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THE CREATIVE PROCESS WHERE THE ARTIST IS AMPLIFIED OR SUPERSEDED BY THE COMPUTER*

Stroud Cornock and Ernest Edmonds*****

Abstract—*The advent of computing stimulates a desire to re-examine the subject of creativity. Though the computer can replace man in the production of graphic images, its function in the arts is seen as assisting in the specification of art systems and in their subsequent real-time management. An art of system or process is placed in the context of primarily the visual or plastic arts but the authors disavow concern with any 'new' or 'modern technological' art. Various types of art systems are mentioned and advantages of the fully interactive one are considered. It is pointed out that the inclusion of complex real-time responses in an interactive art system can frequently make use of a computer. In such work, the artist and the viewer play an integral part. The traditional role of the artist, composer or writer is thus called into question; it may no longer be necessary to assume that he is a specialist in art—rather he is a catalyst of creative activity. Three cases are discussed to illustrate the applications of this approach.*

I. THE ART WORK—OBJECT AND SYSTEM [1]

1. The advent of the data processing machine introduces a novel element into the realm of the creative art process and stimulates a desire to re-examine the concept of such creativity. This may put into new perspective the role of artists, composers or writers, their art works and the role of viewers or audiences. We shall understand by the term *art system* or *process* an activity as a result of which an art object may or may not be produced.

1.2 As the extensions of man have grown more elaborate, we have seen a retreat from the number of specifically human characteristics and functions by which we (in effect) define ourselves. We may mention that the telescope has shown that our Earth is not the centre of the universe, that modern medicine has found that our chest contains a replaceable pump and we may further suggest that the frontiers of biology and behavioural science place us within reach of the ability to control and synthesize the most intimate substance of human tissue and character. It is therefore natural that the premium placed on those remaining characteristics by which we identify ourselves has increased and that the 'ghost in the machine' [2] has become a kind of grail, while the anticipation of machine cognition has spread an underlying note of fear throughout the literature of the 20th century. Jacques Ellul sums up this anticipatory fear: '. . . the machine is deeply symptomatic: it represents the ideal towards which technique strives. The machine is solely, exclusively, technique; it is pure technique one might say. For, wherever a technical factor exists, it results, almost inevitably, in mechanization: technique transforms everything it touches into a machine' [3]. We are concerned here with the application of data processing techniques to art systems or processes. We should like to refute the common and understandable extrapolation of Ellul's doctrine into this field, which sees its development as leading to the replacement of artists by the digital computer.

1.3. The sympathy with which the work of an artist is considered by an art consumer will be proportional to the degree to which control (technique) is direct and personal; the master potter would be considered to be at one end of this scale, the sculptor who delivers telephone instructions for the fabrication of a sculpture to an engineering firm,

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** School of Fine Art, City of Leicester Polytechnic, P.O. Box 143, Leicester LE1 9BH, England.

*** School of Mathematics, Computing and Statistics, City of Leicester Polytechnic, P.O. Box 143, Leicester LE1 9BH, England.

at the other. It is against this background that the machine threatens to usurp what is assumed to be the essentially human function of control of making art works.

1.4. For the purposes of our argument, we shall treat the following as the elements of what may be described as the traditional art situation: the *artist*, the *art work*, and the *viewer*, where the artist is an individual who makes all of the decisions regarding the development of an art work, where the viewer is expected to be 'cultured', e.g. familiar with a set of rules and conventions. What we say is that the computer can be brought in as a tool to mimic certain aspects of this situation by having 'culture' incorporated in the programme by following certain routines (graphic, painterly or otherwise) that artists either have followed or might have followed in designing their works. Also the computer can govern other tools employed in the fabrication of an artifact [4]. In addition, we say that such mimicry does lead to the situation described above in paragraph 1.2. To escape this situation, we abstract the concept of *creative synthesis* from the traditional context of various kinds of artists who work alone and the viewers or audiences of their works and ask whether such a synthesis can be reached in other ways. This creative synthesis might be described as the ordering and re-ordering of information at various levels in our minds simultaneously, in order to achieve new or unfamiliar patterns of perception of awareness. We believe that it is a function of the arts to stimulate a high degree of this kind of involvement. Therefore, it is necessary to introduce at this point the term *participant* to replace the terms *viewer* and *audience*.

1.4.1. In the place of an art work we shall discuss the potential viability of what is, quite simply, a dynamic situation (this is necessarily an open term). The participants may be treated as one of the elements of this dynamic situation, while the sum of the elements comprising that situation may be regarded as an equivalent for traditional art situations. This alternative situation will be referred to as the *matrix*. Within this matrix there is an exchange and the digital computer, including the complex of real-time information processing capabilities now available, may be expected to organise and facilitate this exchange. This is clearly not the situation described above at the end of paragraph 1.2.

1.4.2. Since the matrix we have chosen relies on the involvement in the decision-making process by the participants, there will be an information exchange. The *art of system or process* or *process-oriented art* is a dynamic one in which control is exercised both in the design of the matrix and at each point of contact with it. Below we shall discuss further the nature and significance of the way in which the design is initiated. Ascott has drawn attention to the distinction between an art work as a container of information determined by the artist and an art work as a 'trigger' designed to stimulate unpredictable behaviour [5].

1.4.3. The role of the digital computer in the potentially complex spcification of such a matrix and in the 'real-time' processing, communication and cross-referencing of information within such a matrix can be considerable. There is no question here of programming the computer to mimic the traditional artist nor is its use limited here to the generation of 'random' choices.

1.5. Recent art history in the Western world shows a very strong tendency toward the kind of situations described above in paragraph 1.4.1. Burnham has written the following [without clearly stating that by definition visual or plastic art deals with objects. Editor.]: 'A major illusion of the art system is that art resides in specific objects. Such artifacts are the material basis for the concept of the "work of art". But, in essence, all institutions which process art data, thus making information, are components of the work of art. Without the support system, the object ceases to have definition; but without the object, the support system can still sustains (*sic*) the notion of art. Thus we can see why the art experience attaches itself less and less to canonical or given forms but embraces every conceivable experiential mode, including living everyday environments' [6]. The concepts used in the arts can obviously, by the same arguments, survive art galleries and museums. [However, it should be remembered that art objects are not made for commercial galleries but primarily for the contemplation of individual viewers. Editor.] It is also obvious that concepts of art can survive artists as we know them when their control of the situation is reduced [5] or where they are submerged in collaboration with engineers and others as in '9 Evenings, Theatre and Engineering' mounted at the New York's 25th Street Armory in late 1966 by Experiments in Art and Technology, Inc. We shall assume that developments in the contemporary arts no longer necessarily include any concern with aesthetic hypotheses. [As a matter of fact, artists seldom pay attention to aesthetic hypotheses, in any case. Editor.]

1.6. Before examining the matrix we have chosen we state that:

(a) We wish to speak not of a new art but of a way of looking at creative situations;
(b) we do not feel that new technology contributes (of itself) to the arts and it is not, therefore, our intention to praise or to condemn results obtained through the use of the computer or other 'modern technological art';
(c) and to avoid the question of value judgements, we say that, rather than confront this question, all examples of each class of art work are meaningful or significant for the purposes of our argument.

II. THE MATRIX

2.1. We now look in more detail at our matrix in the light of the above discussion and, in consideration of the way in which the participant interacts with an art work (which may be nothing

more concrete than a system of ideas), go some way towards a definition of the matrix (cf. 1.4.2. and 2.4.).

2.2. We have as a major aim the involvement of the participant in problematic thought processes. In this we follow W. Darby Banhard: 'To have human value, the work must . . . have an overt complexity' [7]. But, rather than consider an art work, we shall concern ourselves with the behaviour of the participants in a dynamic situation. The function of any art work of which we speak therefore, will be to act as a trigger or stimulus and only incidentally to convey information. As noted above in paragraph 1.4.2. we shall assume that an art work may be used to trigger the participant within an open-ended situation such that he relates in some way to himself, his world and his attitudes.

2.3. An interactive situation can, we believe, be much more productive than a passive one. Thus, a dynamic situation where the participant plays an interactive part looks most attractive to us.

2.3.1. Let us look more closely at three possible situations. By *environment* we simply mean the sum of factors external to an art work and to the participant or participants, other than the passage of time.

(a) *The static system* (Fig. 1(a)). In this case the art work is unchanging. This is, in fact, the familiar class of traditional art objects. We do not in any way deny that this system can be organized so as to satisfy our requirements but we wish to look at alternatives.

(b) *The dynamic passive system* (Fig. 1(b)). Here an art object is caused to change with time by the artist's program (e.g. kinetic art) or is changed by factors in the environment (e.g. the mobiles of Alexander Calder). (It is interesting to note that these factors could include another participant who is interacting with an art work as described below.) Within the system the participant has no control, he cannot alter anything.

(c) *The dynamic-interactive system* (Fig. 1(c)). This case enlarges the dynamic-passive system to include an output from the participant to an art work. We thus have a feedback loop. This system can be very rich, though the speed with which the participant may exhaust the set of possibilities means that the result could lack substantial interest or value.

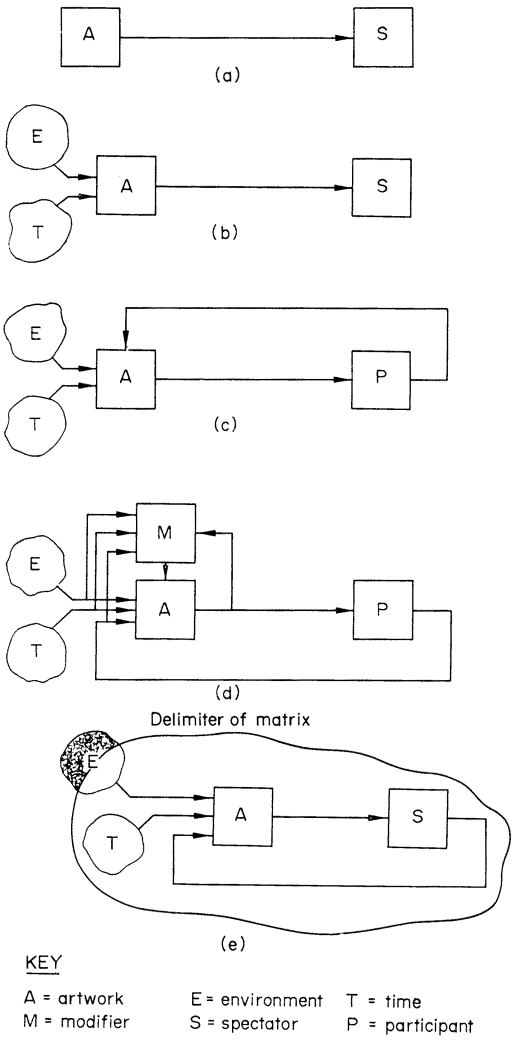

Fig. 1 (a) *Static system.* (b) *Dynamic–passive system.* (c) *Dynamic–interactive system.* (d) *Dynamic–interactive system (varying).* (e) *Matrix.*

2.3.2. An art work as discussed so far is conceived as a system, the definition of which either is or corresponds to the making of the traditional art object (bearing in mind what was said in paragraph 1.5.). As has always been the case, an artist is a participant in the work he makes, though he need not be considered a special case when he reacts in a unique way to process-oriented art. All participants need not react in the same way. (Note, for example, the situation in which a group of performers is asked to make decisions concerning an indeterminate piece of music (e.g. in the music of John Cage, Karlheinz Stockhausen and Christian Wolff.), while the audience, who know what is happening, look on passively.)

2.3.3. A special case does exist where an artist modifies the system or process in a way not allowed for in its original definition. We would then have a varying system (Fig. 1(d)).

2.4. The matrix (Fig. 1(e)) is the total system within which the art system and the participants perform. A varying system leads to a varying matrix.

2.5. Within the matrix the participant plays an integral and interactive part. The art work is the designed sub-system with which he interacts. A participant must be seen simply in terms of the inputs to that subsystem (as an exogenous variable), for to try to design a system that takes a total account of a participant would present an incommensurable problem. Were it otherwise, we should suppose him to be predictable.

2.6. The traditional role of an artist is clearly called into question by these developments: not only does he now find his ability to control the art situation necessarily circumscribed but he often encounters the need to collaborate with other artists

or technical specialists ('Interplay' discussed below, for example). It may no longer be necessary to assume that an 'artist' is a specialist in art; a growing number of individuals whose activities centre on other disciplines are making contributions to the creative arts, so that when one speaks of an 'artist' one means he who is performing a kind of catalysis of creative behaviour within society and not a specialist working for a section of that society. His major function might, therefore, be to initiate.

III. CASES

3.1. The object entitled 'Nineteen', shown in Figure 2 (see colour plate), is an example of a static work where a computer has been used as a problem solver. The arrangement of the twenty elements of the object was found by means of a computer within specified constraints without consideration for the particular relationships within the final layout, which was simply a four element (30 cm × 30 cm) by five element array. It was intended that the assembly in the array be such that a feeling of finality be avoided. The variety of possible relationships between the elements is left for the viewer to sense without actually being able to move them about as he would in an assemblage.

3.1.1. Finding the range of available permutations that satisfied the constraints required the use of a computer. The attempt was made to condition as little as possible the set of relationships seen by the viewer between those elements, both in the design of each element and in the positioning of each element within the array. This may result in some initial annoyance on the part of the viewer who expects to be presented with an harmonious statement but finds, in fact, an 'unsatisfactory' whole that constantly threatens to break down into its constituent parts. The work is thus open-ended in that its visual richness is conditional not only upon the elaborateness of the possible relationships conditionally stated.

3.2. The project, 'Interplay', is a good example of the application of a computer to an art system in the role of management. 'Interplay' involves the design of an environment that would establish a strong interaction among a group of individuals who have no prior knowledge of that environment and where that environment would not contribute any programmed information (entertainment) to the individuals present. The situation is organized as a system that is able only to respond. In order to respond, it is necessary for the system to apprehend and, to this end, it was equipped with an array of sensors. A given input via one of the sensors may lead to a given output or combination of outputs in sound and light. 'Interplay' is, in effect, a large colour and sound organ where the keyboard is represented by the topographical floor surrounded by an audio-visual envelope. The project was exhibited at the British Pavillion of the VI Paris Biennale, October 1969. The movement of people on a sensitive floor was to cause changes in the illumination of a domed ceiling (15 meters in diameter) above them (Figs. 3 and 4). A given input would result in a given output. Clearly, in its simplest configuration, the system could play like a piano and the participants would immediately begin to sense a simpler relationship between their individual floor positions and a section of the audio-visual output. One may anticipate that a tendency to seek order will assert itself, leading to the establishment of control and communication within the group for a limited period.

3.2.1. To encourage these tendencies the inputs in the 'Interplay' project are processed by an on-line computer so as to amplify them (this is a more elaborate configuration). We would therefore consider this system as one leading to amplified play situations that are potentially creative. Some consideration has been given to the problem of enabling 'Interplay' to recognize certain larger patterns in the behaviour of participants and to selectively emphasize or ignore individual inputs so as to maximize such patterns. No simple logic circuit could handle such a problem. We may also note here that, since it was felt necessary to avoid misleading aesthetic choices, the basic configurations of random number tables were used to define the parameters of the topographical floor and the distribution of sound and colour through the envelope.

3.3. Our 'Datapack' (1969/70) art system is an example of a matrix that consists of participants, a display, a computer installation and a designated area around the Vickers Building next to the Tate Gallery in London.

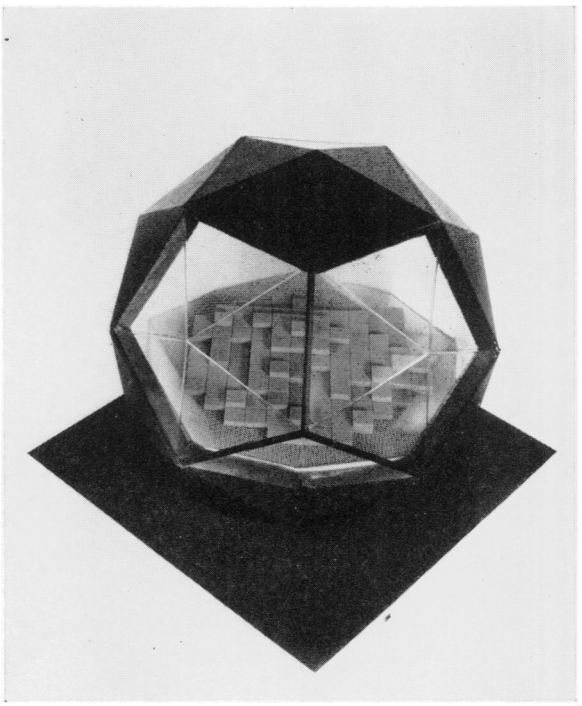

Fig. 3. S. Cornock, B. Faine, N. Nealson and D. Wood, 'Interplay' simulator (scale model) mixed media, 90 × 90 × 90 cm, 1969.

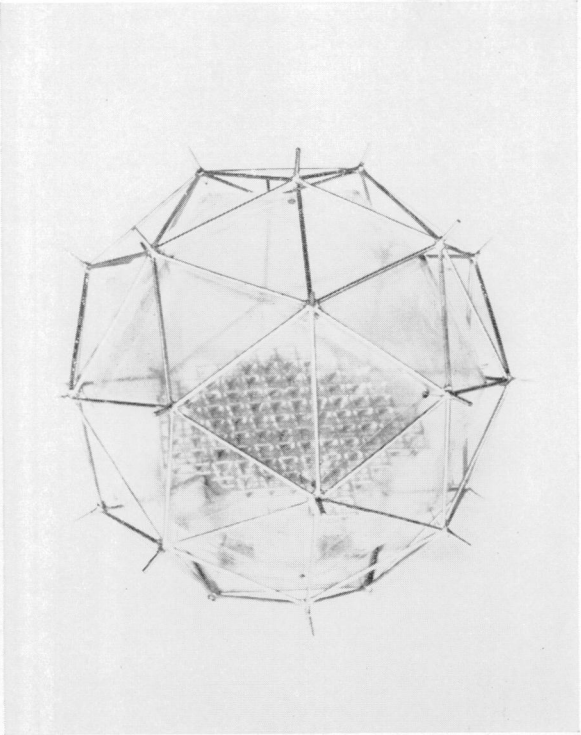

Fig. 4. *'Interplay' structural model, mixed media,* 30 cm diameter, 1969. (Co-ordination of structural analysis and architectural presentation by M. Brackenbury.)

3.3.1. This system is organized so that the participants are involved in three phases: (1) the initial contact with the display (explanations and instruction), (2) the use of a computer terminal and (3) possession of the output from the terminal in the form of a drawing by graph plotter of the Vickers Building in two elevations, against which (in different colours or line thicknesses) are plotted volumes of air space ('sculptures'). The number, shape, size and disposition of the 'sculptures' are determined by the interaction of the participant with the computer. The final output, including the typed record of the interaction or 'conservation' and explanatory material are presented to the participant in a transparent envelope ('Datapack' constitutes an edition of multiples).

3.3.2. This art system is an elaborate and, perhaps, curious game in which the casual spectator is invited to participate. He is, in effect, offered the idea of a sculpture but, rather than taking immediate possession of a determined artifact (sculpture) as the residue of an expressive act on the part of an individual (artist), he is asked to contribute (information) to a process whereby a selection results in his being allotted parcels of air space within a particular environment. The volume of air space has been chosen for the purpose of illustration to emphasize that the significance of the 'game' lies in the process by which the allotment is made and in the concepts formed by the individual concerned and not in the aesthetic merit either of the intentions of the designers of the art system or of the designated volume of air space. Some measure of entertainment may be gained from the proceedings and from the edition of multiples which may be treated as having some aesthetic value or interest. But the burden of the exercise lies with the individual and his own conceptual behaviour when confronted with the art system using our chosen matrix.

3.3.3. This is a rather crude example of a dynamic interactive system (Fig. 1(c)). But note that, on completion of the 'Datapack', a tangible record of the proceedings becomes a kind of static art 'object' in itself and a reference to an idea of another and equally static art 'object'. The system is fulfilled.

What we have done is to suggest an approach to the general problem of computer art. We have necessarily limited our attention to certain points which we hold to be important and have avoided all consideration of the significance of style, expression, the distinction between art works read by references to conventions and other developed heuristically and dynamically with the participant; of the relation between the arts and technology; and of the role of artists, composers and writers as catalysts within the technological society. Nevertheless, we feel that the limited argument presented and certain of the terminology suggested could establish a basis for further consideration of the questions posed.

REFERENCES

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4. R. Mallary, Computer Sculpture, *Artforum*, **7**, 20 (May 1969).
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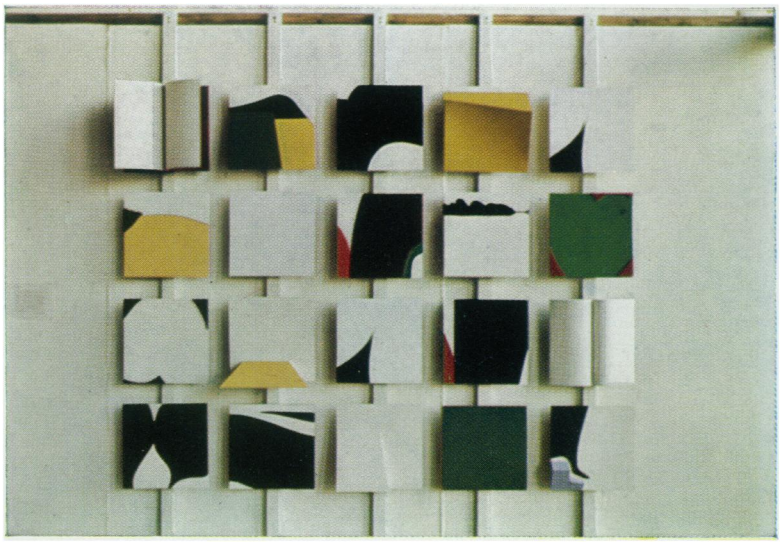
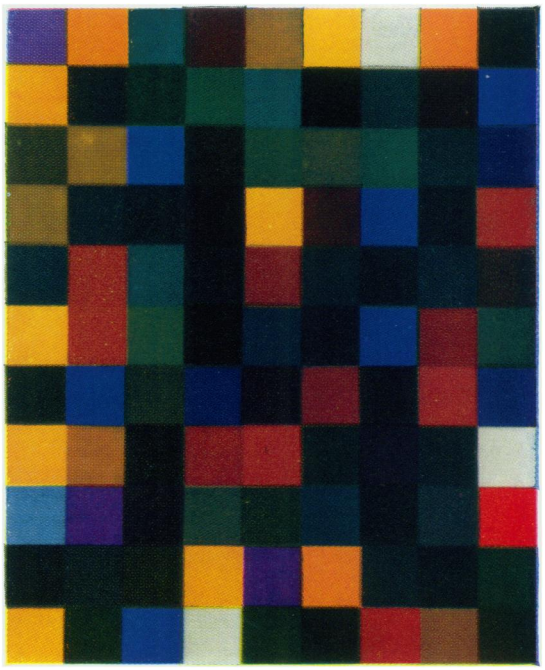
Un processus de création dans lequel l'artiste est suppléé ou supplanté par l'ordinateur

Résumé—L'avènement de l'informatique exige que l'on reconsidère le problème de la créativité. Bien que l'ordinateur puisse remplacer l'homme dans la production d'images graphiques, on peut penser que sa fonction dans les arts est d'aider à spécifier les systèmes artistiques, et à les répartir ultérieurement dans le temps réel. Un art du système et du processus se situe d'abord dans le contexte des arts visuels ou plastiques; cependant la préoccupation des auteurs

n'est d'aucune manière un art 'nouveau' ou 'technologique'. Ils citent plusieurs sortes de systèmes artistiques et décrivent les avantages de celui qui est entièrement 'interactif'. Ils font remarquer que l'inclusion de réponses complexes du temps réel dans un système artistique interactif peut souvent appeler l'utilisation d'un ordinateur. Dans une telle œuvre, l'artiste et le spectateur jouent un rôle à part entière. Le rôle traditionnel de l'artiste, du compositeur ou de l'écrivain est ainsi remis en question; il n'est plus nécessaire d'affirmer que l'artiste est un spécialiste—il est plutôt le catalyseur d'une activité créatrice. Trois exemples illustrent les applications de cette approche.





Top: *Ethel Schwabacher*, '*Oedipus*', *acrylic on canvas*, 60 × 72 in, 1971.
(Photo: O. E. Nelson, New York.) (*Fig.* 2, cf. page 53.)

Bottom left: *Ernest Edmonds*, '*Nineteen*', *mixed media*, 170 × 135 × 15 cm, 1968/69.
(*Fig.* 2, cf. page 14.)

Bottom right: *Ludmila Kodratoff*, '*Jungerer Klang*', *oil on canvas*, 82 × 65 cm, 1971.
(Fig. 5, cf. page 40.)

[*facing p. 28*]