THE ORIGIN OF CREATIVE POWER IN CHILDREN*

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MAN is the most striking piece of organized matter we know in the universe, and he possesses the ability to organize material more strikingly than any other organization of matter does. The ability to shape thought and matter almost has to be one of the central features of any comprehensive view of man. Yet the source of this ability is a very great puzzle. How is it that an aggregation of matter which we call a man, born plastic but creatively inert, comes to be able to shape matter in an organized fashion?

By seeing the act of drawing as a game carried out within the rules prescribed by the available schemata, we shall try to discover the source of the child's ability to organize form. A simple enquiry about the origin of such schemata shows us that the course of their development itself accounts for the child's creative ability; and that the development of the creative ability to organize the form of a drawing may be seen as a purely residual effect of the growth of schemata.

The kind of play behaviour we call 'drawing' is not as mysterious as it is made out to be. Piaget points out that every developed kind of play is a pattern of activities constrained by some arbitrarily chosen set of rules which mark it off from the domain of all possible activities.[1] Just as it is true of games, so it is also true that a particular individual's drawings are governed by a set of rules. The rules or possibilities expand and change as the individual grows older, it is true, so that he is able to play more and more games within these wider frameworks. But any drawing he produces is always generated under constraint.

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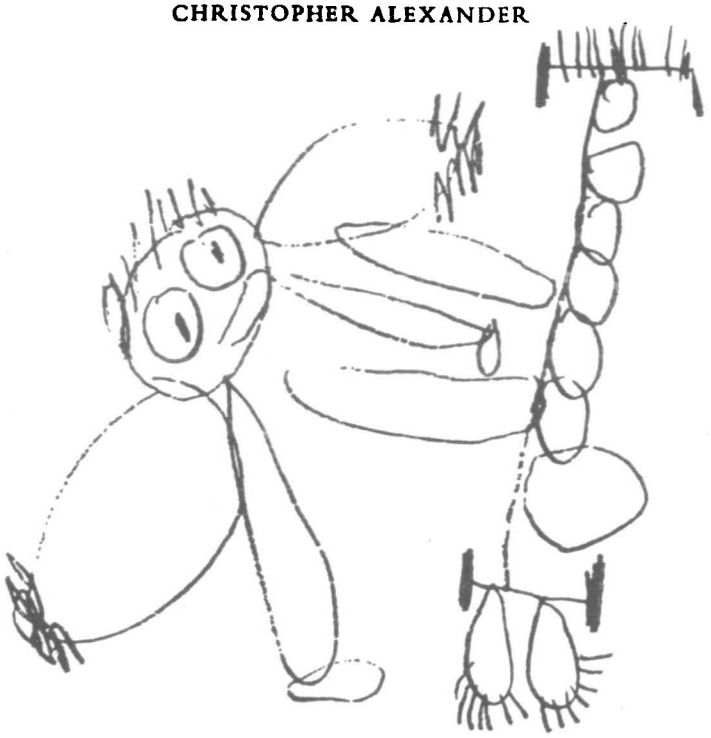
In many games the rules are known explicitly. In drawing this is not so. In fact, in a sense, the artist, though aware that he is constrained, is perhaps less conscious than anybody of the rules which bind him. He does not realize just how narrow the domain of possibilities available to him is. To take an example, look at the picture of a man with a saw (Fig. 1). It was drawn by a five-year-old boy,[2] who was certainly not aware that we might find the use of circles to represent teeth remarkable. One of the rules governing his play, apparently, just at present, is that many things are to be drawn in terms of circles. This example should make it clear how the rule-boundedness of drawing does not consist of externally imposed rules, but of constraints which are implicit in the act of drawing.

It is often said that the artist solves problems within fixed sets of rules, but it is only rarely that one thinks of these rules as being real constraints, or that one considers their source. The first thing to establish is that the act of drawing something depends principally on the existence of pre-established schemata, and does not involve direct imitation from nature in the photographic sense.[3] The point being made here is not that 'Art' depends on what you can call lushly 'the artist's interpretation', but that the schemata of the drawing were invented before the drawing; most of the basic forms which appear in a drawing were known to the artist before the drawing was done, and it is this set of available schemata which constitute the rules within which drawing can take place. But what is the source of such schematic systems, and why do they develop?

I

When we wish to understand the origins of a complex human phenomenon, we must first be sure we can identify the difference between an undeveloped (primitive) version and a developed version. In the case of drawing it has been suggested that we look at one of two kinds of development: either at the 'phylogenesis' or historical development of drawing, as the art historian does; or at what happens when the phenomenon comes to life in a single individual (its 'ontogenesis') as the developmental psychologist does. In both cases, unfortunately, we find that the difference between primitive and sophisticated drawings is less simple than it seems.

For some thirty or forty years, starting about 1900, it was widely held that there was just one basic kind of development from primitive to full-grown art, and that both the ontogenetic and the historical developments were instances of it.[4] This happened because people noticed that the primitive art then being seen for the first time, could be distinguished



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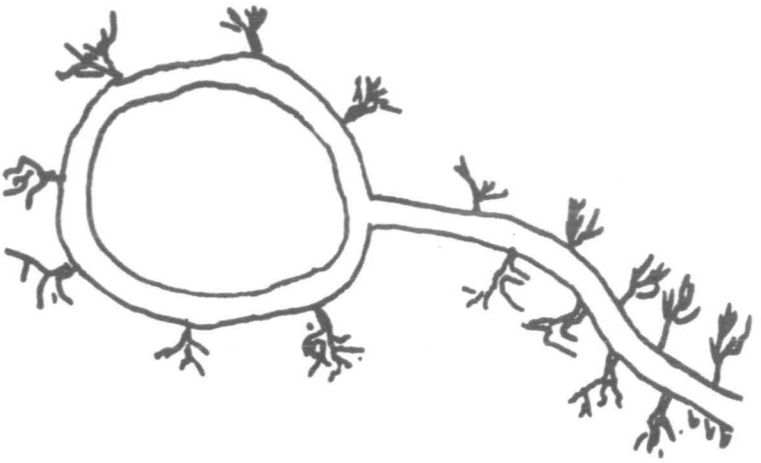

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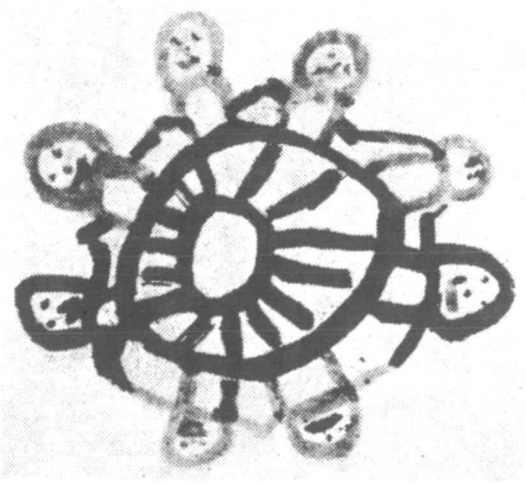

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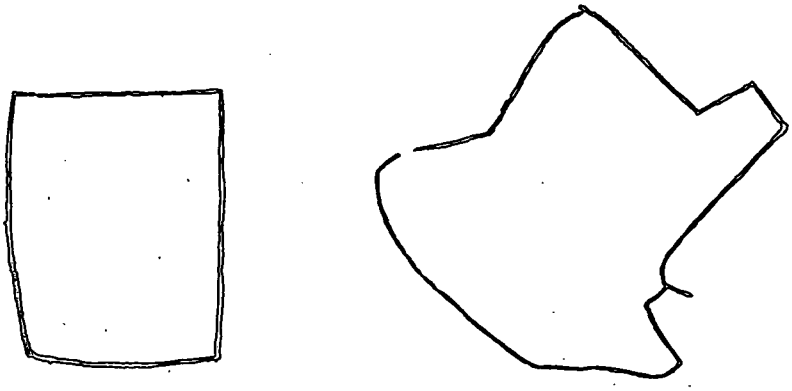

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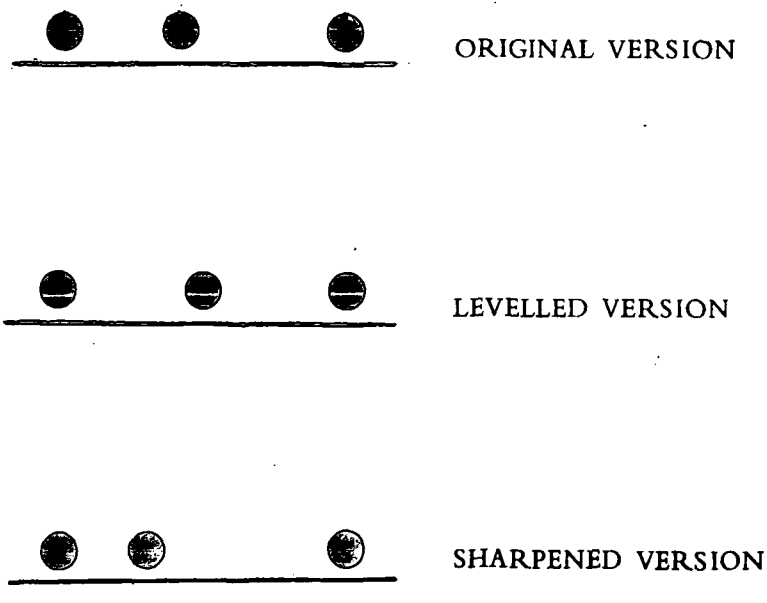

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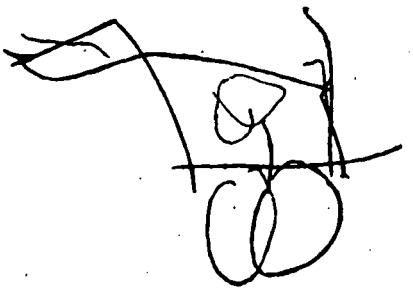

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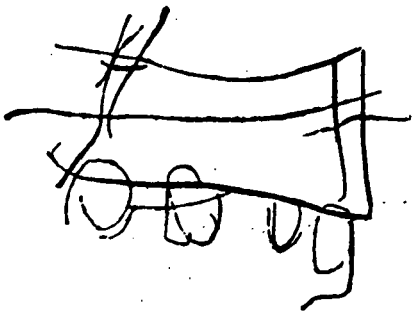

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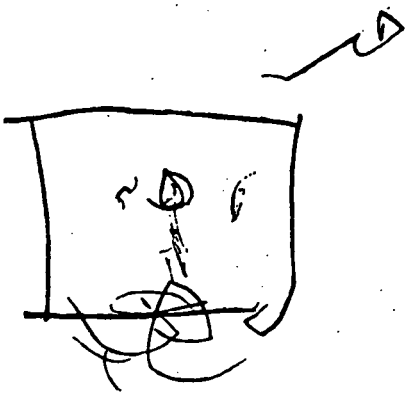

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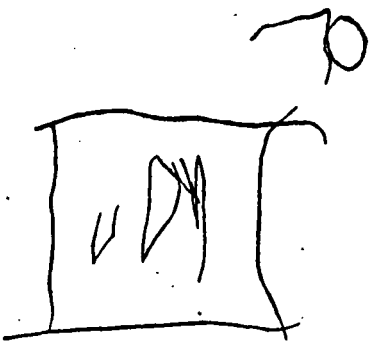

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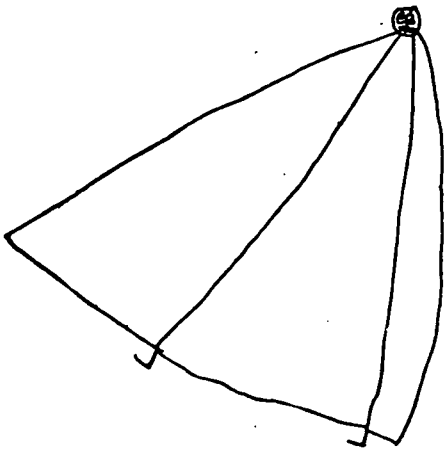

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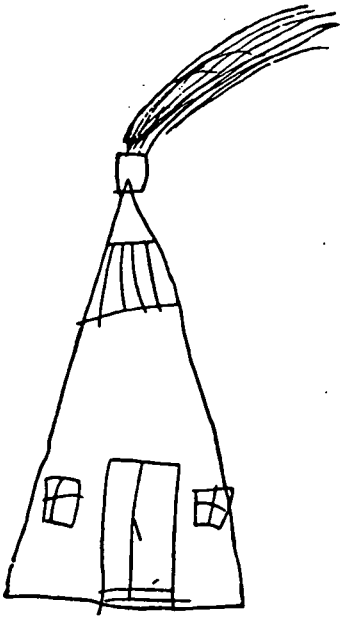

Fig. 18

Fig. 19

from the realistic paintings currently being turned out by the academies in many of the same ways that one distinguishes a twentieth-century child's drawing from those of a twentieth-century Western adult. The theory was made more convincing by the fact that certain cave paintings dating from very early periods were known, which were just a little like the scribbles of early childhood. Some archaeologists were so impressed by this indeed, and by the steady development which they assumed must have taken place between these early palaeolithic scribbles and the painting of civilized times, that one of them even proposed a typology based on successive stages of a child's development, in which the fragments of cave art were to be dated historically by matching them with their counterparts from the chronology of a child's development.[5]

Let us look at some typical examples of 'primitive' or 'poorly developed' drawings (Figs. 2–6). The magnificent lion is by a five-year-old American boy,[6] the wolf's head by a Kwakiutl Indian,[7] the tree by a thirty-year-old imbecilic girl with an IQ of 49,[8] the pond with the trees round it by a Dakota Indian,[9] and the children playing ring-a-ring-a-roses by another small boy.[10] Both the lion's teeth and the leaves on the tree are far too big (though this is just what makes them powerful graphically); the wolf's head is flat and two-dimensional; the children are all drawn as if they were lying down with their feet towards the centre; the trees around the pond are again apparently lying down.

Clearly these drawings are not like the paintings being shown in the academies at the turn of the century. They lack depth and perspective. They lack consistent scale. They contain apparent contradictions in viewpoint. They seem altogether more schematic than pictorial.

For a long time it was assumed that these attributes were characteristic of all kinds of undeveloped art, and that it was therefore necessary to explain the difference between art with these characteristics, and the 'developed' art being seen in the galleries. The most widely accepted account of this difference went roughly like this: '*Neither the child nor the primitive man has yet succeeded in escaping the primitive stage at which objects are depicted* conceptually, *instead of* perceptually. *That is, they picture the essential features of the object as they remember them, rather than as they see them, no matter what anomalies this mode of representation leads them to introduce. They are incapable, as yet, of depicting an object as it appears, because they cannot grasp it as it really is.*' This theory was presented in one of its strongest forms by the art-historian Loewy.[11] The anthropologist Levy-Bruhl lays it on even thicker. He claims that the various features of primitive drawings—formalism, transparency, turning over, spacelessness —are based on features common to the psyche of the child and primitive man, on their want of firm voluntary attention, on the weakness of their

power of abstraction, or logical, or realistic thinking. According to Levy-Bruhl, we derive our representation from the object we are drawing by imitating, while the primitive mentality first draws a shape and then invests it with meaning. We look at a donkey, and then copy it supposedly. The primitive draws a shape first, then names it. Levy-Bruhl cites the case of the aborigine who draws a circle and sometimes calls it a gum-tree, sometimes a frog, sometimes empty decoration, according to its location.[12] Karl Bühler also believed drawing from memory rather than from the object to be characteristic of primitives. He says that the primitive tendency to draw from memory leads primitive draughtsmen to represent what he called the 'orthoscopic' forms of the thing represented.[13] These are the forms which best contain the essence of an object, rather than those forms which correspond to the accidents of its appearance. A table will be made rectangular, not trapezoid, beetles will be drawn from above, a man's eyes and mouth from the front, his nose in profile: everything from its most characteristic point of view.

All these supposed distinctions between schematic 'primitive' and realistic 'sophisticated' art rely on a much more clear cut difference between a seeing, knowing, and remembering than we actually encounter in cognitive behaviour. It is true that the child, when he paints a tree, does not look at the tree but merely reproduces the conceptual schema for a tree which he happens to have learnt. But we do the same, and so does the artist.[14] All the points made, Loewy's assertion that children and primitives draw from memory rather than from nature, Levy-Bruhl's observation that they invest artefacts with special meaning rather than inventing a new artefact to make the desired meaning, and Bühler's theory of orthoscopic forms, all emphasize the schematic nature of primitive art. And in this they all seem to be substantially correct. Where they are mistaken is in trying to make out that there are kinds of drawing possible (our's for instance), which do not share their schematic base. A schematic base is characteristic of *all* art, not just of primitive or children's art. The only reason that this was not obvious from the beginning is that the artists of the academies made a deliberate attempt to obscure this aspect of their own work, and hoped to free themselves of it.[15] But the realism they were after is not the opposite of primitive art. Neither is realism the opposite of conceptual or schematic art. It is certainly a property of certain kinds of schemata that they produce illusions of reality more strongly than others: in Gombrich's words, they preserve the ambiguities of three-dimensional vision better.[16] But this must not blind us to the fact that *all* art is schematic.

It turns out, then, that the history of art does not disclose any uniform or objectively valid progress from primitive to sophisticated; we only

observe change. History offers us no means of distinguishing between undeveloped and developed drawings. Both are schematic, and the most primitive adult form-maker, like the most primitive language speaker we know of, already makes forms which are structurally as complex and as subtly organized as ours. As far as our question about the origin of schemata is concerned, there is little future in the phylogenetic approach. And the characteristics of child art which are picked out as a result of the supposed parallel between onto- and phylo-genesis are fruitless also.

But there are features, characteristic of very young children's drawings, different from those we have discussed so far, which do disappear with maturity. These features give us the opportunity we want, to compare undeveloped and developed drawings, and hence to trace the origins of schematic systems.

In the earliest stages of the child's drawing, when his schemata are still undeveloped, we find the following distinctive features:[17]

1. The young child has incomplete sensory-motor co-ordination, which gives his early drawings a special scribbled kind of crudity.

2. Because of this incomplete sensory-motor adjustment, he finds it difficult to repeat what he has done exactly.

3. The forms he draws exhibit a remarkably low degree of differentiation.

II

Drawing is not a spontaneous activity. The child does not pick up a pencil of his own accord, and begin drawing. Rather he needs to be shown the pencil, shown that when held in such a way the pencil can be made to mark the paper. But once the child realizes that he is capable of marking the paper he is often so fascinated by this ability that he ends many scribbles by blacking out the entire page.[18]

Soon after the child's discovery that he can mark the paper, he begins to scribble. This usually begins at about one year. The scribbles that occur are of several specific kinds, roughly the same for all children, and their chronology is fairly constant (Figs. 7–10).[19] First the child does wavy scribbling—the result of swinging the forearm backwards and forwards. Secondly we find what is called circular scribbling—where the lines go round and round in circular spiralling movements. Variegated scribbling, where the wavy and circular forms are mixed, starts towards the second year. Finally, also about the second year, we find differentiated scribbling. That is, instead of the scribble being a single dense mass all over the paper, there are now various separate blocks of it.

About this time the child begins to draw single figures, lines, spirals, circles, and begins to name them. Thus, when the child is only about two years old he already has certain prototype schemata or formulae in his vocabulary. Although they are, in the end, developed to the extent where he can invent new shapes, there is always a tremendous impulse to use the first and simplest formulae which he invented. Take the circle: we find prominent circular buttons, oversized round heads, and even the teeth of a saw are drawn as circles.

Somehow, at some stage, these endlessly repeated formulae have taken the place of the scribbles he began with. As Arnheim says rather fancifully: 'To see organized form emerge in the scribbles of children is to watch one of the miracles of nature. The observer cannot help being reminded of another process of creation, the shaping of cosmic whirls and spheres from amorphous matter in the universe.'[20] How shall we explain this miracle? How is it that the child progresses from being able to scribble only, to being able to make clear schematic images?

It might be argued first of all that these schemata are derived from life. That, in other words, as soon as the child learns to control his pencil (which he learns by scribbling) he then begins systematically to copy nature, to imitate the forms he sees in nature.[21] However, in view of the fact that all drawing is schematic, this theory is fundamentally untenable. If you draw a bird, not by copying a real bird but by making use of certain familiar schemata, then it obviously won't do, when we ask about the origin of the schemata, to say that their origin is in nature.[22] Such a circle of argument can explain nothing.

Secondly, it might be argued that if the child cannot derive his schemata from nature, we must assume that he derives them from other drawings that he sees. In other words, he learns whatever vocabulary of schematic forms he is exposed to. This seems very likely. At least part of it must be true, in fact, to account for the cultural continuity of schematic traditions which we call style. But there is again a tremendous difficulty. If an adult reads a how-to-draw-a-bird book, he can in fact copy the appropriate schemata he is shown, and make use of them to draw realistic birds. But a young child, quite apart from the fact that he does not copy nature, cannot copy other people's schemata either. Or rather, he cannot copy any schemata for which he does not already possess the specific sensory-motor control (Fig. 11). Here is a typical five-year-old child's attempt to copy a square and a rhombus. He can copy the properly orientated square, which he has drawn before, but he cannot copy the same square when it is in its unfamiliar diamond position.[23]

We are faced with the following problem. In the first years of his

development the child is not copying his schemata from other children or adults, and he is not deriving them directly from the world. Somehow, then, we must explain the genesis of the first schemata in terms of the child's own activity. Consider the following three postulates.

1. The child frequently reproduces his own previously established motor acts.

2. These acts are modified during execution by random variation.

3. They are also modified by a highly systematic built-in process of levelling and sharpening.

1. We know that the child is capable of repeating a schema, once it has been established; for the pattern of motor activity which generates the schema can then simply be called into play. Britsch cites ample evidence for the fact that children do reproduce what they have done before, and do so as often as they get the opportunity.[24] There is enough pleasure to be had from the sheer motor side of the activity, apparently, to guarantee the repetition of the motor acts once they are established.

2. Random variation occurs in either of two ways. First of all, when the child repeats a scribble, it is never quite the same scribble as before. Just on account of the freedom of the activity, certain kinds of random variation are constantly introduced as errors. Secondly, the phenomenon often called automatism is also an instance of random variation. A movement is called automatized when, because it can be made more quickly and easily than other movements, it is sometimes repeated more often than is necessary. Thus, a boy who has learnt to draw legs in pairs as pairs of crossed lines, makes this figure twice under a horse's body; but sometimes forgets himself and does it three times and four, making an animal with six or eight legs.[25] Another boy does the same with fingers when he gets into the habit of drawing hands automatically.

3. Levelling and sharpening are two special kinds of assimilation. In a famous series of experiments which Wulf carried out in Koffka's laboratory, subjects were asked to reproduce simple forms from memory.[26] Wulf observed three kinds of distortion taking place. He called them levelling, sharpening and normalization. What he called normalization —the assimilation to previously developed schemata—is the most familiar of the three. But in a very young child, who has extremely limited experience, and who has, by postulate as far as we are concerned, no previously developed schemata, this kind of modification is the least important of the three effects.

What is more important for us is that in reproduction subjects suppress certain features of the forms, and accentuate others, supposedly in accordance with the Gestalt-coined law of *prägnanz* or goodness of structure. The suppression is called levelling, since it turns out that

departures from regularity are suppressed and the figures thereby made simpler or 'more level'. The accentuation, called sharpening, strengthens these departures from regularity, or 'sharpens' the figure's complexity by making it more definite (Fig. 12).[27] Actually the difference between levelling and sharpening is something of a conceit. In both cases the effect of the activity is to make the figure concerned more easily readable, stronger. As we would put it today, there is a tendency to replace poorly formed figures by versions which are easier to encode perceptually. Or, in artists' language, the new figures have greater strength and greater graphic clarity than their weaker counterparts.

Wulf's experiments, which are memory experiments, do not make it entirely clear at which stage of cognition the distortion he observed actually occurs. As far as his results are concerned, it could be either in the process of perception, or while the forms are held in memory, or during the act of reproduction. It now seems likely that at least a good part of it belongs to the action of reproducing the form, rather than to the defective character of memory. Hanawalt showed that even after subjects have distorted figures when reproducing them, they will often still recognize the original as correct when shown it, which means that it is not the passive side of memory which obscures the detail, but the creative act of reproduction.[28]

Let me repeat the postulates:

(1) The child has a tendency to repeat its acts of drawing.

(2) In the act of reproduction there is a tendency for random variations to occur.

(3) The act of reproduction also tends to level and sharpen the forms which are drawn.

These three postulates seem reasonably well founded in observation. To see how they are enough to account for the genesis of schemata in a child's development, let us watch the birth of two schemata in the life of a little girl.

THE RECTANGLE. (Figs. 13–17.) (Age 2½.)

Here we see a series of drawings in which the child is trying to draw a tram. She begins by making patterns of blobs and scratches. Gradually, as you can see, the rectangular shape of the tram begins to dominate the drawing. In the last drawing the scribbles are minimal, and we are left with a pure rectangle. This is the first time the child has drawn a rectangle. The form now belongs to her vocabulary.[29]

THE TRIANGLE. (Figs. 18–19.) (Age 5½.)

Here it is not random variation which is responsible, but automatism. The child draws a 'lady'. But in her excitement she draws the body twice, the second body outside the first. Since the body lines still have to meet at the head, the outside lines are pulled together at the top to make a triangle. The child calls these outer lines a

cape. The next day she draws all kinds of triangular things, a house, a hat and so on. She now has a triangle in her vocabulary of schemata.[30]

Now, you may say, this is all very well. We have here a highly simplified account of the origin of the schemata a child makes his drawings out of. Constant reproduction, random variation, and systematic levelling and sharpening do account for the transition from scribbling to coherent schemata. But I promised that this origin itself would account for the child's creative ability to organize material. What we have seen so far really only begs the question of organization. It was observed by the Gestalt psychologists that people tend to modify their schemata in such a way as to make better forms or Gestalten. That is what the levelling and sharpening I have described amount to. But this simply introduces the idea of organization into the explanation at an earlier stage, and still does not account for it. We still couldn't build a levelling and sharpening device, because it would still depend on knowing just what characterizes good forms—which is, after all, the very thing we really want to know when we ask questions about the development of creative ability.

But let us replace this interpretation by a rather simpler one. What, after all, does the process of levelling and sharpening achieve? It enables the child to make patterns which are as easy to distinguish from one another as possible. One scribble is very like another. But the line, the circle, and triangle, and rectangle, and the more complex 'good' forms, are easy to pick out, they are easy to identify. The child, even if not born with the push towards making strongly distinct forms, is directed towards it the moment he starts to give names to the forms he draws. It has been noted by many observers that children name the drawings they have done long before they are drawing anything which we should regard as recognizable images.[31] Even if we assume that the child applies names randomly to his first blobs of drawing, he will be brought to task very quickly because the drawings he calls 'flag' and 'mother' and 'flower' are indistinguishable to the people round him (Fig. 20), and he will be told as much. The ambiguity of such patterns forces him to sharpen them; that is, to replace them with patterns which are progressively more different from one another and from all other patterns. These patterns, as different as they can be from all other possible patterns, are just those which we call organized. And the process in which forms are distinguished from one another as strongly and powerfully as possible is, in my view, precisely the centre of what we mean by the creative power to make order.

To review this, let us take a very simple example. Think of all the possible arrangements of a deck of cards. The most clearly organized

arrangement we can think of is the one where the cards are arranged in sequence, and in their four suits. I want to suggest that we call this 'organized' not because of its visible internal structure, but because it is especially different from the result of a typical shuffle. The forms we call organized are those which are as strongly distinguished as possible from all alternative configurations. It seems very likely that this is what we are talking about when we draw attention to the uniqueness of works of art. (In view of certain undesirable tendencies in contemporary painting, it is perhaps important to point out that this is quite different from praising a work because it is 'new and different'. For a painting to be new it need only be different from all known paintings—which is no guarantee whatever of good organization. For a drawing to be unique in the above sense, however, it must be unique in the domain of *all* possible alternatives. It is one of the central results of statistical thermodynamics and information theory that this kind of uniqueness or low entropy is the same as what we usually call order.[32]) What marks a great form as much as its own structure is the fact that it is very strongly distinguished from all possible alternatives. And this is exactly the effect that levelling and sharpening has. It makes forms more codable, easier to deal with cognitively, by distinguishing them more and more strongly from one another.[33]

This brings us to the central point of our discussion. It is often held that creative talent consists chiefly of the ability to synthesize, to bring disparate material together in satisfying relationships. This is a view which has its uses. But I wish to suggest that this is, in a way, a secondary and incidental aspect of creation. [34] It may be regarded as incidental literally, in the sense that it can happen regardless of the artist's intent. For an artist, even if he tries only to differentiate the form he works on from every other which is possible, will, as if by accident, happen to produce highly synthesized material, because this is the only kind of material that serves his purpose from the point of view of differentiation. It is true that what we call strongly integrated material has a clear enough structure to be powerfully different from all other material. But integration can happen whether the artist is paying deliberate attention to it or not.

Of course, we could say the opposite too. We could call differentiation a by-product of integration. But then we face the question: Why should a child develop the power to integrate patterns? Unless we invoke some sort of germanic 'Will to Art', the desire to integrate disparate elements, even if it seems to exist introspectively, is hard to explain. It is much easier to see why a child differentiates whole forms from one another. He does it as the result of a growing need to escape ambiguity. If we

think of integration as a natural result of differentiation, and organization as a residual effect of the process which generates the child's vocabulary of schemata, then, when we ask how the child learns to create form, we do not need to concern ourselves directly with the puzzle of integrative ability at all. The source of creative talent can be fully understood in terms of the child's developing ability to force the forms apart from one another.

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[12] L. Levy-Bruhl, *How Natives Think*, trans. Lilian A. Clare, New York (1925), p. 119.

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[14] Gombrich makes this point repeatedly: *op. cit.*, pp. 146–78, where he gives many examples of schemata used by adult artists even in the most 'realistic' drawings.

[15] *ibid.*, pp. 174–5.

[16] *ibid.*, pp. 275–8.

[17] Arnheim, *op. cit.*, pp. 135–45, and Helga Eng, *The Psychology of Children's Drawings* (1931), throughout.

[18] Miriam Lindstrom, *op. cit.*, p. 9.

[19] Eng, *op. cit.*, pp. 101–6.

[20] Arnheim, *op. cit.*, p. 136.

[21] It seems doubtful that this really goes on at any age. However, for a discussion of the view, see Piaget, *op. cit.*, pp. 62–88.

[22] See Gombrich, *op. cit.*, p. 147.

[23] Eng, *op. cit.*, p. 126.

[24] Gustaf Britsch, *Theorie der bildenden Kunst*, Munich (1926).

[25] Eng, *op. cit.*, pp. 139–40.

[26] F. Wulf, 'Über die Veränderung von Vorstellungen (Gedächnnis und Gestalt)', reprinted as 'Tendencies in Figural Variation' in W. D. Ellis, *A Source Book of Gestalt Psychology* (1938), pp. 136–48.

[27] Wulf, *op. cit.*, p. 147.

[28] N. G. Hanawalt, 'Memory trace for figures in recall and recognition', *Archives of Psychology*, New York (1937), Vol. 31, No. 216.

[29] The sequence of drawings for this example and the next are taken from Eng, *op. cit.*, pp. 28–32. Since I did not actually see the drawings being done, the interpretation, which is mine, may be at fault.

[30] *ibid.*, pp. 61–2.

[31] L. S. Vigotsky, *Speech and Thought*, first published in Russia (1934), about to appear in translation. Ch. 2, Sec. 11. Also Eng, *op. cit.*, pp. 5, 10.

[32] See any standard textbook on thermodynamics or information theory. A discussion that is easy to read is to be found in N. Wiener, *Cybernetics*, New York (1948), p. 70.

[33] Wulf, *op. cit.*, p. 147.

[34] For a recent summary of related points of view, see Donald T. Campbell, 'Blind variation and selective retention in creative thought, as in other knowledge processes,' *Psychological Review*, 1960, Vol. 67, No. 6, pp. 380–400.