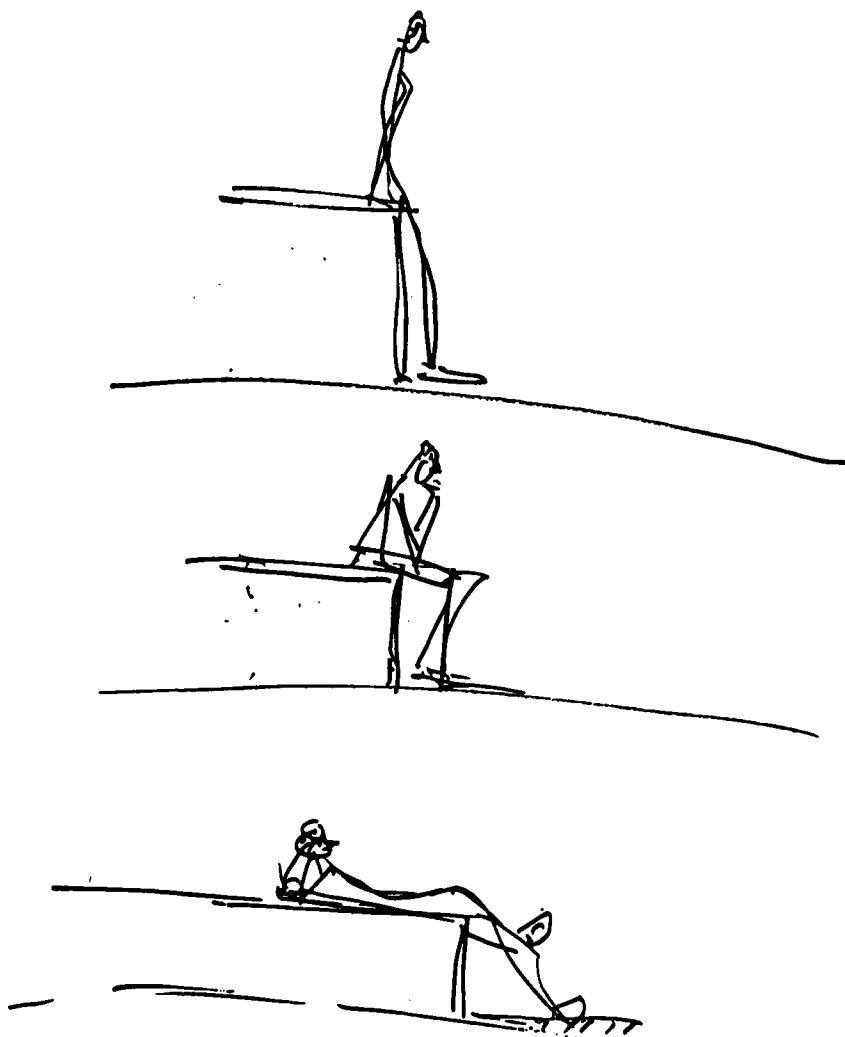


Fig. 5 Various positions for being seated

I have tried to illustrate my point here by a sketch (Fig. 5): one table on which a person can be seated in different ways, simply in response to the suggestion of a height such that he can have a comfortable seat on which he can move easily; another, slightly lower table would allow a position closer to that of rest and meditation; and then something even lower, the floor itself, might prompt the

person to lie on the table; and in certain places he would obviously meet with some very strong prohibitions with regard to this situation of communication.

This is what I have summed up in Figure 6. I would thus acknowledge that the more offers there are in the Gibsonian sense, the more perceiveds are possible, provided that there is no interference with the prohibitions. Now the second part of the diagram: the word 'offer' implies non-completion—that is to say, here is not a gift already received, but something which is offered, relating at any rate the incitement to the act of receiving it.

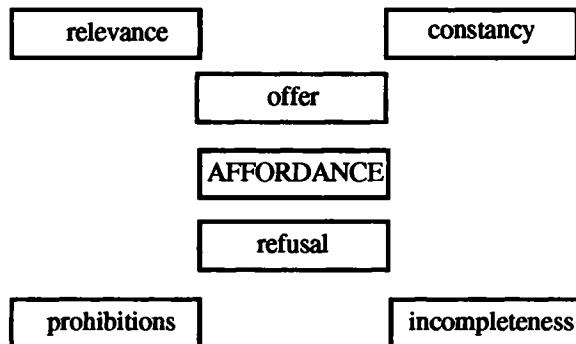


Figure 6. Affordance, offer, and refusal

The drawing from memory in Figure 7 recalls the Pietàs of Michelangelo: the 'Rondanini' Pietà or others which are hewn from a block of marble and in which the marble is still present, the sculpture not completed. In this sculpture there are two levels of offer. There is the relationship of the sculpture to its material, which is an affordance in the Gibsonian sense, a relationship to material of something arising; the sculpture may continue to arise. Then there is a second level of offer: namely, the relationship of the Virgin to her child (see Fig. 9); Jesus in the Pietàs is a dead Christ. An offering in the relationship to death, the gift of itself by the femininity or humanity that accepts the death of its own son. There is a double relationship to the completed and the uncompleted; I think it will be easy to see what I am referring to here if I contrast the degree zero of affordance with the work.

If there is to be articulation of the meaning, there must be cancellation of the meaning (Fig. 8): that is to say, for there to be a distinctive feature, the meaning

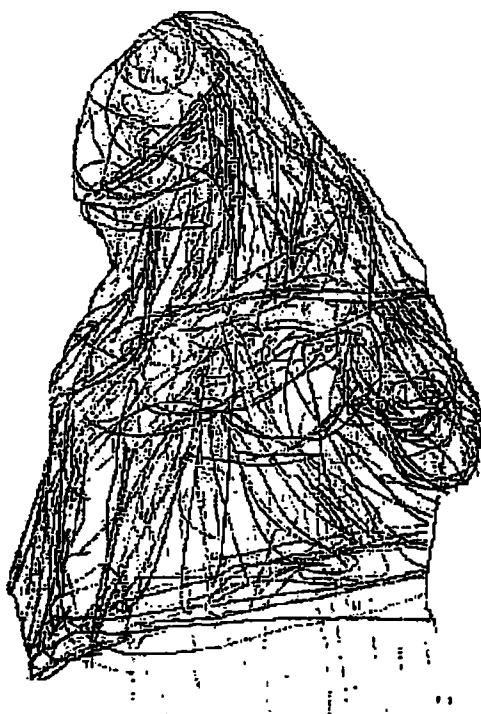


Figure 7. Pietà: Sketch from memory

must first be cancelled; the meaning must be, in an initial act, cancelled in such a way that distinctive features can be brought out, then combined and placed in various situations in accordance with the conventions of a language that enables us to compose them in different meanings.

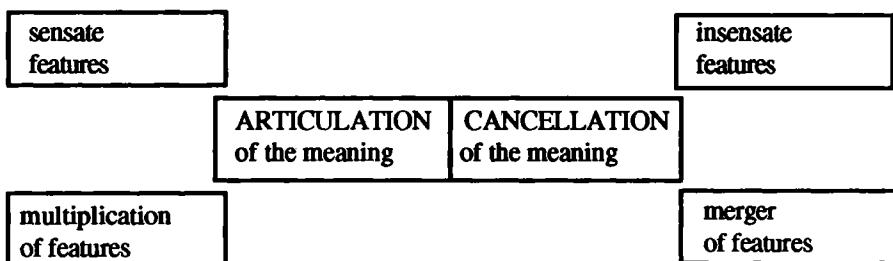


Figure 8. Cancellation of the meaning, articulation of the meaning



Figure 9. Virgin and child: Sketch from memory

Hence affordance, somehow in an inverse movement, arises out of articulation, since affordance—if we acknowledge Gibson's work—carries meaning. Thus it may be said that, in the human condition, they are two opposites in the manner of producing meaning. There must be insensate features whose only meaning is distinctive; distinction is a meaning taken at its degree zero. Furthermore, these features may be composed in two ways: either in intersection by what some logicians call the logical product, in which one part-meaning is deduced from several others; or in logical meeting, in which several part-meanings are brought together.

There are two movements which are opposites. On the one hand we have something rather along the lines of what Barthes calls condensation (1985), and on the other we are rather on the lines of what might be termed expansion. In the symbol, as opposed to the percept, there is a totality. The symbol, however, is a fraction of something; one of the symbol's parts is missing—the part evoked by the part that is present. The symbol is a form of condensation; there is recognition of the whole through recognition of a part; hence there is also an invocation of the unsayable. On the basis of a fragment we make a kind of anamnesis, and then what appears has meaning only by reference to something else.

On the opposite side, the presence of the object and the proximity of objects one to another are necessary if we wish to be able to establish inferences in a context; in perception, the objects must be present. But we may also contrast with the symbol another way of producing the meaning: myth. Myth is path rather than condensation. In myth there is a path that aims at contact; contact is not immediate on it. We try to find a contact; we try to find an unveiling, a knowledge, and we seek to find a balance. Myth is very close to the narrative structure.

These three terms—percept, symbol, and myth—which I have thus briefly reviewed in their manner of articulating meaning, simply serve to complement the notion of affordance: to complement it, precisely because mankind, the various civilizations which have followed one another, have made use of myths and symbols, and not only of direct perception, to learn about nature, come closer to it, unveil it and participate in it (Fig. 10).

Let us take an example from Piaget's *Formation du symbole chez l'enfant* [Symbol formation in children] (Piaget 1978). A child asks an adult: 'That's odd, the sun is moving! Why has it gone—for a dip in the lake? Why is it hiding?' This child is uttering a request for knowledge symbolized by a natural feature, the sun. On consulting the dictionary of symbols I read that the sun has to do with fire; it is a destructive as well as a regenerative element. Fire is passion as well as

spirit and illumination; there is condensation of the idea of knowledge ('why?') in the idea of sun, illumination, light—an idea of light which, moreover, as regards perception, we find explained by Gibson in connection with affordance.

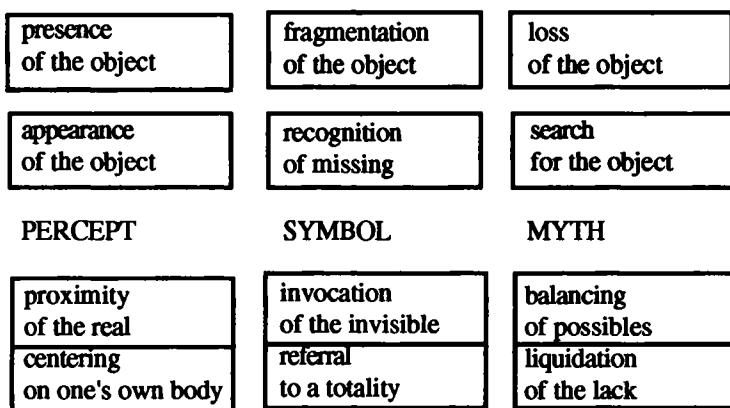


Figure 10. Percept, symbol, and myth

I would like to take another example, this time from Lévi-Strauss's *Mythologiques* (1971), in which we find the myth of the discovery of fire for cooking among the Gé, a people close to the Bororos in what is now Brazil. Two children go up into the mountains in search of food, and one prevents the other from coming down again. An animal comes on the scene—as it happens, a jaguar—which helps him to come down and introduces him to cooked food and a way of cooking it. The child lives with the animal; the jaguar's mate becomes jealous; the child kills her with the jaguar's consent and returns to his village, where he tells the story of his adventure. Second part of the myth: the villagers go to the jaguar, steal the fire and begin feeding themselves by using fire to cook their supplies. The jaguar does the opposite: he turns wild and changes his habits from cooking his food to eating it raw.

In this myth, humanity not only depicts for itself the origin of culture, but also finds a way to detach itself from animality by stealing from it the way of preparing and cooking food. In this particular case, as we can see, there is not only an account of an imaginary foundation, but a contact with animality and, at the same time, an inversion of the historical process. At the beginning the jaguar was cooking his food and at the end he is eating it raw; he thus passes from humanity

to animality, whereas human beings, for their part, pass from animality to humanity. It is a narrative, a process which, in the picture I have briefly roughed out, not only relates to symbolic condensation (even if there are symbols that are used; the jaguar is certainly a symbol, and so is fire), but holds good for what it allows to be inverted in the relationship between human beings and animal nature.

So where do all these reflections about myth, symbol, and affordance lead us? I shall cite a few more cases in order to convey my meaning fully before moving on to make one last point. In the surveys of towns and human settlements which I have directed,<sup>2</sup> all those interviewed contrast the town with the countryside, to the point of finding elements of the countryside in terrain that an architect would not classify as such. For example, someone lives near a tree in the middle of a town, in a particularly noisy area. At the interview the man and woman, who are married and elderly, say they are happy to live in the silence, in the country. Yet when a sound-measuring device is used, a high noise level is found. Here there is symbolic assimilation of an element of reality—noise—to a valued reference—silence; there is inversion in relation to reality.

Now for a second case: someone who has found a superb house in the country and is utterly happy to be able to live in that atmosphere, that environment, tells us that he has had to adjust. He had been used to sleeping with the windows open and now has to sleep with them closed. He has altered his frames of reference. The reason? Because at night, in the early morning, and late in the evening aircraft taking off and landing pass over his house. In contrast to the previous case, we have here accommodation to a reality in Piaget's sense of the term (1981).

In each of these two cases we have different relationships to things that are offered. In the first case noise may be said to be that which affords in the Gibsonian sense; in the second case we may say that what affords is rather the terrain, surrounded by hedges, meadows, and flowers. In both cases there is a relationship diametrically opposed to what is offered. Assimilation, in Piaget's theory, refers us to symbolic play; assimilating means referring all reality to already constituted frames of reference; whereas accommodating means transforming our frames of reference in order to manage, in a process, by transforming ourselves, to adjust to a new reality.

We have here two relationships to the real which are two ways of applying that which others, such as Gibson, have called the offer, and which I shall call the aesthesia of material reality. It is emphasized that this reality is not amorphous, is not made up only of differences, but is also composed of forces (see the works of

the physicists), chemical qualities, and biological qualities; and that, when we know a reality, we are faced with something with which we interact and not something static (Krampen 1992).

If there is anything to grasp in affordance, it is perhaps seeing how nature interacts with culture: in other words, seeing that what is before us is also alive, that it is not merely something constant but also something that moves, that undergoes transformations. There is an interaction between constancies and variances situated on both sides, from the observer to the observed; when we discuss the perception, visual or otherwise, on the part of the perceiver of that which is perceived, in all the dimensions of perception, we are tackling an open task.

To take one more example: on the terrace of a *trattoria* in one of the squares at Urbino, under some trees, there are sunshades (Fig. 11). These sunshades are open at night; there are lights behind them. The sunshades serve both to diffuse the light—not to prevent it from reaching the diners—and to keep the leaves off them; on the sunshades are leaves that fall from the trees.



Figure 11. Affordance, an open task: an Urbino terrace at night

Here there is an affordance constructed by the landlord of the *trattoria*; it is not merely a matter of the fabric being a material of architecture, but of using a potential sunshade when it is night in a sunny country. There is an inversion here that speaks to us symbolically but strongly, that prompts us and causes us to go willingly to that spot. What is suggested has its meaning here and invites us to conviviality.

Perception of the qualities of matter and color requires the presence of the object, but that object has form only if it refers us to something other than itself. That is why art fascinates us; it sharpens our attention to its object, but that object ceaselessly flees, thwarts our desire, metamorphoses it and sweeps it beyond the frames of our culture—as a child in search of his being in the world loses in the past the pages of his youth, to make them the theme of his adult dreams.

### Notes

1. English translation by H.S. Burrows.
2. Surveys conducted on the basis of non-directive interviews lasting about three hours each, in a research project carried out under the aegis of the Swiss National Fund for Scientific Research (FNSRS), Division of Human Sciences, on 'The town offered and the sense of living in it', with the collaboration of F. Jacot, C. Lambert, and A. Lévy (CRAAL-FNSRS, Geneva-Berne, 1990).

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# **Semiotics of Objects Revisited**

Martin Krampen

## **Introduction**

### *Purpose*

The purpose of this paper is to look back at the semiotics of objects as it was conceived of in the past twenty years and take a new look forward into its future development.

### *Look at the Past*

It is twenty years now since I tried at the first Congress of the International Association for Semiotic Studies in Milan to summarize what was then known about the semiotics of objects (Krampen 1979b). The tendency was, at that time, to regard objects as signs (Barthes 1964; Baudrillard 1968) confounding two different kinds of human instruments: one made expressly for the purpose of communication, the other to fulfill human purposes other than communication. The confusion was probably engendered by the enthusiasm of early semioticians for an expansion of the scope of their science by using the ready analogy to linguistics. Thus, as linguistics was articulated in phonemes, morphemes, words, sentences, etc., objects had to follow the same principle of articulation (Rossi-Landi 1968, 1972, 1975). As languages had a syntax, objects had to have one too. The meaning of objects-as-signs was derived from their use (Barthes 1964), and soon there was also a distinction between primary and secondary meaning. The confusion was not alleviated by pressing the object-as-a-sign into the Peircean mould where it could be regarded in relation to its material (Firstness), to its functional fit into a form (Secondness), and to its use (Thirdness) as proposed by Bense (1971; see also Krampen 1986b).

There where, however, some promising beginnings of an autonomous semiotics of objects. Prieto (1973), for one, turned the table on the reduction of objects to

signs by assimilating signs into objects which are made specifically for communication, being thus different in purpose from other human instruments. One further promising approach came from the independent semiotic approach of Jakob von Uexküll, followed and refined by his son, Thure von Uexküll (Krampen 1979a, 1986a). Jakob von Uexküll regarded the meaning of objects pragmatically as 'counter-ability' [*Gegenleistung*] fitting human abilities or needs. In his wonderful description of a stroll through town (Uexküll 1980 [1913]), he anticipated a modern ecological approach to the semiotics of objects:

Everything—indeed everything we get to see is adapted to our human needs. The height of houses, of doors and windows can be reduced to the size of the human figure. The stairs fit our gait and the banisters the height of our arms. Each single object is endowed with sense and form by some function of human life. We find all over an ability [*Leistung*] of man which the object sustains by its counter-ability [*Gegenleistung*]. The chair serves seating, the stair climbing, the vehicle riding, etc. We can talk about something being a chair, a stair, a vehicle without misunderstanding, because it is the counter-ability of the human products which we really mean by the word which denotes the object. It is not the form of the chair, the vehicle, the house which is denoted by the word, but its counter-ability.

In the counter-ability lies the meaning of the object for our existence. This counter-ability is what the constructor of the vehicle has in mind, what the architect thinks of when designing the plan of the house, what the butcher thinks of who slaughters the ox, as also the writer writing the book, the watchmaker fabricating the watch. The gardener trimming the trees and planting the flowers prepares them for counter-ability. Everything surrounding us here in town has only its sense and meaning by its relationship to us humans.

Thure von Uexküll (1973) continued the work of his father by ordering objects in what he considered to be 'pragmatic systems'. What Jakob von Uexküll called 'sense' became in his son's terminology the 'answer' of the object to a 'meaning hypothesis' advanced by its user. This answer contains 'directions for use'. The 'dialogue' between object and user is part of a system of interacting pragmatic programs in which humans and objects function together. The pragmatic system of tea drinking, for example, is made up of several subprograms. The cycle is

triggered off by a need for liquid transmitted by the dry tissue of the body. The tea drinker responds to the optical signs of the cup's handle by gripping it. The tactile sign resulting from this contact evokes the lifting of the cup to the mouth. At the mouth a tactile sign is registered by the lips, to which the mouth responds by opening. At this point the role of the cup in the system fades out. The last programs are reserved for the tongue, throat and stomach in the process of swallowing. In the pragmatic system of tea drinking the cup means 'something-to-drink-with'. In the pragmatic system of commerce it means 'something-to-sell', in the pragmatic system of aesthetics it becomes an 'object-of-art', etc. As can be seen, the meaning of an object changes from one system to another. Since meaning exists only within a pragmatic system, objects serving no purpose cannot have meaning.

### *The Ecological Approach to Visual Perception as the Basis of a New Look at Semiotics*

*Fundamental Concepts.* The ideas of Jakob and Thure von Uexküll lead directly to the consideration of objects as 'furnishings' contained in the ecological niche of the human species.

Since an ecological approach to the meaning of objects is being proposed, some fundamental concepts of this perspective must be clarified.

The first and most important concept to be defined is *ecology*. I shall use this term in the sense the biologist Haeckel gave it when he first introduced it in his 1866 work on 'General Morphology of Organisms': 'Ecology is the general science which studies the relationship between the organism and its external environment'. In this instance, the organism in question is the human one. What we want to study then is the relationship between humans and their (external) object environment.

The next important concept to be defined is *scale*. There are important differences between the scales of the world used by physicists and that of our human everyday environment. The world of the physicist ranges from galaxies to atoms. Our lived-in visible environment is composed of all we must see in order to act successfully. In fact, we do see what we must see. This is not a tautology, but the result of the evolution over millennia of our visual system in concert with our other perceptual systems. So we see landscapes, mountains, trees, plants,

animals, and people. We also see the buildings and artifacts constructed by humans. Our environment ranges from textures measurable in tenths of inches over objects measurable in feet to landscapes measurable in miles. We cannot see galaxies and atoms (Gibson 1979).

A further concept important to any understanding of the ecological approach to meaning is the *reciprocity* of all organisms and their environments. Organism and environment form an inseparable whole. No organism exists without its environment, and there would be no environment without the organism. The best simile for the organism-environment reciprocity is the well-known Chinese figure of Yin and Yang. Whenever we see in our environment what we must see in order to act successfully, we see parts of ourselves ‘in the picture’: our nose, our hands, our feet are always present when we look at an object. That has definite consequences for the scale of our environmental experience: we cannot escape our visual environment (Gibson 1979).

To conclude our survey of fundamental ecological concepts we follow Gibson (1979) in his proposal that our terrestrial habitat is best described by its medium, its substances, and by the surfaces which separate the substances from the medium.

The gaseous atmosphere is the *medium* of many animals and of humans. It permits locomotion, seeing, hearing, and smelling. Fish have another medium—the water.

*Substances* are matter in a solid or semi-solid state. They do not permit movement through them. They differ in hardness, viscosity, density, elasticity, plasticity, etc.

All substances have *surfaces* which are laid out in the environment. Surfaces and their layouts tend to resist deformation. Depending on the substance they delimit, surfaces have different textures and pigments. Surfaces have a shape, they may be more or less lit and absorb or reflect the illumination which falls on them. Objects, too, are constituted by surfaces. Therefore, a semiotic of objects must be part of the semiotics of surfaces.

### *The Semiotics of Surfaces and Their Layouts*

*The syntaxics of surfaces and their layouts.* As has been proposed above, our habitat is best described by its medium, its substances, and by the surfaces delimiting the substances. Hence information on objects must be directly specified for the organism by surfaces and their layouts. Gibson (1979) provides a systematic nomenclature of different kinds of layouts. It results from the syntagmatic combi-

nation of the syntactic elements surface and medium. All such combinations may occur in both the natural and the manmade environments.

One such combination is the *ground*, referring to the terrestrial or a paved surface. The ground implies not only bordering with the medium above it, but also the effect of gravity, a horizon, and the sky. If there was only the ground, the layout would consist of an *open environment*. But this condition is only realized in a flat desert. Generally, the environment is full of *convexities* and *concavities* and all kinds of natural or manmade ‘clutter’. An *enclosure* is a layout of surfaces surrounding the medium. The totally enclosed medium is rarely realized, as for example in the case of an embryo. A *detached object* consists in a layout of surfaces which is entirely surrounded by the medium. Examples of detached objects are all moving animals including humans, but also vehicles, balloons or airplanes. Most objects seem to be *attached*—i.e., only partially surrounded by the medium. Most of them are attached to the ground. A *partial enclosure* such as a concavity, a hole, or a cave consists of a surface layout that partly encloses the medium. A *hollow object* is an (attached) object if viewed from the outside, but a (partial) enclosure if considered from the inside. Examples are the snail shell, a hut or a pitcher. A *sheet* consists of two surfaces which enclose a substance but are very close together in relation to their dimensions. A *fissure* is a layout of two parallel surfaces which are very close together in relation to their size and enclose the medium within a thin opening, as for instance a crack in a stone. A *place* is defined by Gibson as a location in the environment, a more or less extended surface or layout. Places have a name, but no sharp boundaries. They can be located by inclusion within larger places (e.g., the fireplace in the living room of a house in Philadelphia). The habitat of animals and humans consists of places.

There are more terms given by Gibson for surface layouts, but for our purposes the above catalogue might suffice. These types of surface layouts are the signifiers of our environment; what they can be used for is the signified.

*The semantics of surfaces and their layouts.* The environment of the organism is meaningful with respect to the organism and its scale. For example, a rock 45 cm high ‘affords’ seating to the grownup, but a table to the accompanying child. In order to define the semantics of surfaces and their layout we must define what they ‘afford’—what can be done with them.

The concept of ‘affordance’—the term was coined by Gibson (1979)—is the ecological equivalent of meaning. The idea that the meaning of a thing has a physiognomic quality (like the emotions which appear in a person’s face) stems

from Gestalt psychology. Koffka writes in his *Principles of Gestalt Psychology*: ‘To primitive man each thing says what it is and what he ought to do with it: a fruit says “Eat me”; water says “Drink me”; thunder says “Fear me”; and woman says “Love me”’ (Koffka 1935: 7). But even for modern man the handle ‘wants to be grasped’, and objects ‘tell us what to do with them’ (Koffka 1935: 353). Koffka called this the ‘demand character’ of things. By this term he translated a German expression of Kurt Lewin, who used the term ‘Aufforderungscharakter’, which was also occasionally translated into English as ‘invitation character’ or ‘valence’. There is, however, an important difference between the demand character of the Gestaltist’s object and the affordance as conceptualized by Gibson. For the Gestaltist, the demand character belongs to the phenomenal and behavioral, not to the physical and geographical object. Koffka (1935: 354–55) argues that an object, say a mail box, has its demand character only as long as the beholder needs to mail a letter. On the contrary, Gibson maintains that an affordance is an invariant that is always there to be perceived. ‘The object offers what it does because it is what it is’ (Gibson 1979: 139).

The similarity of the affordance concept to Jakob von Uexküll’s ‘counter-ability’ is striking. Thure von Uexküll would argue about his ‘answer’ to a ‘meaning hypothesis’ given by the object more in the line of Koffka.

Natural and manmade surface layouts present some basic positive or negative affordances. Natural terrain layouts either facilitate or prevent locomotion for animals and humans. Paths (i.e., channels not cluttered by objects) afford the locomotion of pedestrians from one place to another. Obstacles, barriers, water margins, and brinks are surface layouts exhibiting negative affordances with respect to locomotion. Slopes may or may not permit locomotion depending on their angle. But for millennia humans have been changing the natural terrain by constructing roads, stairways, and bridges, all artificial surface layouts, to facilitate locomotion. They have also constructed walls, fences, and other obstacles to prevent access to their enclosures.

Since the atmospheric medium changes from warm to cold and from rain to snow, humans must have *shelters*. Originally they used caves, partial enclosures fitting their size, but then they started constructing artificial shelters called huts. Huts are hollow objects attached to the ground. They feature a *roof* affording protection from rain, snow, and sunlight. The *walls* protect from the wind. The *doorway* permits entry and exit.

It is in this context that the semantics of objects must be accommodated. *Objects* are of persisting substance with closed or nearly closed surfaces. They can be attached or detached. An attached object such as a tree branch permits climbing as does a ladder. A detached object may be carried, and if it is of an appropriate weight it affords throwing. Hollow objects can be used as containers. *Tools* are objects of different affordances which can be considered extensions of human limbs, especially of the hand. Similarly, *clothing* is a part of the human body while being worn.

There are various classes of surface layouts of manmade detached objects which contain basic tools:

- (1) elongated objects affording pounding, raking, lifting and piercing: clubs, hammers, rakes, levers, spears, needles, awls, etc.;
- (2) sharp-edged objects affording cutting: knives, axes, etc.;
- (3) elongated elastic objects affording binding and tying: fibres, threads, ropes, etc.;
- (4) light objects affording throwing: missiles, balls, slings, bows, etc.; and
- (5) objects affording the making of traces: chisels, brushes, etc.

In using the latter to make traces, humans have developed *display surfaces* such as pictures which afford visual information. This information is 'second-hand', since it permits the beholder to see as a surrogate what the maker of the picture saw in the original.

A whole set of affordances typical for a given species may be called its ecological niche. Whereas the term 'habitat' refers to the set of places where a species lives, the term 'niche' means how it lives.

The basic affordances mentioned thus far are valid not only for *Homo sapiens*, but also for hominids and in part for higher animals. *Homo sapiens* has transformed his relationship to the environment in such a way that 'ritualized' affordances have been grafted onto the basic ones accommodating different levels of ritualized behavior. Thus forms of social life changed from hordes to families, family clans, and nations. Division of labor introduced professions and social classes of different prestige; more recently, technologies have advanced drastically, and primitive mythologies have been transformed into highly developed religions. These changes have had their repercussions on the meaning of objects. Today objects afford more than a simple extension of the human body. Division of labor

has multiplied types of tools with different affordances by specialization. A look into an average tool box will show us that there are more tools than affordances because some tools offer multiple affordances.

Similar analyses may be carried out on other 'object ecologies'. For instance, we might analyze a great industrial fair as the 'tool box of a nation', and a World Fair as a 'tool box of mankind'.

Thus far we have dealt with differences in affordances corresponding to differences in surface layouts. In other words, we have talked about what different types of objects afford in terms of different functions. We call this type of 'functional' meanings 'denotative meanings'. Now we shall consider cases in which the functions of an object remain constant but where there are more or less pronounced changes in the surface layouts affording them. In other words, we shall talk now about how the same function may be implemented by different surface layouts. This topic is also known under the heading of 'style' (in a broad sense—not as art historians use the term). We call this type of 'stylistic' meaning 'connotative meanings', because they represent variations in affective affordances.

'Connotative meanings' result from the fact that every design problem can be solved in (many) different ways. This variety may be socially functional in that it avoids uniformity of expression. On the other hand, the variety of possible solutions to the same problem may be used in a dysfunctional way, as for instance where unnecessary distinctions between social classes are fostered by different kinds of object designs.

The same or similar surface variations may often constitute the same or similar affective affordances for design products. In one experiment on door handles (Krampen 1976), we found that light alloy door handles of simple design were attributed the connotative meaning of simple, sober, clean, linear, slick, unobtrusive, modern, pleasant, economical, cheap, modest, and cold. In contrast, door handles of nonferrous metal with decorations afforded such connotations as old-fashioned, striking, ornamented, decorative, luxurious, playful, flourished, craftsmanlike, warm, and soft.

The affective connotations afforded by automobile bodies seem to depend on size (big vs small) and predominance of round or angular contours (Krampen 1976).

One affordance which the differentiation of surface layouts of objects seems to have, at least in Western society, is prestige vs non-prestige. Prestige is conveyed primarily by increase in size, angularity, and choice of more precious materials. But prestigious objects need not necessarily afford a sense of beauty. Often very

small, more rounded facets of surface layouts afford the sense of beauty and preciousness, although not of power. Objects with a mythological sense, such as those used in religious ceremonies (e.g., crosier, mitre, tabernacle, etc.), strike by gold, precious stones, and materials.

Bateson (1972) drew attention to the fact that there is a direct connection between the phenomena of context and meaning. I should like to draw attention to the fact that objects often occur in functional contexts. Cups occur together with saucers and plates. In fact, we might estimate the semantic distance between objects on a scale and obtain an ordering of object ecologies according to their functional co-occurrence.

Meaning is also connected to (functional) similarity. Objects having similar affordances may be grouped together under the same meaning. Thus containing is afforded by most hollow objects forming a partial enclosure (e.g., pitchers, cups, decanters, etc.). Warehouse catalogues often provide these groupings for us, and thus partake in the context of objects by providing their pictures and descriptions.

Objects may be distinguished by their scale from other surface layouts, for example from buildings. The scale of objects is small, while that of buildings is large in comparison; and the latter are necessarily attached to the ground while the former need not to be. The latter contain the former; the latter afford the stage, the former the props of human action. These differences allow for a distinction between semiotics of objects and semiotics of architecture.

The semiotics of designed 'products' has to do with objects which enter into human-object confrontations. The scale of the surface layouts ranges generally from somewhat larger than human size to the size of hand tools, although sometimes objects affording movement for groups of people (like buses or railroad cars) may reach fairly large proportions.

All these surface layouts are detached (or detachable) from the ground; in principle they are 'mobile' and constitute what Hall (1966) called the 'semifixed feature' environment.

Objects in our human ecological niche are either natural, technical, design-objects, or art objects. This classification of object meaning has to do with the degree to which objects are not artificial or more or less mass produced for direct or only limited contact with users, as a comparison between a turbine (technical), a door handle (design), and a sculpture will show.

*The pragmatics of surfaces and their layouts: Egoreception.* Information about the environment is always accompanied by information about the self. Egorecep-

tion and exteroception are inseparable. When I write I see not only the letters on paper and the books on the table, but my right hand with the pencil in the action of forming the letters, my left arm leaning on the table, the edges of my eye-sockets and part of my nose. We can never escape from seeing ourselves in the scenes we regard. This proves the Yin and Yang nature of the organism-environment reciprocity. Perception has a subjective and an objective pole, which are like two sides of the same coin.

The perception of objects and their affordances takes place in relation to the presence of ourselves in the scene. The affordances of objects are in proportion to the bodies of the perceiver. As was argued before: the same rock, 45 cm high, affords seating to an adult wayfarer, a table to the accompanying child. Staircases must have an optimal height to be perceived as affording climbing, as must the banisters to be seen as affording leaning. The goal of object design should thus be the organism-object fit.

The pragmatics of surface layouts consisting in egoreception gives rise to the possibility of formulating an ecological aesthetics of objects. Since we always perceive ourselves in relation to the objects in the human niche, we are bound to collate the scale of our body with that of the objects. Objects become thus a source of aesthetic affordance engendering such affective feelings as awe when they are larger, and tenderness when they are smaller in comparison with our own body.

The aesthetic affordance of design objects probably also has to do with such collative variables (Berlyne 1960) as complexity, incongruity, surprisingness, novelty, etc. which result from collating the design object with our own incongruous scale or the succession of our experiences (surprisingness, novelty), always in ‘scenes’ of human-object reciprocity in which we see the object together with parts of ourselves.

## **The Empirical Approach**

### *Background to an Empirical Study*

A new look forward to further development will have to take into account the ecological hypothesis that humans and objects are in constant interaction on the stage of their common niche—humans the actors, objects the props. A new element will be the methodological necessity that this hypothesis be tested in all

its ramifications. Only by empirical evidence can we gain what Peirce called the certainty of experience, that what we talk about is grounded in reality. As an example of the kind of study to be carried out I would like to present the following investigation on objects of everyday use.

The study is based on a model featuring three kinds of ingredients:

—segments of the human ecological niche (from landscapes over settlements to housing, rooms, furniture and objects of everyday use);

—kinds of relationships humans entertain with these segments (e.g., perception, preference, knowledge, etc.); and

—specific human groups with their specific relationships to these segments (e.g., children, elderly people, housewives, handicapped persons, etc.).

The research questions to be asked would then be, for example: 'What kind of perceptual relationship do children have to different kinds of landscape?' or 'What kind of settlement (e.g., rural, city) do elderly people prefer?' or 'What do housewives know about objects of everyday use?' Before we can ask these questions, however, we must know how the segments of the human niche are composed. Before we can ask how children perceive different landscapes, what kinds of settlements the elderly prefer, or what housewives know about everyday objects, we must know what different types of landscape there are to be perceived, which types of settlements the elderly might choose from, of which different types of objects of everyday use housewives can express their knowledge, etc. In other words, we must first clarify the typical structure of the segments of our ecological niche.

In order to learn about these structures, we should not speculate; rather, we should ask people how they structure landscapes, settlements, furniture and objects of everyday use. We might then find out that landscapes are structured according to geological and botanical criteria (flat, hilly, mountainous, with or without running or still water, with or without plants, bushes, and trees). Settlements may turn out to be structured according to architectural criteria (high vs low, old vs modern buildings, presence or absence of greenery and traffic).

In the study to be presented here, we asked how the universe of objects of everyday use might be structured.

### *The Visual World*

Our previous attempts to get at the structure of environmental segments by asking people were hampered by methodological problems. The items in a segment of

the environmental niche are difficult if not impossible to describe verbally in all their detail. In fact they belong to the ‘visual world’. The philosopher and educationist Johann Amos Comenius (1593-1670) understood this problem when he published in 1658 in Nuremberg a schoolbook titled ‘Orbis sensualium pictus, Die sichtbare Welt (The visual World)’ (reprint 1990). In this book, the various environmental segments, mostly in reference to such human activities as trades and crafts, were visually portrayed, and the pictures were coupled with Latin and German reference words. The book was translated into many languages and was still in use, because of the motivating effect intended by Comenius, at the end of the nineteenth century. It constituted a pictorial inventory of places and objects enclosing the span from the distant celestial regions to the proximal situations of everyday life. Everyday situations are mostly documented by the environment of different crafts, with their workshops, instruments, and tools.

The motivating function of pictures was also held to be useful for our studies on environmental structures. We excluded photography as a technique for this purpose, because it can only portray individual places and objects and not ‘types’, and moreover because it carries superfluous details not useful for structural investigations. Better suited for this purpose seemed pictographs stemming from the tradition of Otto Neurath (1936, 1937) which reduce the portrait of an object to its essential features. Using this reduction, a non-interchangeable style should result which would correspond to a modern version of the ‘Orbis pictus’. This style could be further homogenized if the pictographic drawings were executed on a computer, the depicted objects thus being capable of multiplication and combination into scenes. If the pictures are realized on a playing card format they can easily be sorted according to any criteria we might choose.

### *The Connotative Meaning of Objects*

For investigating the structure of the universe of everyday objects, we based our definition on the affordance concept of Gibson (1979) and the idea of semantic distances of functions first advanced by the late Abraham Moles (1972). We further adopted the distinction between denotative and stylistic (connotative) affordances. The latter are identified by looking at the different ways one and the same denotative function—e.g., a flower vase—can be realized (e.g., a painted Chinese vase made of porcelain and a crystal vase decorated by engraving figures into it). It

would be expected that functional and stylistic differences would also condition the structure of the universe of objects.

The importance of the stylistic variable in collections of objects becomes clear in a classic investigation carried out by Laumann and House (1970) in the Detroit area. Interviewers registered in the living rooms of the interviewees the objects they saw by means of a checklist containing 53 items. The data were processed by a 'Smallest Space Analysis' clustering co-occurring objects in a coordinate system. The x-axis of the coordinate system corresponded to social status (measured by income) from low (left) to high (right). The y-axis went from traditional (above) to modern style (below). In the quadrant low status/traditional style, many objects cluttered the rooms: artificial flowers, rugs with flower decorations, religious objects, photographs, etc. In the opposite quadrant, high status/traditional style, traditional furniture, plants, flower pots, pianos, etc. were found and the rooms were very orderly. In the quadrant low social status/modern style, the living rooms were rather empty and in disorder (TV sets, a mixture of old and new furniture, and domestic animals were registered). In the opposite quadrant, high social status/modern style, modern furniture, abstract paintings, and curtains with geometric patterns were found. The authors of this study conclude that individuals specifically in their living rooms—according to Goffman (1959), the 'stage' of the house—express their social identity. Therefore, the decorative objects of the living room with their stylistic meanings become indicators of the social status of their owners.

### *The Study*

**Method.** In the study to be reported here, 54 'playing cards' of 5.5 x 9.5 cm were used as stimuli. They contained drawings of objects of everyday use. The drawings featured in almost equal quantities objects of such different functions as cooking, eating, communication, etc. Each object occurred in two stylistic variants: one modern and one traditional. The set of 54 cards is presented in Figure 1.

Forty subjects, 17 female and 23 male, sorted the object pictures, numbered on the back, according to 'similarity' and gave the sorting criteria for each group of similar pictures after they had finished their ordering. The criteria of 'similarity' were left to their discretion.

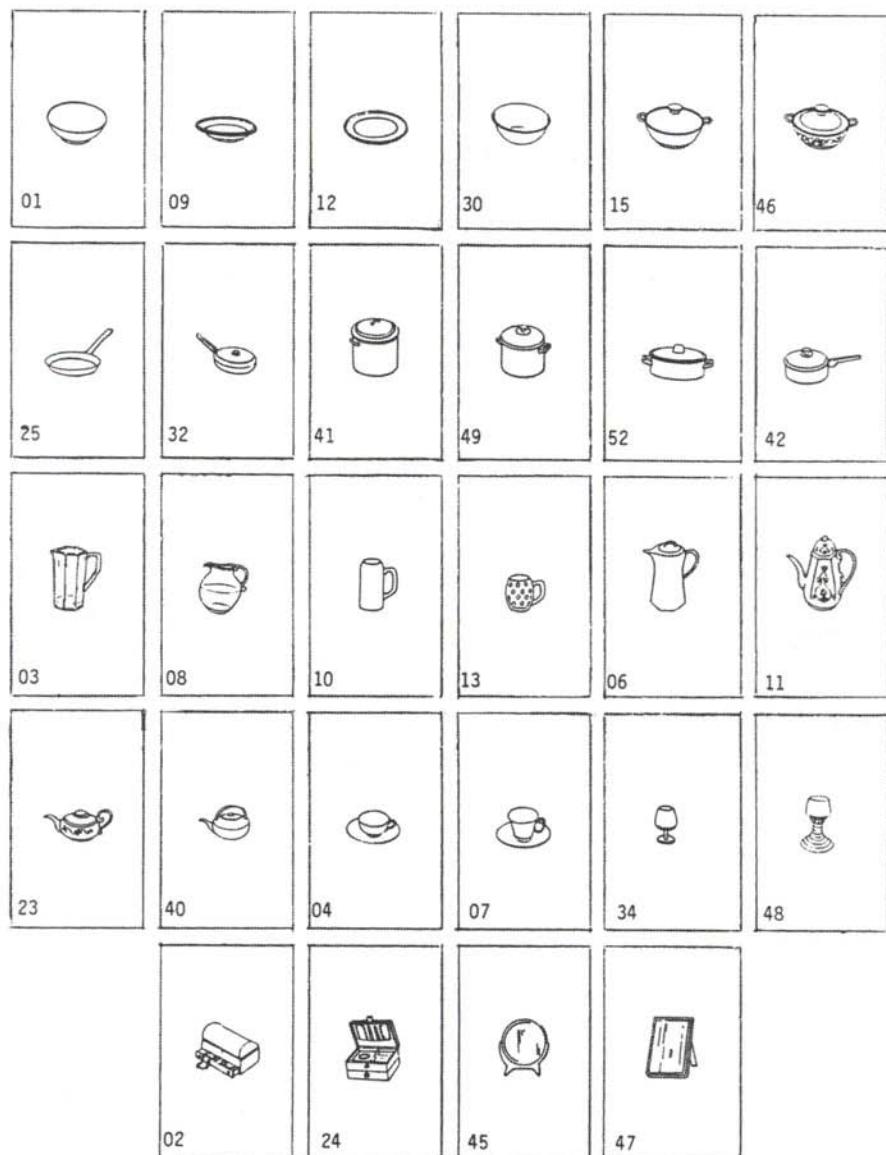
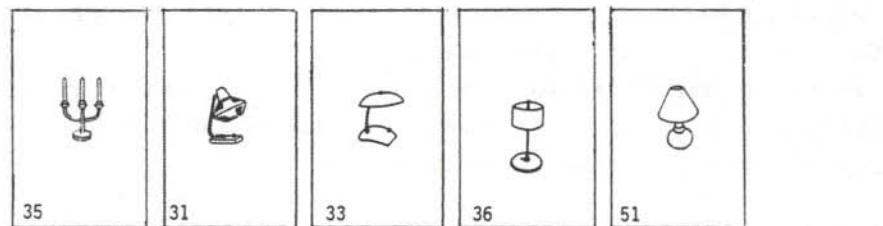
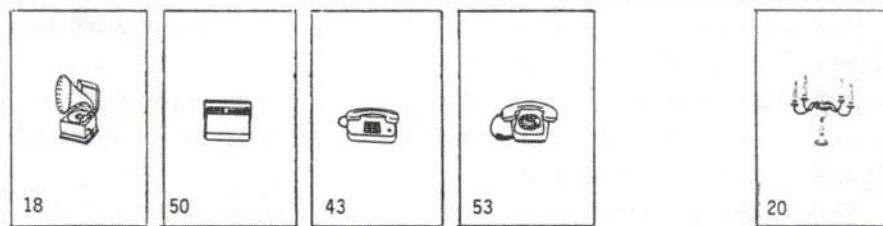
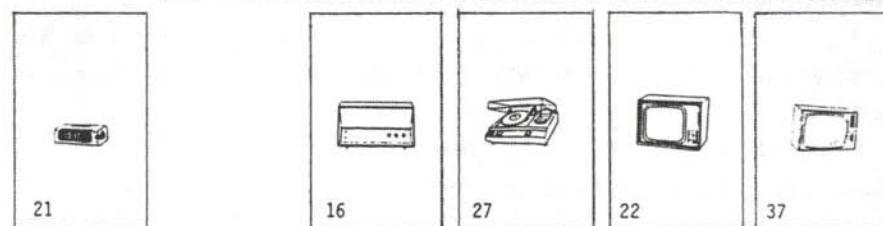
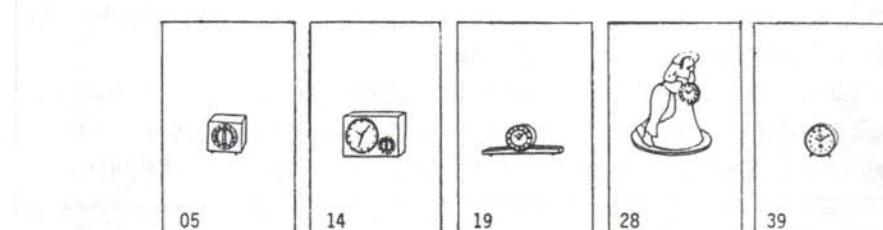
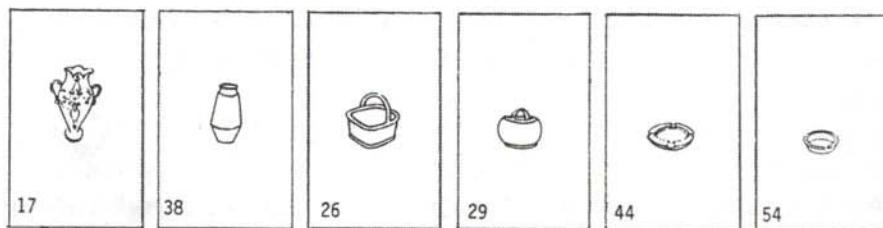


Figure 1 (this and facing page). The set of 54 picture cards used in the study on objects of everyday use. The pictures are numbered at random. They are presented here in the groups corresponding to the six branches of the dendrogram resulting from the hierarchical cluster analysis.



The data, consisting of frequencies of aggregated object numbers, were processed by a hierarchical cluster analysis (HCA) after Johnson (1964) and multidimensional scaling (MDS).

*Results of the Cluster Analysis (HCA).* The results of the HCA are presented as a 'tree' in the form of a dendrogram (Fig. 2). Six branches (clusters) result if a horizontal dividing line is drawn above the association measure 10. This means that 11 of the 40 subjects deviated from ordering the pictures in the six branches. The pictures contained in the six branches can also be seen from Figure 1.

The first branch of the 'tree' contains 24 pictures of objects from the kitchen and to eat and drink with. The sorting criteria most often mentioned in connection with these pictures are 'kitchen', 'eating' and/or 'drinking'. In the first half of the 24 pictures the comments 'kitchen' and 'eating' prevail, in the second half 'drinking' and/or 'eating'.

The second branch contains two pictures of jewel-cases and two mirrors. The comments most frequently attached to these pictures are 'jewelry', or 'decoration' and 'beauty'.

In the third branch we find two pictures of baskets, two of ashtrays, and two of vases (one of them elaborately decorated). The most frequent comment was 'objects of use'.

Branch four contains six pictures of clocks. The sorting criterion attached most frequently to them is 'time (measuring)'.

In the fifth branch two TV sets, two radio receivers, two record players and two telephones are combined. The most frequent comments are 'electro(nic)', 'communication', and 'listening and looking'.

The sixth and last branch has two candlesticks, two lamps for bedside tables, one floor lamp, and one table lamp. The most frequent sorting criteria for the pictures in this cluster were 'lighting' and 'light'.

From these results it seems that the 54 objects of daily use depicted in this card set were sorted by their denotative affordances, and—perhaps with the exception of the jewel-cases and mirrors—not according to stylistic criteria.

*The Results of Multidimensional Scaling (MDS).* The multidimensional scaling of the object pictures suggested a three-dimensional solution. Such a solution can be visualized by the opposition of the three coordinate systems for dimensions 1 vs 2, 1 vs 3, and 2 vs 3. The distribution of the pictures through these coordinate

JOHNSON'S HIERARCHISCHE CLUSTERANALYSE  
MAXIMUM-LÖSUNG FÜR:  
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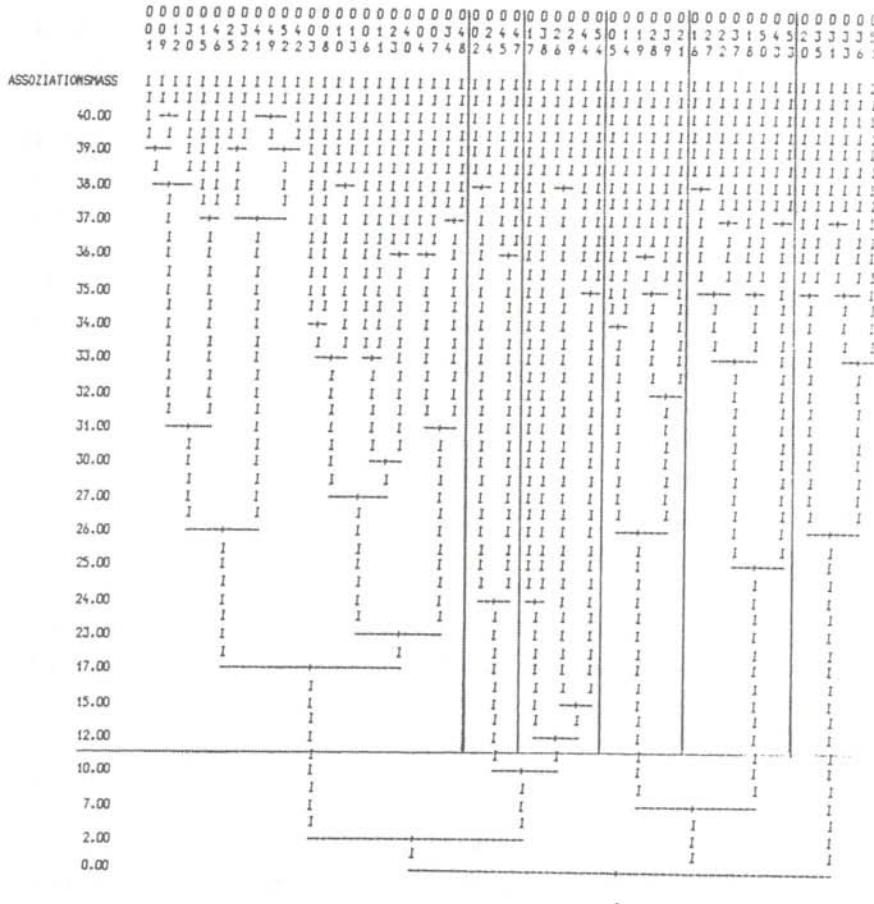


Figure 2. The dendrogram with six branches resulting from the hierarchical cluster analysis (Johnson 1964).

systems can be better understood if we envisage them as a two-storey cube consisting of four smaller cubes at each of the first and the second level. The pictures are then distributed through the eight little 'rooms' of the two-storey 'house'. To simplify the representation of the results even more, we can envisage the pictures as projected on the floor plan of the two storeys, which permits a look at the results in terms of two fourfold tables.

In the left front room of the 'ground floor' we find all the communication objects of branch 5 of the HCA tree. In the right front room of the ground floor a plain coffee pot without decoration is located. In the left back room of the ground floor all the clocks of HCA branch 4 are assembled, while in the right back room all kitchen and eating utensils of HCA branch 1 are gathered.

On the second storey we find in the left front room the jewel-cases and mirrors of HCA branch 2, in the right front room the 'objects of use' (baskets, ashtrays, a vase, and an elaborately decorated coffee pot). The candlesticks and lamps of HCA branch 6 are found in the left back room, and drinking glasses, decanters, and cups in the right back room of the second storey.

On the ground floor all the objects seem to be of the more functional and technical kind. The objects on the upper floor seem to be geared more to luxury, comfort, or coziness. The ground floor assembles the more denotative, the upper floor the more connotative side of the objects of use.

The semiotic structure of the objects of everyday use consists, therefore, of the three dimensions functional vs luxury, technical vs non-technical, and decorated vs plain. Objects of daily use may thus be functional-technical-decorated or plain; luxury-technical-decorated or plain, functional-non-technical-decorated or plain, and luxury-non-technical-decorated or plain.

## **Conclusion**

We have seen that the semiotics of objects has come a long way from its beginnings, hampered by linguistic analogies, via the ecological approaches of Jakob von Uexküll and Gibson to a stage where structures of the universe of objects may be identified and empirically examined. Future work will consist in detecting further structures in the universe of objects and asking people about their relations to the various states of its variables.

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# ***Et in Arcadia Ego: A Spatial and Visual Analysis of the Urban Middle Space***

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## **Two Books and a Project**

In his seminal book *The Machine in the Garden: Technology and the Pastoral Ideal in America*, Leo Marx (1967) introduces the term ‘middle landscape’ as a specific spatial category in American culture. It refers to a *locus* that is able to harmonize the tension between pristine and wild nature and the urbanized world, represented by the human intruder equipped with technology and directed by an unlimited desire to exploit nature’s powers and products. Through the course of the nineteenth century this space acquires the meaning of a garden, neither really urban nor really wild, but open to human endeavors and developments, freed from the obstacles imposed on humans both by the wilderness (dangers, uncontrolled natural forces, etc.) and by the urban world (a morally debased life and a dehumanizing automatization).

Marx is careful not to identify this image of an ideal Arcadian garden with the classic pastoral idyl of a *static* harmonious life in a sylvan setting related to a diffuse nostalgia in people dissatisfied with their actual life, called a sentimental pastoralism (1967: 5). He claims that from the Renaissance this image of the New World added to the image of the garden a *dynamic* quality, that of a place for the utopian unfolding of the uncorrupted human control over nature (e.g., 1967: 10f, 158, 195, 230ff). Here the inventive and industrious human being, in the service of the material and moral improvement of human life, could change nature and himself. This attitude is called complex pastoralism.

So, the middle landscape carries a vision not of neutralizing the tensions of social life, but of dynamic interaction of natural and cultural forces constantly enlarging the realm of human independence and power. But, according to Marx, it also includes a contradiction. On the one hand the respect for and confidence in the unchangeable powers of nature, on the other the permanent quest for expansion and growth on purely human terms. The garden as a middle landscape comprises this insoluble contradiction, but also points to the utopian ideal of a naturally based

human freedom that allows for a conflictual appraisal of both the garden and the machine without exposing the conflict (e.g., 1967: 42ff, 226).

This double structure characterizes the garden as a specific component in American culture, especially of the nineteenth century:

In this sentimental guise the pastoral ideal remained of service long after the machine's appearance in the landscape. It enabled the nation to continue defining its purpose as the pursuit of rural happiness while devoting itself to productivity, wealth, and power. (1967: 226)

It seems that Marx is confirming Erwin Panofsky's analysis of Arcadian landscapes from 1936: *Et in arcadia ego*, meaning that Death—i.e., change, time, destruction, the mortal human being—also belongs to and qualifies the idyllic scene without destroying it (Panofsky 1970; see also Damiani and Mujica 1990).

Another book dealing with basic categories of American culture, Peter Schmitt's *Back to Nature: The Arcadian Myth in Urban America* (1990), takes another stance. Schmitt does not trace the transformation of Arcadian notions from antiquity and especially the Renaissance to their specific American manifestations in the nineteenth century. He observes the myth from the viewpoint of the city, the emerging dynamic center of the same period, which in the American context is called the 'rise of the city' (Schlesinger 1975).

First he distinguishes between agrarianism and arcadianism. According to agrarian standards nature is a God-given resource, both supporting and necessitating human productive and economic intervention. Arcadian conceptions, however, promote the idea of nature as a refuge from the harshness of urban life—peaceful, harmonious, and eternal. Here, an aesthetics of nature, embedded in an abstract universal moralism of beauty and goodness, is opposed to the economic and material reality of natural resources, linked to a specific and locally defined set of values.

While Marx found the sentimental pastoral vision less important than the more contradictory one produced in American culture, Schmitt emphasizes the increasing influence of naïve and escapist Arcadian notions in the dominant part of the same culture—that is, in the rapidly growing urban culture—with an impact far beyond the borderlines of the urban settlement itself. He writes:

The Arcadian dream of peaceful forests and undefiled rivers could hardly compete with the industrial epic that occupied the nation. Wild nature seemed increasingly remote to many city dwellers at the turn of the century, but they could surround themselves with its symbols. (1990: 15)

Not despite its escapist lack of reality, but because of it, the Arcadian dream proved a powerful symbolic force. Nature as a specific locality outside the city became less important than the constructions of nature as part of the urban surroundings in a more suitable distance from the city, no matter how they manifested themselves: paintings, parks, literature, teaching curricula, museums, playgrounds etc. Schmitt's examples of how 'Arcadia existed as much in an act of will as in objective fact' (1990: 45) are abundant.

The final lines of this book contain what may be seen as a hidden reference to Marx:

At whatever level it appeared, from nature-study classroom to the White House [of Teddy Roosevelt—SEL], the Arcadian myth embodied an urban response to nature that seemed most appropriate for an urban age. No matter how indifferently it actually transformed city life, most Americans came to link it with status and sophistication. Many adopted the role with no understanding of its intricate philosophy. Yet in so far as they believed that country life and city culture offered more in conjunction than as opposites, they seemed to welcome the contact with 'Nature'. (1990: 189)

No doubt, the 'intricate philosophy' can be identified with the complex pastoralism of Marx which, according to Schmitt, functions not because of its profound but unnoticed complexity, but because of its simple, escapist face value. Ultimately, it rejects the difference between nature and its surrogates. In this ideological framework the immediate availability of the symbols of 'Nature' is more important than their relation to a complex natural and social reality. Their 'reality' is not constituted by their reference to nature, but by their closeness to the place and agents of the symbolic production and interpretation itself—that is, to the city. Therefore, in their almost ostensive pointing to nature, the symbols of the urban arcadia in fact destroy it: the reality claim of the symbolic reference to nature does not count; in the last analysis the difference between nature and its symbols is irrelevant. Like Panofsky's peaceful Arcadian shepherd and Marx's innovative

American citizen, Schmitt's modern urbanite is accompanied by Death when he indulges in Arcadian dreaming—and that because of the dreaming itself.

One of the most powerful symbolic productions in the emerging modern urban culture following the trend outlined by Schmitt is the urban park. In the United States it did not have the same social and ideological origin as in Europe: in the latter, the park was based on royal or noble property turned into public space, in which the symmetrical aesthetic principles representing a predemocratic vision of society, power, and cosmos were transformed into the soft lines of English or Romantic garden, landscaping the public space with an appeal to individual and casual enjoyment and unrestricted movements. The American urban parks grew out of another context: on the one hand, they secularized the vision of the rural cemetery where the encounter with nature was intimately related to death and metaphysical transcendence (*et in Arcadia ego...*); on the other hand they were a cultivation for the entire urban community of unexploited land (although often privately owned property) inside the urban territory itself (Chadwick 1966; Downing 1849; Machor 1987; Schuyler 1986).

The ideological vision governing the park construction of the most prolific American landscape architect, Frederick Law Olmsted, was a democratic vision very close to that of Jefferson, which was the foundation of Marx's complex pastoralism. In a general essay on parks from 1870 he observes that

in this eighteen hundred and seventieth year after Christ, you will find a body of Christians coming together, and with an evident glee in the prospect of coming together, all classes largely represented, with a common purpose, not at all intellectual, competitive with none, disposing to jealousy and spiritual and intellectual pride toward none, each individual adding by his mere presence to the pleasure of all others, all helping to greater happiness of each.  
(Olmsted 1971: 75)

Hence the park exercises a 'refining influence upon the most unfortunate and most lawless classes of the city,—an influence favorable to courtesy, self-control, and temperance' (1971: 96). The idea of the rural cemetery is gone, and only the architectural principles are left: temperance is not a religious or metaphysical effect, but a social effect. In his (and Calvert Vaux's) proposal for Prospect Park, in Brooklyn, New York, from 1867, Olmsted envisions a park offering 'a sense of enlarged freedom to all' (1981: 98)—not real freedom, only a sense of freedom. In

the park the modern urbanite is turned into a symbol, and only a symbol, of the husbandman from Thomas Jefferson's vision of the ideal American citizen, the most important inhabitant of the complex pastoral landscape but conceived of in the same ideological perspective.

What does this citizen see when he enters the park? How does he see it? And how are we to understand the difference and similarity between Marx and Schmitt? These are the questions I am going to address—the last one first, before I propose some ideas for spatial and visual semiotic analysis and invite you to join me in the visual Arcadia of a park.

### A General Semiotic and Structuralist Perspective

Apparently Marx and Schmitt are analyzing typical American phenomena, delimited to a certain period in American history: the rapid growth of industrialized cities toward the end of the nineteenth century, half a century later than in Europe, and the experience of the heyday and closure of the frontier which as an actual experience has been absent from the European continent for a long time, but which, as an ideological or mythological component, has been and still is part and parcel of European thought among explorers, tourists, and imperialists.

Hence, one may suspect that Marx's and Schmitt's analyses hide a more general perspective. Not only because of their repeated references to European cultural history (e.g., the complex of Arcadian imagination) or to persons strongly influenced by European thought (Jefferson, the urban reformers around the turn of the century, etc.), but mainly because modern urbanity itself, and its real or imagined relation to what is conceived of as nature, is—by its very nature—an international phenomenon, rooted in and formed by the industrial and post-industrial culture of the Western hemisphere. National differences are but variations of a general urban process. So their very topic, the city-nature relationship as the nucleus of cultural analysis, adds to their analysis a *global* perspective (cf. Wilson 1992).

In this perspective it is worth noticing that the two authors adopt two different viewpoints: Marx places himself in the middle landscape or in the wilderness, analyzing the effects the machines breaking into these spaces with a lasting material and ideological impact; Schmitt is standing (with Olmsted) on a street corner looking at people striving to get out of the city or to create symbols of the non-urban realm. Two different approaches to the same phenomenon, the modern

American version of the city-nature relationship, thus turning the same object into different cultural signs—one of a complex landscape, the other of escapist symbolic activities. Taken together they constitute an essential *semiotic* problem in the analysis of culture: not only the reference or the semantics of given symbols (landscapes, machines, parks, etc.), but the very transformation of objects into semiotic structures. In this respect they are part of the same semiotic structure.

Furthermore, both Marx and Schmitt refer to a dichotomic structure of cultural meaning production, based on the same dichotomy (city vs. nature). This mode of thought and argument parallels classical *structuralism*—not in its rigorous formalistic version, of course, but in the sense that any production of meaning originates in a difference and follows certain basic structural principles (their ‘Fundierung’, as Husserl would have put it). Such principles are empty abstractions unless they are related to a semantic field. As structuralism is basically a theory and a method for the analysis of meaning as a *topological* structure, it automatically gives priority to meaning as a spatial phenomenon. The analysis of structures invested with cultural meanings leads one to a conception of, and an analysis of, culture as primarily a *spatial phenomenon*. This is the case in Marx and Schmitt.

The foundational semiotic and structuralist aspects in Marx and Schmitt open a *general cultural perspective* of modern urban culture (not especially American) and reveal a basic, but tacit, presumption that culture is *spatial*. Cultural semiotics is *spatial semiotics*, and consequently, *visual semiotics* will play a role at the core of cultural semiotics, according to the function of sight in our construction and representation of space. The first part of this inference—that culture is basically spatial—is taken for granted by the two authors, or rather by their analytical practice, without further discussion or contrast to possible alternatives (e.g., that culture is a reservoir of ideas, that culture is communication, that culture is a material-symbolic process—cf. the numerous definitions in Kroeber and Kluckhohn 1952).

That may be the reason why space and visuality (or the capacity of other senses) are not intimately linked together in their analysis, and why ‘nature’ without any discussion is seen as a material phenomenon (the environment and its immanent dynamical forces), which can be manipulated, abused, depicted, reconstructed as surrogates, and can evoke mixed feelings of joy and anxiety, etc. But it does not seem to occur to Marx and Schmitt that the very fact that nature itself is taken to be an essentially spatial phenomenon is part of the same cultural process that they set out to interpret.

Nature as material space in Marx and Schmitt is, in Peirce's terms, a dynamical object—i.e., the object as it is independent of any sign process and without regard to any specific character (*CP* 8.343). The immediate object (i.e., the object as it is represented in the sign process), producing knowledge about the dynamical object and influenced by it (*CP* 8.343), is the real or symbolic landscapes analyzed by Marx and Schmitt. But although the dynamical object is outside any actual sign process, this aspect of the object and the semiotic process are interrelated, because the borderline between the dynamical and the immediate object is a product of the semiotic process.

In this perspective it is obvious that the presumed spatial character of the object is not any natural essence of the dynamical object, but belongs to the immediate object, giving a certain knowledge about natural objects or constructing natural objects through processes (based, of course, on certain empirical facts). It is a product of our post-Renaissance cultural heritage not only to accept, but to *foreground* the evident spatial features of the dynamical object and interpret them as their basic quality. The role of the spatial character of the object, the different interpretations of it, and the consequences of these interpretations will change because of the semiotic process, and in fact have changed from antiquity via the Renaissance to the present day through the different interpretants involved in the semiotic process.

In a general semiotic perspective the analyses of Marx and Schmitt are placed on three levels:

(1) A level of *general semiotics*: they share the presupposition that the nature-component in the nature-city complex is naturally given, as a dynamical object, as an essentially spatial phenomenon which, in fact, is but the shared immediate object of their text. This is their common conceptual denominator, making their analyses aspects of one semiotic analysis of culture.

(2) A level of *cultural semiotics*: they are working with the same basic structure, city vs. nature, although one takes his point of departure in the city, and the other in nature. They focus on different positions in the same semiotic structure.

(3) A level of *cultural signs*: they are working with different cultural signs and texts from American culture—Marx mainly with literature (in the tradition from Henry Nash Smith's *Virgin Land* [1950]), Schmitt with broader cultural texts, although mainly verbal and related to the beliefs and intentions of city people.

The basic similarity and difference of the two authors are effects of levels 1 and 2. Leaving aside level 3, I shall develop the structural and semiotic consequences

of the spatial, and the more implicit visual, semiotic perspectives in their analyses before we enter the Arcadian urban park.

### Middle Landscape: Neutral or Complex?

Ever since the construction of the Porphyrian tree, the dichotomic structural analysis of phenomena presupposes that the features of objects to be analyzed can be grouped in two sections, as plus (+) vs. minus (-). In the two texts we are dealing with this holds for 'city' and 'nature'. Further subdivisions especially of the structural +-component follow mostly the same dichotomic procedure. In his theory of structural linguistics, Viggo Brøndal (1943: 15ff) developed a more refined formal model comprising a maximum of six components:

<i>polar elements:</i>	plus (+) vs. minus (-)
<i>neutral element:</i>	(neither + nor -)
<i>complex element:</i>	(both + and -)
<i>complex polar elements:</i>	plus (both + and - with an emphasis on +) vs. minus (both + and - with an emphasis on -)

The plus-element is the chosen point of departure of the analysis, defined in positive terms. For instance, in Latin the term *otium* defines the positive term, and *neg-otium* the negative term in the semantics of social behavior, whereas in modern societies *employed* vs. *unemployed* defines the same opposition from a different point of departure. Of course, plus and minus do not refer to the personal preferences of the author, nor to a moral value system (at least not in the first place). They refer to basic constitutive factors in the process of cultural meaning production.

In the case of Marx the positive term is the *landscape*, reaching from wilderness to the garden (Marx 1967: 42ff); in the case of Schmitt the *city*—the 'urban vantage point' (Schmitt 1990: 3)—constitutes the positive pole. It seems evident, however, that Marx takes *wilderness*, not the landscape, as the basic *positive* component, carrying the driving utopian forces of the whole cultural dynamics he attempts to analyze (Marx 1967: 43). To him, then, the *minus* element is the modern industrialized *city*. And his complex pastoralism is the *complex* term of

the cultural semiotic structure, integrating and foregrounding features from both positive and negative polar components, being the locality of the 'industrial *Naturmensch*' (1967: 363). The so-called nostalgic or sentimental pastoral landscape is the *neutral* term in the structure—the dream of the nowhere of 'pastoral felicity' (1967: 363), the nonexistent 'surrogate for the ideal of the middle landscape' (1967: 365).

As the complex and the neutral terms are determined by both polar terms, they will occur whether one defines 'wilderness' as the positive term, like Marx, or takes 'city' as the positive one, like Schmitt. This difference will not influence the basic structure of the analysis, but will open for different preferences in perspective, interest, choice of texts, evaluation, etc. Therefore, like Marx's sentimental idyl, Schmitt's Arcadian landscape, imagined or produced by the agents of urban culture, can be identified with the *neutral* term in the structural semantics of the city-nature relationship, a dream world without the harsh realities of the city and without the uncontrollable infinity of nature.

Schmitt's more casual, and often ironically flavored, analysis of the escapism of urbanites leaves no room for the study of the complex aspects of the structure. Although underlining the complex form, Marx, on the other hand, is well aware of the inspiring force of the images of sylvan surroundings (the neutral term), and also of the two complex polar terms: the machine taken as the embodiment of *natural* forces in the middle landscape (1967: 192) (positive complex polar), or the unified human and natural innovative forces as a '*technological* sublime' (1967: 230; see also Nye 1993) (negative complex polar). In the following, I shall focus only on the point of intersection between the cultural semantics suggested by the two authors: the *neutral* term.

In the first place we are dealing with a semantic structure, not a spatial locality. Both authors make it clear that the place does not exist as such—Marx shows regretfully how this dreamworld crumbles when transferred to reality, and Schmitt shows ironically how it leads to constructions of places or activities with a false pretension to naturalness, originality, etc., and to an exclusion from these places of certain people and classes that might disturb the Arcadian tranquility. But we are also dealing with semiotic structures with an impact on the material environment and on the thoughts and actions of people as well. They may not be spatial in the narrow sense of the word, but they take place and they create and reproduce limits.

The German sociologist and philosopher Georg Simmel describes social space in relation to limits like this:

*The limit is not a spatial fact with sociological effects, but a sociological fact with a spatial form.* The idealistic [in the philosophical sense—SEL] principle that space is our representation, or rather the outcome of our synthesizing activity through which we induce a form on the sensual materiality—this principle is here specified in the sense that the spatial form which we call a limit is a social function. *When it finally becomes a spatial-sensual construction that we turn into a sign of nature independent of its social and practical meaning,* then this construction will have a strong impact on the interaction between the parties [in relation to the limit]. (Simmel 1968: 467, my translation and italics)

I want to focus on two points made by Simmel. First, he underlines that the naturalness of the spatial character of our environment is a material form of the object, not its materiality as such. Second, this material form is related to the definition of limits—i.e., differences which, like all differences, create meaning. To interpret culture in terms of space is not to construct a spatial semantics of culture, like Marx and Schmitt, but to see the materiality of objects as an aspect of the ongoing semiotic process of meaning creation and interaction in culture between bodily present agents, defining and moving its internal and external limits. Space takes place.

According to Simmel (1968: ch. 9), social space in general has two complementary aspects: active and passive. The *active* aspect covers the social effects exercised by spatial forms, as for example existing national boundaries producing what he calls exclusiveness: you can have but one state on a given territory, or war (but you may have several coexisting religions). Among the series of active spatial forms *movement* is important. The act of moving defines the opposition between dwellers and movers, which may vary in numerous ways in different cultures, and which, uniquely among Simmel's active forms, allows for a *double* viewpoint on social space: that of the dwellers, often hostile to movements and to strangers moving in or people leaving their stable environment; and that of the movers demonstrating the ultimate limits of the given culture—they test how far one can move and still be recognized or even integrated in a culture. Together, dwellers and movers constitute the center and the periphery of a given cultural space and their

interrelation, which then, as a meaning-creating difference, penetrates the whole fabric of the cultural space and incorporates it in a dialogical semiotic structure.

Among Simmel's *passive* spatial notions, the so-called *neutral* space is especially important to our understanding of both the spatial dynamics of culture in general and the function of the neutral term in Marx and Schmitt's spatial semantics. In contrast to other types of social space, the neutral space has no strict internal social coding, or at most only a weak one. Thus it can serve as a borderline or a buffer zone between more well-defined and perhaps conflicting social spaces. Simmel mentions 'no man's land', the church, institutions for research, and embassies as examples of changing neutral spaces through history. Simmel defines the neutral space in negative terms: it is 'unoccupied' (1968: 525)—that is, open to constantly changeable 'occupations' or uses, unless taking on the form of already well delimited and defined uses existing elsewhere in the cultural space.

In the modern urban culture, movements, as an active spatial aspect, are related to movements based on individual intentions. The center and periphery of the cultural space of movements in our culture are defined on a scale from maximal to minimal potential to move deliberately when, why, and where you want. The 'occupations' of the neutral space, seen as the passive complement to this ideal movability, depend only on *ad hoc* determinations by the actual users of the space—that is, determinations that are always changeable, never definitive, and thus only under the control of the individuals present in the space. But in order to be cultural spaces at all, they will have to be public: the *ad hoc* determinations have to be accepted by other cultural agents. In our culture such spaces manifest themselves typically in urban streets, in parks, in contracted naturalized dream-worlds of individual freedom (see in general Altman and Zube 1989, and with specific reference to the street in Larsen 1994).

Following Simmel, the occurrence of a cultural space like the middle landscape or an Arcadian universe does not characterize one single culture. All cultures will produce such spaces in order to make the relation between material environment and meaning structure a dynamic semiotic process. It seems obvious to me that the Arcadian setting of Schmitt and the sentimental pastoralism of Marx are specific examples from our culture of Simmel's neutral space. They are static material and discursive universes that are vulnerable to strict definitions or control from the alternative well-defined and strongly coded cultural spaces around them. Neutral spaces cannot defend themselves, but have to be acknowledged—Death penetrates easily in Arcadia.

Hence Schmitt's ironic attitude to the urban Arcadia, because it is necessary but provisional, without seeing that it is necessary because it is provisional. That also explains Marx's lack of interest in the sentimental pastoral, which is just a delayed European construction of a withdrawal from or a purification of the cultural conflicts of Europe, although it produces contradictions that eventually lead to complex pastoralism. The space of this type of pastoralism is invested with Simmel's active forms of space, especially that of the modern definition of movements—the deliberate, individually based and controlled movements performed by the prototypical Jeffersonian husbandman. So, the complexity is due to its combination of both active and passive aspects of cultural space—i.e., movements and neutrality. Marx and Schmitt analyze examples of general *urban middle spaces*, either in the passive form of purely neutral spaces or in the combined active and passive forms as complex spaces. The urban park will be a manifestation of this middle space.

## Two Analyses and a Prospect

So far, nothing has been said of *visual semiotics*. I do not understand visual semiotics as a parallel to verbal semiotics; the former focuses on motivated, iconic sign systems, and the latter on arbitrary, symbolic sign systems, both of them considered as types of 'language' in a more or less analogic relation to verbal language (iconic signs are coded, after all). To me visual semiotics exists only on the conditions of a spatial semiotics, because visuality is based on the mode of corporeal presence in a space depending primarily on sight. Visuality in a semiotic perspective is not primarily related to certain two-dimensional (images, etc.) or three-dimensional iconic signs (sceneries, landscapes, etc.), or specific neurological facts in eye and brain. It is founded on the *mutual* relationship between body and environment through the sight. This reciprocity is based on the movements of the body as well as on the capacities of the eye and the material and semiotically evoking ('affordant'—Gibson 1979) layout of the surroundings, presenting them to a moving subject placed in shifting positions in space (cf. Gibson 1979, and also Merleau-Ponty 1964).

What is lost in most visual semiotic analyses is the reciprocal 'spatial-sensual' relationship (cf. the Simmel quotation above) which makes visuality a dynamic force in the creation of an *Umwelt* we construct and take part in. So, if we want

to analyze a visual and thus spatial phenomenon, it is crucial first to determine its specific value as a text in a cultural space. Now when we enter a park in order to analyze it as a visual sign, the focus of the analysis is not just its discrete visual components, but its visuality as a complex middle space—a neutral space defined by individually controlled and changeable body movements.

We will take a look at *Prospect Park*, in Brooklyn, New York (Barlow 1972; Lancaster 1967). The name itself, Prospect Park, is loaded with allusion to visuality. Literally, 'pro-spicere' means to look ahead. From this semantic nucleus spring several semantic derivations that are *grosso modo* identical in many languages. The most important components of the semantics of 'prospect' are (1) a general view of a region, a landscape or a scene; (2) an image of such a site (e.g., a postcard); (3) a promising future situation, plan, or object; and (4) a diagrammatic survey of the three dimensions of a building or a site for construction purposes. Thus, literally or metaphorically, 'prospect' indicates a general view of a scenario from a vantage point, a conception of space which grew out of the Renaissance conception of space, intimately linked to the experience of the explorers, the newborn sciences, and the new visual aesthetic techniques of central perspective, and which acquired a dominant position as *the* conception of space in our culture.

Although the type of space we have inherited from the Renaissance and Newtonian physics is static, empirical, and three-dimensional, it has a dynamic potential. However, the dynamic force does not belong to space itself, but to the human beings acting in it. As Nicholas Green has pointed out (1990: 128ff), natural space as a landscape is built up around a 'centered human subject' or 'a centered self': an arrangement of space organized by the Renaissance development of central perspective, giving priority to sight among the senses. The centered self in this space is not the spiritual human being embedded in transcendental conceptions of space and nature. It is an individual human being in its immediate bodily presence, engaged in the process of visual perceiving. When sight is prior to the other senses, the subject is located in relation to the horizons of space, thus making distance more fundamental than closeness, which is more directly related to touch.

On these conditions each subject becomes the center of 'its own' natural space at whatever point sense perception locates that center. In order to remain central, the subject is obliged to maximize the distance which it controls but with which it is literally out of touch. Thus parallel to the development of nature as primarily material space are developed what Green calls 'technologies of perception' (1990:

83, 112): semiotic structures, with which the subject maps spaces and embraces the distance in order to remain in control, 'in touch'. This effect can be obtained through constructions, as Schmitt's account of the behavior of urban Americans witnesses: because of its purely material character, nature as a perceived space remains equally natural whether organic or artifactual. So, with every move of the centered human subject a new perspective, and thus a new space, arises or may be constructed. What the park offers the modern individual is this experience of deliberate and effortless control of natural space, a constructed confirmation of this specific post-Renaissance conception of material space as the essence of natural space.

The already existing Mount Prospect (like Montevideo in Uruguay, a name from the early colonial days) should have been part of Prospect Park, but in the end it turned out differently, so 'prospect' does not really refer to a site, but to a way of constructing visual space. The landscape architect Frederick Olmsted and his colleague Calvert Vaux have left detailed descriptions of their plans and reports from the first years of construction (Olmsted 1971, 1980). Their conception of visual space follows the guidelines of the post-Renaissance tradition, as modified especially by the development of the Romantic or English garden (cf. Larsen 1993).

Of course, any person entering the park will see it as an *iconic* sign of a natural landscape (an *image* in Peirce's sense), without paying much attention to the fact that it is not developed through years of gradual cultivation or that it presents only a slight modification of the given natural forms, like a scene serving as a middle landscape in the cultural semantics of space. It is constructed as meticulously as any painting of a landscape. It is a prospect. Therefore, it is not an iconic sign of nature, but of the ideal middle landscape. Schmitt's urbanites produce iconic signs of Marx's middle landscapes, themselves constructed iconic signs of pristine nature, which again is manifested in (iconic and symbolic) signs of nature as absolute origin. As an iconic sign the park is an image as well as a *metaphor*. Of course, the description of the park as an iconic sign will tell us what it looks like, but it does not tell us what it is a sign of, nor does it inform us about how and why it has played an important role as a visual sign in the space of urban culture.

Nevertheless, we will first take a look at the park as an iconic sign, an image. Olmsted carefully defines the distinctive features of the park in two dimensions: externally in their difference from the visual details (and sounds) of the surrounding city, internally in their mutual similarity and difference. In contrast to the city's

gridiron street pattern, non-organic materials, square forms, constructed objects, grey and brown colors, vertical structures, and closed space, the park is dominated by curved paths, organic materials, round forms, natural objects, green and blue colors, horizontal structures, and open lakes and meadows. The clear-cut layout of the surface of the city, making you feel but an anonymous element in a formal structure, is replaced in the park by a less predictable layout which offers the visitor the opportunity to explore a route on an individual basis, to hide, to contemplate, to act on his own terms. Opposed to the fixed one-to-one relationship between the space of the city and its use (sidewalk for pedestrians, roadway for vehicles, etc.), the different sections of the park can serve more open-ended and temporary uses. So, if the park is an iconic sign of nature, it is basically coded in its contrast to the city, not in its likeness to nature. It is nature on urban conditions.

Internally, the components of the park are combined along the following lines. There are six basic components: water, trees, paths, meadows, hills, and buildings. They are combined in such a way that the horizontal components (water, paths, meadows) are more pronounced than the vertical (hills, trees, buildings); this gives the impression of a space stretched out on the level of human eyesight. Furthermore, all signs of limits are reduced to create the impression of a space with endless possibilities for new experiences (the outline of the park is almost invisible from inside, we have soft borders of lakes and groups of trees, the paths have no clear beginnings and ends, no dramatically steep hillsides, etc.). Finally, the organic components dominate the buildings (they are not very tall, and there are only a few, hidden behind trees, often placed only at the entrance, or constructed with organic forms—e.g., iron or concrete banisters looking like branches). So, the park is not basically a visual iconic sign of nature, but a *symbolic* sign, although with iconic features referring to an ideal relationship between human beings and their surroundings, based on the individual freedom for unlimited movement. The iconic elements simply allow for an interpretation of this semiotic construct as a natural state of affairs.

The park builders of the nineteenth century were inspired by a common intention: as a public natural space in the city, the park offered urbanites, removed from morally elevating and physically healthy natural surroundings, a mediation of the otherwise unbridgeable contrast between city and nature, with nature itself as subject. However, the nature they had in mind was not nature, but the middle landscape, itself a culturally created mediation between city and nature. What the

park actually offered was a mediation between the culturally created conflict between the alienating city and certain basic human needs, situating not nature but the individual human being as the subject of the mediation. Hence Olmsted's view of the park as a place for educating people to freedom and democracy, as referred to in the first part of my paper.

The park is an invitation to this free individual to enter a space of temporary individual freedom, to feel a 'sense of freedom' (Olmsted 1971: 75) created in and by the city. Let us accept the invitation and change the orientation of the visual analysis. How does the park attempt to reach this effect through semiotic processes? My answer will be that the use of *indexical* signs is more important than the iconic and symbolic aspects of the sign process, although these aspects, as we have seen, are still part of the park as a cultural text.

As we know from Peirce, indexical signs are of two types (*CP* 8.368, note 23): the *reagents* that establish a (mainly causal) link from the object to the sign (e.g., a pain in the finger caused by fire); the *designations* that orient the sign relation from the sign to the object (e.g., the utterance 'It hurts here' directing your attention to the finger). The indexical signs interrelate the object and the sign in relation to an interpreter, as body (perceiver of reagents) and subject (producer of designations, perceived by others as reagents of your presence as an utterer). The reagents presuppose the existence of real objects that have to be further interpreted by interpreters, the designations locate interpreters in relation to objects whether real, fictitious, imagined, etc. The reagents delimit a field of reality, the designations a field of interpretability. They have to cooperate in order for us to be able to locate ourselves in a universe with a certain ontological status and a certain interpretability. The main indexical process in the park is that the role of reagents is reduced in favor of designations, especially designations related to the locations of the individual body.

Let us enter Prospect Park from the main entrance at Grand Army Plaza. As one may guess from the name, there is a huge martialistic arch in the center of the plaza. This monument and two impressive columns at the gate of the park remind us of warfare, victory, and the inferiority of the individual human being. Entering the peaceful Arcadian retreat of individual freedom, we leave behind these signs of the ultimate limit of our existence, Death.

The monuments are symbolic signs, but taken together with fences, low walls, hedges, gates, etc. around the park they function as designations of the park as a naturalized neutral space: 'Look, here is a space different from streets, plazas,

warfare, with greenery etc.' If we look for symbolic signs to provide a more precise and positive definition of this space, we find only a board announcing the opening hours of the park and a few restrictions on park activities. And a few steps inside the park, the designations of the elementary delimitation of the territory are almost invisible. The same goes for the reagents of the outside urban space: you hardly see the surrounding houses (Olmsted was happy that the ground in Brooklyn was hollow in the middle, so that this effect was created without expensive constructions), and the sounds from the streets are softened. So, the stable collective visual designations of the demarcation to the outside space as well as the reagents of this outside space are gone.

Once inside the park we see not only trees, lakes, and meadows, but also people. Most of them indulge in casual *ad hoc* activities: sunbathing, jogging, playing different ball games, picnicking, just sitting on a bench, fishing, walking. Most of the activities are interchangeable and not tied to a specific spot. If you want to picnic on a certain lawn where some people are playing softball, you will have to find another place. Tomorrow you may be more lucky. If you leave the bench, anyone may take your seat. You occupy a certain space as long as you want it and use it for whatever purpose you want (within certain generally accepted limits of decorum). The park appears to be first and foremost a public space, not a natural space. Its naturalness is a qualification of its publicness, not the other way round.

What we observe is people producing publicly recognizable and acceptable designations for the delimitation of a temporary, individually defined space. They are behaving extremely privately in public, most often without great conflict. So these provisional designations will have to be visible to other park visitors: you place sticks around the playing ground, you place a carpet to sunbathe or to picnic on, you stretch out a rope between tree trunks to tell that today this space is for your kids' birthday party, etc. Visibility is important, because you will have to recognize the designations at a certain distance before you come too close to the temporary private space of others. You can remove the designations and move to another place, and you do not have to be very explicit about what you want to do—just that you want to occupy a certain spot as long as the designations are there. Alfred Schütz (1955) calls such individual *ad hoc* designations, not always easily recognizable by others, *marks*. In the park you can *mark* the limits for your deliberate individual moves. As the external demarcation lines of the park are invisible, the then apparently infinite space of the park makes it a privileged place

for us to try out the possibility of being always free to move when and where we want. It is a neutral social space in our culture.

But this semiotic appeal (or affordance—Gibson 1979) of the layout of the park to produce marks requires that reagents of absolute impediments are reduced. If not, you cannot have the ‘sense of freedom’. In the park, not only the reagents of the surrounding city but also the reagents of natural processes are reduced or transformed. Of course, in the park we adjust our movements according to the sounds, sights, smells around us, as we do everywhere else, but most often it is not fatal if we do not do so: we can excuse ourselves for bumping into someone, or change our course if the meadow is too wet at a certain point. But in the park the more significant reagents of the changes of the seasons are reduced (there are many trees that are green all the year round, the dead leaves are removed, lawns and hedges are trimmed, plants are distributed so that we have flowers in blossom from early spring to late fall); the organization of the elements of the park—colors, forms and sizes of plants, trees and stones, etc.—corresponds to a harmonic landscape. They are not reagents of nature, but designations of culture: ‘Look, here is nature’.

The basic function of the park as a neutral social space is to allow us to feel that it is publicly accepted that, at least in a certain place, we have a permanent possibility of producing signs, *marks*, of a totally free private space, defined only by the movements of our individual body according to our free will and visible to others.

### *Et in Arcadia Ego*

Extreme individualism always creates visual signs of conflict; this also happens in the park. The general public effect of pronounced individualism invades the park. Already in the 1890s Prospect Park was used as an illegal waste dump (Barlow 1972). Today parks, like many other public places functioning as neutral spaces, are places for violence, rape, and drug-dealing, and are dangerous after dark. Apart from soft meadows, you also see broken trees and destroyed benches. And you can observe not only people engaged in leisure activities, but also police officers protecting them. Visual reagents of death in society. So, even though dead leaves are shuffled away into a remote corner of the park, death is present in the Arcadia of the park.

The park as a visual sign is not an iconic sign of nature, nor is it a symbolic sign of the ideal of human control of nature. It is a complex of visual indexical

sign processes designating in public, in a continuous process of marking, the limits of individual freedom in relation to culture and nature. The park is one of the reagents of the conflict inherent in this freedom. *Et in Arcadia ego.*

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## **Other Varieties of Visual Meaning**



## **Performing Arts, Visual Arts**

André Helbo

### **Definitions**

The phrase ‘performing arts’ raises terminological problems. A definition covering the extension and comprehension of the concept implies a criteriological debate that cannot be tackled here. I shall limit myself to recalling the Aristotelian theses linking the ‘spectacle’ to both performance and mimesis; privileging either performance or mimesis, the main aesthetic forms (within the Judeo-Christian socio-culture) would be: the concert, sport, the carnival, the circus, dance, the traveling theater, street theater, lyrical or dramatic performance, and the visual arts.

The visual dimension of the spectacle originates in part from a parameter evoked by the Greeks, viz. ‘the analogy’ (resemblance or reference); hence Bazin, Mitry, Metz (Marie-Vernet 1990: 271), and Aumont (1990: 153) mention links ‘inferred from the mimesis’ between ‘scenography and two-dimensional images’. Does this, however, imply the systematic association of stage arts and visual arts? The category of the visual (shown, visible, or otherwise determined) dimension paves the way for prejudicial questions regarding the specificity of the performing arts.

The concept of *scenic image* points to the complexity of the debate. Generally and successfully tackled by studies on reception, it refers to a difficult issue: the fact that the eye will (mostly but not only) construct/destroy the material supports (set, lighting, actor, voice, and body) staged by the spectacular continuum; the spectacle (‘spectare’) is conceived of for both the linear (the spectator puts pieces together) and the tabular (the spectator takes in heterogeneous visual messages) functioning of the eye. It orchestrates induced visions with which reception can conflict or dialogue; it is not surprising, then, that the task of the spectator takes both the production and the reception of the ‘image’ into account (Helbo 1985; Helbo et al. 1991).

Some, however, even though they accept the theory of the ‘focalization of the image’, reluctantly admit the closeness—acrobatic coupling?—of the visual and the performing arts. A proof of this is the judgment of Franco Ruffini (1986),

who distinguishes the historical legitimacy and the epistemological irrelevance of the '*visual*' as a spectacular category:

Cinema and theatre have been tackled in a peculiar way in research. Historically speaking, rather than concentrating on the resemblance, so as to open up a unitarian conception of the spectacle, emphasis has been laid on the differences. Theoretically and semiotically speaking, rather than observing the differences in order not to fall into a totalising and generic category of the visual, the emphasis has been laid on the resemblances.

The works of Aumont, however, borrow the argument of the validity of a coupling and, referring to the Aristotelian mimesis, concentrate the discussion on the concept of *representation*:

between a theatrical performance, the representatives at the Assemblée Nationale, the pictural and photographic representation, there are enormous differences of scope and status. But all these uses of the word have one point in common: the representation is a process through which a representative is created who, in a given close contact, will stand in for what he represents. Gérard Desarthe stands for Hamlet in the enactment of Shakespeare's play by Patrice Chéreau: however, this does not mean that he is Hamlet but that for a couple of hours, in a place specially assigned for it,—and in a highly ritualised way—I can consider that Desarthe through his voice, his body, his gestures and his words, gives a certain number of actions and states of mind belonging to an imaginary character for me to see and to understand. (Aumont 1990: 76)

For Aumont, the debate concerns the concept of iconicity (backed by representation), in the Peircean sense of the word; and quite a few other scientists share this position. Alter (1990: 28), for example, examining the opposition between 'referent and symbol', adds: 'theater is the most iconic of mediums'; but this relation to iconicity questions at the same time the aesthetic specificity and the process of encounter between different types of aesthetic forms. Carlson (1990: 74) adds: 'this tendency of theater to invest pieces of reality with its particular artistic significations is not only a distinguishing feature of this art, but also ... a source of particular artistic power'.

In an intuitive way, the discourse of practitioners seems to be attracted by the same presupposition: i.e., the image, the visual, the iconicity, which appear as concepts that rightly or wrongly unite spectacular aesthetic practices.

### **Divorce and Second Wedding: A History of a Household Row**

The history of Western culture, next to the rather recent concept of 'the performing arts', points to how far the critical vision of the performing practices has suffered from a certain 'amblyopia'. Since the Renaissance, theater has been perceived through the prism of the literary category and distinguished from other spectacular forms. Even practitioners have made this distinction. The antique sources notwithstanding, sport, circus, ballet, opera, and theater have often been considered as independent arts.

A certain number of exceptions must, however, be mentioned. Brought forward by the pantomime, mime, and the *commedia dell'arte*, they postulate a global paradigm of the performing visual arts while emphasizing the prominence of the theater over the other arts. The notion of synthesis, the so-called Wagnerian *Gesamtkunstwerk* that inspired Appia and Craig as well as the Bauhaus movement, insists on the convergence of the dancer, the musician, and the artist. The 'total performance', extolled from Vsevolod Meyerhold to Maurice Béjart, emanates from an aesthetic movement (historically situated) that conveys both a sensitivity to the image and an ideology of decompartmentalization between performing practices. The same can be said of the intercultural theater, whose openness to the other, to difference, forces us to revise the opposition between performances long accepted in the Western world: the Africa of Brook, the East of Barba, the India of Béjart, the Asia of Mnouchkine or Robert Wilson not only evoke more or less imaginary 'elsewheres'; they also bring forward technical and theatrical confluences that flout the contrastive categories of the spectacular pedagogy. The comedian's body, his performance, the plastic materiality of the stage languages, all supports perceived by the eye, all come forward as a common inheritance of all performing arts, of the performance paradigm. Ariane Mnouchkine uses the Japanese mask to enact Molière or Shakespeare, and includes songs, spoken dance, and mimicry in the same plot. Conversely, when Mishima reinvents Shakespearean themes in the No tradition, he obviously displays a comparable dialectic will and constructs an event that is both mime and theater. The perception of the past, as a model of alterity

within the same culture, works in the same way: the Greek tragedy, at the cross-roads of opera and theater, is used by our European contemporaries to display in an emblematic way—beyond the historical shift—the aperture of the genres and the critical visualization of the text.

More fundamental than the phenomenon of the generic synthesis, the concept of kindred arts emerged in the 1980s. At that point in time a large number of scholars in the field became interested in the paradigm of performance: Vitez, Delvaux, and Chéreau insistently unfolded the theatricality of the opera; Bob Wilson, Carmelo Bene, Pina Bausch, Tadeusz Kantor, and the Plan K in Belgium questioned the narrative structure of the theatrical fact and preferred the rhythmic structures, the process of the actor's utterance as sound phenomenon, a repetitive and fragmentary syntax reminiscent of the plastic or musical composition. More and more, dramaturgy moved away from the literary heritage to focus on the production of meaning linked to the presence of living exchange between the stage and the audience: 'Theatre is an accomplished act here and now in the body of the actors, in front of other beings' (Grotowski 1971). The happening, the Living Theater, the League of Improvisation, the action-theater developed the vivacity of movements that combine, according to the case, theater, sport, game; not that they included real risks in reality—more like the risks incurred by artists at the circus.

A double-edged inquiry on neighboring arts was set in motion, experimenting with both the limits of the spectacular event—be they carried out, danced, gestualized, shown, constructed—and its specificity in the face of our daily life. Together with the aperture process, the spectacular moved toward becoming a mixture of images and voices; in the Romance-language-speaking countries, the advent of scenographers (a new job multiplying the references to painting, sculpture, cinema, and living spectacle) reinforced this interartistic consciousness. Quite a few contemporary directors—Brook, Chéreau, Polanski, Lavelli, Strehler, etc.—assumed a double (not to say a treble) involvement in movies and on stage (both theater and opera), and did not hesitate to bring together aesthetic practices. In the same way, films (by Rohmer or Godard, for instance) became 'theatrical'. As Francis Vanoye writes: 'A certain modern theatre clearly questions the pervading logocentrism to move its resources to the scenic picture and the body of actors, whereas the cinema claims, for its part, a right to the abundant and determining word' (1991: 180).

As seasons wore on, the European repertoire acquired a new intertextuality: nontheatrical texts were enacted (e.g., the diary of Camille Claudel) before being

adapted for the screen. From cinema to opera, theater to ballet, even to the circus, the notion of the performing arts expanded and distorted; it turned into an art of the signs aiming at the performance—to such an extent that renowned directors no longer claimed a naturalistic epistemological (Antoine) or Marxist (Brecht) inheritance, but openly linked their knowledge to semiotics, as was done by Antoine Vitez when he was the administrator of the Comédie française.

### A Semiotic Knowledge for Theatrology

Semiotics has accompanied the movement toward cross-fertilization of the performing arts. It is partially linked to the development of the visual practices on stage and to the questioning of the written word. A simple look at the disarrayed reaction of certain practitioners might convince us that semiology influences creation, perhaps orients it subtly, or even 'anesthetizes' it, as some detractors contend.

The situation is no doubt much more complex. In the first stage, territorial semiotics have coexisted: it is possible to determine their features and to try to grasp at the same time their relationship with the study of visual signs.

### The Semiotics of the Theater

Developed after general semiotics, narratology, and film semiotics, this discipline did not question its scope much at first. A sort of tacit understanding accepted in a non-problematic way the preeminence of the written drama as theatrological object.

This mutism/backwardness concerning methodology can among other things be explained as a reflex of humility favoring the borrowings from kindred semiotics (film, literature), whose techniques had proven useful, and by the wish to select the corpuses most propitious for exercises of style. Other reasons can be alleged: the complexity of the theatrical phenomenon as a highly syncretic medium has long challenged any attempt at globalizing apprehension; the pathologies typical of empirical research have not facilitated the removal of the obstacle; practitioners have steadfastly refused to accept any other theoretical speech than their own; the terminogenetic inflation of some criticisms (literary, philological, aesthetic, historical, etc.) have also permeated the epistemology of the 1960s.

In the 1970s the dissection of the social object (text versus performance) as well as the link between the theater and the other arts were not key elements in the debate; at the same time, the semiotics of the theater adopted an idealistic attitude—i.e., it sought to pinpoint all elements of the communicative relationship (Mounin 1970), from steps prior to the scenic performance (author, written text) to the scenic realization (direction, deciphering by the audience). The privileged pattern of analysis thus refers to a linguistics and explores the segmentation of the text (Serpieri), the minimal unit (Kowzan, Marcus), and the influence of verbal deixis on the stage (the literary script determining the performance).

However, a materialistic perspective follows this logocentric approach: it aims at abandoning the terrorism of the linguistic text and at studying the performance as acts; at taking into account the relationships *in praesentia* between the text, which has become a voice, and the other stage components. Opting thus for a code-to-code analysis, or for a more global—even a more pragmaticist (Elam)—approach, this way of study tackles the complexity of languages *in vivo*. By extending the Barthesian description of the stage as informational polyphony, semiotics becomes interested in all the visual supports of the performance: the comedian's performance, the setting, the space, the object, the music, the words, the construction of fiction, chronological rhythms, etc.

A broader approach to the text, conceived of as a texture, as an organizational principle of the staging, is taken at the moment of its actualization: its interstitial nature ('gapped', incomplete text, according to Ubersfeld 1977), its reticular aspect (the performance text of De Marinis 1993) do not permit conceiving of the verbal or written support as a deep structure. The function of the theater is to bring fiction to life and make a feat of it; such is its Janus' face.

The hold on consciousness provoked by suspicion regarding the deep structures opens up new avenues. Another methodology appears as soon as the performance is conceived of as an aleatory and ephemeral process, unable to anchor stable supports. It is less important to determine the units than to determine the significative systems, the working, the function, the coherence of the theatrical continuum.

The concept of theatrical event is moving forward; new hypotheses collide over the hazardous, ephemeral character of the performance without giving up the hope of systematizing its approach. Carlson emphasizes the dialectics, expounded by various schools, between semiotics and symbolics, reference and performance,

desire and communication. He sees in the spectacle a lability feature which helps in distinguishing between visual arts and performing arts:

A quattrocento painting may undergo enormous changes in visual reading as it is experienced in times and places far from its origin, but it remains the same object.... Theater, however, as a performed art, creates no total artefact available for subsequent experience and interpretation. Every performance is unique and unrepeatable.... (1990: 113)

The expression of performance as life art is increasingly successful: a European postgraduate degree, which leads to the publication of a handbook (Helbo et al. 1991) and to the creation of an interuniversity curriculum backed by the E.C., includes this denomination in its diploma. The epistemological existence of the theater is questioned. In the wake of Piaget's remark, according to which 'the observer creates the observed', a new inquiry is set up concerning the analyzed corpus and the critical outlook. New debates have started about the performance, its remanence; they have also evaluated the means to fix the performance, its notation, its captation, its recording or preservation, and its coherence (*Degrés* 1990, 1993: 188). The issue dealt with is the construction of the frame, but also the selection through the spectator's and the critic's eye. The theme of the instruments of analysis (photo, slide, video, film, and other technological formats) concretely opens the debate about the construction and the coherence of the image/model. In the same way, the essential debate moves to the way in which semiotics can elaborate its model/image and reduce it without destroying its object.

So we can say that semiotics and the theory of performance follow a parallel route in their mutual questions: the setting-up of the puzzle that is—both for stage people and for the spectator's eye—the performed play, which finds an echo in the semiotic research.

Semiotics evaluates its own achievement (the transformation of the theatrical phenomenon into an object of knowledge) and fathoms the relevance of its own knowledge. Must we—it wonders—elaborate universal deductive models, that are valid both for the theater and for other means of expression (the meaning process advocated by Greimas)? Or conversely, ought we to build up inductive models based on an estimate of the scenic material (and in this case should we accept at face value the typologies of the means of expression inherited from historically connotated dramaturgic treatises)? This new alternative perpetuates, in a different

form, the debate between an idealistic view (Greimas: ‘the discourse is independent of the vehicle of manifestation’) and an empirical one (see Kowzan 1975, 1992a and b) that lists a series of material components, called ‘signs’. Should we accept that the inventory of ‘the languages of manifestation’ and the unavoidable prejudices of the tradition would determine the construction of the model: the light or the costume would be auxiliary to the voice, the decor set up for the comedian, etc.?

The essential point, however, lies not in the contradictions between a deductive and an inductive attitude, but rather in the coming to consciousness of the importance of the semiotic process. As a simulating machine, semiotics builds up models; and in doing so it functions very much like any spectator, according to operations and choices. Likewise, the creativity of the practitioner works in the same way: the staging is a setting up of signs; from these emerges a conception that has already been claimed by the Prague School (Matejka), then by Peirce (see especially the concepts of semiosis and interpretation: Sebeok): the performance as a flow of meanings. The founding texts of the Prague School (Honzl, Mukařovský, Veltruský) have given way to rereadings that draw our attention to cultural relativity and the lability of the meaning linked to the various scenic languages of manifestation (‘concretization’, accumulation of meanings, artificialization, etc.).

This move inevitably draws our attention to the concept of the ‘ideal spectator’ inspired by Eco. We thus rediscover Barthes’s opinion about Brecht: ‘All of Brecht’s plays explicitly end with a “look for the way out” addressed to the spectator in the name of the deciphering to which the materiality of the play must lead him.’ The sociological reference of the audience gives way to the rhetorical figure of the addressee, whose activity is compared to strata: a role which is historical (determined by expectations within a socio-cultural context, a ‘common ground’), psychological (the attention process), emotional (linked to individual determinatives), cultural (also related to the individual and the repertoire most experienced by him), and cognitive-discursive (the ‘observer actant’ whose silent presence is taken up in the occurrence of the theatrical utterance).

Reception theories focus attention on the event-related dimension of theater, in conjunction with the importance of the theatrical enunciation at the moment of the performance: the exchange between stage and audience, the invention of the meaning drawn by the spectacular event are conceptualized through the ‘theatrical rela-

tionship' (Durand 1982), the 'collective utterance' (Helbo 1983a and b), the 'reception' (Pavis 1982), and the 'spectator's role' (Ubersfeld 1981).

Beyond the boundaries of this point of view, an antisemiotic perspective will refuse to reduce such a relationship to conceptual categories: in the name of psychoanalysis (Féral 1982), or of a deconstructivist phenomenology (Kirby 1987; Derrida, Lyotard), one should preserve the incommunicability of desire, the libidinal flow, the energetic investment. In the answer to those claims lies the basis of a performing arts semiotics approached from a dialectic angle, linking the stage and the spectator, who invent one another in the very moment of performance.

Little by little, the idea emerges that the study of processes encompasses all the performing and visual arts. Of course the Lotmanian studies have accustomed us to comparisons between theater and cinema; but the step forward from there transcends the problem of categories, so the move through which stage and audience invent one another is linked for some (Slama-Cazacu 1986; Helbo [ed.] 1986; Helbo et al. 1991; Groupe μ 1992) to the relations between the visible and the readable. Referring to the works of Metz and Marin on the iconic message (photo, picture, etc.), the terminological pair 'visible/readable' reminds us that any iconic production displays an underlying linguistic work. The picture translates, 'figuralizes' a primary, premanifested linguistic presence. The verbal and the iconic are intimately interwoven so as to make a verbal-visual complex. The picture shows that 'what it represents is not what it means'. The discrepancy—so dear to the psychology of communication—between the analogical picture and the verbal message that lexicalizes the already iconic there has thus been moved to favor another opposition: between the symbolic linguistico-iconic dimension and the plastic dimension of the picture.

The theatrical spectacle is supposed to display a comparable process that simultaneously includes the scenic picture in the plastic performance (visible and opaque presence of the signifier through the body of the actor, the materiality of the scenery) and in the readable enunciation of fiction (the contextualization of the body in a symbolic structure).

The concept of representation will henceforth be our primary preoccupation. It is tackled through numerous modalities that attempt a more and more detailed approach. Ostension (Osolsobě) is one first approach: it refers to the essence of 'theatricity' through which 'events, persons or oneself are shown' (Osolsobě 1980: 414).

As a follow-up of hypotheses about the iconicity of the theater, the 'monstration' (Gaudreault 1988; Gaudreault and Jost 1990) has led to many contrastive analyses included in the relationship among theater, film, and literature, their aim being to facilitate the emergence of mimesis in acts. The return of mimesis opens up a comparatist avenue that questions the paradigm of the visual arts (Aumont 1990: 153). As narratology and film theory have undergone important mutations (Jost 1991), new methodological pairings have been attempted. The process of the construction of the performance within the various media has drawn the attention of many researchers (Bouissac 1989; Carlson 1990; Gaudreault and Jost 1990). A new branch of multimedia and intertextual studies, based on the relationship between the types of spectacle, and even on the spectator's role, has developed, thus opening the way for an interartistic semiotics.

### The Semiotics of the Opera

The semiotics of the opera rather closely follows the developments in the theory of the theater. This closeness will not surprise us much—after all, Brecht asserts that the opera 'eintheatert'. The similarities between the two arts are numerous: the presence of a double enunciation (of a fiction and its discursive contextualization in the form 'I am at the theater or at the opera'), the status of the interpreter (and of the singing actor), the richness of the performance, the weight of convention and illusion. To this proximity we can add a conception upon which the analysis of the theatrical spectacle has been based and which situates it 'at the crossroads of literature, the plastic arts and music' (Kowzan 1992b: 262). However, apart from the works of Nattiez and Tarasti, and a seminar by Grivel at Urbino ('The ear, the eye, and the mouth'), many studies refrain, 'prima la musica', from taking the visual aspect of the opera into account. If the theatrical spectacle appears a genuinely scandalous challenge to semiology, what can we say of the opera, whose libretto, score, and set give rise to many possible methodological positions? Eric Buysens (1943) does not hesitate to consider the opera as the richest semic fact. Do the semiotics of the text, the music, and the theater help to apprehend the opera-object? Quite curiously—like a ventriloquist's act—the first attempts (Kerman, Noske) focus the research on the *punctum dolens* of the minimal units that are supposed to characterize the libretto and the narrative deixis. Very quickly,

however, it becomes apparent that the matter of the ‘bad topic’ of narrativity deserves an original and highly justified study in the field of music (Tarasti 1988).

The matter of the relevance of narratological models to studies of opera opens the way for research. The temporal structures of the libretto, the possible worlds in the opera, the point of view, and the narrative logic are explored. ‘The most essential element ... is the comparison of the results of the narratological analysis of music and the study of the emergence of certain categories of the “libretto” in music’ (Sivuoja-Gunaratnam 1991: c15).

Beyond the narrative dimension and the ‘poetics of unfaithfulness’ claimed by Nattiez (1983), the issue of the links between the libretto and the performance is revisited by Tarasti (1991) in terms of ‘authenticity’. After a distinction between authenticity and iconicity (1991: a4), Tarasti mentions the opposition between objective authenticity (i.e., the copy is iconic to the model, as Eco says) and subjective authenticity (as tackled by Greimas through the identity between the categories of being and seeming). He notices that this categorization is valid for music as well as for painting. The relationship between the readable and the visible (as discussed above in relation to the theater) can also be applied to shed some light on the semiotic working of the opera. We thus get a dialectic between the image, the visual-auditive materialization and the narrative support that is closely linked to the illusion.

The space where the meaning, the rhythm of fiction (sociologically branded among other things by the interval) can be found does not escape analysis (Carlson 1990): it points to the convention that starts the performance and tackles the issue of the spectacular discourse.

### **The Semiotics of the Circus**

The semiotics of the circus follows certain objectives that are fixed by theater scholars. The code-by-code approach (especially the nonverbal), the separate analysis of each of the languages of manifestation enables Bouissac to describe the process of meaning. His aim is to describe a ‘performance’ as a part of an eventful process that respects the rules of the narrative: ‘it focuses on the sign status of all commutable elements of an “act” and on the schemata formed by the successive actions comprises by an act’.

Recent works favor a comparison between the circus and the theater. Alter sums up as follows:

in any case, in order fully to appreciate circus events, the public must enter a pact whereby any performance will be received as a performance. Theater has different conventions. Its basic pact, whereby everything on the stage is received as a sign, concerns the referential and not the performant function. (1990: 60)

The idea of a spectacular pact, already mentioned in the works of Hotier (1984), insists on the spectacular code of the performance: at the circus there is a tacit contract based on conventions in which the feigned infringement (the acrobat emphasizes the difficulty of his trick by pretending to fall before succeeding in his attempt) is the main part of the spectacle.

As a consequence, if the performance is essential, its relationship to the outside world displays many features of the circus: the incurred risks are genuine, the bodies and objects do not elicit disbelief in the spectator's mind.

Bouissac (1989: d7) closes in on this by emphasizing not only the event-related dimension of the circus spectacle, but also its construction of a reception frame. While evoking the contradiction between the visual information brought forward by the circus spectacle and the daily space of which it is a part, he asserts: 'The circus does not produce its spectacles in a referential reception structure, as a theatrical group does it for instance ... but it rejects straightaway the general system of the existing spatial structures'.

The fundamental question correlative refers to the definition of the spectacular convention and the receptive activity of the spectator.

The spectacular device simultaneously supplies the spectator with the almost punctual perception of the stage and a global vision of the space thanks to the scotopic perception through the peripheral area of the retina which is specialised in the treatment of lesser-lit spaces.... This implies a dialectic of the verbal and visual information; it also implies, as we have seen, a working of the topological categories. (Bouissac 1989: d12-d18)

As it is impossible to fix, determined as it is by its event-related structure and its conditions of reception, the circus asks of semiotics a question regarding the boundaries of the spectacle.

### **The Semiotics of the Spectacle/Spectacular**

Toward the end of the 1980s, the separate approaches to the theater, the circus, and the opera gave way to a more global approach. This movement, as mentioned above, yielded an epistemology that influences the research of practitioners in the neighboring arts. But it can theoretically be justified by the propaedeutic nature of semiotics. It logically invites us to take into consideration the complexity of the scenic phenomena, as well as to organize the dialogue between the analytic approaches.

Far from being a mere accretion of different points of view—like the ‘discoveries’ of the eighteenth-century scientists that were so dear to Bachelard—the paradigm of the spectacle necessitates a major reorientation of the research. Whereas regional hypotheses flourished for a while, the privileged track—at the end of the 1980s—was closer to a jigsaw puzzle that brought together various ways of constructing a model (Balea 1982). The validity of such a course gave rise to numerous interdisciplinary debates.

Set up in Brussels in 1981, the International Association for the Semiotics of Performing Arts—whose denomination is sufficiently explicit—has devoted its two first congresses respectively to the semiotics of the spectacle (Helbo 1982) and to the opera (Helbo 1986).

A second avenue is also explored: the distinction is made (Durand 1982) between the ‘spectacle’ and the ‘spectacular’, between the institutional form, the artificial reconstruction of a coded, closed, autonomous and meaningful system (in a place called the theater, the opera, or the circus), and the basic frame, the rule of our culture that sustains the theatrical identity and the produced effect. The idea of an everyday dramaturgy (Goffman 1974), of rituals, of the theatricality of everyday life (Duvignaud) that is reconstructed and isolated on the stage thanks to the ‘frames’, the montage, the focalization/disbelief, is explored through semiotics (Carlson 1990; Ruffini 1986).

For Greimas and Courtés, the notion of the spectacular even implies a reorganization of the conceptual field of the discipline: one should tackle a function of the

discourse which is determined by external (space, distance) and internal (the presence of the observer) features.

In such a perspective, the distinction between the spectacular and the visual arts incurs caducity: one should henceforward study a form of discourse, whatever the language of its manifestation.

We can be interested in the concept of theatricality, in the distinctive feature that separates the spectacular activity from everyday life. The emphasis lies on the definition of convention, on the boundaries of the spectacular: what is the arbitrary gesture that excludes the natural world so as to reintroduce it in the scenic universe?

Carlson draws attention to the importance of a definition of the cultural and contextual systems of the spectacle (place, insertion in the urban space, spatial codes, determination of the audience). The problem of the boundaries of cultural codes refers to identity: to what extent does our spectacular experience contain emotional features that are indifferent to societies, languages, and audiences? Do the spectacular arts work from cultural references that apply throughout the world?

Schechner (1985), Pavis (1992), and Fischer-Lichte (1990, 1992) attempt a semiotic approach to interculturality. A similar process can apply to the theorization of emotion and passion: can it take place, in terms of universal features, independent of any cultural reference?

Through the theory of interartistic emotion and reception, the semiotics of the spectacle ties in with a question that appears in many descriptions: at the cross-roads of knowledge and pleasure, it reopens the debate between the boundaries of semiotics and its links with epistemology.

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## **Toward a General Rhetoric of Visual Statements: Interaction between Plastic and Iconic Signs**

Groupe  $\mu$

### **Program for a General Rhetoric**

The purpose of a general rhetoric is to describe the rhetorical functioning of all semiotics according to powerful operations which remain identical in all situations.

Such descriptive breadth has been achieved in the field of linguistics and for some transsemiotic systems such as narration. In those several fields, figures as heterogeneous as argotic suffixations and cinematic flash-backs can be accounted for by the same operations of suppression, addition, suppression-addition, and permutation. What varies from case to case are the units on which these operations bear—whether they are semes for tropes or indicators for some narrative figures, for instance. The first task of particular rhetorics, such as those for lexical meanings, narration, plastic or iconic signs, is thus to identify the homogeneous subsystems that define and isolate units on which rhetorical operations will bear (for instance, in a narration, subsystems of characters, indices, and nuclei had to be identified). When we distinguish between plastic and iconic signs brought together in a visual message, we isolate distinct systems and thus provide rhetoricians with a new program: they will have to determine how the rhetorical element infiltrates the plastic and the iconic fields, and to what extent the methods used are the same.

We define rhetoric as the regulated transformation of the elements present in a statement in such a way that the receiver will have to dialectically superimpose a conceived level on the perceived level of an element in the statement (see Groupe  $\mu$  1970a, 1976b, 1977). The operation can be divided into the following stages: production of a gap called allotopia, identification and re-evaluation of the gap. These operations cannot be carried out randomly; they must follow strict rules which will be developed at the proper place. What has been said so far can be illustrated by a linguistic example. In the statement ‘Le lit refait des sables ruisse-lants’ (‘The bed folded again with running sands’—Saint-John Perse, analyzed by Edeline 1972), we can perceive an allotopia between ‘sands’ and ‘bed’, and the

superposition of 'beach' at the conceived level to the perceived noun 'bed' is called for by the context. The same situation can be found transposed to the iconic field in the famous collage by Max Ernst called *Rencontre de deux sourires* ('Meeting between two smiles'): the allotopia there is between the head of a bird and the human body which supports it. It is solved if we consider the bird's head as the iconic perceived level and the human head of the manifest body as the conceived level.

A general rhetoric will thus first define the rules at work in plastic and iconic statements, according to which the receiver will (1) consider a particular statement (or part of a statement) as unreceivable (ungrammatical), and (2) project a conceived level onto it. In the field of linguistics these rules are now fairly well-known: laws for syntactical and semantic combinations are described with increasing accuracy, and further helped by the use of pragmatic notions.

The rhetorician's second task will be to observe the relationship that can develop between conceived and perceived levels. The nature of this link determines the specificity of rhetorical figures, and ultimately their degree of efficiency in a given statement. The nature of the link is itself determined by two variable elements: namely, (a) the rules governing the field in which the operation is brought to bear, and (b) the operation itself.

The complete program for a rhetoric of visual messages, within the program of a general rhetoric, is thus clearly outlined. It will first have to work out rules for the segmentation of the units on which rhetorical operations bear, in the plastic and iconic fields, as well as rules for reading plastic and iconic statements (this is the task of the visual semiology as presented by Groupe μ 1992). In a properly rhetorical perspective it will then work out rules for a rhetorical reading of these statements, describe the rhetorical operations at work in the statements and the various possible connections between the perceived and the conceived levels, and consequently develop a taxonomy of figures, and finally describe the effect of these figures.

The program will have to be carried out distinctly for plastic and for iconic messages. Nevertheless, it can be interesting to consider the two fields together for the following three reasons: if there is a general rhetoric, some of its rules must apply to the two families of messages; a joint perspective makes it easier to distinguish between what is specific to the two types of rhetoric; and striking interactions can be noticed between plastic and iconic elements, and can produce rhetorical effects.

We will also have to ask whether and to what extent general rhetorical principles can be applied to visual messages. In other words: do visual messages meet the necessary conditions to be susceptible to rhetorical moves? More specifically still, do they meet the essential condition for a visual rhetoric to exist at all (namely, the possibility to distinguish in the message both a conceived and a perceived level, and to create within the message the tension which defines rhetoric)? This question will be discussed next. We will then examine the relationship between perceived and conceived levels, which will lead to a classification of figures in visual rhetoric. Finally, we will consider the problem of the interaction between plastic and iconic elements in order to show how this interaction can produce rhetorical effects—can in fact produce an ‘icono-plastic rhetoric’.

### Rhetorical Effects in Visual Messages

#### *Base, Figure, Invariant*

Recall that in a statement with figures, two parts can theoretically be distinguished: one that has not been modified (called base), and one (called figured element/figure) that has been submitted to rhetorical operations and can be recognized by certain markers. The part that has been transformed (the perceived level) retains some connection to its zero level (or conceived level). This connection can be called mediation; it rests on the conservation of a common part between the two levels, which is called invariant.

If we use the words ‘common part’ we posit that the figured element can be split into smaller units. This makes for articulations through which the invariant can be identified, based on an assessment of the extent to which the base is compatible with the figured element.

#### *Redundancy*

Such compatibility is measured in terms of the redundancy of the statement, which makes it possible to notice a gap and to assess it. Redundancy is produced by the superimposition of several rules on one unit of the statement. In the visual field,

however, things are not as simple as in the field of linguistics. To make them clear we have to distinguish between iconic and plastic statements.

In iconic statements the role of the code is fulfilled by an index of types which, for each unit, lists subunits called determinants. Everyone can easily provide a list of criteria to recognize the type ‘head’, such as roundness or upper position. Even when the /head/ of a given statement does not meet all those criteria, and even if the statement has undergone numerous transformations (black and white drawing, etc.), this does not interfere with recognition. Visual redundancy, which so far cannot be measured, is undoubtedly much higher than that found in linguistic messages.

The plastic image, by contrast, has no referent by definition, and the status of type is completely different here. Theoretically a plastic statement cannot be read according to a code. It could be deduced from this that a plastic statement cannot be redundant and therefore is not compatible with rhetorical operations. However, we have established that plastic messages are semiotic in that they associate forms of the expression with forms of the content (Groupe μ 1992). More specifically, we will see that plastic statements can elicit their own code in a stable enough way for gaps to be perceived and reduced. The redundancy that has thus been introduced allows for rhetorical operations, even though it may not be sufficiently stable or intersubjective; yet it makes it possible for us to give a positive answer to the initial question—namely, whether a visual image meets the necessary conditions for it to be the seat of rhetorical operations.

### *Concomitance of Plastic and Iconic Statements: Foundation of an Icono-plastic Rhetoric*

In a statement in which iconic and plastic signs coexist, the zero level seems to be a general rule of co-occurrence. This means that units belonging to one plane, once segregated in the statement as a whole, coincide with units or parts of units belonging to the other plane. In other words, signifiers of an iconic entity coincide as a rule with signifiers of a plastic entity, and vice versa.

How does this rule of concomitance emerge? From looking at the visible world. In this case the plastic element only helps recognition, and vanishes altogether in what is seen. This way of reading is readily transferred to artificial or allegedly artificial statements. A red spot, for instance, will seem to be there only

to help identify the jacket of a character; the thickening of a line will serve to emphasize the cragginess of a face.

We would like to insist here on the usual way of describing the relationship between the two orders of signs. It generally proceeds from the plastic element to the iconic element. Indeed, when the process of identification of an iconic type is described, the perception of a plastic manifestation is foregrounded. Yet this plastic signifier is only potential; it tends to disappear behind the iconic one. This is when the distinction between natural and artificial sights or spectacles must be reintroduced. The reading of a statement or spectacle functions differently in the two cases, since they posit different presuppositions.

But there are also some similarities: in both cases the statement is assumed to obey some inner coherence, to be sufficient to itself and to stand for a regulated structure. In the first stage of the reading the incoming rough stimuli are scanned to foreground whatever might be regular. From that moment onward, the stimuli are no longer a shapeless magma. In a second stage of the semiotic reading, isolated motifs are compared with a list of types, and most of them are identified. Most viewers stop at this stage and neglect the form of the expression, concentrating only on the form of the content. In the case of a natural spectacle the process can safely stop here: a completed reading with no loose ends is one that has identified all the visible objects, for in this kind of spectacle only objects are to be seen, even if some of them may turn out to be deceptive, such as constellations.

But concerning a semiotic spectacle, even an iconic one, things are different: it is not necessary that all visual stimuli which form plastic objects resolve themselves into iconic objects. In a semiotic spectacle, the same right to exist is granted to both plastic and iconic signs, which are sometimes similar and sometimes different. An uninvolved observer could validly deduce from the law 'In a natural spectacle there are only objects' the following corollaries: 'In a natural spectacle there is no plastic element' and 'all rhetorical effects are banished'. But when we respond to the beauty of nature (for instance), we also perceive plastic features in it, *as though* it were a semiotic spectacle. This attitude is widespread. It is, however, in the semiotic spectacle that the second kind of relationship between plastic and iconic signs specifically develops; we will call this an *icono-plastic* relationship.<sup>1</sup>

The icono-plastic relationship is the foundation of a third category of rhetorical figures, next to the plastic and the iconic figures. In a given statement consisting of iconic and plastic signs, a deliberate plastic move may lead to perceiving plastic

signs whose borders do not coincide with those of the iconic signs. One way the viewer can handle this situation is to try to suppress the difference by presupposing that it has to modify the iconic signified. Another way is to shape the iconic statement so that it serves a particular plastic logic. Rhetorical discrepancies are thus attempts to contradict the necessity of the norm of concomitance.

### The Icono-plastic Relationship

#### *General Description*

Icono-plastic figures are made possible by a fact mentioned earlier—namely, that iconic signs cannot manifest themselves independently; they depend on plastic signs to become actual, and this coexistence tends to obey what we have called a rule of concomitance.

An icono-plastic figure will result in all cases when a rhetorical relationship develops between two elements belonging to one plane while redundancy occurs on the other plane. Let us develop an example: the head represented by a square in an otherwise carefully accurate and ‘realistic’ drawing of a human body. The square would not have been anomalous in a schematic drawing resulting from a topological transformation in which the flexions of limbs would be represented by more or less acute angles, and the limbs by straight lines. But the chosen context called for curving lines, the kind of plastic outline corresponding to the subdeterminations of type ‘head’ compatible with the drawing. Here we face one of those plastic tropes that allow for the combination of perceived straight lines and conceived curves. However, this plastic trope is produced and received thanks to a redundancy in the iconic order.

Starting from these bases we can now consider a classification of icono-plastic figures. The criteria for classification will differ slightly from those used for a general rhetorical classification: while the couple *in absentia* vs *in praesentia* is still valid, the opposition conjunction vs disjunction is no longer relevant; indeed the two degrees are always necessarily jointly present (conjunction) due to the redundancy of the statement. By definition, this redundancy works on a different plane from that used for rhetorical units. In other words, when these units are of a plastic nature, they come together (in conjunction) because of an iconic statement, and when they are of an iconic nature they do so because of a plastic statement.

The particular case of icono-plastic couplings brings together pairs of simultaneously present units, any one of which can be reevaluated in relation to the other. In this case reversibility—which in principle is always present in a figure, but is often checked by the context—is certain: what we have is an effect of oscillation.

We thus end up with a four-entry matrix and four possible tropes (Table 1).

Table 1.

Mode	Place of conjunction	iconic	plastic
<i>in absentia</i>		Plastic trope in the iconic order	Iconic trope in the plastic order
<i>in praesentia</i>		Plastic coupling in the iconic order	Iconic coupling in the plastic order

### *General Classification*

The way these categories of figures function can be illustrated by a number of combinations in which I and P stand for iconic or plastic orders, p and c for perceived and conceived, and S for statement.

*Plastic Trope in an Iconic Order.* In Figure 1 the two units belong to the plastic level and can be substituted due to an iconic redundancy.

Instance playing on the variable ‘shape’ of the plastic sign: the man with a square head mentioned above. Instance playing on the variable ‘color’: when in one of his strips with Yoko Tsuno as heroine, the cartoonist Leloup invents a young lady from the imaginary planet Vinéa, he makes her look exactly like a European, but with a blue skin. He does of course intend to suggest some new ‘Vinean’ type with /blue/ as one of its subdetermining features, but readers cannot help wavering in their recognition of this new type, and the rhetorical anthropocentric reading /blue/ (pP) is perceived in its tension with /flesh-colored/ (cP).

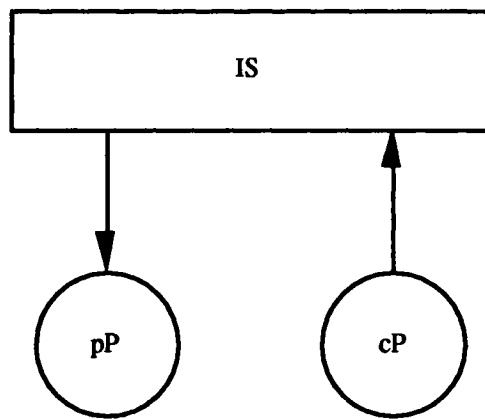


Figure 1.

*Plastic Coupling in the Iconic Order.* In order to illustrate Figure 2 *in praesentia*, in which an iconic redundancy establishes a rhetorical relationship between two plastic units, we could imagine a drawing of a man, which would ensure a high degree of iconic redundancy; his eyes, ears, arms, and legs should be similar and symmetrical. Supposing, for instance, the artist has only partly respected the symmetry and colored one leg in red and the other one in green; the iconic redundancy (IS) compels us to note the relevance of the coupling of two plastic units (a red and a green area, which are alternately pP and cP), and to interpret it as pointing to the complementarity of the two legs rather than to their similarities.

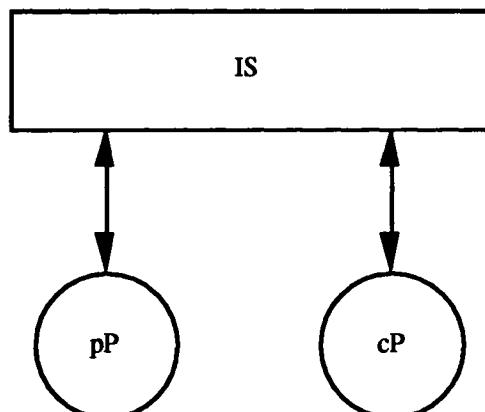


Figure 2.

*Iconic Trope in the Plastic Order.* In Figure 3 the statement is plastically homogeneous (PS). This applies to all sorts of repetitions such as friezes or the succession of capitals in a cloister. Even if the repeated elements belong to the iconic order, the way the repetition functions is plastic (unless recurrence corresponds to an iconic criterion, as is the case in the representation of centipedes, backbones, bicycle spokes, or regiments). If a series of capitals with a rhythm based on the repetition of human forms then has an animal form inserted into it, we are allowed to read this as an iconic substitution which creates a rhetorical relationship between the animal (pI) and the human representation (cI).

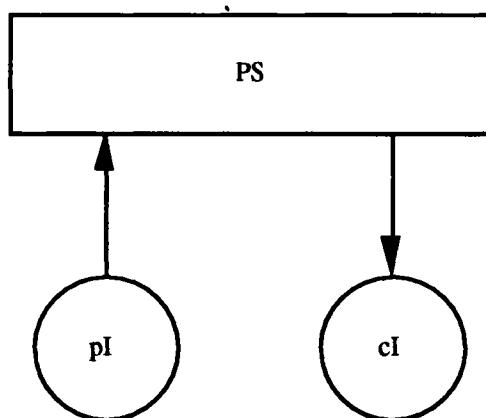


Figure 3.

*Iconic Coupling in the Plastic Order.* Figure 4 is probably the combination most frequently found in Western painting. We could start from a pastel drawing by the Belgian painter Maurice Pirenne, *Paysage d'industries* (landscape with industrial plants). The drawing presents simultaneously a country upland with, further down, an urban combination of factories and houses. The salient feature is the yellow color which links the upland and the buildings. There is no need to posit a typological rhetorical effect here: house gables can be yellow. But because of the law of concomitance, the strongly predominant color leads us to posit one single iconic type, which can only have a limited degree of stability. The oscillation occurs here between this nameless iconic type and the coupling of two encyclopedically stabilized and often opposed types: country and town, presented here as

though they were symmetrical ( $mI > cl$ , with the  $p$  variable alternately town and country). The comparison is made possible by the common color (PS).

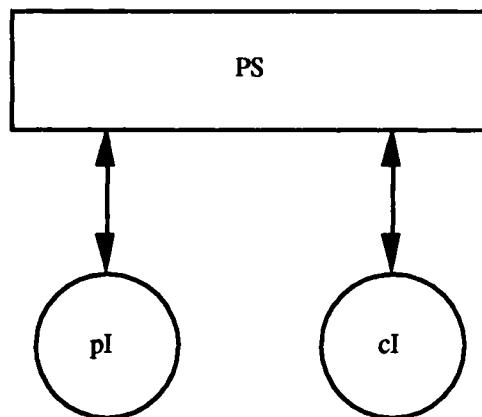


Figure 4.

#### *The Icono-plastic as a Form of Rhetoric*

As seen above, we can consider that some icono-plastic processes are rhetorical effects: indeed, they run against the law of concomitance between plastic and iconic signifiers which has been established as the norm. Yet before we examine the main groups of icono-plastic figures, we have to consider the conditions which make these effects possible: i.e., redundancy and free variables.

In the iconic order, the functioning of a statement rests on the recognition of types. But these types are formally overdetermined: they offer many redundant determinations. The fact that a drawing can consist of a mere outline shows that both color and surfaces can be dispensed with. On the other hand, the types we are referring to have a degree of generality such that they leave a number of variables free: a 'house' can be presented as /blue/, /white/, or /yellow/ and still be a house. A painter can thus change the colors and the shapes of his or her model and still be thought of as figurative, for the iconic nature of a sign is never assessed from the conformity of the image to the model, but from the conformity of the signifier to the type.

These features taken as a whole make those various icono-plastic moves possible which fit into the spaces left open by redundancy and the free variables in the name of a plastic object that is superimposed upon the iconic project, and changes its significance.

From a genetic point of view it can be considered that the plastic purpose predates the statement while the iconic one only conforms to it. In this case, far from being subservient to the iconic level, the plastic element thus shapes and informs it. The interaction between the two goes further, since the identified iconic element helps in turn to identify the plastic project.

What happens is of a rhetorical nature. Indeed, the plastic statement is a sign. As such it has a signifier which consists of repetitions, parallels, symmetries and the like. Now these can all be defined as adjunctions or deletions of order in relationship to a figurative zero level.

The effect of such rhetorical discrepancies is related to the two categories of possible discrepancies on the axis of order: more order strengthens the cohesion of the statement and corresponds to an ordered view of the represented world (which needs not be harmonious or euphoric). Too much disorder, by contrast, corresponds to a chaotic vision of a world that has lost all meaning. So far what we have is a nuclear signified of a very general order, on a par with the generality of the moves that create it. The following instances will show that this signified can become somewhat more specific on an autonomous level, according to which iconic entities are forced into and onto the plastic project, and that complex statements may or may not heighten these effects.

### **Detailed Consideration of Icono-plastic Figures**

#### *Icono-plastic Effects with Texture*

We will start from Cézanne's painting *La route près du lac* (The road along the lake, 1885-1890), in which we can observe an interesting use of hatchings or brush strokes: only horizontal, vertical, or 'rising' oblique hatchings are used. Their length and breadth are by and large the same all over the painting. A quantitative analysis of the canvas points to a significant prevalence of the oblique hatchings (79 percent) by comparison with the horizontal (16.5 percent) and the vertical (4.5 percent). It also shows that all hatchings touch each other: there is neither a

progression of the oblique element nor any smooth area. Each iconic area is manifested through a single kind of hatching (the road for instance is painted in horizontal strokes), but one kind of hatching may overlap to neighboring types: for instance the oblique hatchings are used similarly for an embankment, bushes, leaves, and part of the sky. It must thus be observed that texture plays an extremely weak if not nonexistent part in discriminating between iconic types; in fact it rather functions as a unifying factor on the plastic level and counteracts the division of what is presented into different colors.

There is a further contradiction in a figurative painting like this one between what is presented and the natural orientation of things. Hatching has a directional significance. It would thus seem 'normal' to use horizontal strokes for types such as the 'road' or the 'lake', much less so to use oblique strokes for 'tree trunks', and utterly irrelevant to use them for the 'sky'. Such discrepancies can be called rhetorical since these are places at which we would expect either another orientation (vertical for the tree trunks, for instance) or no hatching at all (for the sky).

To reduce the discrepancy, which will be the second stage in the rhetorical process, we could refer to the oblique rays of the sun as a unifying principle resulting in oblique strokes. However, this is necessarily subjective, since other iconic explanations could be equally valid—for instance, the effect of the wind, which bends all that lives, or the slanting sides of the hill.

However things may be in the case of this Cézanne painting, several interpretations of which can coexist, we note the dominant icono-plastic influence of the oblique strokes. What then is the function of the remaining 16.5 percent of horizontal strokes and 4.5 percent of vertical strokes? They simply provide the viewers with rational and physical axes from which angles can be perceived. When he recalls the horizontal weight of water and earth, Cézanne makes the referential directions of the frame internal to the painting and lightens the sense of unbalance and precariousness suggested by the high number of oblique strokes. When he 'frames' his oblique hatchings between horizontal and vertical ones, he somehow neutralizes them or establishes a mediation between them and the frame, not only of the canvas itself but of the walls and rooms in which it necessarily stands—unless we decide to say that those oblique strokes mediate the opposition between the horizontal and the vertical.

Cézanne was fascinated by texture. His early years (1862-1868), which he called his 'période couillarde' or 'big-balled period', are characterized by the 'generousness of a thick paste, heaped several layers thick with the knife' (AA.VV. undated:

1353; translated from the French). Yet it is his use of hatching which is most striking in his famous painting *Trois Baigneuses*. This results again in an icono-plastic effect, although in this case the canvas is not entirely hatched. Oblique strokes at about 38° are used for the top part of the canvas—that is, the trees and the main bather—while horizontal strokes are used in the bottom part—the water and the grass on the bank. The surfaces covered by those hatchings are different and there are rather more oblique than horizontal strokes, but the difference is not as marked as in *La route près du lac*. (Anyway, the hatching is not systematic, and there are areas left unhatched, such as the bodies of the other two bathers.) The distribution of hatchings again works against the principle of concomitant variation. It also contravenes the principle of figuration for natural textures. Indeed, ‘natural’ hatchings for grass should not be horizontal, and if the naked bathers on our beaches were hatched we would probably be less inclined to kiss them. The kind of hatching used by Cézanne is thus a discrepancy made possible by the redundancy of texture and color, which can be reduced by means of the information provided by the list of types.

But of course reduction does not nullify the discrepancy, nor does it give the solution to an enigma: it rather involves the perception of a significant effect, which in this case is double. On the one hand grass is negated as vegetal substance and assimilated to the horizontality of the ground on which it rests; its main function is probably, as in *La route près du lac*, to provide a perception reference to the painting. Hatching makes the perception of the reference far more obtrusive thanks to the effect of overlining. On the other hand, hatching assimilates the tall bather, whose posture is slightly curved, to the vegetal world around: she somehow becomes plantlike, with all this can imply on a semantic or poetic level. Things go even further, as acutely noted by the author of the following commentary on *Trois Baigneuses*: ‘In this composition, as in others on the same theme, Cézanne endows his apparent strokes with an essentially rhythmical function by giving them a given orientation, whether oblique, horizontal or vertical’ (AA.VV. undated: 1359). Through their repetitiveness, hatchings do give a rhythmical shape to space. In this painting the effect is doubly rhythmical, since it involves intraserial repetitions (parallel strokes) and interserial repetitions (hatched areas with given angular differences). The significant effect with which this plastic move endows the statement is fairly vague and undefined. It is no longer an icono-plastic effect in the sense that it would modify the significance of this or that figurative unit; but, in making space and orientations discrete, it superimposes a ratio-

nal grid on the landscape, thus reducing its strangeness and unpredictability and making it more easily readable.

### *Icono-plastic Effects with Shape*

Contrary to textures and colors, lines are not a property of surfaces. They involve different mechanisms, which detect special motifs in the recurrence of lines as well as their characteristic features (straight, curved, broken, dotted lines). These detecting mechanisms have a contiguous and short-range mode of operation; i.e., they work on continua of adjacent dots. As a plastic variable the line is part of a more general analysis which organizes a set of lines according to certain rules (for instance, whether they touch each other or close upon themselves) and then produces the shape. Shapes in turn contribute to identifying types through referring to the list, and if a high enough number of features conform to the type (in regard to shape as well as to color and texture) an iconic hypothesis can be reached.

We will not repeat here how this iconic hypothesis can lead to a rhetorical reading. Rather, we will focus on the case where discrepancies concern sets of two or more types and are thus suprasegmental. This occurs when the signifiers of two different types are jointly present in one and the same plastic shape, whether the first signifier appears to continue into the second (as in interpenetrations, an instance of which would be the ‘cat-coffeepot’), or whether the two signifiers are so obviously similar that they combine in a homogeneous plastic sign (parallelisms, similarities, complementarities—i.e., what are usually called, after André Lhote [1967], ‘plastic rhymes’). The list does not provide any type that would allow us to see new manifestations of iconic signifiers; viewers have to create them, as in the ‘cat-cum-coffeepot’. In this case the detected moves are presumed to have been intentional, and viewers project a signified of their own.

Klee’s *Mère et enfant* (1938) offers an instance of an icono-plastic figure based on shape. It uses few colors: apart from a blond area for the mother’s hair, probably the only color in the painting that has an iconic value, the only two colors are shades of umber and turquoise. They almost never touch, since they are contained within thick brown lines. These two colors, chosen independently of any iconic correspondence, are complementary and add up to a shade of grey, which obviously contributes to the theme.

Another characteristic feature is the perfect imbrication of the two characters, who fit into each other like pieces of a jigsaw puzzle. The colors' complementarity is thus echoed in the complementarity of the figures, whose shapes cover an area without either gap or overlap. The composition rests on an equally complementary structure of horizontal and vertical lines: noses, axes of the faces, hands of the mother.

But a more daring plastic figure is used in the outlines. As is well known, outlines are still perceived as being part of the shape. Now, in Klee's painting the outline of the mother's face and neck is common to mother and child, so that the picture calls for an oscillation in the reading: is this the outline of the mother's features, or of the child's? As in the well-known figure by Rubin—vase or profiles?—it is impossible to see both at the same time. The line can be said to effect a plastic mediation between the two iconic types and to suggest their consubstantiality.

Lastly, there is something of a suggestion that the mother herself is part of a larger body located outside the frame, a body whose shoulder would be in the top right-hand corner and whose chin would be in the top left-hand corner. The same ambiguity of lines is at play between the mother and this hypothetical encompassing figure. The whole painting thus presents a hierarchy of imbricated figures in a generalizing movement which viewers are expected to carry further and which easily fits into the notions of motherhood (see the matriochkas) or of filiation.

### *Icono-plastic Effects with Color*

Color can also be involved in an icono-plastic relationship in each of its three components: colored dominant, saturation, and brightness. To make an iconic statement with 'unsaturated colors' is to enter a plastic project which can often be defined through the limitations imposed upon freedom in the choice of colors. It has been said that painters interested in colors could be divided into 'colorists' and 'valuists'. When we refer to a painting as consisting of 'fauve shades' we define it through its plastic effects, and it is immediately obvious to anyone that paintings by Matisse, Mondrian, or Van der Leck, who work with pure highly saturated colors, are essentially different from those by Boucher, Constable, Turner, or Buffet.

We can note again that the plastic project is independent from the iconic project and can be perceived before any figurative interpretation. Nevertheless, the two projects do interfere with each other, as will be shown presently with Pirenne's pastel drawing *Paysage d'industries*.

This drawing, mentioned above, shows an industrial valley with workers' terraces and factories next to a more rural landscape. In terms of color, a strong horizontal stratification opposes the blues and pinks of the sky to the whole landscape including houses, factories, and hay fields. The fronts of the houses are of the same golden yellow as the fields. From the start the viewer thus perceives a yellow object, which does not coincide with any iconic type. The statement is wholly iconic, but the double status of the color yellow forming a plastic object has to be carefully analyzed. As the color of the dry hay field, yellow is iconic and belongs to the paradigm listed in the types. As the color of houses' gables, by contrast, yellow is a free variable, not listed as belonging to the type. Pirenne was not free to choose the color of the hay field, but was free to choose the color of the houses. By choosing to use the same for both he undoubtedly strayed from any external reference that may have served as a starting point, without being any less figurative. He took his referent through the (partial) transformation of a colored filter so that he shapes one plastic object, the limits of which only partly coincide with iconic demarcations. This object is perceived, yet it does not lead to any recognition: from other clues such as shape buildings and fields can be distinguished separately, but no identifiable object corresponds to the yellow color. (Our description of the way yellow is used also applies to the color green. Among the yellow gables we can indeed see some greenish roofs; but in this case chromatic coupling associates the roofs and the hillsides.)

However, the meaning of such use of color remains perfectly opaque as long as types have not been identified and the combination of the various presented objects further elaborated: viewers cannot remain passive, and what we observe here is the kind of participation that is expected of them if they are to account for all aspects of the image. This interpretation is not coded, and thus includes some uncertainty as to its results. Nevertheless, as it is essentially semantic, the visual components of the image can support elaborate meanings that sometimes involve implicit concepts, which cannot be represented visually and can only be expressed through words. In the case of Pirenne's pastel painting the landscape brings rural and industrial worlds together; the latter definitely belongs to the realm of human artifacts (that is, to the world of culture), while the former, though not strictly speak-

ing a part of nature, is still very close to it. We thus have an iconic opposition between nature and culture even as they are united in one plastic object. The opposition is thus mediated by color.

The plastic project is then justified in that the painting acquires a meaning which accounts for both its plastic and its iconic elements, something like: 'the opposition between nature and culture is vain, it is abolished in the sun's light....'

To what extent can the painter's intention here be called rhetorical? Rhetoric proceeds from a discrepancy that can be both perceived and reduced. Now a yellow-painted house is still a house, just as a moss-covered roof is still a roof, and if there is a discrepancy, it could only be in the high improbability of coming across so many yellow houses and green roofs side by side. Similarly, it is difficult to establish how such discrepancy can be reduced, since there is no 'normal' color for a house, nor any 'normal' combination of colors for the gables and house fronts found in a town.

The icono-plastic relationship is probably one of the important features exploited in figurative art. We have described how it functions for the three components of the plastic sign: texture, color, and shape, repeating in each case a similar process. We also observed the rhetorical nature of this relationship, since it introduces either more order or more disorder. In addition we have shown the nuclear ethos of the figures it produces, and in several instances we have specified the autonomous or synonomous ethos engendered by the figure in a given statement.

An important though indirect theoretical result must also be noted: the existence of an icono-plastic relationship is evidence that the plastic element is autonomous from the iconic representation. In fact plastic and iconic elements complement each other. Because it is the phenomenological signifier of the iconic sign, the plastic element allows viewers to identify the iconic, while the iconic element thus identified makes it possible to discover a content in the plastic elements that do not belong to iconic types. The latter process is yet another proof that the plastic sign is indeed a sign—that is, the union of form and content.

#### Note

1. The rule of icono-plastic co-occurrence is of course only valid for statements combining plastic and iconic signs; it cannot apply to purely plastic state-

ments. In this case, however, another rule of co-occurrence is applicable: the rule defining the parameters of the plastic sign. One color will correspond to one shape. This expectation of co-occurrence can be explained because of the way figures are produced (in the sense of 'perceived'): a figure which its contour distinguishes from the background is recognized as much by means of color or texture as by shapes in the strict sense of the term. Figures are thus all the more obvious, as they are redundant in the three plastic levels. It can be noted that the rule of icono-plastic co-occurrence is completed by the present rule of purely plastic co-occurrence. In the case of an icono-plastic statement the co-occurrence will be between an iconic unit on the one hand and a shape, a color, and a texture on the other.

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Groupe μ (Center for Poetic Studies, University of Liège) has, for more than twenty years, undertaken an extensive body of interdisciplinary work in rhetoric, and in linguistic or visual communication theory. Apart from the authors of the present article—Francis Edeline, Jean-Marie Klinkenberg, and Philippe Minguet—the group has counted as members Jacques Dubois, Francis Pire, and Hadelin Trinon. Beyond their personal research in biochemistry, cultural sociology, aesthetics, or semiotics, the authors have published collectively *Rhétorique générale* (1970, since translated into a dozen foreign languages), *Rhétorique de la poésie* (1977), *Rhétoriques, sémiotiques* (1979), and *Traité du signe visuel* (1992), as well as more than fifty papers in such journals as *Communications*, *Poétique*, *Versus*, *Cahiers Internationaux de Symbolisme*, *ERA*, *Le Français Moderne*, *Texte*, *Documents de Travail d'Urbino*, etc. or in collections of papers like *Mélanges Greimas*, etc.



## **The Transformation of Traditional Histories of Representation: An Introduction**

**Barbara Maria Stafford**

What amounts to a paradigm shift may be described as the move currently underway from a text-based world, ushered in by the mass literacy movements originating during the Enlightenment, to an electronic imaging era. Visualization returns us, I believe, to the opportunities and challenges of an interactive, integrated, and now high-tech visual-oral culture, characteristic of the pre-modern period (see Stafford 1991, 1994). In short, we are moving forward into the past. This turn of the historical wheel once again offers those of us working with images across fields, disciplines, and periods the chance to construct the cognitive and social milieu of our time. The topic is vast, this essay is short. Nevertheless, I would like to raise certain general issues and to outline some specific instances that highlight the need for a visual pedagogics and, more fundamentally, for a remetaphorization of images from their historically low cognitive status as an 'inferior gnosis'. It is striking that the broad cultural and educational ramifications of the new imaging technologies have not yet been examined in a comprehensive way.

On one hand, the mixed media of sight and sound—already available in computer systems that readily hear and respond to spoken commands—provide a means for cutting across an increasingly diverse population, encouraging active learning, self-discovery, and problem-solving in people who do not speak the same language, except for that universal imagism that Bishop Berkeley dreamt of in the eighteenth century. On the other hand, any overarching institutional or disciplinary reconfigurations occurring in this new climate will have to take a long-term view of electronic images, both inside the classroom, and outside, in society. Further, I predict that the humanities, social sciences, and physical and biological sciences (or the fields dealing with traditional theories and practices of representation as heretofore construed) will need to redefine and reposition themselves in this altered intellectual and electronic environment of simultaneous presentation. Because of computers, texts will increasingly take on, if not a deflated, then a composite role as one more pattern among patterns. The book of the future will

no doubt be a digital-image compact disk, the library an electronic environment connected by Ethernets. The scanner-scholar, or new Romantic, in this not-too-distant utopia will be an independent desk-top image-manipulator and word-processor capable of working alone while drawing on a global database.

This shift of all information to the intrinsically visual entails, I believe, a fundamental revision of the conventional wisdom not only regarding the supposed sophistry of apparatus (that is, the belief that all optical technology is a form of visual quackery), but of the widespread Platonic opinion that images are synonymous with the manufacture of fraudulent simulacra constituting a sort of secondary experience. Understanding that illusion is not delusion requires an educated public acutely aware of how images variously communicate and persuade. Thus the mandate of the history of science is approaching that of the history of art. Indeed, looking at technical practices and changing media transforms our very concept of history as narrative. Investigating visual rhetoric, or the arts of demonstration, exhibits the intricate means for optical persuasion embodied in reflection-provoking images. This much-needed historical dimension—for which scarcely a voice has been raised in the general critique of mass media—would remind the larger public that technology and imagination, instruction and pleasure, thought and pictures, can and, in fact, have been fruitfully conjoined in the past. There is no reason other than academic prejudice that they cannot be reunited in the present. There are, of course, entrenched institutional reasons and traditional power structures that contribute to maintaining the text/image hierarchy.

Let us look at some concrete examples of image transdisciplinarity at the end of modernity. If it is true that our society is shifting increasingly toward communicating with pictures rather than with texts, I would like to suggest several ways in which a new cadre of imagists are in a special position to help members of fields untrained and unskilled in the rhetoric of images to deal knowledgeably, appropriately, and responsibly with this global medium for communication. My selections come from the areas of medicine and law because these are fields in which I am currently involved. The collaboration involved is transdisciplinary, not interdisciplinary, because such joint labor is based on the equality, mutual respect, and retention of individual expertise of the researchers and their specific disciplines. These cases look forward, I believe, to what may be an imaging art-science of the future predicated on the disanalogy between words and images lost in early modern and postmodern criticism.

I want to mention, first, an international symposium on 'Imaging the Body: Art and Science in Modern Culture', co-organized by Robert Beck, Director of the Center for Imaging Sciences at the University of Chicago, and myself (held in April 1992). Its aim was to place the new medical imaging technologies (PET, MRI, and CT scans) within the larger historical perspective of image-making and the changing views of the body ranging from the corporeal musclemen of the Renaissance to the postmodern era of colored apparitions restlessly floating on a luminous computer screen.

Coinciding with and planned around this symposium were three exhibitions. The first, 'Imaging the Body: From Fragment to Total Display', instantiated the themes of fragmentation, ideality, and monstrosity, passionate and dispassionate observation, and the new transparency brought about by modern equipment, that the symposium investigated. It asked through its very pattern and arrangement how, in our post-industrial and post-historical milieux, the human body, constituted of recombinable and digitizable parts, might be reunified or reconstructed. The second exhibition, 'Metaphors of Biological Structure/Architectural Construction' (mounted at the Ryerson and Burnham Library of the Art Institute) explored the longstanding association of the human body with buildings stretching backward to Vitruvius and forward to Stanley Tigerman. Metaphors of youth and age, of the sketchy or ruined artificial and fleshly façade were explored. Finally, the Smart Museum at the University exhibited a selection of biological and physiological manuals, treatises, and folios. 'Depth Studies: Illustrated Anatomies from Vesalius to Vicq d'Azyr' investigated the changing modes of penetrating vertically and violently into the somatic interior.

Shifting gears, and turning to a different (but not unrelated) area, I want to mention the revolution occurring in the nature of visual and demonstrative evidence in the courtroom. The new cross-disciplinary imagist, I believe, has much to contribute to several hotly debated legal issues that will no doubt be argued before the Supreme Court during the next few years. Some of the major visual issues in contemporary trial practice revolve around hermeneutical and ethical problems. These include, first, DNA 'fingerprinting' cited in criminal cases to identify lawbreakers by 'typing' their DNA. This technology has been heralded as 'a prosecutor's dream'. Yet we should be concerned about the reliability of DNA evidence and, more broadly, about the manner (hence the need for a historical perspective) in which this and other new scientific techniques, designed for forensic use, are developed, validated, and promoted. A second issue arises in child abuse

cases where, traditionally, the child has been separated from the alleged molester by a screen. What does this shadow projection do to a jury? Pressure is mounting in certain quarters claiming that the accused has a right to confront the accuser. Third, the increasing use of videotapes and the question of whether this form of evidence is consistent with due process needs to be examined. How this imagery is constructed, and the psychological responses to partisan images manufactured to win a particular verdict has not been discussed. Fourth, and related to the previous example, is the matter of wrongful life videos. These currently lack any normative theory as to which style is actually congruent with the situation. Sixth, there is an increase in the use of expensive anatomical or architectural models in which the method of presentation also needs to be a matter of concern. Seventh, economic testimony frequently makes use of badly-conceived, and hence fundamentally unaesthetic, charts and graphs from which the jury is asked to project into the future. As Edward Tufte has shown, however, much contemporary graphic design is actually 'chart-junk', and, therefore, misleading and useless. Finally, I think the most pertinent area for future collaboration involves the computer reconstructions of events: animated crimes or video simulations of accidents. Recently, newspapers have raised the question whether, in death penalty cases, the jury should have access to the impact of the crime on the victim. The prosecution wanted to show photographs of what she was like while still alive in order to evoke an image of what the deceased might have become had she lived. In all these cases, it is the image component that the text-bound legal profession could use some help with.

My purpose has been to focus on a few of the productive, positive, and truly collaborative potentials of our evolving field. Images must be pried loose from those negative metaphors reducing them to mere 'imitations', 'simulations', or degraded 'copies' of some higher and nobler written reality. My hope is that our culture will begin remetaphorizing all graphic patterns, including the electronic or digital, into the constructive and illuminating educational forces that, at their best, they have always historically been.

## References

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1991 *Body Criticism: Imaging the Unseen in Enlightenment Art and Medicine*. Cambridge, MA: The MIT Press.

- 1994 *Artful Science: Enlightenment Entertainment and the Eclipse of Visual Education.* Cambridge, MA: The MIT Press.

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**New Visual Technologies/New Society**



# **The Future of Imaging Science**

**Robert N. Beck**

The late 20th century is witnessing an explosion of techniques that may be unparalleled since Galileo and van Leeuwenhoek shook the 17th century to its intellectual foundations.—Perhaps the subtlest effect of innovations in technique, however, is not on the field, or on the researchers, or the speed of data collection, but on something that is both more tangible and often less consciously appreciated: images of the natural world.  
(Stephen S. Hall)

## **Preamble**

Visual images are a part of our earliest experiences in life. We see before we speak. We perceive and recognize objects in the world around us, as well as images of those objects, before we learn their names. We know that certain visible objects can satisfy our needs before we can verbalize those needs. We gain insight into relationships among visible objects long before we can explain these relationships in abstract terms (e.g., ‘round pegs don’t fit into square holes’). Thus, from an early age, we come to accept the images that result from natural vision as a source of important information that will help us to cope with the world.

At the same time, our Western culture has taught us to be wary and even distrustful of images as reliable sources of information and knowledge. ‘Seeing is believing’ is a dangerous adage and should not be accepted uncritically. The dancing shadows on the cave wall bear little resemblance to the objects that cast those shadows; i.e., such images are clearly imperfect representations of the objects. A rigid rod does not bend sharply on entering the water; it merely appears to do so. Such imperfections and false appearances may be explained in words and

described quantitatively in mathematical terms; as a consequence, these latter modes of knowing and communicating are generally regarded as being more reliable than images of objects. On the other hand, images may provide a great wealth of useful information, aspects of which are of such complexity as to defy detailed verbal or mathematical description. In many instances, particularly in the physical and biological sciences, imaging devices may provide the *only* means for observing and measuring certain object properties. Also, it is clear that certain images can accelerate insight. Others can affect us in unique, powerful, and deeply personal ways. Images can be used to excite every human emotion from ecstasy to despair, and to convey a sense of mystery that stimulates our curiosity and imagination in ways that words alone may not—and, interestingly, *vice versa*; however, my point here is that no one would expect a poet, a linguist, or a mathematician to provide the *experience* of ‘knowing’ the Mona Lisa without *seeing* it! The broad questions that emerge from our experience are: How are we to understand the separate roles of images and words as means for learning/knowing and communicating? And how can we best make use of *both* to enhance the quality of our lives?

## Introduction

In recent years, images have become commonplace—a ubiquitous part of everyday life and culture—and currently are being produced in huge numbers to serve the needs of virtually every area of science, engineering and technology, medicine, education, and commerce and industry, as well as the advertising, news, and entertainment media. Despite this fact, the title of this chapter begs many questions, such as: What is imaging science? Isn’t the very term ‘imaging science’ an oxymoron (i.e., is it possible to have a ‘science’ of something that is recognized as being intrinsically *false*)? Does imaging science exist presently in any form? What is its past? What is the current state of its development? Is it of sufficient importance to warrant increased attention in the future? What challenges comprise its intellectual agenda, and who will carry them out? What sort of training will these individuals need? What will be the impact on our culture of a fully emerged discipline of imaging science? And finally, what is the relationship between imaging science and semiotics?

Although entirely satisfactory answers to such questions do not presently exist, an exciting part of my research in medical imaging has led me to conceptualize how imaging science might be defined (Beck and Crewe 1988), and how images relate to other means for knowing and for communicating about material objects of interest, such as the human body and brain. In particular, I have been interested in understanding how *visual* and *verbal* means relate to each other, and have found it helpful to think of both images and words as *signs* that are useful for knowing and for communicating, as well as to regard the visual and verbal modalities as components of the broader field of semiotics, which I take to be defined as the ‘science of signs’.

Furthermore, I have found it helpful to examine the relationship between the visual and verbal modalities from an evolutionary perspective, as I will do here, in recognition of the fact that our success in surviving and thriving as individuals, and as a species, is now, and has always been, dependent on information about the environment in which we live, and on our ability to process this information efficiently and to respond to it adaptively. Moreover, it is clear that much of this information comes to us in the form of light and sound, through the senses of vision and hearing, both of which evolved very early in many living systems, along with the senses that require some degree of material contact or close proximity—touch, taste, and smell.

Based on eclectic reading, I offer a brief summary of my current conclusions and concerns, which may explain why I see imaging science and the associated technologies as giving rise to ‘the Tsunami of the future’ that has begun already to inundate our lives and culture in ways that are not guaranteed to be uniformly positive. Cultures that respond thoughtfully and adaptively to this unprecedented phenomenon may survive and, indeed, thrive; others may well vanish.

### **Early Evolution of Vision and Hearing—Prior to c. 20,000 BP (Years before the Present)**

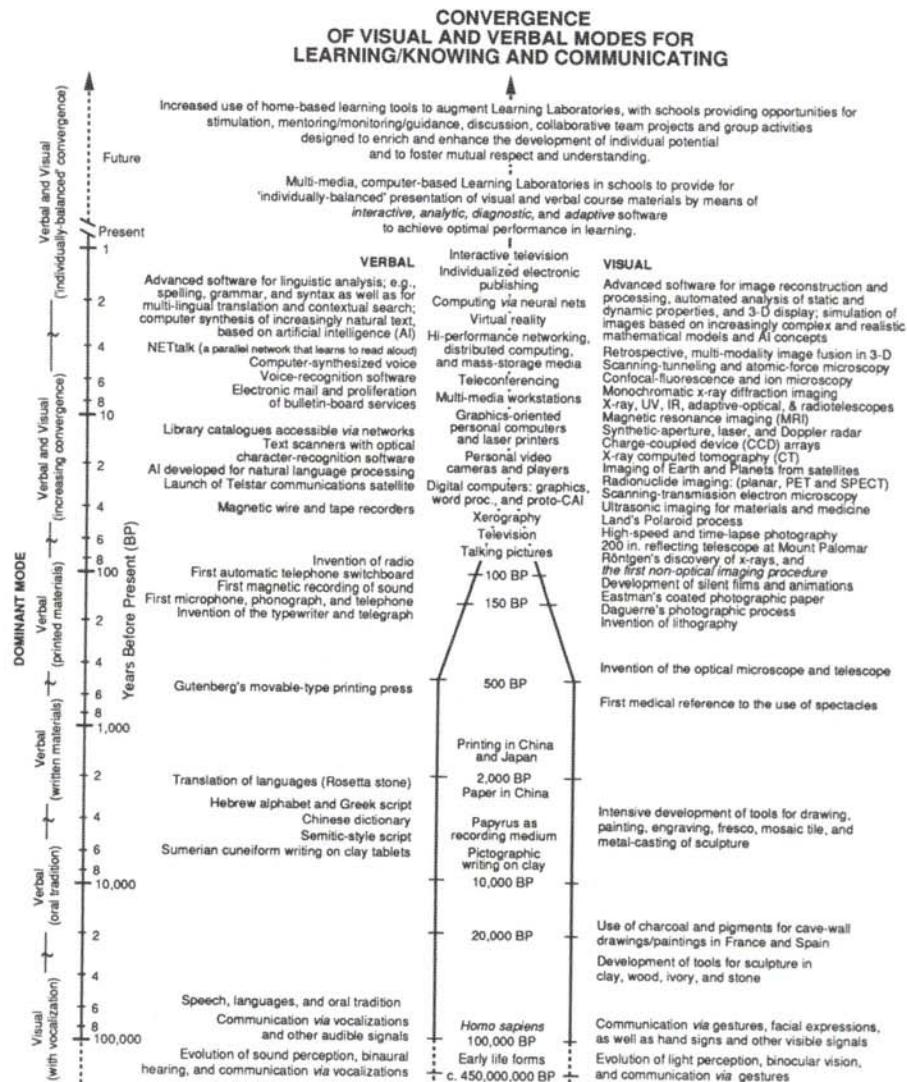
#### *Binocular Vision*

Light perception (i.e., the response to a narrow [‘visible’] range of the electromagnetic spectrum) and even binocular vision evolved very early. For example, mollusks had remarkably sophisticated visual systems more than 450 million years

ago, and it is difficult to imagine the more recent evolution of mammals without vision (see Figure 1, lower right).

In the higher primates and early *Homo sapiens*, vision provided the principal means for obtaining information essential to learning/knowing something about the material objects in their environment, as well as some of the important dynamic processes these objects undergo. Without attempting a discussion of the biopsychological aspects of sensation, perception, cognition, and learning, by 'knowing' I mean to suggest the complex set of the neurologic/mental processes involved in focusing attention, observing, abstracting, remembering/recognizing, generalizing, extrapolating, and classifying objects on the basis of common visible features, behaviors, and abstract properties, many of which we *idealize*.

For example, although every material object is unique, in infancy the undeveloped visual system may be incapable of distinguishing *similar* objects; thus, the visibly 'roundish' shape of certain objects may be abstracted from observations, and those having this shape may be recognized/remembered as the same, or as belonging to the same category or class. (Moreover, the ability to classify visible objects very *quickly*, even if imperfectly, has enormous survival value for the following reasons: [1] it is a remarkably efficient means for 'filtering' or 'compressing' and thereby *simplifying* the continuous stream of unique sensory inputs, without which we would suffer from sensory and memory overload; and [2] an 'immediate-alert' response to a member of the class of 'striped animals' may mean survival on encountering a tiger, and nothing is lost if it turns out to be a zebra!) Furthermore, by the mental process of extrapolating the 'roundish' shape to the limit of 'ideal' forms, the class of objects with this shape may give rise to the idealized, purely mental concepts of the circle and the sphere, which do not exist in the material world. Nevertheless, we use these idealizations in mental modeling and reasoning even before we *name* such properties with words like 'circular' or 'spherical' and long before we *define* the words 'circle' and 'sphere' formally in mathematical terms—i.e., in terms of *other* idealizations, such as point, line, plane, and center. (In this example, 'circle' may be defined formally as the set of points in a plane that are equidistant from a single, coplanar point, which we call the center.) Perhaps in this way, and without making use of such words to verbalize or to 'think about' the relationship between a circle and a right circular cylinder, even the chimpanzee may come to 'know' (by some mental process that may be described as 'reasoning') that 'round pegs don't fit into square holes'! In short, we use idealizations, or 'perfect forms', during more contemplative, prob-



**Figure 1. Technological milestones in the shifting dominance of visual and verbal modes for learning/knowing and for communicating, leading to their convergence in very recent interactive, multimedia technologies.**

lem-solving periods—when we are ‘philosophizing’ or attempting to get at the ‘truth’ or the ‘essence’ of material objects, unhurried by the need for an immediate response to sensory inputs. Confusion may result when we use the same *word*, circle, to represent both the idealization and the material trace produced with a compass.

### *Binaural Hearing*

Sound perception (i.e., the response to a narrow [‘audible’] range of the sound spectrum) and binaural hearing evolved in parallel with vision and provided additional directional information about objects in the environment, including predators. Also, by being sensitive to omnidirectional sounds and not dependent on a clear line of sight, binaural hearing provided information complementing vision as a means for knowing (see Figure 1, lower left).

### *Visual and Verbal Communications*

Moreover, binaural hearing increased enormously the survival value of *vocalization* as a mode of *communication*, which led ultimately to the much more recent evolution of speech and language. However, during the many millennia before the development of articulated speech, it seems plausible that vision provided the principal means not only for knowing, but also for communicating through visible postures, gestures, facial expressions, eye movements, and hand signals and signs. (See Figure 1, left-hand column, which suggests an approximate, logarithmic time scale for shifts in dominance of the visual and verbal modes for learning/knowing and communicating.) Once the vocal structures needed for articulated speech had evolved, perhaps 100,000 years or so ago, early human beings were able to produce complex vocal patterns very rapidly, and highly inflected language became possible. And with the proliferation, migration, and relative isolation of small groups over many millennia, it is clear that many hundreds of distinct languages developed, each including at least some words that were uniquely well suited for knowing and communicating about the objects and conditions of the local environment and the challenges they posed.

It is important to recognize that the development and elaboration of spoken language required no instruments or tools and therefore could be pursued unimpeded, greatly facilitating such domestic activities as food gathering and preparation, child-rearing, and the like. In contrast (but for the elaboration of hand signals and signs, which must have been of great value primarily for silent communication during activities such as hunting), the same cannot be said for the further early development of visual means for knowing and communicating, which had to await the development of science and technology. As a consequence, the visual and verbal modes became separated by their quite different *rates* of early development, with the verbal increasingly supplanting the visual to become the principal means for conveying knowledge and beliefs *via* the oral tradition of naming and describing classes of objects and behaviors, explaining/teaching, directing, and mentoring. Vestiges of the oral tradition persist in all existing cultures.

#### **More Recent Development of the Verbal and Visual Modes—c. 20,000 BP to c. 500 BP**

##### *Recording and Manual Reproduction/Replication*

It seems plausible that the *recording* of information with simple tools and readily available materials—in the form of images, pictographs, signs and symbols representing words—originated as a means for augmenting and reinforcing the oral tradition, particularly in the contexts of commercial transactions and trade agreements, and somewhat later, in law and in religious and secular writings. Such recordings reduced the need to rely upon memory and thereby facilitated consistency of communications; this, in turn, fostered the continuity of culture through the systematic transfer of information and knowledge from one generation to the next, and led to more formal education.

However, the recording of accurate pictorial representations of objects and dynamic processes (i.e., the use of lines, shading, perspective, and color to produce detailed images of important object features and actions) is difficult, requiring the development of artistic sensibilities and skills as well as suitable media, tools, and techniques for subtle graphic renderings. Although some earlier pictographs have been discovered, as well as visual representations in the form of figure sculptures in clay, bone, wood, ivory, and stone, perhaps the most remark-

able and certainly the best known extant examples of early images are the drawings and paintings recorded on the cave walls in France and Spain, c. 20,000 BP, with both charcoal and pigments used to depict animals in extraordinarily realistic detail and dynamism, as well as with a deep aesthetic sense. In view of the care with which these images were produced, it is generally believed that they served some serious purpose—to communicate important information, perhaps to fellow hunters, to young hunter-initiates, to the god of the hunt, or to the spirit of the animal to be killed. In any case, during this period of entirely manual methods, it was difficult and time-consuming to replicate subtle and detailed images faithfully and aesthetically. In contrast, for the purposes of communication, it was relatively easy to replicate abstract symbolic representations, such as pictographs, hieroglyphs, and Chinese characters (which preserve certain pictorial elements) as well as written words, with more abstract alphabetical symbols. As a consequence of the relative ease of recording words when compared with more detailed images, numerous writing styles were developed during the period c. 7,000 BP to c. 2,000 BP. These have been analyzed and discussed in the works of Friedrich (1993) and Gaur (1992).

Although writing reinforced the dominance of verbal over visual communication, it is nevertheless worth noting that, to a very significant degree, success of the (written) verbal mode of communication was due to the truly remarkable ability of the human visual system to recognize patterns. For example, we learn very quickly that

a, α, a, Α, a, α, a, a, A, a, a, a, a, a, and a

represent the same letter of the alphabet, despite obvious differences in style, size, and weight. In many contexts and for many purposes, these symbolic representations (using words) are both efficient and adequate for communicating important knowledge or beliefs about material objects, despite their being incomplete, imprecise, and to some extent inaccurate—for example, as when the words represent idealizations.

### *Printing*

The use of patterns carved in stone surfaces for recording seals and other such impressions in clay, and the use of pigments applied to paper with incised wood blocks for replication of a great variety of visual and verbal materials, date back a

few millennia; however, the proliferation of written language was accelerated enormously by the invention of the movable-type printing press by Gutenberg just 500 years ago. Clearly, the impact of this technological advance also has been enormous, particularly on Western culture, and has further reinforced the dominance of verbal over visual communication, as is still evident in our *logocentric* system of education.

#### **Technological Advances Related to the Visual and Verbal Modes—c. 500 BP to the Present**

##### *Advances in Mechanical and Electrical/Electronic Means for Verbal Communication*

The invention of the typewriter, patented in the U.S. in 1829, was followed by a great flurry of technological advances for recording and/or communicating verbal information, including the telegraph, telephone, microphone, phonograph, magnetic recording, and radio, all of which were based upon the emerging science of electromagnetism. The revolution in verbal communication *via* electronic means has continued at an accelerated rate to the present, with the very recent development of computer technologies for word processing, text scanners with optical character-recognition software, voice-recognition and voice-synthesizing software (see Figure 1, under the column heading VERBAL), as well as the multi-media technologies, such as interactive television and computer workstations that *bring together* verbal and visual materials—a topic to which I shall return later (see Figure 1, center column, in which some of the major recent advances in multi-media technologies are identified).

##### *Advances in Optical Imaging*

Meanwhile, on the visual side (see Figure 1, under the column heading VISUAL), the development of the optical microscope and the telescope, in the 1600s, extended the range of visual observation enormously, to objects that are very small, as well as to those that are large but very distant. The discovery of photosensitive emulsions during the mid-1800s permitted the recording of optical images of all

sorts, and made possible the more recent development of motion pictures, and of time-lapse and high-speed photography. And, of course, the very recent development of photosensitive electronic devices, such as the vidicon, has revolutionized the capture of optical images from all sources, and their distribution (most frequently accompanied by verbal information) *via* television broadcasts. Although these advances are well known, it is important to recognize that all of these imaging methods involve the use of *visible light* and are grounded in the science of optics; that is, these methods are based upon the emission, reflection, or transmission of visible light from, or through, the object that is imaged, and the image-forming devices are based on ‘bending’, or refraction, of light by lenses.

### *The Turning Point—Non-Optical Imaging*

Moreover, it is particularly important to recognize that it was only with the discovery of X-rays by Röntgen in 1895 that images of certain *internal* structures of objects that are opaque to light could be made, based on physical principles *other* than those pertaining to visible light. In this case, invisible X-rays penetrate the object and expose photographic film. It is the *difference* in penetration through neighboring regions of the object that results in contrast and reveals internal structures. (For example, when an X-ray image of the hand is made, the soft tissues stop a smaller percentage of the incident X-rays than do the more dense bones. As a result, bony regions of the film are *less* exposed, and show up as *lighter* [or more transparent to visible light] than the soft-tissue regions. Generally, these ‘negative’ images on film are then viewed by human observers with transmitted *visible* light from a ‘view box’.)

### **Toward a Conceptualization of Imaging Science and the Challenges It Poses**

It is useful to think of imaging with X-rays as a means for gaining *new* knowledge of object properties—knowledge that is inaccessible *via* purely optical means. In addition to its impact on science and medicine, Röntgen’s discovery, perhaps more importantly, stimulated a great wave of creativity in the broad field of imaging that has grown exponentially since 1895, and that will continue to grow in the future. From an evolutionary perspective, I find it startling to realize that, during the brief

span of 100 years since Röntgen's discovery, devices have been developed that enable us currently to form images of *many additional* object properties, based on physical principles *other* than those pertaining to visible light and X-rays. In fact, most of these developments have occurred during my lifetime! (See Figure 1, under the column heading VISUAL, for advances since 1928.) Together, these imaging devices provide us with tools of unprecedented power for the study of important aspects of ourselves and other material objects in the world around us. (Some additional properties of objects that can now be imaged are identified in Figure 2, within the column heading 'Objects to be Imaged', and in Figure 3, under 'Detectable Properties of Material Objects'.)

We can think of all devices that are designed to form images of material objects as means for the detection and spatio-temporal localization, or *mapping*, of some particular object property into 'image space', where the resultant image can be viewed with visible light—e.g., on a view box, television tube, or computer screen. (The concept of 'mapping' is of fundamental importance and is discussed at a very high level of generality, although in plain language, by Nagel and Newman [1958]. Generally, images are 'topologically correct' mappings of object features, but they may suffer from 'rubber-sheet' distortions.) Moreover, we can think of *imaging science* as encompassing all means for performing such mappings, and its agenda as including all the issues this entails.

Advances in physics and engineering in recent decades now enable us to make images by use of a great variety of other *invisible* radiations (radio waves, infrared and ultraviolet light, gamma rays, and acoustic/ultrasonic waves) and particle beams (electron, positron, proton, neutron, and heavy-ion beams), as well as with tiny styli that are scanned over the surface of an object to produce microscopic images which reveal local properties such as conductivity or electric- and magnetic-force fields at the atomic level of spatial resolution. (See Figure 2, left-hand column, for a list of major imaging modalities, and Figure 3 under 'Radiations to or from Material Objects'.) Such lists only hint at the power of these tools, as each imaging modality can be used in a number of distinctly different ways to provide a more nearly complete understanding of the structural and functional properties of material objects. For example, the *kind* of information about tissue functions that is revealed in images obtained with the radionuclide imaging systems used in nuclear medicine depends upon the specific chemical compound that is 'labeled' with a radioactive material and administered to the patient. Already, literally hundreds of compounds have been radiolabeled for the study of

OBJECTS to be IMAGED	IMAGE-DATA ACQUISITION	IMAGE RECOVERY	IMAGE RECORDING AND DISTRIBUTION	IMAGE DISPLAY AND VISUALIZATION	IMAGE OBSERVATION	IMAGE ANALYSIS	IMAGE EVALUATION
<b>GENERIC IMAGING ISSUES</b>	Delineated by the physical, chemical, & isotopic composition at each point in space and time, which gives rise to properties that are detectable; e.g., emissivity, reflectivity, fluorescence, transparency/opacity, and scattering properties, relaxation times, conductivity, force fields, etc.	Detection and localization of otherwise undetectable objects; e.g., molecules, cells, organs, and intact organisms; in principle, may be described by its physical/chemical/isotopic composition at each point in space and time. Associated with its composition are certain properties that are detectable (i.e., they give rise to signals in suitable detectors), some of which can be localized in space and time. Such properties can be mapped into "image space" to form an image that represents the spatial distribution of the detected property, averaged over the period of observation, i.e., the image data acquisition period.	Reconstruction and processing with analytic, statistical, and probabilistic methods; linear and non-linear; stationary and non-stationary methods	Storage, networking, and transmission.	Monochrome/color; 2-D and 3-D; static and dynamic; single mode and fused.	Segmentation and measurement; morphologic analysis; pattern recognition; feature extraction; expert systems; and AI schemes.	Physical measures of image quality (maximum signal-to-noise ratio, information content, and image/object correspondence); Observer performance; Expert systems; cultural, aesthetic criteria.
<b>IMAGING MODES</b>							
<b>MICROSCOPY</b>	Light; UV; X-ray; fluorescence; electron- & ion-beam; ultrasound/ acoustic; scanning-tunneling; atomic- and mag.-force						
<b>X-RAY IMAGING</b>	Digital; screen-film; DR; CT; biplanar; fluor.; A, diffraction Imaging with monochromatic beams						
<b>MAGNETIC RESONANCE IMAGING</b>	Conventional and spectroscopic						
<b>RADIONUCLEIDE IMAGING</b>	Conventional planar; PET & TOF-PET; SPECT						
<b>ULTRASOUND</b>	Maternal testing; biomedical; side-scanning sonar						
<b>HOLOGRAPHY &amp; PSEUDO-HOLOGRAPHY</b>	Light; X-ray; gamma ray						
<b>TELESCOPIC IMAGING</b>	X-ray; UV; optical; IR; radio						
<b>COMPUTER-GENERATED IMAGE-simulation/animation</b>	From mathematical models; multi-parameter graphics						
<b>GRAPHIC ARTS &amp; SCIENCES</b>	Drawing; etching; painting; photography; printing; lithography; teleview/video						
<b>HUMAN VISION</b>	CCD arrhythmics; retinalcam images						

### Topics Providing Opportunities for Multidisciplinary Research in Imaging Science

The physical and biological sciences are grounded in the observation and measurement of object properties, both static and dynamic. Computer-based, quantitative imaging systems extend the range of observation and measurement to structural and functional properties of objects that otherwise would be inaccessible. As a result, much of what we know about ourselves and the world around us has been derived from images of objects and the processes they undergo.

Every object, including those of biomedical interest (e.g., molecules, cells, organs, and intact organisms), in principle, may be described by its physical/chemical/isotopic composition at each point in space and time. Associated with its composition are certain properties that are detectable (i.e., they give rise to signals in suitable detectors), some of which can be localized in space and time. Such properties can be mapped into "image space" to form an image that represents the spatial distribution of the detected property, averaged over the period of observation, i.e., the image data acquisition period.

These mappings of images, are always imperfect representations of the object in several ways; in particular, they are:

- incomplete representations, as blurring, nonlinear distortion, spatial deformation, and artifacts are always present in images;
- inappropriate as random noise, or noise always accompanies the signal associated with the detected object property.

As a consequence, measurements of object properties from their images are correspondingly imperfect. These imperfections are addressed within the field of imaging science, the goals of which include:

- increasing the number of properties that can be imaged, so that our representations of objects can be more neatly complete;
- by increasing the accuracy of measured values of object properties; by improving spatial resolution (to reduce spatial averaging; or blurring);
- by increasing the sensitivity of the imaging system (to reduce the observation time and temporal averaging or motion blurring);
- by increasing the temporal resolution (reduce, for example, the nonlinear saturation effects when photon counters are used); by improving energy resolution (to reduce the effects of scattered radiation); and by reducing distortion, deformation, artifacts, etc.;
- by increasing the reproducibility of measured values of object properties by reducing noise; e.g., by increasing the sensitivity of the system;
- by use of contrast-enhancing agents to increase the local signal amplitude; or, as a last resort, by increasing the observation time.

The achievement of these goals, which involve balancing trade-offs among multiple competing measures of performance, will require a comprehensive understanding of all the steps, or generic issues, that are involved in the imaging process (as well as their interdependence) — from image-data acquisition (i.e., signal detection and localization) through image analysis — as all of these steps may affect the accuracy and reproducibility of measurements made during finite periods of observation. In particular, such an understanding would enable us, in principle, to explore alternative strategies and to optimize parameter values associated with each of these steps, based on some appropriate (goal-related) criterion for the evaluation of image quality. As yet, no imaging system has been optimized fully in this sense. Nevertheless, image quality is clearly related to performance measures of the imaging system, such as sensitivity and (spatial) temporal, and energy) resolution. In biomedical applications, image quality is affected also by patient-related factors, such as the amount of contrast agent that can be administered safely, patient motion during the observation period, radiation absorbed dose, etc. In short, progress toward an understanding of important topics and opportunities for multidisciplinary research, as suggested by this matrix.

**Figure 2. Major imaging modes and generic issues of imaging science**

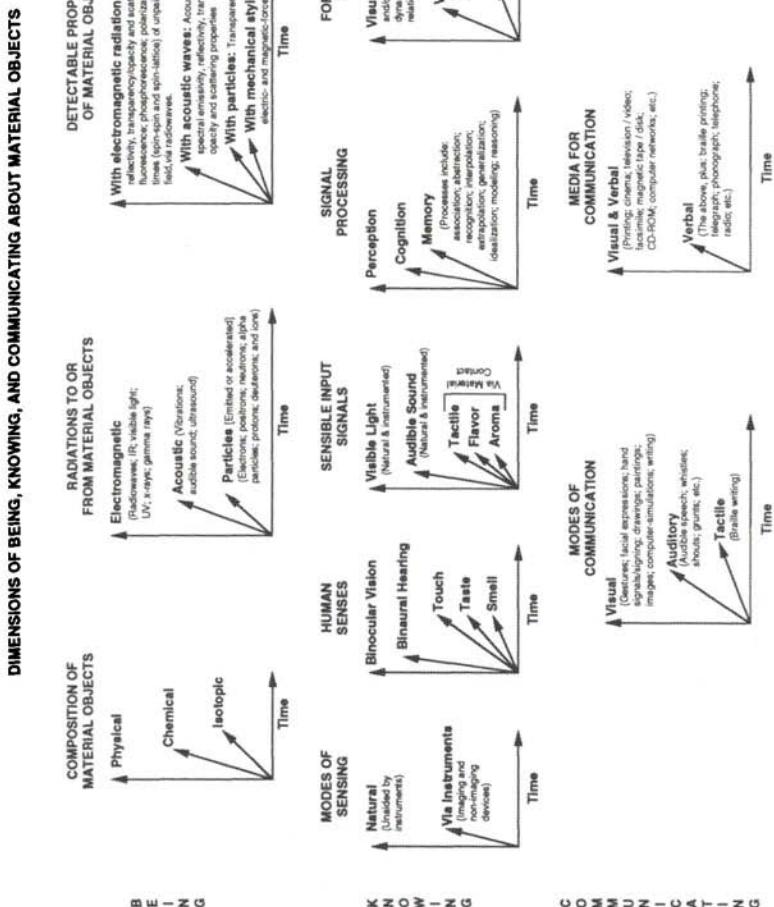


Figure 3. The physical, chemical, and isotopic composition of material objects at each point in space and time gives rise to certain properties that can be detected directly *via* the human senses or indirectly *via* instruments and localized in space and time by means of various forms of radiation or by direct physical contact or close proximity. In these ways, we come to know something about the structure and functions of material objects. We can communicate such information and knowledge to others *via* various modes and media.

physiologic processes in health and disease, and countless others will be radio-labeled in the future. With suitable calibration of the imaging system, these images provide a fairly accurate quantitative measure of the concentration of the radionuclide in the tissues of different organs. Additional information may be derived or inferred from the images; for example, metabolic activity and receptor binding can be determined, as well as the effects of drugs—from alcohol to Prozac—on such tissue functions. Moreover, from a sequence of images, we can derive measures of the rate of change of the concentration, which provides information about the *dynamics* of the physiologic processes involved.

### *The Importance of Digital Imaging Methods*

As in the example above, most of the recently developed imaging systems make use of digital computer technology. This not only facilitates calibration, which is essential for quantitative measurements; more importantly, the use of digital computers enables us to describe and to record any image as an *array of numbers*, with each number representing the local numerical value associated with the particular object property that is mapped, or imaged. These images are always *imperfect* representations of the object, in that they are always *incomplete* and, to some degree, *inaccurate* and *irreproducible*, for reasons summarized in the framed text of Figure 2. This is not to suggest, however, that images are of no value! Rather, it is to clarify one broad goal of imaging science, which is to identify the origins of all such imperfections and to devise means of *improving* images for specific applications.

Being described by an array of numbers, it is evident that an image can be altered in any way we wish by *changing* the numbers. For example, if we want to reduce the random fluctuations (or ‘noise’) in an image, we can do this by replacing each number in the array with the local *average* value. Of course, this form of image processing (‘smoothing’) degrades image contrast and spatial resolution, and it may render the fine details invisible. The degree of image smoothing (or other manipulation, such as ‘sharpening’) that is desirable depends upon our goal. In this instance, the question is: how much smoothing is *optimal* in a particular application? The answer depends upon our notion of ‘image quality’, which is of central importance to everyone involved in the development of imaging methods. In addition, almost everyone who makes use of images in professional work

employs some form of image processing to improve his/her notion of image quality, although few would claim to know how it should be *measured*, even for a task-specific goal. In short, the identification of suitable measures of image quality for different contexts (e.g., science, medicine, education, news and entertainment) and for different goals (e.g., measurement of a particular object property, detection of a specific disease, maximizing learning rate and retention of specific subject matter, communicating most effectively, whatever the objective) remains a major challenge for the emerging field of imaging science, as I have discussed elsewhere (Beck and Crewe 1988; Beck 1993c). (See Figure 2, column heading 'Image Evaluation', for frequently used criteria, and the later discussion of some of the ethical and cultural issues raised by the enormous power of modern computers to alter images.)

The more general question is: what are the optimal values of parameters associated with *each* of the steps in a particular imaging process, in order to achieve a specific goal? The other column headings in Figure 2 indicate the steps involved in *all* digital imaging procedures; therefore, we think of these as the *generic issues* that must be addressed if our objective is to produce optimal images based upon some selected, goal-specific criterion for the evaluation of image quality. Formally, such optimization will require first the development of a mathematical model of the particular imaging process, in which the selected measure of image quality is expressed as a function of the parameters associated with each step. Optimization of parameter values may then be achieved, in principle, by the use of methods such as 'simulated annealing'. To date, no one has succeeded in fully modeling and optimizing the values of all of the parameters involved in all of the (interdependent) steps of *any* imaging procedure, based on *any* measure of image quality. This is another major challenge for imaging science in the future.

### *The Importance of Multi-Modality Imaging*

It is only when we have a number of *different* imaging approaches to gaining knowledge of the structure and functions of material objects that we begin to compare and contrast these approaches and to gain some perspective on the strengths and limitations, or value, of each. (This is analogous to the situation with linguistics, in which the existence of many languages for study has enriched

and deepened our understanding of verbal means for knowing and for communicating, a point to which I shall return later.)

In particular, it is worth reiterating that no single imaging system detects and maps *all* properties of an object, and as a consequence, images from a single modality are always *incomplete* representations of objects. In this important sense, they are, indeed, *intrinsically false* representations. This fact invites criticism and verbal abuse of images. And although images may support or contradict verbal analysis, they do not communicate *about* themselves; that is, they are not self-analytic, as language may be. In contrast, language can be used endlessly for analyzing images critically, and images have been subjected to 'bad press' at least since the rise of monotheism, with a resurgence of such criticism during the Enlightenment Period, as Stafford (1994) has discussed so eloquently. In short, I believe it is the incompleteness that accounts for much of the skepticism and outright *negativity* toward images as means for knowing and communicating, quite apart from the fact that they can be manipulated at will, and are also recognized as being, in varying degrees, irreproducible (due to ever-present 'noise') and inaccurate (due to various forms of blurring and distortion). I say this because of the great value that was immediately recognized in the very recently developed methods for 'image fusion', or the superposition (in spatial registration) of images obtained from different imaging modalities. Specifically, a multidisciplinary team of my colleagues at the University of Chicago (C.-T. Chen et al. 1987; Levin et al. 1988; Pelizzari et al. 1989) succeeded in superimposing magnetic resonance (MR) images of the brain (in shades of gray) and positron emission tomography (PET) images (in pseudo-color), in 3-D spatial registration. To my knowledge, they were the first to perform this feat successfully, and without attention to patient positioning or the use of fiducial markers or stereotactic frames. The significance of this achievement is discussed by Maciunas (1993); specifically, the relatively low-resolution images of tissue *function*, obtained with PET, are of much greater value to radiation oncologists and to neurosurgeons in the planning of therapeutic interventions when they are fused with high-resolution images of brain *structure*, obtained with MR, which do *not* reveal important tissue functions, such as metabolism. With the use of these methods, it is immediately apparent that the fused image, showing important aspects of both brain structure *and* function, is a more nearly *complete* representation of the object, despite the fact that many additional properties are missing.

It is useful to think of the fused image as representing two distinctly different attributes of the brain that have been mapped in 3-D registration into a two-dimensional 'attribute space'. To put the matter in other terms, each of these imaging modalities provides a different *kind* of 'fragmented' view of the object, while image fusion brings the fragments together into a more nearly complete and, therefore, more meaningful and useful integration. 'Understanding' a *particular* object requires both analysis (fragmentation) and synthesis (integration) of *all* its properties—a process that will never be completed because many important object properties will remain inaccessible through imaging means. However, it is clear that the synergy among different imaging modalities compensates for the limitations of each, and together they bring unprecedented power to the study of complex objects such as the brain. These methods are now being extended to other areas of science and medicine, and the discovery of *additional* object properties that can be imaged, and fused (if desired) with images obtained from other existing modalities, is yet another major challenge for imaging science in the future. On the other hand, it should be recognized that the imaging and fusion of *all* properties of an object, even with the *existing* modalities, is never achieved in practice. In part, this is due to the fact that imaging with X-rays,  $\gamma$  rays, and particle beams always causes some damage to the object. In the context of diagnostic radiology, the questions that need to be addressed are: What is the *optimal sequence* of imaging studies? And when should this sequence be terminated in a particular instance, based on some acceptable criterion, such as risk/benefit or cost/benefit to the patient?

Before I proceed, it is worth noting that similar statements apply to 'understanding' a particular object through verbal means; that is, no material object, not even a single hydrogen atom, can be described completely in words, if for no other reason than that it changes continuously in time, due to its own intrinsic dynamic properties and to interactions with its environment. At best, we may hope to develop adequate descriptions of important attributes of certain classes of material objects that are similar; that is, in the form of probabilistic, mathematical models (quantum mechanical, or statistical mechanical) based on their similar, idealized properties, accompanied by verbal definitions of the parameters and symbols employed. In such a case, the question is: what is an adequate description so that one achieves some desired goal? (See Figure 4 for a summary of comparisons of images and words as imperfect, though complementary, means for knowing and communicating about material objects.)

## IMAGES AND WORDS IN RELATION TO MATERIAL OBJECTS

### IMAGES

- are *spatio-temporal mappings* of certain detected or (simulated) object properties.
- can be viewed with and/or without the aid of ancillary devices, or visualized (imagined).
- are language-independent, but their meaning and significance may be culture-dependent.
- are structured (approximately) by the spatial arrangement of object components, which may undergo temporal change.
- may present enormous amounts of information per unit time.
- present all component features of a single image simultaneously (i.e., in parallel); thus, the spatial context of individual features is established rapidly.
- can be strung together in temporal sequence to convey change, process, or motion in real time, lapsed time, or slow motion, and to indicate temporal and/or (changing) spatial relationships among object components.
- do not, in practice, provide complete mappings of objects; i.e., only those object properties that can be detected and localized spatially are imaged --- a small fraction of the whole.
- can be used to obtain qualitative information and to perform quantitative measurements of important object properties in many instances.
- can be fused, or superimposed in spatial registration, frequently to advantage; e.g., in multi-modality imaging of the brain.
- frequently contain irrelevant features, as well as artifacts, interference, distortion, and noise (except for those man-made images in which image content is selected and controlled).
- can be used to contradict, to support, or to enrich verbal statements in some instances.
- are more likely to produce insight quickly in some instances, particularly those involving complex relationships and dynamic processes.

### WORDS

- are *symbolic representations* of certain abstract or idealized object properties.
- can be viewed (when written), vocalized, signed, felt (as in braille), or imagined.
- are different in different languages and cultures, and change over time.
- are arranged spatio-temporally by rules of grammar, syntax, and logic so as to convey meaning.
- generally present very much less information per unit time than do images.
- are presented in a spatial or a temporal sequence (i.e., serially); thus, the context and the significance of individual words are established more slowly.
- can be strung together indefinitely in sentences, paragraphs, etc. to describe objects, processes, and relationships, or to explain their meaning, value, or significance.
- do not, in practice, provide complete representations of objects; i.e., only those properties that are relevant to the context are generally described.
- can be used to describe the results and the significance of observations and measurements of object properties.
- cannot be superimposed temporally or spatially without producing babble and confusion.
- can be selected individually to minimize irrelevancy; nevertheless, verbal text may contain excessive redundancy as well as distorted or false information.
- can be used to contradict, to support, or to enrich the interpretation of images.
- are more highly regarded as a means for conveying information, knowledge, and understanding; hence, our *logocentricity*.

**Figure 4. Images and words provide means for knowing and for communicating about material objects. However, even when they are not used 'rhetorically', each provides only incomplete information, which may give false or misleading impressions. In short, they are limited, though complementary, means for knowing and communicating.**

The major additional point to be made is that all of the advances in image fusion, and most of the advances in *quantitative* imaging methods, have occurred since the development of digital computers. This technology enables us to make use of a common set of principles, concepts, strategies, and methods in the development of new imaging systems, in conceptualizing what imaging science is about on a level of abstraction that encompasses all digital imaging procedures, and in defining its intellectual agenda, as I have discussed elsewhere (Beck 1993a). As such computers are a very recent development, it is not surprising that imaging science is beginning to emerge only now, or that, currently, very few people (if any) would identify themselves as ‘imaging scientists’ despite the fact that many individuals who are associated with traditional disciplines (in particular, mathematics, statistics, physics, computer science, engineering, and the graphic arts) are currently contributing to its emergence, as are the many more who depend upon imaging methods for the study of objects of special interest to them (in astronomy, materials science, radiological science, pathology, etc.). The difference between these individuals and ‘imaging scientists’ of the future may become clearer from an analogy.

### *Linguists and Imaging Scientists*

As means for knowing and communicating about the structure and functions of material objects, the situation with *images* is analogous to that with *words*. We use words to generate ideas and to communicate to others what we know or believe, and/or what we want them to believe we know. In a very real sense, all communication (including this piece!) is rhetorical, as Lanham (1993) has suggested. Our success depends upon finding the words needed to make the distinctions we want to impress upon them, and in communicating these as convincingly (i.e., completely, clearly, accurately, reproducibly, and effectively) as possible. However, very few people are regarded, or identify themselves, as ‘language scientists’ or linguists. That label is reserved for those who deal with words on a more abstract conceptual level—i.e., in the present context, in terms of: (1) the categories of words needed to name and describe the structure and functions of objects (nouns, pronouns, verbs, adjectives, adverbs, etc.); (2) the representation of words with signs and symbols (pictographs, hieroglyphs, alphabets, etc.); (3) the relationships among categories of words that are sequenced so as to convey mean-

ing (grammar, syntax, logic, semantics, etc.); (4) the similarities across different languages (in both spoken and written forms); and (5) the unique features of each language, which require further (verbal) explanation. At the risk of excessive redundancy, modern man has been engaged in: (1) the creation and use of spoken words (in meaningful temporal sequences) for perhaps 50,000 years or more; (2) the representation of words by recorded signs and symbols for perhaps 7,000 years or more; (3) the (spatial) arrangement of recorded signs and symbols so as to convey meaning for perhaps 5,000 years or more; (4) the study of similarities among languages, and the translation among them, for at least 2,000 years (the age of the Rosetta stone); and (5) the discovery of verbal expressions that defy direct translation, from the first attempt to the present.

Moreover, in the course of these developments, words have been created which describe not only real, material, and visible objects, but also invisible, imagined, and idealized objects (atom, angel, point, line, plane, circle, etc.), spatial relationships (larger, smaller, inside, outside, etc.), temporal relationships (before, after, etc.), and temporal idealizations (present, instant in time, simultaneous, etc.), as well as important concepts (similarity, congruence, equality, mass, energy, momentum, power, justice, truth, beauty, value, etc.) and principles (conservation, equivalence, etc.) that are extremely useful in mental modeling and reasoning, as well as in communicating our thoughts and beliefs to others by use of metaphor, analogy, comparison, and contrast.

In addition, the replication and distribution of verbal materials not only has served to stimulate discussion and creativity, but also has resulted in the development of multilingual translation to provide a shared information and knowledge base, as well as to reveal cross-cultural differences in values, customs, and beliefs, with which world leaders are currently attempting to cope.

### *Mathematics—‘The Language of Science’*

The cross-cultural sharing of knowledge of the material world clearly has been most successful in the sciences, particularly in those that use mathematics, and it is important to understand why. Largely, this is due to the fact that mathematics is the most idealized, unambiguous, and logically consistent language yet developed, despite its inherent limitations, which were first revealed at a very deep level by Gödel in 1931. His theorem can be stated briefly as follows: every consistent set

of axioms is incomplete, and every complete set of axioms is inconsistent. Moreover, in mathematics, the notion of *truth* is based on *internal* consistency (or tautology) and has little to do with the material objects of the *external* world, except that the idealizations it uses may be traced to abstraction of certain properties of objects, as suggested earlier. In his inimitable style, Einstein has stated the relationship between mathematics and objects succinctly: ‘So far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality.’

Nevertheless, the use of mathematical models to describe important properties of material objects and their dynamic processes has been enormously successful in physics and engineering (despite the use of simplifying assumptions: e.g., that the systems described are ‘isolated’, ‘linear’, and ‘non-dissipative’—which do not exist in the material world). The *validity* of these models in describing and predicting the behavior of material systems depends largely upon how many properties and interrelationships are included in a particular model, and how accurately we know the ‘initial conditions’ that are assumed in its use. Their *usefulness* depends on our goal, and on the accuracy required to achieve it. For example, if our goal is to send a man to the moon, or a space probe to the planets of our solar system, then mathematical models of the trajectories, based on Newtonian mechanics, are generally accurate enough. On the other hand, if our goal is to describe accurately the trajectory of an electron beam in a television tube, a model based on Newtonian mechanics does not work so well; in this case, a more accurate and useful model can be developed, based on Einstein’s special theory of relativity (1947), which takes account of the relationship between the mass of an electron and its velocity.

In recent years, much attention has been focused on the ‘chaotic’ behavior of material objects and processes of everyday life (from the pendulum to blood flow to tornadoes, where quantum mechanics and relativity are not needed), by use of mathematical models that incorporate the ubiquitous nonlinear and dissipative properties of such systems, as discussed in layman’s terms by Gleick (1987), and by Prigogine and Stengers (1984) at greater depth. Currently, the ‘complexity’ of systems, such as neural networks that can ‘learn from experience’ to recognize objects (e.g., letters of the alphabet), is being explored through mathematical models, as discussed in layman’s terms by Waldrop (1992), and at greater depth by Nicolis and Prigogine (1989). Increasingly, the concepts of ‘fuzzy logic’ are employed in these models, as discussed by Kosko (1993). Although the formula-

tion of such mathematical models may be straightforward, the numerical calculations required to explore them are generally beyond human endurance, and must be carried out with computers. Such studies promise to provide deeper insights into the structure and functions of objects such as the brain, especially when correlated with multi-modality brain images. We can only wonder how the physical and biological sciences might have evolved if Poincaré had owned a digital computer, even of the simple sort that sits on my desk!

Finally, it is well recognized that mathematics bears a very close relationship to linguistics ('the science of language'). Scholars have been discussing this relationship for many years in colloquia that could well have been titled 'Language of Science: Science of Language'. In short, mankind has a long and rich history of engagement in the development, detailed analysis, and comparison of numerous languages, including mathematics, as well as the diverse cultural contexts in which they have matured; as a consequence, linguistics has long been recognized as an intellectual discipline in its own right, practiced by linguists.

### **The Emergence of Imaging Science**

The same cannot be said of the emerging field of imaging science or of the role and intellectual agenda of its practitioners, who might be identified eventually as 'imaging scientists'—I hope, not as 'imagists'! (Fortunately, that label has been applied already to certain poets who aimed at 'clear pictures' of what they had in mind.) However, now that we have a plethora of means of forming images of numerous object properties, as well as the means to distribute these worldwide *via* telecommunications systems and over computer networks, scientists trained in many traditional disciplines have begun to form effective, multidisciplinary, collaborative relationships to focus their attention on certain generic issues of imaging. Generally, they are motivated not only by the needs of their respective disciplines for improved images, but also by the growing recognition of the similarity of principles, concepts, strategies, and methods that underlie all digital imaging procedures, which can be communicated in the languages and vocabularies of mathematics/statistics, physics and engineering, the biopsychology of vision, and the graphic arts. Such multidisciplinary activities are accelerating the emergence of imaging science by helping to identify the major topics that relate to the generic issues, many of which are covered in courses currently offered in the various

departments of universities. For example, we have identified more than 70 such courses in 14 departments of the University of Chicago (Beck and Crewe 1991; Beck 1993a), which provide a starting point for the development of a graduate program in imaging science, and which would be augmented by additional core courses focused specifically on the generic issues. (The first [and currently the only] graduate program in the U. S., leading to the Ph.D. degree in imaging science *per se*, is offered by the Center for Imaging Science of the Rochester Institute of Technology.)

### *A Curriculum for Imaging Science*

In contemplating the nature of a curriculum designed specifically for imaging science, I see strong similarities not only to linguistics, but also to certain aspects of the recently emerged field of computer science, which I have discussed elsewhere (Beck 1993a and c). Briefly, computation is grounded in mathematics and is of vital importance to all of the traditional disciplines as well as to imaging science. And although computation is based on high technology, largely in the form of digital computers, education in computer science is not concerned solely, or even primarily, with the technological aspects of computation, but with preparing computer scientists to contribute to our understanding of the deeper, underlying issues. Examples of such issues include: alternative and optimal computer architectures and algorithms; computational complexity and the solvability of various classes of problems; the potential of machine learning based on expert systems and artificial intelligence schemes; and, ultimately, with such questions as: what is knowable through computation?

Similarly, imaging is grounded in physics and mathematics, and images are essential to all of the traditional disciplines of science, as well as to medicine, the graphic arts, and education. Most modern imaging methods are based on several high technologies, including digital computers. However, an educational program in imaging science would not be concerned solely, or even primarily, with technological aspects of imaging, but with preparing 'imaging scientists' to contribute to our understanding of the deeper underlying issues. Examples are alternative and optimal ways of acquiring, processing, and displaying images of the properties of various classes of objects; the potential for imaging additional object properties that are now inaccessible; the potential for extraction of more information from

images *via* human vision and automated computer-vision methods of image analysis; and, ultimately, such questions as: What is knowable about objects from their images? How can images and words best be used together synergistically to communicate knowledge through educational programs in numerous *other* fields? What will be the impact on our culture of bringing together, in a more intensive convergence, these historically divergent ways of knowing and of communicating?

### **Technologies for the Convergence of Verbal and Visual Modes**

Every technological advance that has enabled us to bring together images and words within a single medium of communication has had a major impact on our culture: e.g., printing, motion pictures, and television/video. It is this capability that is referred to here as *convergence* of the visual and verbal modes of communication. (See the center column of Figure 1 for the major technological milestones on the path toward convergence, beginning with Gutenberg's press.) The cultural impact of this convergence has been felt primarily through the use of these media for news and entertainment purposes, and increasingly, for education. However, for educational purposes, such media have major limitations, the principal one being that they are designed for *passive* viewers, who have little or no control over the content, sequence, or rate of presentation. As a consequence, it is difficult to hold the attention of the viewer/listener without resorting to the presentation of highly dramatic and emotionally charged materials, which generally are neither appropriate nor effective for learning any subject in depth, particularly those that include significant intellectual content that is built up systematically.

On the other hand, a major advantage of television/video is that the equipment required for presentation of materials (a standard television set, plus a video tape or disk drive) is already mass-produced and relatively inexpensive, and therefore widely distributed. To the extent that videotape and disk technologies have been used in education, they have resulted in a significant shift away from language as the dominant mode of communication toward a more balanced use of both images (which promote insight) and words (which explain and enrich these insights, as suggested in Figure 4). However, the optimal mixture of images and words that will maximize the learning rate and retention is undoubtedly highly variable among individuals, as Gardner's (1983) work suggests. For use by individual students, a flexible means is needed to vary this mixture, as well as the rate and

sequence of presentation, in order to establish and sustain a high level of attention, interest, and motivation to learn. In a much broader context, Csikszentmihalyi (1990) has coined the term 'flow' to describe such desirable states of 'optimal performance.'

To summarize the key points discussed elsewhere in more detail (Beck 1993c), one means of establishing and maintaining 'flow' in the learning situation might be to make use of full-featured personal computers, which are inherently *interactive*—they do what we tell them to do and report results. Moreover, they perform these functions very flexibly, rapidly, accurately, and reproducibly—and generally, without complaint or fatigue, but for the occasional 'crash'!—well beyond the capabilities of human beings in many tasks. In particular, they can cope gracefully with the complex task of presenting numerically coded images (still, or in motion) and words (in visual display, and/or spoken), and under the interactive control of the viewer/listener.

The importance of interaction in the learning situation has long been recognized and cannot be emphasized too strongly. An ancient Chinese proverb states: 'I hear, and I forget; I see, and I remember; I do, and I understand.' Until very recently, however, the only means for interacting with computers was through the keyboard; and this interaction required the development of typing as well as programming skills, originally at the level of machine language. Much effort has gone into the development of higher-level and object-oriented languages that enable the user to write computer programs in a form that resembles natural language. In addition, the development of graphical metaphors that have intuitive appeal—icons, menus, windows, files, and folders—facilitates the organization, management, and rapid retrieval of numerically coded information in all its forms, including visual and verbal materials. More recently, multimedia workstations have been developed which enable the user to interact not only through the keyboard, but also through other mechanical devices (e.g., the 'mouse' roller ball, joystick, and drawing pad), as well as through voice commands, touch-screen displays, and the like. In addition, they provide access to information stored on video tapes and compact disks, and output in the form of high-resolution color displays, as well as high-fidelity sound and color images that can be printed, if desired, with near-photographic quality. These technological advances not only make interacting with computers easier for users with limited experience, but also enrich the process of gaining the necessary experience by broadening the range, and improving the quality, of the visual and verbal materials that can be presented

or produced. In short, such 'user-friendly' tools enable us to adapt quickly, and to do what we want to do more efficiently and effectively.

Moreover, computer-based imaging devices—microscopes, biomedical imaging devices, telescopes, and robots employing remote sensors—have dramatically increased our capability of producing images of virtually any material object of scientific, technologic, industrial, medical, legal, commercial, or educational interest. In addition, the prodigious computational power of modern computers with vast random-access memory enables us to *simulate* and to study images of increasingly realistic and complex objects and dynamic processes—from molecular interactions to neural networks to the formation of galaxies—based on increasingly realistic and complex mathematical models. This 'virtual reality' approach is revolutionizing the way research is done, not only by limiting the number of experiments that must be performed to a critical few, but also by providing both qualitative and quantitative information that accelerates insight into the behavior of objects of interest in the physical and biological sciences, which are noted for their 'complexity' and their 'chaotic' nature. The impact of the resultant explosion of new scientific knowledge is already large, and will undoubtedly grow with the further development of computer hardware based on parallel architecture; smaller, faster, and more specialized computer chips that require less power; and more sophisticated software based on expert systems and artificial intelligence schemes, designed to assist the observer and/or to automate the analysis of images.

Currently, much attention is being focused on implementation of high-speed computer networks for 'distributed computing' and for the transmission of both visual and verbal information rapidly, interactively, selectively, and inexpensively, with access to this information controlled by very sophisticated security systems. As a result of such technological advances, a substantial fraction of the contents of the libraries and museums of the world, as well as vast databases relevant to myriad human interests and activities, will become readily accessible to an ever-increasing portion of the human population in the form of both words and images. In short, it is rapidly becoming possible for the first time in human history to bring together cost-effectively, within a common medium and on an unprecedented scale, these previously divergent ways of learning/knowing and of communicating. The future is never predictable; nevertheless, if we hope to make constructive and adaptive use of this development, we must attempt to examine its potential for affecting our lives and culture in both positive and negative ways.

### The Impact of Advanced Technology on Universities

Of all our institutions, universities, the conveyors of culture, are in some ways the best suited to conduct this examination. On the other hand, they embody a rigidity of structure that will likely resist both the examination and the adaptive changes that are needed. As Lanham (1993) has stated, 'school and university structures, administrative and physical, are affected at every point, as of course, is the whole repository and information system we call the library. In the university world, it is disciplinarity and its departmental shadow that will be most transformed.' In order to survive, and to thrive in the third millennium, universities must embrace and participate more actively in the revolution in computer-based imaging and communications technologies that is upon us, and view it as an opportunity to transform themselves while preserving their missions in the production and dissemination of knowledge. To succeed, the new organizational structures must not ignore or attempt to *erase* existing disciplinary boundaries; rather, they must make them more surmountable and *transparent*, and flexible enough to allow a natural evolutionary process to occur—one that is responsive to changing interests, activities, needs, and opportunities that have already begun to emerge. Rather than being seen as disruptive or competitive, it is important for the new multidisciplinary organizational structures to be seen accurately—as *facilitating* the academic and intellectual goals of the existing traditional disciplines. Although it seems clear to me that imaging science could be a facilitative component of such a new structure, the resolution of these issues of territoriality will require visionary leadership, creativity, faith, determination, and courage at the highest levels of administration within our universities.

### Summary and Conclusions

During the past half century, the explosive growth in science and digital computer technology has been related synergistically to the exponential growth in methods for imaging of previously inaccessible properties of material objects of every sort. Thus, digital imaging methods have accelerated the production of new knowledge, and will continue to do so as new methods are developed. The inevitable next step has begun already with the use of images for dissemination of this knowledge via computers linked over high-speed networks.

With the technological convergence of the visual and verbal modes of learning/knowing and of communicating, we appear to be on the brink of a cultural revolution of unprecedented proportions—substantially greater than that which accompanied the industrial revolution—with which we must learn to cope and to *adapt*, as individuals, as a species, and as participants in a global process. Undoubtedly, the impact of this convergence will be felt first within and among the cultures of the industrialized nations; moreover, it seems clear that leadership in the world of the future will be in the hands of those nations that adapt most effectively. This will require the creation of new organizational structures, particularly within our universities and funding agencies, that will foster new multidisciplinary activities designed to reduce redundancy of effort, to facilitate the transfer of new knowledge across disciplinary lines, and to coordinate funding so as to accelerate imaging research and the emergence of imaging science as an intellectual discipline, on a par with computer science and linguistics.

In the broad field of education, we must anticipate a major shift away from language as the dominant mode of communication toward a more *balanced* use of both words and images, and the rapid further development of multimedia computer-aided instruction (CAI) programs for virtually every area of interest, presented with increasingly advanced software—*interactive, analytic, diagnostic, and adaptive* to the needs of individual students—in some respects emulating a private tutor. This powerful learning paradigm promises to unburden teachers and enable them to focus their energies on the important and rewarding functions that only human beings can and should perform.

Empowered by further advances in imaging science and technology, more advanced CAI methods will provide increasingly effective means to develop the *positive* potential of a larger fraction of the heterogeneous population Gardner (1983, 1991, 1993) has discussed, and enable these individuals to function as the well-informed citizens that a democratic society requires. Unfortunately, the same methods can be used instead as increasingly powerful means for subtle ‘thought control’ of an unwary population that has not been trained to deal critically with both verbal and visual materials. From my perspective, the most challenging issue for the future of imaging science, and the powerful CAI methods to which it will give rise, is one of values: how will this power be *used* by our own society, and by others? Although scientists tend to avoid such value-laden issues, I believe the public needs to be informed about *both* the positive and the negative potentials of imaging science and advanced CAI methods to affect their lives.

Clearly, the most positive effect would follow from the use of these tools to develop a truly *deep understanding of ourselves*: how we evolved, and remain, as participants in a global process of awe-inspiring complexity; how our own self-interest, as individuals and as a species, is inextricably related to global interests; how our bodies and brains function in health and disease; how our emotions, values, and behavior are related to genetic, gender, and cultural factors; and, most importantly, how we might employ conscious and deliberate *thought* and *reason* to overcome some of the maladaptive consequences of these factors, and at the same time to become wise enough to retain those elements that *have adaptive value*—along the lines that Csikszentmihalyi (1993) has discussed with deep insight into, and compassion for, the human condition.

Mere survival is not a worthy goal for mankind; stones do that much better than we can ever hope to do it! Rather, *all* living organisms seek not only to survive, but also to *thrive*—to improve the *quality* of their lives. This requires the ability to *adapt* to an ever-changing environment. For an understanding of how they do this, the concept of *complexity* is of key importance. Complex systems are those having structures that consist of highly *differentiated* components which function in a highly *integrated* manner. It is this complexity that enables them to process information, to learn, and to respond *adaptively* to continual changes in their environment. In this sense, every living organism is complex, as is every species and every human culture; otherwise they would not exist. Most importantly, the entire biomass on our planet has evolved over eons as a complex ecosystem, with countless complex sub-systems that, until very recently, functioned in the safety of relative isolation. Modern technology has drastically reduced this isolation, and at the same time has created the *potential* for more complex integration. However, we have yet to achieve the integrated functioning of the diverse subsystems our technology has brought into contact; this will require deeper understanding.

The inevitable consequence of such contact is change. Large and/or rapid changes in the local environment may challenge certain components of any complex system beyond their ability to adapt, and in the long term may threaten the survival of other components. The reason is that such changes may reduce the diversity of the system as a whole, which reduces its ability to adapt. This point is made clearly by Barbour (1993) in his extraordinarily comprehensive survey of technological impacts: ‘Diversity in an ecosystem contributes to its stability and adaptability; systems with a very small number of plant or animal species are more vulnerable to disease, predators, and changing conditions.’ More serious are the

well-known global changes wrought by mankind, due to a combination of ignorance, greed, and shortsightedness, as Passmore (1974) has argued. Global pollution and destruction of natural habitats reduce diversity, complexity, and adaptability in ways that we do not currently understand. Perhaps because they live in more natural environments, 'primitive' tribes understand this better than 'civilized' city dwellers, and they more frequently express respect for life in all its forms, as well as for inanimate objects of the world. They place high value on living in harmony with the natural world, rather than on subduing it. Among others, this view is expressed eloquently and poignantly in the writings of Native Americans, such as those compiled by McLuhan (1971). If the human species is to continue to survive and thrive for another millennium, it is essential that decision makers come to understand and value diversity and complexity, and behave accordingly. And to the extent that interactive communications media will enable 'grass roots' democracy to exist in the future, our citizens also need to be sufficiently well informed to do likewise.

It is only in recent years that we have begun to model and study complex systems, and currently we do not understand adequately how these 'chaotic' systems function—indeed, we may never understand. Although we cannot expect to achieve 'perfect' or 'complete' knowledge and understanding of ourselves or our environment, this is not a time for cynicism or timidity; rather, by making constructive use of the new tools for learning, knowing, and communicating, we may hope to achieve a level of understanding that will enable us to survive and to thrive a bit longer than otherwise. Whitehead (1929) has suggested that 'The function of reason is to enhance the quality of life', whereas Eliot (1963) has observed correctly, 'The only wisdom we can hope to acquire is the wisdom of humility: humility is endless.' I subscribe to both statements and believe that, with due humility, we must dare to think broadly and deeply, using all of the available tools, including those that imaging science and advanced CAI methods will provide.

Finally, imaging science will not have emerged fully as a new intellectual discipline until the conceptual, organizational, educational, cultural, and ethical issues it raises have been addressed, openly and explicitly, and at greater depth than my limited knowledge permits. Nevertheless, I have made an effort to begin, and urge others to join in this exciting adventure, as the breadth and depth of these issues provide both daunting challenges and unparalleled rewards for all of us; we become active participants in the flow of life itself!

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## The Iconosphere and the New Mecanographic Media

Roman Gubern

Gilbert Cohen-Séat, founder of the Institut de Filmologie in Paris, proposed and defined in 1959 the concept of Iconosphere in his seminal book *Problèmes actuels du cinéma et de l'information visuelle*. In this text Cohen-Séat offered first a quantitative approach to the iconosphere, and two pages later, a qualitative evaluation. He wrote:

Les chiffres que nous aurons à examiner permettent de se faire une idée de certaines dimensions quantitatives du phénomène cinématographique. En leur adjoignant le complément des phénomènes concurrents ou solidaires du cinéma, la télévision et les dérivés iconographiques des techniques visuelles, nous verrons que c'est bien de l'institution d'une *iconosphère* comme milieu d'existence constant que l'intervention du cinéma nous fait les témoins.  
(Cohen-Séat 1959: 8)

Among these iconographic media derived from visual technologies, Cohen-Séat mentions the posters and photographs created for cinematographic publicity; the *photoromans*; and comics (Cohen-Séat 1959: 37). And for his qualitative evaluation, he wrote:

Le cinéma introduit une coupure entre la chose et son contexte traditionnel de représentation, en la déracinant de la biosphère et en opérant sa transplantation dans un milieu nouveau. Ce milieu, constitutif de l'univers filmique, *iconosphère*, constitue bel et bien une mutation de toutes les conditions de présentation et de réception de l'information. (Cohen-Séat 1959: 10)

Some years later, Umberto Eco quoted and praised Cohen-Séat's theoretical contribution in his essay 'Appunti sulla televisione', included in *Apocalittici e integrati* (1965). The 1960s saw a growing interest in the visual media which spread among European scholars and produced an emblematic book expressively titled *La Civilisation de l'image* (1969), by Enrico Fulchignoni. It seemed as

though a typical trait of the new 'affluent society' (Galbraith 1958) was the spread of a ubiquitous visual culture, linked to the expansion of television, motion pictures, and the advertising industry. For the semiotician, this phenomenon could be described as a textual density, originating in the proliferation of textual sites pertaining to iconic, audio-iconic, verbo-iconic, or scriptural-iconic technological cultures; sociologists, on the other hand, were mainly concerned with the social effects of information overload and psychological alienation presumably produced by this new cultural ecosystem.

We can easily assume that the iconosphere is a complex system, in the sense this term carries in physics: a system that embraces many interrelated variables whose behavior is unpredictable or enormously expensive to reproduce. Another basic principle of the iconosphere has a biological flavor: images compete with each other in the social space in order to attract the attention and the gaze of the public. With its highly diversified semiotic capital, comprising icons, indices, and symbols, the iconosphere has to be regarded as a socio-holistic concept: social, in what concerns the behavior of the audiences, socializing the human vision, subject to a daily pedagogy and even an 'inculcation' (Goodman 1968); and holistic, for the interactions among the different iconic media.

At this point, we have to remember that the iconic image is a perceptual and cognitive category; but in the same way that Saussure established a dichotomy between *langue* (language) and *parole* (speech), we can propose the distinction between Image (the iconic system) and images (its various material representations). We can find a mythical anticipation of this dichotomy in Plato's belief in the Idea (archetype) and its earthly, debased visual representation. Let us admit, beyond this suggestive myth, that Image is an abstraction, a perceptual and cognitive category, while the iconic images are texts, particularized manifestations in the form of different technical modalities derived from that model. At the same time we must keep in mind that the supratextual iconic models are not abstract models existing prior to the texts; rather, they are products of the intertextual distillation generated by the different textual options that permit the code to function on them as a kind of semiotic superego. There is no language without speech, nor speech without language. And this code/superego establishes what is imperative, what is permitted, and what is forbidden in each concrete textual option (of a given culture, epoch, genre, school, style, etc.).

The semiotician has traditionally been more interested in the Image, while the anthropologist, the sociologist, and the art critic have been more attracted by

images. But in the past half-century, iconic research has been sliding from the study of the Image, as an ideal supratextual model, to the analysis of its iconic dialects, as confirmed by the issue of *Communications* in 1978 titled *Image(s) et Culture(s)*. In a scientific field dominated before the Second World War by the assumed universal Gestalt laws, anthropologists, ethnographers, and art historians have devoted themselves in the past decades to showing the dialectological fragmentation of iconic cultures. Today everyone assumes that images convey a knowledge about the visually perceived environment in a way codified by each culture.

The iconic image is a social artifact which conveys meaning, defined by an isomorphic structure of invariant relations among its elements, endowing each part with a meaning in relation to the whole. This definition could be called organic, because every organism is a unit made up of a diversity of organs. But we can state more simply that the iconic image is a motivated convention (or a non-arbitrary convention) and, in agreement with Gombrich, that the meanings are universal but not the conventions; therefore it is the meaning that motivates the convention, and not the other way around.

The iconic dialects integrated in the iconosphere are characterized by their density, semiotic heterogeneity, technical diversity, and plurality of functions. We find side by side in its texture both indexical and iconic images, according to the classic distinction by Peirce. Photochemical images and most televisual images are indexical, being a print of the light reflected by a referent, while some iconic images very often try to simulate an effect of indexicality with realistic disguises by artificial means. According to Aumont (1990: 57-58), the three social functions of images are symbolic, epistemic, and aesthetic.

The previous references to the plurality of the iconic dialects in the iconosphere deserve some attention. According to linguistics, a dialect is a variety of a language, distinguished by features of expression and by its social use. Everyone agrees on the presence of multiple codes in iconic representations, depending on the genre, the context, etc. Martin Jay (1988: 4) has talked about different *visual subcultures* based on different *scopic regimes* (Metz 1977). Art historians focus their attention on genres, schools, and styles, while anthropologists talk about iconic sociolects within different cultures (like the pictographic codes used by architects, engineers, hobos, etc.). In addition to these familiar diversities, film critics and media analysts are quite familiar with the contamination of genres (*Blade Runner* as a hybridization of science fiction and thriller), the loan of

stylemes (from comics to publicity), the hybridization of systems of representation, and the syncretism of many discourses. We can therefore speak about a dialectology of the iconic image.

During the lively years of the encounter of cinema and semiotics in Europe, Peter Wollen wrote:

What is needed is a revival of the seventeenth-century science of characters, comprising the study of the whole range of communication within the visual sensory band, from writing, numbers and algebra through to the images of photography and the cinema. Within this band it will be found that signs range from those in which the symbolic aspect is clearly dominant, such as letters and numbers, arbitrary and discrete, through to signs in which the indexical aspect is dominant, such as the documentary photograph. Between these extremes, in the centre of the range, there is a considerable degree of overlap, of the coexistence of different aspects without any evident predominance of any one of them. (1972: 139-40)

In addition to these obvious semiotic diversifications, neighborhoods, and overlappings, we can verify that the changing process of technogenesis of the pictorial signifiers determines a changing iconic morphology, creating and maximizing some expressive possibilities and impeding others:

—Perceptual state: images can be manifest or latent, the latter being only a potential image, like the undeveloped photographic image or the magnetic image encoded in the molecules of a videotape.

—Process of technogenesis: images can be the result of a chirographic pigmentation (drawing and painting), technographic pigmentation (photoengraving), photochemical (photography and cinema), photonic (hologram), electronic (television), or magnetic-electronic (video). And the genetic structure of the electronic image can be analogic or digital, a very relevant distinction for its production, manipulation, transmission, storage, and reproduction.

—Spatial dimensionality: images can be two-dimensional or three-dimensional.

—Spatial delimitation: images can be framed or environmental (like Virtual Reality).

—Representation of temporality: images can be static, sequential (comics), or mobile.

—Chromatic nature: images can be achromatic or colored.

—Process of enunciation: images can be originated by an individual or a collective process of production, raising in the second case the question of the identity of the *author* of the representation. And they can be mono-directional or interactive, these latter being defined by the reversibility of the role of the enunciator.

—Method of storage or preservation: images can be optical or magnetic.

—Narratological type: images can be narrative or descriptive.

—Semiotic syncretism: there are audio-iconic, verbo-iconic, and scriptural-iconic texts.

—Segmentation: we find a wide range of modalities, ranging from fractal images that allow the isomorphic divisibility of the whole to cinematographic image (whose perceptual unit is the photogram), television image (whose perceptual unit is the line), and computerized image (whose unit is the pixel), showing that the sequence leading from analogic to digital follows a law of decreasing extent of the structure of the signifier and a correlative increasing versatility of its articulation, passing from analogic poly-articulation to the digital omni-articulation of the pixels.

—Social access: images can be private or public (mural painting, mass media).

But the iconosphere is not simply a physical or a perceptual environment; it is a complex system of interactions between the subject and the images present in his or her private and social space. We live in an oculocentric culture, which means that its center is located in every perceptual human apparatus, creating an overlapping of visual fields for every ocular system. Every human gaze scans its optical space and segments its visual field into objects and backgrounds by a phenomenon called preattention. And the selectivity of this gaze leads to a perceptual hierarchy generated by diverse objective and subjective factors: scarcity or ubiquity of some images (television, publicity), physical size, distance from the observer, originality or aggressiveness of the stimulus, affinity with the interests of the observer, etc.

We have mentioned the distance between the stimulus and the observer, but this distance can be physical or psychological. To see a film in a theater means the voluntary adoption of a short psychological distance from the image, even if the spectator is located very far away from the screen in a huge drive-in. But glancing at an illustrated magazine in a newsstand entails a long psychological distance from its pictures, despite the physical proximity. This is why we speak of modes of viewing, modes of seeing, and modes of reading images. There is an active and a passive spectatorship, in the same way that there is a conscious gaze and an inat-

tentive look. Very often the conscious gaze requires a motionless body (like watching a film or analyzing a painting), while the dispersed attention of the latter fragments the visual landscape and transforms the stable iconic texts into sequential and fleeting impressions. A good example of the fugacious look is provided by the image of the television set perceived as *moving wallpaper* by the housewife working around it.

### The Computer Challenge

The textual density of our iconosphere has increased in the past twenty years due to the emergence of many forms of computerized images, in a new postanalogic and interactive stage of the relations between man and machine in the domain of iconic production.

The irruption of the so-called *intelligent machines* has allowed three different types of communication:

- (1) Discursive flow from man to machine, with the machine acting as enunciatee.
- (2) Discursive flow from machine to man, with man acting as enunciatee.
- (3) Discursive flow between machines.

There is no intersubjective relation in any of these three structures of communication, but in (1) and (2) the process and the roles can be reversed, generating an interactivity between man and machine with one of the poles defined by the intentionality. This means that only one of the poles of this communication structure has intentions and a subjectivity, leading to a volitional asymmetry in the system, although some performances of the machine can be superior. In (3) there is no intentional pole, and the communication in the system is entirely deterministic.

The infographic production of images synthesized by a computer in the form of a mosaic of pixels (acronym for picture elements) on a screen is a technique with many remote antecedents in the history of art. The techniques of mosaic, tapestry, and the pointillist painting of Seurat were based on the divisibility of the image into small units of color. And for the keyboard of the computer, Boris Vian invented in his novel *L'écume des jours*, written in 1946, a *piano-cocktail* that produced sounds, colors, and flavors.

The infographic image generated by computer is also based on an analytic technology that transforms the discontinuity of the pixels into an analogic, continu-

ous, and compact visual form. The image is first digitalized, converted into a series of numbers corresponding to the spatial position, color, and brightness of each of the several thousand pixels. This digital image is in fact an imaginary image in the form of binary information stored in a computer which is only visible as output to another format such as film or videotape. The pixel information is stored as a set of numbers (this is why some have called the numerical images *arithmographies* or *algorithmic art*) because the pixel is a unit of information referring to tiny dots defined by their position and homogeneous color and brightness. The pixel is a unit of information but not a unit of signification, and its nature is pre-semiotic, like the horizontal line in the television screen. But an organic group of pixels can become a unit of signification if the resulting visual form appears invested with semantic value.

The infographic image is an iconic utterance that springs onto the screen out of the interaction or dialogue between two propositions: one recorded in the program of the machine and offering a limited range of morphogenetic possibilities, and the other from the operator who is interpellating the program (rarely the program's designer). In this conversational or quasi-dialogic model of interaction between man and machine, the operator is addressing his or her utterance to the intelligence of an absent subject, the designer of the program, whose proposition is vicariously represented in the program.

In contrast to photochemical images, infographic icons are not indexical. But the two types have in common their latent or potential image: the undeveloped photochemical image and the magnetic record of information stored in the memory of the machine. Other relevant differences are found in the permanent autonomy of the digital image in relation to its physical support, allowing any alteration without damaging it, which is not the case for the photochemical image. In this way the computerized image is the culmination of the technical dissociation initiated by the Magic Lantern between the storage support of the image (memory) and the support of display (screen), with a stored image that is neither optical nor isomorphic, and a screen image which, unlike the cinema, is produced not by reflected light on a surface, but by emitted light.

Experts on computer graphics have classified the typology of the synthesized images in four categories that are very close to Arnheim's (1969) traditional distinction of signs, symbols and pictures. These categories are (Martinez 1984: 17):

*Abstract images:* images without any explicit semantic values.

*Symbolic images:* graphics, diagrams, or schemes providing quantitative, topological, or structural information.

*Figurative images:* oversimplified representations abstracted from the perceived visual world.

*Realistic images:* the highest level of analogic or isomorphic representation in our pictorial culture.

Infography combines the creative advantages of painting, in respect to the unlimited artistic imagination, and the performative perfection allowed by the machine. In fact, the computer automates the subjective imaginary of the painter, but the operator of the machine can only imagine a form (previsualize an output) if he or she knows the technical possibilities of the program, which are very different from the potentialities of the indexical photochemical image. The cinematic concept of *shot* as a segmented and discrete unit representing a virtual space in a real time appears obsolete when transitions are generated by digital *morphing*, with the visual forms evolving in a process of continuous metamorphosis. The formal discontinuity of the pixels allows the paradox of a permanent continuity in the iconic flow which does not exist in film language built up through the editing of independent shots.

The field of the computerized image is extremely wide, and some of its applications have had considerable and controversial social impact. A case in point is provided by the interactive videogames worrying so many pedagogues. Interactive videogames offer an excellent example of iconic dialectology in the realm of the computerized image, not only by its specific social (*ludic*) use for a specific portion of the market, but also by its formal features and the way they interact. The icons of these videogames are programmed with the technique of *limited animation*, a low-budget technique in which most parts of an animated figure are held stationary while only a few, such as arms and legs, actually move. This limitation renders the trajectory of the icons stereotypical and highly predictable. On the other hand, the relationship between the operator and the screen does not respect the canonic distance between the television set and the viewer (a minimum of three times the diagonal of the screen), and is even shorter than the usual distance between the operator and the computer monitor — as if the player were trying to penetrate the virtual space displayed by the screen in order to physically manipulate its figures. The player seems thus determined to reverse the experience of the character who leaves the screen in *The Purple Rose of Cairo* and to emulate the adventure of Alice through the looking glass.

### Beyond the Mirror: Virtual Reality

The computerized image has found its most spectacular display in Virtual Reality, a technique derived from the strategies used to train air pilots that unfolds a surrounding iconic environment that constitutes in itself a complete and undivided iconosphere for the experimental subject.

The goal of Virtual Reality is to maximize the referential illusion not only by simulating the visual referent, but by usurping its three-dimensional space. To achieve this hyperrealistic effect the subject wears a helmet with two television monitors, one for each eye, providing the optical perception of binocular vision and retinal disparity (but suppressing the accommodation of the eye's lens to the different distances represented in both screens). The two computerized images are furthermore coordinated with the subject's body motion to produce the impression of physical integration and mobility in a three-dimensional space. This three-dimensional space is not a material form, but an optical landscape that transforms the subject in the mobile perceptual center of an illusionary environment. A key factor in this optical and kinesthetic illusion (eventually reinforced by the tactility provided by the *datagloves*) is the absence of frame for a bidimensional image that covers the global visual field of the subject. Rejecting a tradition established during the Renaissance, but also respected by photography, cinema, and television, this image breaks the clear physical and psychological separation and distinction between subject and external object, observer and observed, to provoke a sensorial immersion of the watcher in the watched, in a much more radical way than the Total Cinema Huxley proposed in *A Brave New World* (1932).

Virtual Reality overcomes the traditional culture of simulacra, with its external and portable artifacts of semblance, to immerse the perception in the realm of simulation, a simulation that includes the subject and his or her topological position in the represented space by erasing marks of enunciation as relevant as the frame of the image. This is why the referential illusion tends to become referential usurpation in a new *cyberspace*, replacing the conceptual interaction with the machine of the computer operator with a new sensorial interaction. And this new sensorial relation between spectacle and spectator promotes a conflict between contemplation and narrativity, mimesis and diegesis, perception and structure, modifying the traditional role and tasks of the spectator in regard to the spectacle and its represented fiction.

The illusionistic Alternative World created by Virtual Reality appears to be very close to the myth of *artificial paradises* (Baudelaire) because it is in fact a kind of programmed or consensual hallucination that a semiotician can evaluate as a perfect allegory of the iconosphere for the modern hypervisual citizen. Virtual Reality embodies the myth of Alice through the looking glass, fighting the afflictions of the dim quotidian realities. It is not strange that Virtual Reality is more appealing nowadays to artists (called cyberartists) than to the army.

And looking toward the next century, the combination of the computerized image with the new technologies of transmission of numerical signals will allow the rise of *televirtuality in real time*. And according to some technological prophecies, at this point the use of *telehography* will also be quite common.

The hyperrealism of Virtual Reality, like the hologram, in fact runs a pathway parallel to the work of biologists in their experiments on cloning. The creation of clonic worlds will make men similar to gods. The real molecular cloning will confound nature and artifice, the original and the copy, the object and the sign, leading to its dissolution. Semiotics, according to Eco, deals with everything that can be used to lie. But clones have no capacity to deviate from their model, to lie. This is why molecular cloning will inaugurate a new post-semiotic culture in which the concept of representation will have to be reformulated.

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