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Mental Spaces:
Aspects of Meaning Construction in Natural Language

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A "past space of Freud's beliefs" is introduced by the space-builder *Freud believed,* and propositions holding in that space are accordingly marked grammatically as *past*. Not surprisingly, then, tense can indicate which space a description belongs to, as in (82) and (83):

(82)
In 1929, she married someone who *was* a friend of mine.

(83)
In 1929, she married someone who *is* a friend of mine.

(84)
In 1929, she married a friend of mine.

It may be appropriate at this point to emphasize an important methodological difference between the approach followed here and classical generative grammar: the space format and the ID Principle account directly for the interpretations of (82) through (84) and explain as a consequence why the linguistic form (84) may have the same reading as (82) or the same reading as (83). It does not follow from this semantic relationship that (84) is structurally related to (82) and (83) (e.g., through underlying forms). The relationship is a consequence of the discourse-processing possibilities and is not a property of the syntax; reflecting the relationship directly in the syntax by means of underlying forms amounts to arbitrary reduplication, since the posited underlying forms will be different in every case. For time, tensed clauses will be reconstructed; for propositional attitudes (*want, believe,* etc.), logical forms will have to be reconstructed, since no linguistic paraphrase happens to exist; for concrete images, (*paint, draw,* etc.), a third kind of form would have to be devised; and so on. This is really a badly disguised form of paraphrase that masks the generalization that all the ambiguities in cases like (85) follow directly from the ID Principle:

(85)

David { married / is painting / wants / never found } a lady with white hair.

Chapter 2
Roles and Multiple Connectors

Archie: "My sister's father is a rich sewer tycoon."
Barrow: "Your father? Where?"
Archie: "I said my sister's father. My family connections are none of your business, and besides, they're too complicated for you to understand. He is also occasionally my mother's father, on account of the fact that on the telephone last night my sister was my mother. But he isn't my father because I've never met him."

Rex Stout, *Some Buried Caesar*

2.1 Pronouns across Spaces

Because the connectors that link elements in different spaces are *open,* in the sense of section 1.1, a pronoun with an antecedent in one space can freely identify its counterpart in another, connected space.

(1)
Vivien saw herself in *Gone with the Wind.*

(2)
Harry believed himself to be a woman.

(3)
Julian thought of himself back in 1929.

This would come as no surprise if one viewed all the counterparts as being in some sense "the same" element. However, there are some interesting facts that seem to rule out this possibility even in its weakest form (e.g., equivalence class of counterparts or cross-world identification function).[1]

The relevant cases can be subdivided into three main categories: multiple connectors, multiple counterparts, and multiple descriptions.

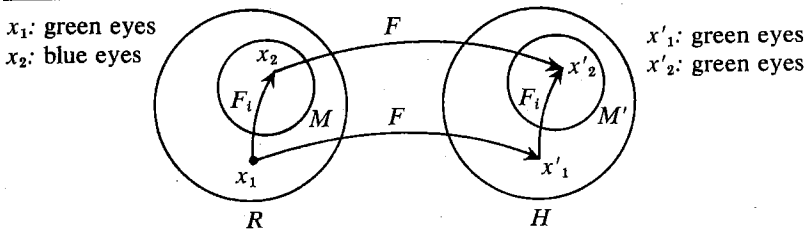


Figure 1.17

(74)
If he had listened to his mother, this criminal would be a saint.

(75)
If you were a good painter, the girl with blue eyes would have green eyes.

Notice also:

(76)
If you were a good painter, the girl with green eyes would have green eyes.

As depicted in figure 1.17, four spaces are involved: R ("reality"), M (the painting), H (the counterfactual hypothetical space), and M' (the counterpart of M within H). *The girl with green eyes* points to a trigger in R ("the model") and identifies a target in M' after successive applications of the ID Principle.

The properties of hypothetical spaces will be examined more carefully in chapters 3 and 4 in connection with presuppositions and indefinites. Similar counterfactual spaces can be set up by *otherwise* or sometimes directly, after a negative utterance:

(77)
Too bad you were never baptized. (Otherwise), *your godfather* could take care of you.

(78)
I don't have a car. Otherwise, I would drive *it* to work.

Your godfather and *it* set up elements in the hypothetical space ("otherwise ____") with no counterpart in R.

1.6.5 Tenses and Moods

Tenses and moods do not by themselves explicitly set up spaces, but they give important grammatical clues concerning the spaces relevant for the sentence being processed. For instance, (62) followed by a past tense means that we stay in M (1929); followed by a present tense, it signals a shift back to R; the "conditionals" (*could, would*) in (77), (78) signal the counterfactual space M. When they appear within a description (inside a relative clause), tenses and moods can signal explicitly what kind of space the description is relative to, thereby removing some or all of the indeterminacy of the ID Principle on Spaces (principle (53)). For instance, in examples like the following, from French, the subjunctive marks propositions in the "want" space W and the present indicative marks propositions in the origin space R:

(79)
Marie veut que Gudule *mette* une robe qui *soit* jolie.
subj. subj.
(Lit.: Marie wants that Gudule *wear* a dress that *be* pretty)

(80)
Marie veut que Gudule *mette* une robe qui *est* jolie.
subj. ind.

Potentially, the indefinite noun phrase *une robe qui . . .* is either a description in R (d_R) or a description in W (d_W). The subjunctive in (79) indicates that the description is in W and forces the d_W interpretation (that is, the "nonspecific" reading) for that sentence. The indicative in (80) signals that the description is in R and forces the d_R interpretation ("specific"). The readings and ambiguities linked to such sentences are unrelated to the indefinite article, which preserves the same semantic function (introduction of new element in discourse) in all cases. Rather, the multiple interpretations stem from the ID Principle and may be resolved if grammatical mood indicates explicitly which space the descriptions are made in. We shall see that the same is true of definite noun phrases.

Sequence-of-tense constraints are an example of the same process for time spaces.

(81)
Freud *believed* that Jung *was* a psychotic.
past past

could also be a direct description of the target x_2, yielding the somewhat contradictory reading depicted in figure 1.15 that the lady was a blonde with white hair. (Compare "In 1929, the aging president resigned," "Forty years from now, my middle-aged daughter will get married.")

Consider another context. We are talking about the young woman I fell in love with when I lived in Spain in 1929, and I say:

(63)
Today, *that young woman* is an old lady with white hair.

This time, the origin space happens to be "1929." The space-builder *today* sets up a space corresponding to the present. The noncontradictory reading of (63) is obtained as for (62), by letting *that young woman* point to an element in R_{1929} and identify its target counterpart in M_{today}.

Other well-known ambiguities are accounted for in the same way:

(64)
In 1929, the president was a baby.[22]

(65)
At that time, my husband was a traveling salesman.
(The husband changed professions *or* the speaker changed husbands)

(66)
When Jimmy was born, we had *the table* in the bedroom.
(Followed in discourse by, for example, "It was a bed at the time, which we later converted into a table" or "We don't have a table anymore")

1.6.2 Space Space

Not surprisingly, geographical spaces are also linguistic spaces:

(67)
In Moldavia, the president is a tyrant.

In Moldavia sets up a new space M different from the origin R (say, "here"). The noun phrase *the president* may point directly to an element in M (reading: the president of Moldavia is a tyrant), or it may point to a trigger in R (the president here), identifying a target in M (the president when in Moldavia) (reading: when in Moldavia, the president (from here) is a tyrant).

Again, any noun will do:

(68)
In the other apartment, the chandelier looks fine.
(The chandelier, when in the other apartment, looks fine, *or* the chandelier of the other apartment looks fine)

1.6.3 Domain Spaces

A domain of activity (game, field of science, sport, type of literature, etc.) can be processed linguistically as a mental space, and we observe the usual ambiguities. Consider in particular the transparent noncontradictory readings of the following examples:

(69)
In Canadian football, the 50-yard line is 55 yards away.

(70)
In Martian chess, the bishops are castles.

(71)
In Rubik's new theory, transformations are phrase structure rules and phrase structure rules are transformations.

(72)
In this new Californian religion, the devil is an angel.

1.6.4 Hypothetical Spaces

Linguistic forms such as *if p, then q* set up a new space H in which p and q hold.[23] *If p* is the space-builder. Again we find noncontradictory "transparent" readings and somewhat contradictory opaque ones, as in (73) through (75). Figure 1.16 depicts the mental spaces set up in (73).

(73)
If I were a millionaire, my VW would be a Rolls.

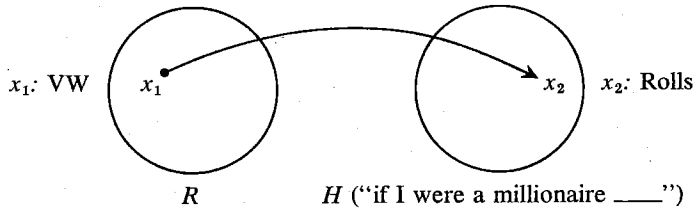


Figure 1.16

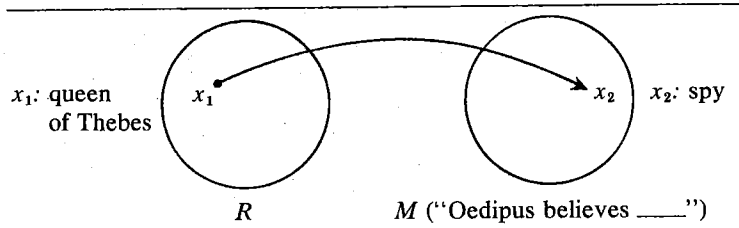


Figure 1.12

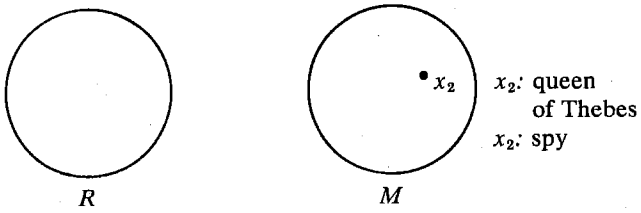


Figure 1.13

from natural language trigger-target identification, that is, from the operation of the ID Principle across spaces. For example, consider (61):

(61)
Oedipus believes that the queen of Thebes is a spy.

If R is the origin space (e.g., speaker's reality or story containing (61)) and *Oedipus believes* is a space-builder that sets up space M within R, which is linked to R by a connector F, then by principles (51) and (53), the noun phrase *the queen of Thebes* may point to an element in R or to an element in M. In the former case, the element in R, x_1, will be a trigger for identification of x_2 in M (see figures 1.12, 1.13). Figure 1.12 corresponds to the classical transparent reading: it allows the possibility that x_2 does not have the property "queen of Thebes" (hence the possible, noncontradictory reading of "Oedipus believes that the queen of Thebes is not the queen of Thebes"). Figure 1.13 corresponds to the classical opaque reading: "queen of Thebes" is a property of x_2 (i.e., informally, part of Oedipus's belief); x_2 may turn out to have no counterpart in R (discourse: ". . . Actually, there is no queen of Thebes") or a counterpart with different properties (e.g., someone Oedipus mistakenly takes for the queen).

Notice that the availability of two "interpretations" for a sentence like (61) is purely a consequence of the discourse processing involved

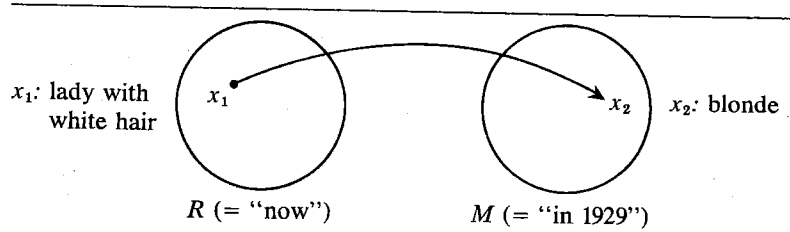


Figure 1.14

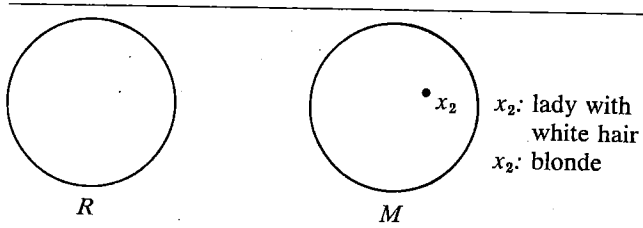


Figure 1.15

(construction of spaces, connectors, etc.); it is not linked to any structural ambiguity of the linguistic form at deep, semantic, or logical levels.[19]

Typically, then, the double processing possibility will appear if there is more than one space—in particular, if the relevant sentence contains a space-builder.[20] Therefore, we expect to find similar ambiguities with space-builders other than image creators or propositional attitudes. This is indeed the case, as a brief survey of various kinds of spaces will show.

1.6.1 Time Space

As mentioned in section 1.4.1, time adverbials such as *in 1929, last year, next time you're here* are space-builders. Informally, the counterpart of an element in some space corresponding to time t is "that element at time t." Let us consider some examples:

(62)
In 1929, *the lady with white hair* was blonde.

In 1929 sets up space M. Assume the parent space R corresponds to "now."[21] The noun phrase *the lady with white hair* may set up x_1 in R and identify its counterpart x_2 in M (x_1 "is" the old lady today, x_2 the "same" person when she was young, in 1929) (see figure 1.14). But, as in all our previous examples, the noun phrase *the lady with white hair*

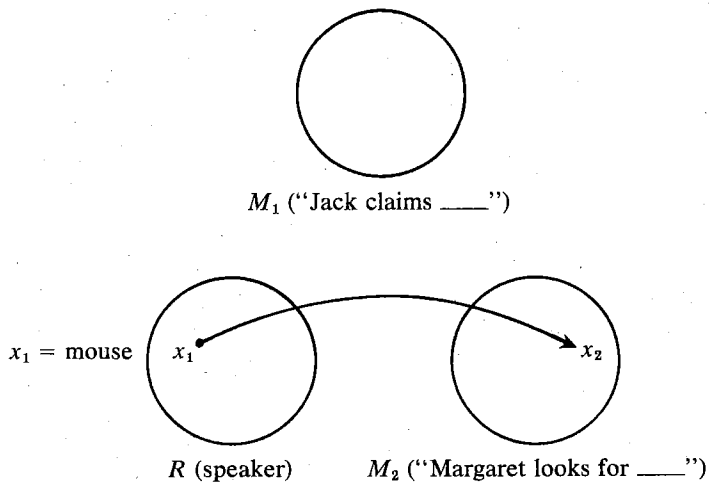


Figure 1.9

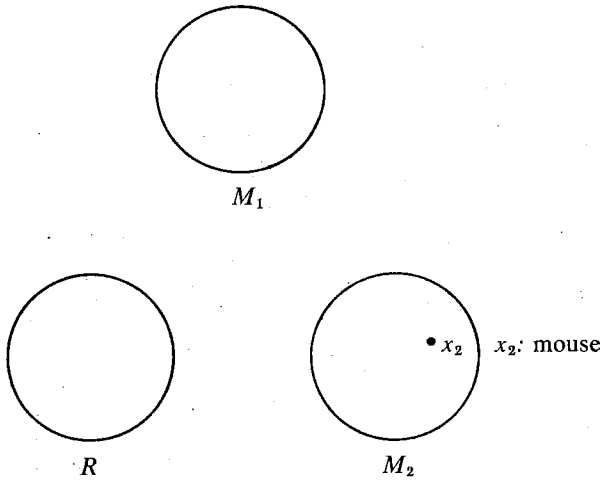


Figure 1.10

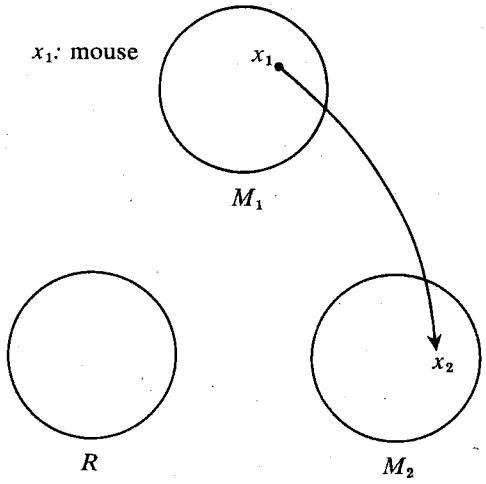


Figure 1.11

Whether or not dragons exist, Alberta may believe they do and (6) is ambiguous as to whether Alberta maintains a belief about a particular dragon or about some unspecified dragon. We could paraphrase the specific reading by:

(7)
There is a particular dragon that Alberta believes ate her petunias.

which could be true without the ontological reality of dragons; for example, she could intend Puff, the Magic Dragon. The ambiguities concerning specificity appear to be independent of ontological existence entailments. The distinguishing factor which separates the two readings is that of individuation.

(59) shows that ontological reality is not the issue, nor is "existence" (imaginary or "real"). The possibility of introducing the "indefinite" element into various spaces gives rise to this type of pseudoproblem when a linear, "scopal" representation is attempted. From the present point of view, the interpretations can just as well be regarded as instances of vagueness with respect to which space the trigger belongs to and which connector is involved. Individuation is related to role-value contrasts (see chapter 2).

1.6 Simple Ambiguities

We have seen in section 1.2 that the simple opaque-transparent ambiguities associated with verbs of propositional attitude follow directly

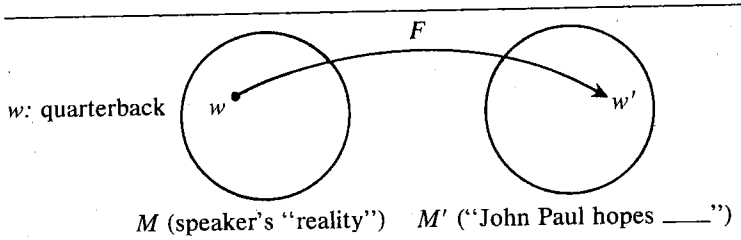


Figure 1.8

not necessarily a property of w': John Paul may know the speaker's former quarterback only in his capacity as a missionary.

Note one important general type of justification for setting up space elements in both the specific and the nonspecific situations: further discourse reference is possible in all cases. That is, (56) can be continued by utterances like (57), regardless of the interpretation:

(57)

John Paul prays that { he / this quarterback / this former football player } will be an example to all.

Also, returning to the concrete model-image correspondence, we find the parallel between pictures and spaces still in force. The following sentence has two readings relevant to the issue:[16]

(58)
Ari painted a tanker.

A tanker may be a "model" (i.e., a real boat) for whatever is in the picture, or it may point solely to the boat in the picture (in which case there may have been no model). Since *Ari painted* is a space-builder,[17] this double possibility follows straightforwardly as before from the indeterminacy of Indefinite Interpretation (principle (50)): the new element set up by *a tanker* may be in either of the two discourse spaces R or M ("Ari painted ____"). In the former case, as in figure 1.8, a target is available via (53).

Incidentally, example (58) underscores two major flaws in the traditional and still popular scopal treatment of specificity. First, (58) has only one possible scope position for an "existential" quantifier and yet has two interpretations, in accord with a space-connector approach.[18] Second, existence is not at issue: model and image are both quite real.

(56) followed by (57) illustrates another flaw: the possibility of discourse reference on the nonspecific reading runs counter to a representation in terms of narrow-scope quantifiers (e.g., John Paul hopes ($\exists x$(x adopt needy children))) or for that matter in terms of intensions.

If current discourse involves more than two spaces (say, n), the possibility arises that the element corresponding to the indefinite will be introduced in any one of the n spaces, giving rise, in a sense, to n contextual readings for the utterance of the sentence. For example, consider (59):

(59)
Margaret is looking for a mouse.

(59) is of course true (for the speaker) if Margaret is looking for Minnie, Minnie being a mouse (so-called specific reading). It is also true if any mouse will do, for instance, one from the next-door pet shop (so-called nonspecific reading). But it is true as well in other cases, for instance, if Margaret's son Jack claims to have seen a mouse in the bedroom and this is the one Margaret is looking for. This third situation not only does not entail the existence of any mouse for the speaker but also does not imply any belief in the mouse on Margaret's part—she may be looking for it essentially to make sure that Jack told a fib. Still, the mouse here is not nonspecific in the usual sense: it is very precisely the one Jack claimed he saw, and no other will do. Given the pragmatically present spaces M_1 ("Jack claims ____") and M_2 ("Margaret is looking for ____"), we have three configurations according to (50) and (53) (see figures 1.9, 1.10, 1.11). The introduction into M_1 can be made explicit by an appropriate relative clause:

(60)
Margaret is looking for a mouse *that Jack claims he saw*.

Figure 1.11 corresponds to the third situation: not any old mouse, but no existence entailments.

The possibility of such situations has not been entirely overlooked. Following Fodor (1970), Ioup (1977, 235) comments:

> The following sentence is ambiguous with respect to specificity, even though no referent of the indefinite exists ontologically; and the sentence could be true on either reading.
> (6)
> Alberta believes that a dragon ate her petunias.

struction, "If the ID Principle applies, assume there was a target for its application." Although ultimately such strategies follow from more general laws (see section 3.3), I shall, for the sake of explicitness, write down a temporary formulation:

(53)
ID Principle on Spaces
Given two spaces M, M', linked by a connector F and a noun phrase NP, introducing or pointing to an element x in M,
a. if x has a counterpart x' ($x = F(x')$) in M', NP may identify x';
b. if x has no established counterpart in M', NP may set up and identify a new element x' in M' such that $x' = F(x)$.

(This formulation is meant to cover both cases where NP is introducing x (50) and cases where NP is merely pointing back to x (51).)

From this perspective, consider (54):

(54)
Henry's girlfriend, Annette, is Swedish; but *Len believes* that *she*'s his wife, that *her* name is Lisa, and that *she*'s Spanish.

The space-builder *Len believes* sets up space M' with parent M. The noun phrase *Henry's girlfriend* points to a. a in M has several properties (girlfriend of h (Henry), name *Annette,* Swedish). The pronominal noun phrases *she* and *her* point to a. By (53), they set up a counterpart a' of a. *His* sets up a counterpart h' of h. a' has different properties from a (h''s wife, name *Lisa,* Spanish).

1.5 Scope of Indefinites

In virtue of Indefinite Interpretation (principle (50)), an indefinite noun phrase *a N* will introduce a new element w into space M. Moreover, if M is connected to M' by F, then the ID Principle may apply to this noun phrase, so that *a N* will identify a target of w, w'. If w has no target (typically the case, since w itself is a new element), then by (53) the noun phrase also sets up the target w'.

As noted in section 1.4.1, a space-builder comes with a companion clause specifying relations holding in the space (for example, *in Len's painting, S; Len believes that S*). Therefore, a noun phrase in that clause must[14] identify an element of the space, which it may do either by direct identification or by pointing to a trigger in a connected space.

Consider then the possible *interpretations* of a linguistic form consisting of a space-builder and a companion clause with an indefinite. Our example will be (55):

(55)
In that movie, *a former quarterback* adopts needy children.

In that movie is a space-builder for M', the parent space M may be R, the connector ($M \rightarrow M'$) is the actor-character pragmatic function F_d, "drama" of (47). The companion clause is S = *a former quarterback adopts needy children.*

S must specify a relation holding in M'. Therefore, the noun phrase *a former quarterback* must identify an element in M'. It can do this in two ways:

(i) by directly setting up w in M' according to (50); then w in M' has the property Q = "former quarterback." w, being in M', is a character in the movie. Property Q holds in the movie for this character; or

(ii) by setting up w in M by (50) and its target w' in M' by (53). Then w in M has the property Q. Since w is an actor, property Q holds in "reality" for this actor. That is, a former quarterback is playing the role of a character who adopts needy children.

What (55) shows is that if two spaces M and M' are relevant in the discourse and NP is an indefinite noun phrase in the companion clause, the characterization of indefinites (Indefinite Interpretation (50)) and the ID Principle on Spaces (principle (53)) allow NP to set up a new element either in M or in M'. This accounts for the so-called scope ambiguity of the indefinite in cases like (55). The same is true for the so-called specific-nonspecific contrast in (56):

(56)
John Paul hopes that *a former quarterback* will adopt needy children.

The only difference between (55) and (56) is the space-builders. In (56), the space-builder is *John Paul hopes,* there are two spaces M, M', and the connector F maps "reality" onto "hopes." If the noun phrase *a former quarterback* sets up w directly in M', then w has no counterpart in M; that is, no "real" quarterback is set up (the so-called nonspecific reading). If the noun phrase sets up a trigger w in M and a target w' in M', then a "real" quarterback, w, is set up, with a counterpart in M' (the specific reading). As figure 1.8 shows, in the first case, the property "quarterback" holds (for w) in M';[15] in the second, it holds in M. In this configuration (corresponding to the specific reading) "quarterback" is

Similarly, the noun phrase *a unicorn* sets up a new element u in M such that UNICORN(u). The verb form indicates among other things that a relation holds between u and w: RIDE(w,u). The same holds for (49) with the space-builder *Len believes*.[12]

Taking N to stand for a common noun, either simple or complex (*witch* or *wicked witch who came from the west*) and "N" the property it denotes,[13] the indefinite article can be partially characterized as follows:

(50)
Indefinite Interpretation
The noun phrase *a N* in a linguistic expression sets up a new element w in some space, such that "N"(w) holds in that space.

(I shall return to the question of determining what space w is introduced into.)

In contrast to indefinite descriptions that set up new elements, the *direct* function of *definite* descriptions is to point out elements already there (though, as we shall see, this may also result, albeit indirectly, in setting up elements).

(51)
Definite Interpretation
a. The noun phrase *the N* in a linguistic expression points to an element a already in some space M, such that "N"(a) holds in that space.
b. If N is a proper name, the noun phrase N points to an element a already in some space M, such that N is a name for a in M.

(Ultimately, (50) and (51) will only be partial characterizations, since, as shown in chapter 2, definites and indefinites can also set up "roles" rather than mere elements.)

Given (51), if the space M is pragmatically connected to another space M' by a connector F, then a in M may have a counterpart a' in M' such that $F(a) = a'$. a is a reference trigger with a' as its target, and, by the ID Principle, *the N* may be taken to identify the target a'. This is the typical situation that obtains in the paradigmatic examples of section 1.2 from OBC, such as (35):

(35)
In Len's painting, *the girl with blue eyes* has green eyes.

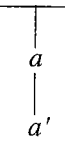
The space-builder *in Len's painting* sets up a space M'. The parent space M could be R (or some other origin: a story, a hypothetical situation, a movie with Len as one of its characters, etc., depending on previous discourse). By (51), the noun phrase *the girl with blue eyes* may point to a in M such that "a has blue eyes & a is a girl"; a (the model) has a counterpart a' (the image) in M'. By the ID Principle, the reference can shift from the trigger a to the target a', whereby (35) indicates that "a' has green eyes" holds in M'.

For the ID Principle to operate, linking the trigger-describing noun phrase to the target a', there must be some assumption that the trigger does in fact have a target counterpart. In the case of (35), this may be background information: the model and the image are already connected. But simple inspection is not enough to establish a connection. Consider (52):

(52)
a. Here is a picture of the European heads of state.
b. In the picture, Margaret Thatcher is completely hidden behind Helmut Kohl.

Margaret Thatcher has no physical counterpart in the picture, but given $SB_{M'}$ = *in the picture* and the corresponding space M', (52b) says that Margaret Thatcher's counterpart in M' is behind Helmut Kohl's counterpart. The assumption in (52) is that each head of state—that is, each "model," each potential trigger in M—has a counterpart in M'. The same phenomenon is apparent in (37):

(37)
Len believes that the girl with blue eyes has green eyes.



$SB_{M'}$ = *Len believes* sets up space M'. To interpret the sentence, we assume that a in M has a counterpart a' in M', but a' has actually never been set up independently of a.

The moral of these examples is that targets do not require explicit introduction. We might say that the system uses a shortcut here: instead of explicitly introducing targets in M', it lets the ID Principle apply freely to trigger elements in M with the implicit, "sensible" in-

In (44), no parent space is explicitly specified for M. R is inferred as the parent space: $M \subset R$.

(45)
Discourse D starts relative to R

a. In that play, Othello is jealous.
   - In that play: space-builder for $M_1 \subset R$
   - Othello is jealous: establishes property of Othello in M_1

b. He believes that Desdemona is unfaithful.
   - He believes: space-builder for M_2
   - Desdemona is unfaithful: property of Desdemona in M_2

In (45), no parent space is explicitly specified for M_2. (45) is typically understood with M_1 as the parent space: $M_2 \subset M_1$ (that is, (45b) is taken to hold in the play, not in reality). But this interpretation is not imposed structurally; R is also a candidate for parenthood, as (46) shows:

(46)
a. In that movie, Clint Eastwood is a villain.
   - In that movie: M_1

b. But he thinks he's a hero.
   - he thinks: M_2

(46) has two likely interpretations: one in which, as in (45), M_1 is the parent space for M_2 (the character in the movie thinks he's a hero) and one in which R is the parent space (Clint Eastwood misunderstands the role). (There is an additional twist in this example, given that *he* (in *he's a hero*) may refer not to the target (the character in the movie), but to the trigger (Clint Eastwood himself); under this third interpretation, the "real" Clint Eastwood considers himself a hero.)

1.4.2 Connectors and Counterparts

When a space M is introduced in discourse by a space-builder SB_M, it must be pragmatically connected to its parent space: there must be a connector capable of connecting *triggers* and *targets* in the parent and daughter spaces. Typical cases are as follows:

(47)

	Parent Space	Space M	Connector
(in (46))	R (speaker's reality) or M_1 (movie reality)	SB_M = *he thinks*	mental image connector F_b: from "reality" to "beliefs"
	R	SB_M = *in Len's picture*	image connector F_i: from models to pictures
(in (46))	R	SB_M = *in that movie*	drama connector F_d: from actors to characters

Many other types of connectors are possible and will be exemplified below; it will also turn out that M and M' may be linked by more than one connector. Many linguistic reference phenomena do not depend on which particular connectors are involved but rather on general properties of open connectors and the trigger-target configurations they set up.

We have considered how spaces are built by space-builders, how they fit into other spaces by syntactically or pragmatically conditioned inclusion, and how the umbilical cord of pragmatic connectors keeps them in touch with their parents.

Having come this far, we are faced with another problem: How do spaces acquire elements? How are they "filled up" and internally structured? There are several strategies for introducing elements into spaces. As the following examples show, one device that does this explicitly is the indefinite article:

(48)
In Len's picture, *a witch* is riding *a unicorn*.

(49)
Len believes that *a witch* is riding *a unicorn*.

In (48), the space-builder *in Len's picture* sets up space M, the noun phrase *a witch* sets up element w in M with the property indicated by *witch* (I shall transcribe this as WITCH(w) for expository purposes).

Here also, no absolute notion of what Len wants is involved, only what Len wants according to what Max believes, what Max believes being in turn according to the speaker's reality—that is, possibly different from another presumably mental object, namely, what Max actually believes.

But what about the picture cases? Aren't such things as paintings and photographs real objects? To be sure, the objects themselves are real, but their interpretation as images is mental.[10] The analysis in terms of only one connector is grossly oversimplified; at least three connectors are involved, linking the model to the paint on the canvas, the paint to the image perceived, and the model (in the speaker's mental reality) to the image perceived (also in the speaker's mental reality). This accounts for cases like (42):

(42)
In this painting, the house is acrylic, but the girl is oil.

1.4 Mental Spaces

1.4.1 Space-Builders

Having informally suggested that pragmatic connectors operate on mental objects and that such objects may fall within different domains, I shall now suggest a more precise model for the corresponding linguistic processes and mental constructs.

To this end, I introduce the notion of *mental spaces,* constructs distinct from linguistic structures but built up in any discourse according to guidelines provided by the linguistic expressions. In the model, mental spaces will be represented as structured, incrementable sets—that is, sets with elements (a, b, c, ...) and relations holding between them (R_1ab, R_2a, R_3cbf,...), such that new elements can be added to them and new relations established between their elements. (In a technical sense, an incrementable set is an ordered sequence of ordinary sets, but it will be convenient to speak of the mental space as being built up during ongoing discourse, rather than to refer to the corresponding sequence of sets.)[11] Expressions like "$Ra_1a_2...a_n$ holds in mental space M" will be taken to mean that a_1, a_2, ..., a_n are elements of M and that the relation R holds of (a_1, a_2, ..., a_n). A partial ordering relation is defined on spaces. I shall call it *inclusion* and use the usual notation $\subset$, but unlike set inclusion, it carries no entailments for the elements within the spaces: $a \in M$ and $M \subset N$ does not entail $a \in N$. In fact, I

assume for the moment that all spaces are entirely distinct, that is, that they have no elements in common.

Linguistic expressions will typically establish new spaces, elements within them, and relations holding between the elements. I shall call *space-builders* expressions that may establish a new space or refer back to one already introduced in the discourse. Later sections will show that space-builders may be prepositional phrases (*in Len's picture, in John's mind, in 1929, at the factory, from her point of view*), adverbs (*really, probably, possibly, theoretically*), connectives (*if A then* ____, *either* ____ *or* ____), underlying subject-verb combinations (*Max believes* ____, *Mary hopes* ____, *Gertrude claims* ____). Space-builders come with linguistic clauses, which typically (but not always; see chapter 5) predicate relations holding between space elements.

Furthermore, the space-builder SB_M establishing space M will always establish M as included in some other space M' (its *parent space*). This inclusion may either be indicated explicitly by syntactic embedding of the space-builders for M' and M, as in (43),

(43)
Max believes that in Len's picture, the flowers are yellow.

$SB_{M'}$ — space M' $\supset$ SB_M — space M

or be inferred pragmatically from previous discourse, as in (44), (45):

(44)
Discourse D starts relative to space R (origin (= "speaker's reality"))

a. Susan likes Harry.
   establishes relation between Susan and Harry in R

b. Max believes that Susan hates Harry.
   space-builder for M — establishes relation between Susan′ and Harry′ in M

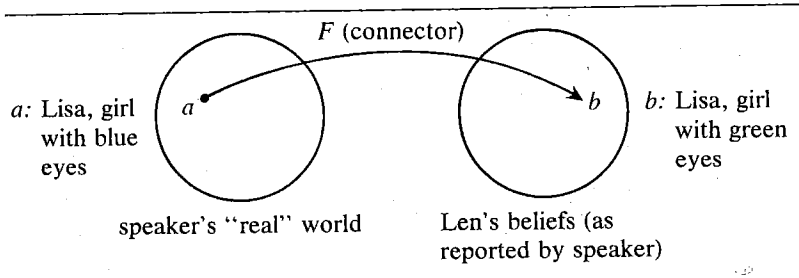


Figure 1.7

1.3 Reality

The pragmatic connectors in section 1.1 could be taken to represent links between real-world objects. In (36) through (38) and figure 1.7, on the other hand, the targets, whatever they may be, are not real-world objects, since they are part of beliefs, desires, and such. In OBC, a particular metaphysics is assumed, in order to allow the required extension: namely, there is a "reality" in which physical objects exist, and the normal situation is for linguistic descriptions to *refer* to these physical objects, but this reality may be connected to images (mental, verbal, concrete, etc.) by means of the relation "purports to refer" (the equivalent of the image connector). Something like the ID Principle will then create ambiguities of the opaque-transparent kind. In setting up his image operator, Jackendoff writes (p. 72), "Since the normal reading of *a girl* is as a physical object, we will choose the image reading as the modal reading. . . ." Thus, reality is sharply distinguished from images: there are real, essential referents on the one hand and various representations of these referents on the other. Under this view, the triggers will always be real referents, while the targets may be concrete or mental representations of them.

However, this asymmetrical view is not reflected by the linguistic data: the triggers may be in the pictures, beliefs, etc., and the targets in the so-called real world. Suppose we are in an artist's studio, looking at a painting that includes a girl with brown eyes. The artist might say:

(39)
In reality, the girl with brown eyes has blue eyes.

(39) is quite parallel to (35), but the scheme is reversed: instead of going from reality to the picture, we go from the picture to reality. The trigger

is the image ("girl with brown eyes in the picture"), and the target is the "real" girl. As usual, the ID Principle allows the target to be identified in terms of the trigger's description; in this case, the real girl is identified in terms of a description of the image (*the girl with brown eyes*), and it is predicated of her that she has blue eyes. So in this case the relevant connector is the inverse of the previous one. Instead of mapping reality onto the picture, it maps the picture onto reality. It is also an open connector. Notice that the direction of the mapping is indicated in such cases by the adverbial (e.g., *in Len's painting* or *in reality*). Similar connector inversions are possible in the case of "mental" images such as beliefs. If the context is such that Max believes he has inherited a castle with a park, the speaker might say:

(40)
In reality, *the castle* is a run-down shack and *the park* is a junkyard.

Again, descriptions valid in Max's belief system are used to identify "real" entities with different properties. This follows from the ID Principle operating on a connector from Max's beliefs to reality.

In presenting the fundamental symmetry of these reference phenomena, I have continued to use the terms *reality* and *real object*. But this cannot be right. The connectors are not linking real objects and representations, for the speaker who uses expressions like (36) through (40) need not be *right* about the properties he assigns to entities (including whether or not they exist). So what we have been calling "reality" must itself be a mental representation: the speaker's mental representation of reality.[9] In accounting for the *linguistic* phenomena under scrutiny, it is not our (immediate) concern to tell whether (or to what extent) such representations may be accurate; nor is it our concern to find the philosophical, psychological, or neurological nature of reality, beliefs, desires, and pictures. We are looking only at ways of talking about them, in principle a different issue.

We end up, then, with links between mental representations. And of course the same holds if we add more layers of mental "pictures": in (36) or (37), it cannot be that Len's beliefs in some absolute sense are involved; rather, we are dealing with the speaker's view of those beliefs—that is, a mental representation of a mental representation. This embedding is often reflected by corresponding syntactic embedding:

(41)
Max believes that Len wants to leave the country.

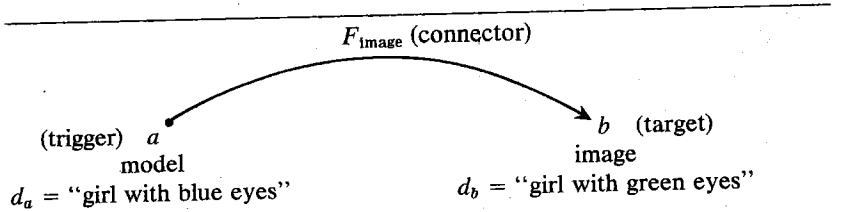


Figure 1.6

language, the existence of this usage must be taken for granted and accepted" (p. 54).

This usage is indeed central to picture reference and follows from Nunberg's more general characterization of pragmatic reference. First, there is a pragmatic relation between a model and its representation. Something is a picture of something else by virtue of psychological perception, social convention, how it was actually produced, or any combination of those three: the artist's decision (especially in the case of the three-year-old child or the cubist painter), the viewer's perception with respect to various "likeness criteria," technical considerations (as in X-rays), and so on. This pragmatic relation meets the criteria for being a pragmatic reference function, a connector. Therefore, the ID Principle will apply, allowing a description of the trigger (in this case the model) to identify the target (in this case the image). In fact, as we have seen, image functions are open connectors.

This view puts Jackendoff's important observation in its proper perspective: the "means the language has to refer to images in pictures" follows from the very general ID Principle operating on trigger-target connections. Furthermore, the distribution of reflexives and anaphors for pictures is a general property of open connectors.

The characteristics of crucial examples in OBC, which have the form of (35),

(35)
In Len's painting, *the girl with blue eyes* has green eyes.

will then follow from this generalization. The adverbial phrase *in Len's painting* in (35) sets up an image situation. The model, a (say, Lisa, a girl who has blue eyes), triggers the image connector F, and the target, b, is the representation in the painting, with the property of having green eyes, as depicted in figure 1.6. The ID Principle very generally allows a description of the trigger to identify the target, so d_a (*the girl with blue eyes*) may identify b, the image. If so, sentence (35) is taken to mean that b, the image, has green eyes. We are in fact likely to interpret (35) in this way. However, the ID Principle also allows the description of the target, d_b, to identify the target b (the connector is then trivially the identity function). So nothing prevents *the girl with blue eyes* in (35) from being taken as a description of b, yielding a second (somewhat contradictory) reading to the effect that b's eyes are both blue and green.

Now, Jackendoff makes the following essential point: the double possibility noticed in the case of pictures for expressions like (35) is quite parallel to the one found in so-called opacity-transparency phenomena linked to verbs of propositional attitude and, more generally, intensional contexts:

(36)
In Len's mind, the girl with blue eyes has green eyes.

(37)
Len believes that the girl with blue eyes has green eyes.

(38)
Len wants the girl with blue eyes to have green eyes.

All these expressions have a noncontradictory reading (for (37): Lisa has blue eyes, and Len believes she has green eyes) and a contradictory reading (Len believes that Lisa has blue eyes and has green eyes).

This parallel sets the stage for treating images, beliefs, stories, etc., in a similar way. If we assume that just as Lisa has a counterpart in Len's painting (her image), she has a counterpart in Len's mind, or (more precisely) if we assume that we talk *as if* she did,[7] then the world-mind function will operate as a connector and the ID Principle will work as before to yield potential interpretations for descriptions like *the girl with blue eyes* in (37): on the one hand, a description of the trigger a ("the real girl") identifying the target b ("the belief girl") (it is b, not a, who has green eyes) and, on the other hand, a direct description of b, identifying b (b has blue eyes and green eyes).

This unified analysis assumes an as yet ill-defined correspondence of the kind informally suggested by figure 1.7.[8]

In the case of deictics, one can point to the omelet and say "He/That one left in a hurry," but not "It/that left in a hurry," which would force the connector to apply to the interpretation of the inanimate pronoun *it* or *that*. In contrast, one *can* point to the person Norman Mailer and say "He's/that guy's on my top shelf."

What makes connectors available, and when are they open or closed? This is in itself a central and fascinating question involving psychological, cultural, and sociological conditions that bear directly on linguistic data. I cannot pursue it in detail here, but the following general point of view suggests itself: connectors are part of *idealized cognitive models* (ICMs), in the sense of Lakoff (1982), Fillmore (1982), and Sweetser (1981), which are set up locally, culturally, or on general experiential or psychological grounds. This implies possible variation from community to community, from context to context, and from individual to individual. Indeed, we find exactly such variation in informant judgments about openness of connectors: speakers are typically able to learn new connectors (by setting up new ICMs), and the more familiar, general, and useful a connector becomes, the more open it tends to be. Other related conditions come into play: for example, to what extent properties of the target are felt to reflect important characteristics of the trigger (to say "Norman Mailer is not selling at all right now" says something not only about the books but also perhaps about the author; for a nurse to say "The gastric ulcer in room 21 wants more coffee" may imply nothing about the illness itself) and to what extent the ICM fits the particular context (compare "Norman Mailer likes to bind himself" with (11)).

The connectors relevant to the rest of this study are those that link mental spaces and, as we shall see, they turn out to be invariably open. Central in the present context, then, will be the properties of *open* connectors, and in particular the ones already pointed out: the ID transfer principle, the capacity to set up target and trigger as potential antecedents, and applicability to anaphoric elements.

1.2 Images

As noted explicitly by Nunberg (1978, 1979), images, pictorial representations, photographs, etc., are clearly linked to their models by pragmatic connectors, as shown in figure 1.5, since for example *Lisa* in "Lisa is smiling" may point to Lisa *en chair et en os* or to Lisa in a picture.[5]

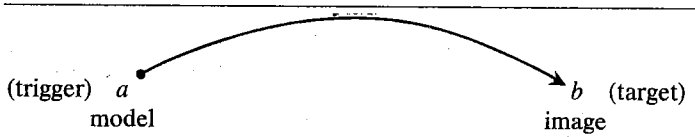


Figure 1.5

The following pronominalization data show that image connectors are open; that is, they set up both target and trigger as potential antecedents and may apply to the output of pronoun interpretation:

(29)
Lisa is smiling in the picture, but she has been depressed for months.
(Trigger antecedent of *she*)

(30)
Lisa has been depressed for months, but in the picture she is smiling.
(Connector applies to interpretation of pronoun *she*)

(31)
Lisa, who has been depressed for months, is smiling in the picture.
(Trigger antecedes *who*, target is smiling)

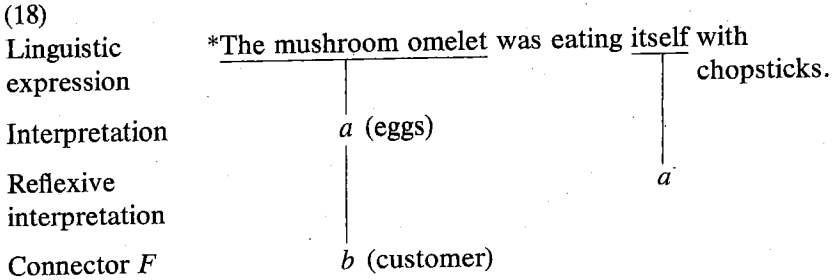
(32)
Lisa, who is smiling in the picture, has been depressed for months.
(Lisa (model) antecedes *who;* connector applies to *who*)

(33)
Lisa saw herself in Len's picture.
(Connector applies to the output of reflexive interpretation, so that *herself* = image; cf. (11))

(34)
In that drawing, *Lisa* appealed to *herself*.
(Connector applies to the interpretation of Lisa as a person, yielding the image (drawing); the reflexive interpretation is with respect to the trigger, *herself* referring to the person)

Jackendoff (1975; hereafter OBC) has also noted the possibility of giving a linguistic description of an image in terms of its model. He stresses that the phenomenon is not "imprecision" or "loose metaphor" but rather "the means the language has to refer to images in pictures,"[6] and he adds, "If one wants to study the semantics of natural

(18)



The order of operations is the same as in (16), but in (18) the connector applies to the "antecedent," not the reflexive. Schema (16) applied to the mushroom omelet cases will not work either:

(19)
**The mushroom omelet* appealed to *itself.*

(Intended reading: the eggs appealed to the customer who ordered them)

The only order that works for such cases has the reflexive interpretation following the application of the connector:

(20)
The mushroom omelet paid only for himself.

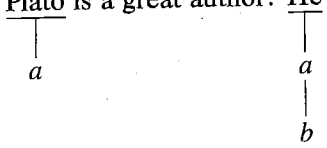
Furthermore, this distribution of reflexives correlates with the contrast noted above between (5) and (10):

(5)
Plato is on the top shelf. You'll find that *he* is a very interesting author.

(10)
**?The mushroom omelet* left without paying. *It* was inedible.[3]

In (5) the reference trigger *Plato* (author) is a suitable antecedent, but in (10) the reference trigger *the mushroom omelet* is not. Nor can a pronoun be a trigger in the omelet case; compare (21) and (22):

(21)



(22)
**The mushroom omelet* was too spicy. *It* left without paying.

Let us say that a connector is *open,* when it sets up both target and trigger as potential antecedents and may apply to the output of pronoun interpretation, and *closed,* when it sets up the target as foremost potential antecedent[4] and cannot apply to the output of pronoun interpretation. In the above examples, F_1 (authors → books) is open, and F (food → customers) is closed.

The behavior of relative and deictic pronouns is also consistent with this distinction:

(23)
Plato, *who* is on the top shelf, was a great man.

(24)
*The omelet, *which* left in a hurry, was too spicy.

(25)
Plato, *who* was a great man, is on the top shelf.

(26)
*The omelet, *which* was too spicy, left in a hurry.

Examples (23) through (26) contain *nonrestrictive* relatives. *Which* in (24) and (26) behaves like *it* in (22) and (10), respectively; *who* in (23) and (25) behaves like *he* in (21) and (5), respectively. The contrast follows from the open-closed distinction: In (24), the closed connector cannot apply to the pronoun *which.* In (26), the closed connector applies to "the omelet"; only the target (customer) is a potential antecedent—*which* has none.

With *restrictive* relatives we find a superficial difference because the connector will now apply to the interpretation of the full noun phrase, relative clause included:

(27)
**The omelet which left in a hurry* was too spicy.

(28)
The omelet which was too spicy$_i$ left in a hurry.

(27) is (doubly) ruled out by the closed connector condition. But (28) is fine: the connector applies to the interpretation of the full noun phrase *the omelet which was too spicy,* yielding the customer who got that particular omelet.

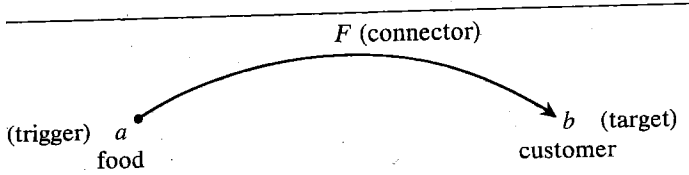


Figure 1.4

Nor is the choice of pronouns free:

(7)
*Plato is on the top shelf. *It* is a very interesting author.

Consider the connector linking food and customers induced by the restaurant "frame," illustrated in figure 1.4. In this context, statements like (8) are possible:

(8)
The mushroom omelet left without paying the bill.

(8) is understood with the interpretation that the customer who had ordered the mushroom omelet left without paying. The target may then serve as a pronominal antecedent:

(9)
The mushroom omelet left without paying *his* bill. *He* jumped into a taxi.

But in this case, pronominal reference to the trigger is more awkward:

(10)
The mushroom omelet left without paying. *?*It* was inedible.

Reflexivization shows even stronger contrasts:

(11)
Norman Mailer likes to read *himself* before going to sleep.

(12)
*Norman Mailer likes to read *itself* before going to sleep.

(13)
The mushroom omelet was using chopsticks.

(14)
*The mushroom omelet was eating *itself* with chopsticks.

(15)
*The mushroom omelet was eating *himself* with chopsticks.

In (11), we find the masculine pronoun *himself* agreeing in gender with the trigger (Norman Mailer), but referring to the target (books by Mailer). A closer look shows that since the noun phrase *Norman Mailer* both describes and refers to the author, its interpretation does not involve the connector. The reflexive pronoun *himself,* on the other hand, although anaphoric to *Norman Mailer,* refers to the books: its interpretation *does* involve application of the connector, and this application must follow the reflexive "rule." This process can be schematized "interpretively" as follows:

(16)

Linguistic expression	Norman Mailer likes to read himself.	
Interpretation	*a*	
Reflexive interpretation		*a*
Connector F_1 applied to trigger *a*		*b*

The impossibility of (12) also follows: *itself* would require the "inanimate" antecedent *b,* but only *a* is available. However, if the connector applies to the first instance of *a* (corresponding to the noun phrase *Norman Mailer*), yielding *b,* then *b* may serve as an antecedent for the reflexive *itself:*

(17)

Linguistic expression	Norman Mailer	is not, in itself,	a great dissertation topic.
Interpretation	*a*		
Connector F_2	*b*		
Reflexive interpretation			*b*

Thus, examples like (11) and (17) show one anaphoric process, reflexive interpretation, applying either before or after the pragmatic connector. But in (14) the process schematized by (18) fails:

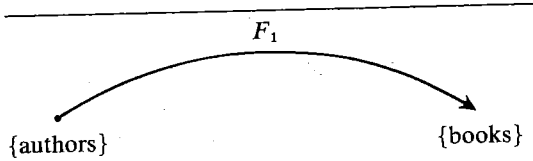


Figure 1.1

For instance, one function (call it F_1) links authors with the books containing their works, as shown in figure 1.1. Taking as an example a = "Plato," $b = F_1(a)$ = "books by Plato," the ID Principle allows (2) to mean (3):

(2)
Plato is on the top shelf.

(3)
The books by Plato are on the top shelf.

In (2), a description or name of a person, d_a (in this case the name *Plato,* but *Socrates' friend* or *the author of the Dialogues* would do just as well) identifies an object b, the collection of books.

Of course, other pragmatic functions are available to interpret (2)—for example, functions from persons to representations, from persons to information about them, from persons to bodies, from persons to names (= words), and so on. Using one of these instead of F_1, (2) could be interpreted to mean that a bust or portrait of Plato is on the top shelf, that the file containing information about Plato is on the top shelf, that Plato's body is on the top shelf, that the sign with the word *Plato* on it is on the top shelf, etc.

F may simply be the identity function, as in figure 1.2. In that case, b will be described in terms of its own properties—not a surprising possibility.

Pronominalization is one area where the possibility of "indirect" reference by means of pragmatic functions and the ID Principle has linguistic consequences.

Consider again the general situation in which b is linked to a by a pragmatic function F and may be referred to by means of a description of a, according to the ID Principle. Call a the reference *trigger,* b the reference *target,* and F the *connector,* as illustrated in figure 1.3.

The ID Principle states that in a connected situation, a description of the trigger may be used to identify the target. Clearly, this allows reference to the target b: in example (2), under the authors → books connector interpretation, there has been successful reference to certain books, and this reference target becomes a potential antecedent for pronouns and other anaphors:

(4)
Plato is on the top shelf. *It* is bound in leather.

However, the trigger a is also a potential antecedent in such situations:

(5)
Plato is on the top shelf. You'll find that *he* is a very interesting author.

Superficially, then, *Plato* in (2) can be an antecedent both for *it* and for *he*. More precisely, both the reference trigger (the author Plato) and the reference target (books by Plato) can be pronominal antecedents of discourse following (2). And this is not a matter of choosing one or the other as the antecedent for pronominalization, since both may simultaneously warrant anaphors in the same discourse:

(6)
Plato is on the top shelf. *It* is bound in leather. You'll find that *he* is a very interesting author.

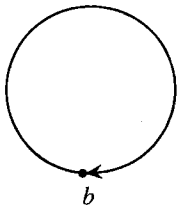


Figure 1.2

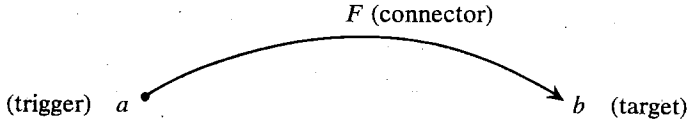


Figure 1.3

opacity, attributivity, intentional identity, presupposition projection, counterfactuals, and comparatives.

And yet this book is not about reference in the usual sense. I shall speak throughout of elements being *set up mentally, pointed to,* and *identified* by language forms; the language forms do not *refer* to such elements. If there is to be reference, it will go from the elements in mental spaces to the objects referred to.[2] Nevertheless, complete theories of truth and reference for natural language cannot bypass the space construction process (see section 5.3).

Another crucial feature of the analyses presented here must be emphasized at the outset. The standard way of trying to account for the multiple meanings of a given linguistic form consists in associating it systematically, at a more abstract level, with a set of representations (logical forms, semantic structures, etc.). The space format reveals a different organization: Relatively simple grammatical structures give instructions for space construction in context. But this construction process is often *underdetermined* by the grammatical instructions; thus, simple construction principles and simple linguistic structures may yield multiple space configurations. And this creates an illusion of structural complexity.[3]

To be sure, there is complexity somewhere, but the point here is that a good part of the load can (and should) be shifted from the intemporal language structures to the field of virtual and multiple mental constructions. What is complex for the linguist-observer may be much less so for the speaker-listener who is engaged in a single construction at a time, narrowly guided by context. This bears in turn on the fundamental problem of language acquisition.[4]

Language, then, is not merely interpreted with respect to worlds, models, contexts, situations, and so forth. Rather, it is involved in constructions of its own.[5] It builds up mental spaces, relations between them, and relations between elements within them. To the extent that two of us build up similar space configurations from the same linguistic and pragmatic data, we may "communicate"; communication is a possible corollary of the construction process.

Chapter 1
Pragmatic Functions and Images

1.1 Connectors

In the quest for a fully explicit and maximally integrated account of language organization, much attention has been focused on the multilevel structural intricacies of linguistic forms. Recently, however, some studies have shifted this focus of attention from the language forms themselves to other structures and networks on which they depend and to the correspondences that hold, or are established, between such structures and networks. Outstanding examples are the notions of frames and scenarios; literal metaphor as an elaborate structuring of conceptual networks via partial correspondences underlying semantic-pragmatic organization and its expression through language; the account of presupposition in terms of discourse worlds linked to each other; and the treatment of "scopal" phenomena like opacity and transparency as referential correspondence between concrete or mental images.[1]

In his excellent study of reference, G. Nunberg provides a key idea related to such correspondences: the notion of *pragmatic function*.[2] He shows that we establish links between objects of a different nature for psychological, cultural, or locally pragmatic reasons and that the links thus established allow reference to one object in terms of another appropriately linked to it. The general principle is this:

(1)
Identification (ID) Principle
If two objects (in the most general sense), a and b, are linked by a pragmatic function F ($b = F(a)$), a description of a, d_a, may be used to identify its counterpart b.