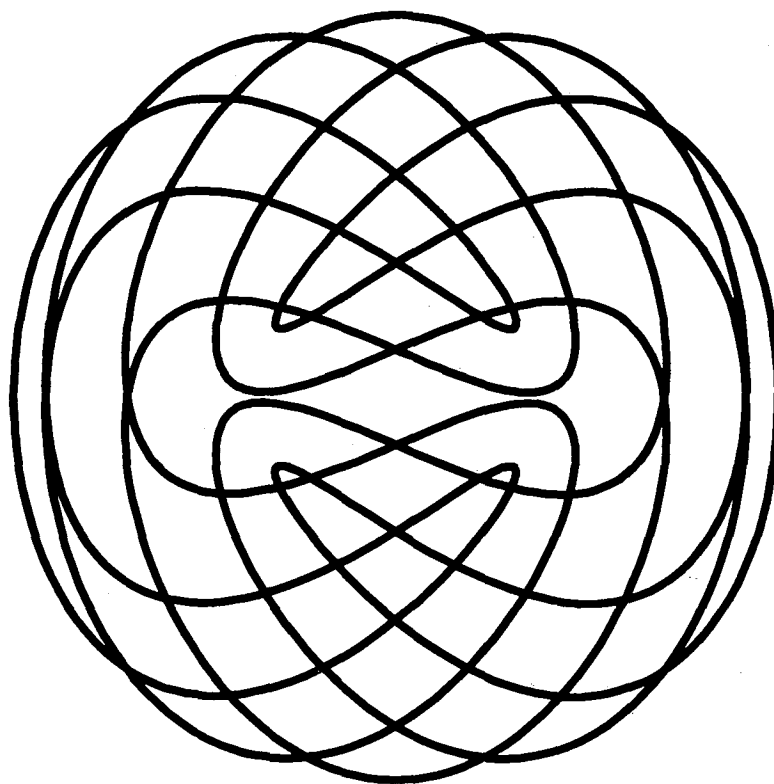


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MINDPRINTS: THE STRUCTURAL SHADOWS OF MIND-REALITY?

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Abstract: *The point of departure for this essay was the question: What are the cognitive attributes without which the prehistoric image maker could not have begun to create painting? The aim of the search for these a priori attributes was an attempt to anchor the nature of art in attributes of the mind and thereby to uncover an Archimedean fulcrum for tracing lines of demarcation between art and non-art, which have become completely blurred in our century. The search has revealed some ten unique attributes all of which are epistemological and ontological oxymorons, or metastructures of the complementarity of mind and reality such as: Connectivity–Disconnectivity, Hierarchy–Randomness, Symmetry–Asymmetry and others. While the point of departure of this study was art, it may be that its results also have implications for the understanding of science and the other areas of culture, for these attributes which I have called “mindprints” appear to be common to all products of the mind. One may say with some boldness that these attributes are perhaps common to all levels of Being: the material, biological and noetic levels; but they are manifested by different means and at different levels of abstraction and generalization. If the mindprints are common to all branches of culture as is proposed here, it may be that this can serve as the structural basis for a particularly coherent transdisciplinary approach.*

*“...the soul is analogous to the hand; for as the hand is a tool of tools,
so the mind is the form of forms..”*

Aristotle, De anima 432a

*In the beginning God created Mindprints,
and they have been doing the rest ever since.*

Throughout the twentieth century not a few theoreticians and artists have maintained that modernism has failed and that art has reached its end or at least has reached a dead end. This deep scepticism arose from the great perplexity created with the rejection of the paradigm of figurative art, without the creation of another paradigm in its place. The unavoidable result of this situation is the complete blurring of the demarcation lines between art and non-art. For this reason the need for a new and truly reliable Archimedean fulcrum that would make it possible to distinguish between art and pseudo-art became an essential need for the very continuation of the existence of art as a relevant branch of culture. A search that has continued over tens of years for an adequate answer to this problem has led me to many and various channels, some of which I have already reported upon in other essays, and others which I shall report upon in the future. But among those particularly worth mentioning are two directions of exploration which appear on the face of it to be opposed, but are in actual fact complementary: on the one hand, the search for the graphic and cognitive sources that *preceded* art and made possible its actual emergence some 40,000 years ago, in the hope that in this embryonic stage it may be possible to identify more easily the most basic attributes of art from its first beginning. On the other hand, this study revealed the need for a cognitive understanding of the *a priori conditions* necessary for a person to read or create a figurative picture at any time: in the prehistoric era, or today. The attempt to understand these *a priori* conditions led perhaps serendipitously to a new understanding of the mind and the way in which its basic patterns are manifested in the products of culture.

I have summed up the research regarding the sources of art in two essays (Avital, under review, and Avital, 1997c, *Footprints Literacy...* is to be published in this journal.) The second aspect of the research, which is of a purely theoretical nature and deals with the *a priori* conditions of art, is given very briefly in the present essay. While the point of departure was art, its results and conclusions may have implications which pass far beyond art itself and touch upon all areas of culture regardless of time and place, since like art, all are various products of the human mind. The central rationale of this essay is the attempt to reach a newer and more adequate understanding of the nature of visual art by anchoring it to the nature of mind itself. It is hoped that this may be achieved through an understanding of the way in which some of the basic attributes of mind already became manifest in the very earliest origins of art, which seem to be *footprints literacy*. This skill seems to have preceded prehistoric art by about 4 million years (Avital, 1997c, *Footprints Literacy...*). According to this understanding, art is an expression or embodiment of certain basic attributes of mind, by means of the

composition of aesthetic elements such as color, form etc. I have called these basic attributes “mindprints”. These metastructures are fundamental attributes of mind and reality such as connectivity, complementarity, open-endedness, recursiveness, hierarchy, transformation, symmetry, *and their complementary opposites*. In the following, I shall try to give only a brief explanation of them, since a more complete explanation of the concept and its implications for other fields would require a far wider framework than this essay. In a minimal sense, mindprints are fundamental properties or attributes of human intelligence, or the interfaces between mind and reality. In a broader sense, it appears that mindprints are common to all levels of Being, and are therefore epistemological and ontological oxymorons, or metastructures of the complementarity of mind and reality. In other words, mindprints are the bridge between epistemology and ontology. Thus, when scientists such as Einstein and many others, observe with awe and wonderment the sublime concord between theory and nature they are really experiencing the grace of crossing this bridge. Many experience the same feeling when observing a great work of art. In both cases we unconsciously recognize in nature or art, as in a mirror, the mindprints which bind our mind and reality into a complementary unity. Indeed, the fact that science can make such remarkably accurate predictions, or the fact that we can easily read prehistoric paintings done eons ago, is probably the best evidence that mind and reality must have something fundamental in common, or that they are two aspects of a complementarity. In a sense, mind is reality folded upon itself, i.e. a reflective, and sometimes conscious reality. Thus consciousness is a node in the lacework of mind-reality. Regarded in this spirit, reality is a shadow of mind, and hence there should be at least partial correlation or symmetry between the “two”. This is also true regarding products of mind such as art and science.

The reader may already have sensed the high degree of ambiguity of the concept “mind” and be wondering if what is meant is mind in the human context, or Mind in a total or metaphysical sense, such as the concept has for Hegel, or as it has in the Greek terms Logos or Nous, and the like. I subscribe to the view, and more precisely to the belief, that the human mind is a special case of Mind or Intelligence in the total sense and that these two meanings of “mind” are therefore, at least to some extent, symmetrical, inasmuch as they have similar basic attributes. Nevertheless, these two kinds of “mind” are different inasmuch as the one constructs our private and cultural world, while the other constructs the human mind, as well as reality and all that is in it. However, for the purpose of our discussion, it makes no difference at all in which of the two meanings the concept of mind is understood, and it should therefore be emphasized that the

characterization of art, or the establishing of its demarcation lines with the aid of mindprints, does not necessarily entail the commitment to perceiving Mind as a total and metaphysical entity; but rather is it possible to regard mindprints as hypothetical and very basic principles of organization of the human intelligence or mind. The problem is, that a paradox of no mean proportions is concealed here: how is it possible to indicate basic attributes of mind when the possibility of our knowledge regarding "mind" - whether in the human context or, even more, "Mind" in its total meaning - is in principle extremely limited? This problem has been discussed at length and from various angles throughout the history of philosophy and science, and there is no need to enlarge upon it, and I shall therefore briefly indicate only a few of the reasons for the impossibility of really knowing what Mind is in any sense, and why we must be satisfied with far less.

Firstly, language is in a way constructed like a multidimensional web in the form of a mountain chain with peaks of various heights. Concepts receive their significance in this multidimensional hierarchy as nodes in our conceptual system. When we understand a certain concept, we usually achieve this in relation to the concepts or nodes above it and including it, as well as to the concepts that are below it and included by it, and also through the language game of the concept within the entire linguistic system. But conceptual understanding is particularly difficult when one attempts to understand such unique meta-concepts as "Mind", "Being", "Reality", and "God", which are among the apexes of our conceptual system. These concepts can have only partial significance, since we have no concepts higher than them, and they can therefore only be understood in the light of concepts that are beneath them - through those that are contained by them, and not through any by which they are contained, since none such exist. In other words, such concepts are never sufficiently clear, since every such concept is the name of an ultimate meta-reference beyond which there is no meta-reference or concept of a higher logical type that would *give it* a truly full significance or characterization. These concepts indicate the highest limits of abstraction, generalization or induction that our thought is capable of achieving by means of our symbol system. These meta-concepts delineate the boundary between discursive thought and the domain of mysticism. Secondly, one of the main conclusions of philosophy since Kant, is that any knowledge that we may obtain is the outcome of some interpretation of our own. It follows that it is impossible really to know what that non-physical entity is that we call mind, just as we cannot know what is the thing-in-itself that we interpret as a physical or phenomenal entity. By stretching not too grossly Heisenberg's principle of uncertainty, which in a certain sense is itself a derivative of Kantian philosophy, it may be said that uncertainty exists not only with regard to physical measurement, but even more so when we try to

understand the mind, since here an attempt is being made to measure both the measurer and the measured. Thirdly, a difficulty entailed in every attempt at understanding mind follows from the limitation in principle, of reflexive thought trying to understand itself, or mind itself. Every understanding of this sort is in principle only partial, and every attempt to deny this leads to a paradox similar to that of the great antinomy of Russell regarding the impossibility of a class including itself as a member (Russell, 1985). Furthermore, even the scientists who reduce mind to brain, in most cases acknowledge that it is very doubtful whether our brain is ever likely to understand itself completely. On the other hand, if Mind is considered in its all-embracing sense, one immediately encounters the old problem that a finite consciousness cannot understand infinite mind, but can at most *intuit* it, as the mystics maintain. If the mind is beyond our reach, what can we nevertheless know about it?

Outside my window, about 2 kilometers away, lies the last valley before the steep ascent to Jerusalem from the west. At the edge of this valley is the village of Beit Zayit where the fossilized footprints were discovered, of a dinosaur that passed there tens of millions of years ago. We do not know, and never will, what the dinosaur that walked there really looked like, but through an examination of the structure of the footprints it is possible to deduce *at least* some of the characteristics of its body, which turned to dust long ago. An example that is far more recent and closer to our origins, is the path of fossilized footprints of three hominids, an adult male, a smaller man or child, and a female, that were preserved for about 3.6 million years in Laetoli in northern Tanzania, (Leakey 1981, Leakey and Harris, 1987). Again, we do not, and never will, know exactly what these hominids looked like, but from the structure of their footprints, the scientists reached instructive conclusions as to their height, their gait and the fact that they walked upright! In another paper (Avital, 1997c, Footprints Literacy...) I have shown that from the unique pattern of those footprints one can derive remarkable conclusions regarding their *cognitive* capacities. In the opinion of most scholars, there is superimposition of the footprints of the smaller male within those of the adult male; if this is indeed so, it has staggering implications regarding the cognitive structure of these hominids. That is, although these hominids did not yet have language, and despite the fact that their brain size was only about half of ours, they must have shared the same basic cognitive structures that we have. Obviously their thinking was visual rather than verbal, but we must assume that they applied similar fundamental structuring principles which I have called "mindprints", for otherwise it is quite impossible to explain the most striking aspect of those footprints, which is the fact that the smaller male trod

deliberately and precisely *into* the footprints of the male adult that walked ahead of him. By analogy with these examples, I would say that mind is like the Tibetan Yeti, the mythical being which nobody claims to have sighted, but whose footprints many assert that they have seen in the snows of the Himalayas. Similarly, I subscribe to the opinion of many who have affirmed that we shall never know what mind really is. But I believe that it is perhaps possible to learn something not trivial about mind itself from some of the attributes of its *products*; these properties or “mindprints” are as it were prints of the mind which produced them.

In the history of philosophy, and especially since Kant, several attempts have been made to map the basic categories or parameters of mind. Their main aim was to provide a satisfactory explanation for the possibility of knowledge and thereby to reduce the skepticism aroused by Hume's philosophy. This was attempted by means of a new characterization of the relations between mind and reality, while bringing out the autonomous and primary aspects which the mind has with regard to the subjects of knowledge of all kinds. In the light of the inevitable limitations we have with regard to the possibility of knowing what mind is, it is clear that every characterization of it by means of these or other categories is itself necessarily limited, and is a *particular interpretation* which cannot exhaust the subject, even when it is the thought of a great philosopher. This can be seen very well in the fact that every philosopher who has proposed a theory of categories, has begun by harshly criticizing his predecessor's theory of categories, without being thereby prevented from adopting part of it. It goes without saying that the orientation of these philosophers has been mainly epistemological and ontological. This being so, and despite the extreme rigor of these attempts, they hardly help us at all to an understanding of the nature of art.

I therefore wish to emphasize that I make no pretense at all of proposing a theory of categories, and certainly not a complete theory such as was attempted by Kant, Hegel, Whitehead and others—something which is anyway far beyond my capability, but to try first and foremost to identify *at least some* of the most basic attributes that are shared by all works of figurative art from its beginning and up to this day, and without which no figurative painting would be possible. The integration of these common attributes in paintings throughout tens of thousands of years was not “out of the blue”; their origin lay rather in the attributes of the minds of the artists who produced them in all periods of time, and which must have existed long before the emergence of art itself. If such attributes can indeed be identified, then the very fact of their extreme continuity, transcending time, place and cultures, perhaps suggests the possibility that they are not

attributes peculiar to art alone. They are basic mindtools which must also have been manifest in the stages that preceded art, and constituted a preparatory stage for it, as in footprints literacy and tool making. Again, if these attributes are indeed so fundamental, then it must be expected that they will appear in other areas of culture as well, since they are after all products of the same mind. A study of these mindprints suggests a more far-reaching possibility: namely, that these same mindprints exist not only at all levels of the human-noetic plane, but also at all levels in nature, and are therefore perhaps the morphological shadows of Mind, Reality, God, or Nature—everyone having his preferred name for the totality of Being. After many years of searching, the possibility of understanding art by anchoring it in the nature of mind seems to me, at least, to be a last resort in meeting the imperative need for an understanding of what art is. For in the light of the chaotic situation that characterizes art today, and in the light of the fact that aesthetics and the history of art have not succeeded in drawing clear demarcation lines of art, then without a new understanding making possible the distinction of art from non-art, there is little point in continuing to produce art, and it may be regarded as a closed chapter in the history of our culture.

The list of mindprints given below is not derived from any particular general theory or meta-principle, but from the question: *What are the cognitive attributes without which the prehistoric image-maker could not have begun to create painting?* A prolonged examination of mindprints has led me to think it possible that these attributes are not special to art alone, but are rather at the base of all branches of culture, and perhaps also at the base of Being at all levels. Nevertheless, the main aim was and is to understand art within a far wider context than that of art itself, but the reader is therefore by no means obliged to accept the implications of the mindprints beyond their application in art. It goes without saying that this list is neither exhaustive nor exclusive, but is merely the list of those properties of the mind that I have perhaps identified in the search for the attributes that anchor art in mind or intelligence, which are for me synonymous. Bateson (1980) and Waddington (1977) also attempted to characterize fundamental properties of the mind, but the starting point for them both was mainly scientific, with the emphasis on biology. Some of the attributes that they mention are similar to those which I have found, and some are different. R. Sheldrake (1981), who proposed the interesting hypothesis of Formative Causation, also set out from a mainly biological standpoint. His idea of morphogenetic fields is in several ways analogous to the idea of mindprints, and is in many ways very different from it. The main difference is that Sheldrake assumes the existence of an infinite number of morphogenetic fields: a special one for

each entity in the universe - for each particle, for each combination of particles, for each plant and for each living thing. In doing this, he in fact assumes double and parallel worlds: the one a formative hierarchy and the other a material hierarchy. Despite the great sympathy that I have for his motivation, I believe that one should follow in the steps of William of Ockham and prefer hypotheses that make do with as few assumptions as possible. As we shall see in what follows, the number of mindprints that I tentatively assume is ten, and it may even be possible to reduce this number by conceiving some mindprints in terms of others. Nevertheless, because of the considerations I have pointed out in connection with the limitation in principle of our knowledge of the mind, any list or table of the basic properties of the mind is necessarily partial, and will always be so. I only hope that others will add to and reduce it according to a more coherent and adequate understanding than my own. The drawback of a short explanation of such a complex subject is that it is inevitably very condensed. However, on the credit side it may be said that a certain roughness is sometimes the earmark of innovation. I therefore suggest that the reader should not give up or become confused by the prodigality of concepts that appear in the explanation that follows. It is my hope that the mindprints concept will be clearer in the paragraphs that follow as a result of the short explanation of the way in which they appear in art. (However, this concept will certainly be clearer if the reader cares to read my other papers, each of which deals specifically with a single mindprint or a combination of several. Avital, 1997c, *Footprints Literacy...*; 1996, 1997a).

At this point I wish to propose a tentative table of mindprints:

1. Connectivity–Disconnectivity (Codis)
2. Open endedness–Closed endedness
3. Recursiveness (Nesting)–Singularity
4. Transformation–Invariance
5. Hierarchy–Randomness
6. Symmetry–Asymmetry
7. Negation–Affirmation (Double Negation)
8. Complementarity–Mutual Exclusiveness
9. Comparison–(No Comparison ?) Imparison
10. Determinism–Indeterminism (Probability, Selection, Choice).

In order to reduce this tentative explanation of mindprints as far as possible to essentials, I shall content myself with pointing out a few of their characteristics, and dealing with

only some of the mindprints. After that, I shall briefly explain how it is possible by their means to distinguish between painting and pseudo-painting.

1. The first obvious characteristic of the mindprints is that almost all of them are in a sense paradoxical concepts, or *oxymorons*. That is, they indicate a thing and its opposite at one and the same time. This fact makes them particularly difficult both to discover and to understand, since in the Western world we are all still enslaved by the logic of the Greeks, the fundamental law of which is the law of contradiction. It is for this reason hard for us to think in terms that are constructed upon an Eastern or Heraclitean world view that sees the complementarity of opposites as the nature of things, and sometimes sees paradox as the earmark of non-trivial truth. It is therefore not by chance that in Western languages there are (so far as I know) no concepts such as the Chinese concept of Dao which explicitly indicates the complementary unity of opposing tendencies: Yin-Yang. Thus for example, the mindprint *Connectivity–Disconnectivity* is not intended to indicate two attributes but *one*, of which connectivity and disconnectivity are two aspects or poles. Simply put, it may be said that every connection is made against a background of a state of disconnectivity, and every separation is made against the background of some connectivity. In the absence of a suitable word, I have called this attribute *Codis* ('co': collective prefix; 'dis': separative prefix.). Most of those of our cognitive attributes that deal with connectivity and disconnectivity are derived from this mindprint, for example: grouping, differentiation, classification, generalization, abstraction, inclusion and exclusion, symbolization or coding-decoding, synthesis and analysis, etc. Likewise, all order, organization and regularity or lawfulness that we can comprehend are modes of connectivity-disconnectivity, and it is at the base of all our perceptions of unity and plurality, whether religious, artistic, philosophical or scientific. In order to bring out the uniqueness of *Codis* it is worth mentioning that Aristotle, Hume, Kant and others already stressed the unifying capacity of the mind. For Kant this is even the most important property of the understanding: "Combination does not, however, lie in the objects, and cannot be borrowed from them... On the contrary, it is an affair of the understanding alone, which itself is nothing but the faculty of combining *a priori*, and of bringing the manifold of given representations under the unity of apperception. The principle of apperception is the highest principle in the whole sphere of human knowledge." (Kant, 1787 B, pp.134-135.) But in this there is a concealed assumption, namely that there is no need for a special *a priori* capacity in order to understand or create the "manifold of given representations" as such, since plurality is "given". The

concept of Codis evidences a different understanding of the mind, in that it does not only connect and create the awareness of unity, but is at the same time also that which separates and creates the awareness of plurality. That is to say, these two attributes of unity and non-unity or diversity, are two complements or poles of *the same function* of the mind or of the same mindprint. These two attributes are the two ends of the same Ouroboros - the tail-eating serpent. Indeed, Codis is perhaps the pattern that underlies every image or concept of Ouroboros. This mindprint is also the most important characteristic of every symbol system - pictorial, verbal or formal, because all symbols are different modes of Connectivity–Disconnectivity. That is, the fundamental function of all symbols of all kinds is the same: every symbol connects or groups certain entities into a certain class, but at the same time it also separates those entities from all other entities. Thus Connectivity–Disconnectivity is the foundation of all classifications. It goes without saying that Connectivity–Disconnectivity or Codis is one of the most basic mindprints of Being at all levels: material, biological, social and noetic.

2. It is not hard to see that some of the mindprints are more basic than others, in that some are primary and not derivable from others, whereas some are derivable from the integration of other mindprints. Thus, for example, Codis is undoubtedly one of the most basic of all, and cannot be derived from any combination of other mindprints. Nor is negation derived from any other mindprint, but its complement, affirmation, is generated by a recursion of negation itself. Furthermore, *Open endedness–Closed endedness is not derived from other mindprints, but when it is combined with Codis and Recursiveness–Singularity* and with *Transformation–Invariance*, attributes are generated such as creativity, metaphor, evolution, new orders, induction, extensivity, hypothetical thinking, etc., all of which involve one form or another of recycling and transformation of earlier connections, in a reorganization which is usually of a higher level. This being so, creativity is immanent to the world; evolution is the natural parallel of metaphor in human creation. This integration of mindprints generates the dynamic and evolutionary dimension of Being at all levels, for Transformation–Invariance and Open-endedness–Closed-endedness are the melody of intelligence, being and becoming, life and decay, connectivity and disconnectivity–material or other. In the dialectic of Open-endedness–Closed-endedness, the pole of Open-endedness is the stronger, in the way that in the dialectic of Connectivity–Disconnectivity the pole or tendency of Connectivity is stronger than that of Disconnectivity, and in the dialectic of *Hierarchy–Randomness*, the pole of Hierarchy is more dominant than that of Randomness. In other words, the negentropic pole of mindprints is always more dominant than the entropic, for otherwise this world would have come to an end long

ago. (The fact that Hegel did not realize that mind is forever open-ended is in my opinion the main drawback of his conception of mind.)

Unlike mindprints such as Open-endedness–Closed-endedness, Codis, Complementarity and others, Hierarchy–Randomness is a mindprint created by the integration of other mindprints: recursion of the pole of Connectivity creates Hierarchy, whereas recursion of the pole of Disconnectivity creates a cumulative breaking of connections until at a certain stage a state of randomness or chaos is created, but only up to a certain limit of disorder, in which the tendency reverts to the other pole of the mindprint; and then new connectedness, hierarchy or order is spontaneously generated. Here there is latent perhaps one of the most extraordinary and complex properties of some mindprints which has a Daoist character. According to Daoism whenever Yin is overdeveloped to some extreme, then Yang will evolve and vice versa. Thus, in a sense, mindprints theory is expanded Daoism but in a structuralist key. And indeed extreme connectivity such as a black hole leads in the end to evaporation or dissolution. Malignant cancer, which is a form of extreme local connectivity within the organism, leads in the end to the disintegration both of the organism and of itself. Dictatorship frequently ends in anarchy, and anarchy frequently invites dictatorship, until it is learned that democracy is the most reasonable compromise. According to the big bang theory, the Universe began with the transformation into a state of radiation, of a singular point in which the entire mass of the Universe was concentrated - that is to say, a transformation from a state of total connectivity to total diffusion; at the same time levels of connectivity began to come into being which continuously developed into elementary particles, atoms and increasingly large combinations of them. Academism in art reached stagnation because it created excessively rigid connective principles for pictorial representation. According to the reasoning proposed here regarding these matters, this rigid connectivity had to lead to the splendid explosion of Impressionism, but in its wake no new and more flexible connecting principles were created, but rather the anarchy that reigns in the twentieth century, which in the end will lead to the need for the creation of a new kind of connectivity, more complex and abstract, in the art of the future.

Hierarchy and Randomness are, then, almost certainly two poles of a single phenomenon. Indeed, hierarchical structure (which always contains random aspects, except in formal systems) is the commonest ordering principle in nature at all levels. That is, Connectivity–Disconnectivity or Codis is probably the most basic mindprint, but Hierarchy–Randomness is certainly the most *complex* mindprint. Actually it includes

most of the other mindprints: Connectivity–Disconnectivity (Codis), Open-endedness–Closed-endedness, Recursiveness (Nesting)–Singularity, Transformation–Invariance, Symmetry–Asymmetry, Complementarity–Mutual Exclusiveness, and it probably includes all of the other mindprints too. This to some extent explains a fairly common misunderstanding among great scholars such as Bateson, Koestler and other students of General System Theory who explicitly or implicitly tended to reduce mind to hierarchy or systemic structure. (However, this issue is of great complexity and will be elaborated far more thoroughly in another essay.) It can likewise be shown that Symmetry–Asymmetry is basically a product of other mindprints. Thus all symmetries and asymmetries are modes of Connectivity–Disconnectivity, but additional mindprints are also involved such as Transformation–Invariance, and Complementarity. In those cases where there is also recursion, as in figurative art or biological and other phenomema, there may also be a hierarchy of Symmetries–Asymmetries.

5. Another characteristic of mindprints is that regarding some, there may be an accumulation of the products of the operations of the mindprint, while with regard to others there is no such accumulation. Thus for example, it is clear that in Codis, Symmetry–Asymmetry and Hierarchy–Randomness, there can be an accumulation of the products of these mindprints; but there is not, and cannot be, accumulation in the cases of Negation, Comparison, Complementarity and others. That is to say, in this regard it appears that mindprints fall into two types of organizational principle. For those mindprints that have an accumulative effect there is in any case also an evolutionary dimension. It may be said a little simplistically, that the history of the world is to a great extent the evolution of Connectivity–Disconnectivity – beginning at the material level, through the biological and up to the social and noetic level. As the level of connectivity increases, so it connects more things, but by fewer means. Every word or equation has a greater potential of connectivity than that of the things it connects, even though it is constructed from only a minute number of signs. In other words, the more noetic connectivity increases, so is more manifest intelligence and less matter involved, and vice versa.

I have some doubt regarding the generalization that *all* mindprints are constituted from pairs of *complementary* attributes, especially since at least in the case of “comparison” I do not know whether it has no complement, or whether it has and I have not found it; or whether there is no necessity for every mindprint to have a complement. The mindprint of Comparison is the mechanism of comparison between entities with regard to *identity and difference*, which accompanies every perceptual or cognitive activity, whether

conscious or unconscious, at least among human beings and animals (and it is not impossible that an analogous mechanism is also present at the level of matter), so that this is a basic mindprint and not some derived or marginal attribute. However, I do not find a completely satisfactory complement of it, unless we accept the negation of Comparison–*No-comparison* , or Imparison - as the complement of Comparison (I am indebted to D. Nagy and J. G. Harries for suggesting this term as a possible alternative to “no-comparison”). Moreover, there is a little nested paradox here: it is impossible to perform Imparison consciously because any such act necessarily involves Comparison, which is its opposite. Here I am still groping in the dark.

It is reasonable to assume that all of the mindprints *act together*, but that not all of them act to the same extent in every situation. I am inclined to think that all of the mindprints are particularizations of a single complex principle, but again, because of its totality it probably remains forever beyond our grasp and can be only partially understood. On the one hand, it is clear that in a certain sense there is a hierarchy among the mindprints, and I am therefore inclined to think that they are all subject to some meta-principle, as though the mindprints were a kind of fingerprints which are an organic part of the handprint. On the other hand, I have not found the handprint or hierarchic structure that comprises all of the mindprints. This being so, there is no necessary hierarchic significance to the order in which the mindprints are presented in the table above. It is likewise easy to see that some of the mindprints possess an internal hierarchy; thus, for example, it is clear that there are very many levels of Connectivity–Disconnectivity: material, biological, social, noetic and others, and in each of these types there are many levels of Connectivity–Disconnectivity. That is to say, the totality is an infinite system of nested hierarchies. I am sure that my understanding of mindprints is very partial, and I can only hope that in the future I may understand the idea a little better. Nevertheless, this concept has helped me to understand art (and many other things), much more than has all the literature on art and aesthetics that I have read over many years. I therefore hope that the reader too will profit from the attempt at understanding this concept by applying it to his/her field of interest, be what it may, even though at this stage it is far from being presented in a polished manner.

Having noted a number of their basic attributes, we shall see how mindprints appear in a particularly simple prehistoric picture such as, for instance, the contour drawing of an ibex, deer, ox or any other animal, to be found in every book dealing with prehistoric art. If painting and all branches of culture are indeed different embodiments of basic

structures of mind, then the very appearance or non-appearance of these attributes in the products of art may serve as a criterion for the distinction between art and pseudo-art. Clearly the appearance of one or several mindprints does not suffice to distinguish between art and non-art. But if all of them appear, then it is definitely likely that we have before us a work of art. At the same time, the mere appearance of mindprints does not establish in any measure the *quality* of the work, but rather does it establish that it belongs or does not belong to the category of art objects. In like manner, if we say that lettuce is a food, we do not thereby commit ourselves to its degree of nutrient value, which is a completely different matter.

a. Connectivity–Disconnectivity – CODIS

I have discussed this mindprint thoroughly in a separate essay (Avital, 1997a) and shall therefore content myself with only a brief characterization. The reader should, then, imagine a prehistoric contour drawing of a deer, for example. This drawing does not represent a particular deer, but is a pictorial class-name for all deer which share the visual characteristics denoted by the picture. It is in other words a pictorial universal just like the verbal universal “deer”. As such, this picture *connects* all deer of the particular kind represented by the painting, but at the same time, it *separates* this class of deer from all other animals and all other entities in the world. In every figurative work there are at one and the same time at least three levels of connectivity: material, perceptual and symbolic. By contrast, in so-called “abstract” art there is only connectivity at the material and perceptual levels, just as with any object and any phenomenal entity, but it never has connectivity at the symbolic level. In the light of this, one should see in the difference in the levels of connectivity a prime difference distinguishing art from pseudo-art.

b. Complementarity–Mutual Exclusiveness

It has to be emphasized that complementarity is manifested not only in every mindprint but also in the products of culture. Thus for example, it was only in our century that Niels Bohr discovered the tremendous importance for science of the idea of complementarity, but this mindprint was implicit as a necessary condition for the possibility of art from its beginning 40,000 years ago, and it was implicit millions of years before that as a necessary condition for the possibility of reading footprints. In both instances it is impossible to detect the figure on the ground or on the wall without

the background which is its complementary aspect. Furthermore, since the symbols in every figurative painting consist in inclusion relations, or in a relation of nesting at various levels, thus in every figurative painting nested levels of complementarity are also present. As against this, in abstract art there is no necessity at all for complementarity between figure and ground, nor for nested levels of complementarity, for here there is the possibility of a uniform background with no figure within it as in monochrome paintings, or paintings in which the surfeit of colour causes us to see them as a more or less uniform surface. On the other hand, the very existence of an abstract painting, or any other object, cannot be distinguished without the background in which the painting itself is found, so that complementarity is a necessary condition for perception. Since complementarity is a necessary condition in every figurative painting but not within an abstract painting, it may be that this mindprint can serve as one of the factors that distinguish art from pseudo-art.

c. Open endedness–Closed endedness

The dialectic of Open-endedness – Closed-endedness is the source of all creativity and all metaphorization on the cultural plane; it is the root of existence and evolution in the biological world, and this dialectic can be seen on the cosmological level as well. Thus, the existence of every organism is absolutely finite, but with certain changes it continues its existence in its offspring. Similarly, the duration of the existence of every star is finite, but from the cosmic dust that remains after its disintegration other stars are created. The dialectic of Open-endedness – Closed-endedness also characterizes all types of symbol, whether verbal or pictorial. Symbols are as it might be special vessels, the inner space of which possesses a qualitative and not quantitative character, so that they are thus unlimited in their interior space, but have an outward facing partition. Thus for example the symbol “deer” whether verbal or pictorial, applies to every deer there was in the past, is in the present or will be in the future, and the symbol is thus open-ended. Every symbol has the attribute of extensivity which is a characterization of open-endedness, and therefore the symbol “deer” applies to every deer regardless of its age, size and special characters, unless it is of importance to us to create a sub-class having special characters, in which case a separate symbol is created for it. On the other hand, there has to be a limit to the measure of application of the symbol, for otherwise it will not be efficient for the classification of entities, and this fact indicates its closed-endedness. This dialectical duality of Open-endedness – Closed-endedness is present in every figurative painting without exception, but is not present in so-called “abstract”

painting. Paintings of this kind do not include symbols but patches of colour and shapes which we may interpret in any way we please as in a Rorschach test, and therefore there is in these works only the dimension of unlimited open-endedness. However, without limitation they have no value from a cultural point of view, for the supreme function of symbols is precisely to create finite coordinates and boundaries within the infinity that enfolds us. By contrast, when the matter of discussion is a non-representational work consisting of some common object taken out of its useful context and transferred to a museum – such as Duchamp's urinal – there is no open-endedness at all but only closed-endedness; that is, symbols and objects belong to different levels of reality, and symbols are always of a higher level than objects, because symbols are the precondition for the existence and meaning of objects. Hence, the introduction of an object into a museum can never transform it from an object into a symbol. Here again, there is not the complete mindprint, Open-endedness – Closed-endedness, which includes the dialectic of both of them. On the other hand, a so-called abstract painting such as an Yves Klein monochrome has only open-endedness but no closed-endedness, since there are no limitations to its possible interpretations. Since in every figurative work of art there is always the dialectic of Open-endedness – Closed-endedness, and in non-figurative art we find only one of the poles of this mindprint, it seems that Open-endedness – Closed-endedness can be one of the parameters that differentiate between art and non-art.

d. Recursiveness (Nesting)–Singularity, Hierarchy–Randomness:

Connectivity–Disconnectivity or Codis is not sufficient for the creation of order, nor is it an ordering principle such as hierarchy, without which there can be no life or intelligence. Basically, hierarchy is recursive or nested Codis. In other words, hierarchy is an embedded oxymoron comprising connections and disconnections (Codis) at various levels of order. That is, hierarchy is connectivity turned upon itself or more precisely; it is connectivity folded upon *simpler* versions of itself and thereby gradually creating more and more complex versions of itself. In this process the earlier versions are not overruled or canceled, but are preserved and embedded as “intermediate stable stages” (Simon, 1962) or holons (Koestler, 1967, 1978) by their nesting in the new and more complex versions. Through such a process a *systemic* connection is generated between all stages and levels of the connectivity. However—since there is no connection without separation—simultaneously with the recursion of connections there is also a recursion of separations or disconnectivities, which at a certain limit create disorder or

randomness. Thus hierarchy, and its opposite and complementary pole—anti-hierarchy or randomness—are the two poles of the same mindprint.

Hierarchy and recursion are inseparable because both are founded on nesting. The more detailed a figurative painting, the deeper is its nesting of symbols or structures within each other; and the deeper its recursive structure. The structure or hierarchic order in a figurative painting is the result of *inclusion relationships*, nesting, or self-embedding which exist between all the symbols of the painting, all of which are included by its background. That is to say, every figurative painting without exception is a hierarchic system of pictorial symbols. However, different figurative paintings are likely to have completely different levels of stratification. Thus for example, in a typical Vermeer painting there is far greater detail than in a prehistoric painting of a deer, and for this reason the degree of stratification in a Vermeer painting such as “The Milkmaid” is immeasurably more developed, and therefore contains more levels of organization, than any prehistoric painting. By contrast, it can be shown that in non-figurative paintings the degree of stratification is always negligible or extremely small, for, since in this art there is no symbol system, there are inevitably no recursive processes or nesting, but rather repetitions; however this is not enough for the creation of levels of order. Thus for example all monochrome paintings are utterly lacking stratification. Similarly, despite the large difference in the number of colours in minimalist and abstract expressionist paintings, this does not alter the fact that in both the degree of stratification is minute, because the degree of stratification is not determined by the number of elements but rather by the manner of their organization. A further important aspect present here is the fact that in every figurative painting there is always present at the same time a dialectic of hierarchy and randomness. By contrast, in works called “abstract” this dialectic need not necessarily be present at all, and many of these works are quite good examples of random organizations almost entirely devoid of any hierarchical patterning. Another aspect of this matter is the fact that figurative painting has from the beginning and until this day served as a means of presenting *the order in the world*. This attribute is what makes it above all a branch of culture, for all branches of culture are different ways of expressing the order that is in the world, either as an actual, a hypothetic, or an imaginary phenomenon. This is possible because its hierarchic structure is an ordering relation and it is symmetrical to one degree or another, to the order we see in the phenomenal world. Since non-figurative painting lacks hierarchy it inevitably lacks an ordering relation and cannot therefore represent any extensive order whatsoever. This point may be summed up by arguing that

recursiveness, hierarchy and their derivative attributes are factors that distinguish art from pseudo-art.

e. Symmetry–Asymmetry.

All kinds of Symmetry–Asymmetry are modes of Connectivity–Disconnectivity, but symmetry also includes other mindprints such as Transformation–Invariance, some kind of recurrence which is a special case of Recursiveness–Singularity, Complementarity–Mutual exclusiveness and perhaps other mindprints as well. It is possible that all kinds of Connectivity–Disconnectivity include, at least in a minimal sense, Symmetry–Asymmetry as well, in the sense that there can be no connectivity without some kind of interface or common denominator, which may be either literal or metaphorical. Nevertheless, symmetry cannot be reduced to connectivity because there are numerous kinds of symmetries besides the one inherent to connectivity. As noted before, the most basic function of symbols is at one and the same time connectivity and differentiation. But symbols of different types serve this function in different ways. This difference is especially noticeable in the special way in which pictorial symbols connect and differentiate the entities they symbolize, in contrast to the way in which verbal and formal symbol systems connect their entities (Avital 1996). The special connectivity of figurative art is based upon maintaining a *certain symmetry of a relative nature* between the object and the symbol that denotes it. This symmetry is a structural common denominator of the class of entities connected by that symmetry. Thus for example, the contour depicting a deer is the graphical common denominator between all members of the class of deer. In this sense, symmetry is a connecting pattern in art as in science. Therefore the annulment of this symmetry from visual non-representational art, exactly like the annulment of hierarchy or any other mindprint from this art, has far-reaching implications for the cognitive functioning of modern art. This matter is especially relevant to “abstract art”, which completely abrogates symmetry or similarity between symbol and symbolized as a principle of representation, thereby losing the cognitive function of Connectivity–Disconnectivity that has been so central to figurative art throughout the whole of its history. The breakdown of symmetry as the connectivity principle of art, is at the very root of the breakdown of art itself in our century, and it can therefore safely be assumed that in the future paradigm of art Symmetry–Asymmetry will be restored, without however reverting to figurative symmetry, but rather to Symmetry–Asymmetry of a much higher level of abstraction. This seems to be inevitable because, like all mindprints, the complementarity of Symmetry–Asymmetry,

is one of the most basic means of organization of mind or Being in all of its manifestations: on the material, the biological, and the noetic level, of which art is one sub-aspect.

f. Transformation-Invariance:

Transformation is the melody of matter, life and intelligence. It is the magical bridge between Being and Becoming. For Heraclitus change and transformation was the only truth, and invariance was illusory. For Parmenides transformation was sheer illusion and only invariance was the truth. For Plato transformation was the earmark of the phenomenal world, which for him was an intermediate reality between the realm of illusion and the world of Forms or Ideas, which is invariant and the only eternal truth. In Plato's conception there is thus room for both poles of this mindprint, but he did not see them as complementary opposites. Modern science has clearly opted for the Heraclitean view which perceives reality as dynamic and transformational. However, at the same time, science posits a number of invariants such as levels of organization or hierarchy, symmetry, transformation and others, as well as their complementary opposites. Indeed, the central and as yet unproven supposition of this essay is that the list of mindprints I have indicated is almost certainly a partial inventory of the invariants that are common to all branches of culture, and science among them. There are evidently many kinds of transformation: some are common to all levels of Being, some are unique to each level. The concept of transformation is too wide for discussion here, and I shall therefore focus only upon a few of its aspects that are relevant to symbolization, of which art is a special case.

Transformation-Invariance is not only inherent to all kinds of Symmetry-Asymmetry, but is also the precondition of all perceptual and cognitive activity. The reason for this is, that all mental or cognitive activity involves interpretation, and interpretation involves some kind of coding-decoding, signification or symbolization, which is impossible without transformations of various kinds. While the necessity of transformation is self-evident in the physical and biological domains, it is less apparent in the cognitive context. Thus, the creation of pictorial symbols involves spatial and temporal transformations: from three to two dimensions, and from faster to slower time. The first kind of transformation is self-evident, but the second is less obvious. Time is not a uniform phenomenon but rather is it an immense hierarchy of times which includes within it several hierarchies of kinds of time characterized by different levels of rate of

change (Fraser, 1975; Stamps, 1980). Thus for example, the rate of change in the physical world is much faster than in the noetic world. On the other hand, in each of these two domains a hierarchy is present, of rates of difference. By a broadening of this idea, it may be said that in drawing a house, a flower or a horse, the very creation of a symbol for one or all of them together, performs simultaneously two kinds of transformation: on the one hand, the transformation is made of a three-dimensional entity into its two-dimensional image, and furthermore it is removed from physical time to noetic time, which is much slower or characterized by a much lower rate of change. It is as if we had trapped or frozen a bubble from a world in which change takes place at a rapid pace, into a world in which change takes place at a far slower pace. Notwithstanding, despite these two transformations, a drawing representing (for instance) a horse, does not represent a particular horse, but constitutes a pictorial universal that can indicate any horse. This fact indicates the *invariant* and complementary aspect of transformation. In other words, there is present in figurative art a duality of descriptive vs. described processes, and there is a vast gap between the rates of change and levels of complexity in the two processes. However, the two processes are complementary and are connected by transformation and symmetry. That is, a basic function of pictorial symbolization is the preservation of information by translating or transforming a faster to a slower process, or by creating a slower process which denotes the symbolized process or entity. Thus, information is preserved by increasing connectivity. Connectivity is then in inverse relation to difference, and deceleration in time is a kind of freezing of the object as an image or concept. In most cases (but not always) intelligibility is also achieved by shifts to lower levels of difference, i.e. slower time or higher connectivity. As we shall see in the following, in the case of conceptual and formal symbolization the dynamics of Symbol vs. Symbolized is far more complex.

As already stated, when we construct a representation of a phenomenon it is necessary to move to a slower time than that of the symbolized phenomenon. But when attempting to represent a totally conceptual and highly abstract entity, such as "God" for example, it may be that we then pass to a level of change much more rapid than that of the matter symbolized since according to the monotheistic view, for instance, God does not exist in time and in any case has no variance! On the other hand, our concept of God, however abstract this may be, will include some measure of difference since we are unable to think otherwise. A less extreme case would be when we try to represent a mindprint like Symmetry-Asymmetry. For this we shall have to pass from the low level of difference at which the meta-patterns of the mind exist, to a higher level of difference, in order that

the concept shall have sense within our conceptual system. Two more examples: A close childhood friend whom I have not seen for many years has remained in my imagination in the same state, a kind of freezing in time of the image, and if I were to meet him in the street I might very well not recognize him. By contrast, when I draw a circle, there is no passage into a slower time than that in which geometrical ideas exist, but on the contrary: we pass from a low level of difference in which these ideas are present in our thought, to a much higher level of difference in order that the concept of the circle should receive actuality in the phenomenal world. The conclusion to be drawn from all that has been said is, that our consciousness exists only *within a certain range* of levels of difference. That is to say, in order that we may be able to function cognitively we move, in certain cases, into a time that is slower than that of the subject of symbolization, while in other cases we move into a more rapid time.

Unlike the case of figurative art, in abstract art there is no symbolization and therefore no transformation—neither spatial nor temporal. There are neither descriptive nor described processes. The work in this case is time-dependent only in a physical sense, as with any perceptual object. There are no shifts or transformations up or down the hierarchy of time and there is therefore no symbolization, no preservation of information and no intelligibility. It has also no invariant aspect, because one may interpret it in any way desired. In the light of these profound differences between figurative art and abstract art, it is reasonable to suppose that Transformation-Invariance, like the other mindprints, is one of the parameters that may distinguish art from pseudo-art.

g. Determinism–Indeterminism (Probablility, Selection, Choice)

Determinism in its classic formulation, as with Laplace and others, assumed a total causal connectivity between all events at all levels of Being, and therefore saw in selection and in free choice only illusion. Spinoza, Hume, Darwin and others saw in the assumption of the existence of chance an admission of our ignorance with regard to the causality of things. In a less extreme formulation, as with Descartes, absolute determinism exists only in the material world but not in the spiritual world, and not with regard to God. Modern physics learned to understand what had already been understood thousands of years earlier in the mythologies of Egypt, Greece, Iran and India: that there is no complete determinism, but two opposed tendencies of order and disorder. The difference is that modern physics, like Daoism, sees in these two tendencies opposed but complementary tendencies, whereas the mythologies saw in them opposed

forces that were not dependent upon one another. In complete opposition to the mechanistic view which is fundamentally classical determinism, Prigogine argues that matter is not passive but is characterized by *spontaneous* activity (Prigogine, 1984, p.9). This means, that the physical world is an open-ended process and that therefore in principle our knowledge regarding material reality discloses only a probabilistic situation, and not an absolute one. From this follows the profound connection between Open-endedness–Closed-endedness and between Determinism–Indeterminism. The fallacy of determinism is in the end the assumption that in Being there is absolute connectivity without the opposite pole of disconnectivity. In other words, determinism is an expression of connectivity and closed-endedness, and indeterminism is an expression of disconnectivity and open-endedness. And indeed, as there is no absolute connectivity and no absolute diffusion as permanent states but rather for very brief durations as a stage within a broader process in which they change, so too there is no determinism or its opposite as absolute states, but rather only intermediate states of connections of different strengths. Moreover, creativity is one of the salient expressions of Open-endedness – Closed-endedness, and the fact that there exists continuous becoming and creativity in all aspects and at all levels of being is perhaps the best refutation of the deterministic view.

In culture, as in the physical and biological worlds, there are constraints of different kinds which constitute the deterministic aspect of the products of culture; but along with these constraints there are also indeterminism, open-endedness or one measure or another of degrees of freedom. The deterministic aspects are the factor making the products of culture inter-subjective; otherwise they would have no cultural value. On the other hand, along with these constraints there are also anti-deterministic factors such as the idiosyncrasy, talent and the special point of view of the creators. Similarly, another contribution to this matter is the uniqueness of the consumers of culture and other factors such as arbitrariness and randomness, which are a dimension that accompanies every creative process and every interpretation of it. Basically the indeterministic aspect, which is largely subjective, becomes in particularly successful cases public property. However, in less successful cases it remains the property of the subject, and therefore irrelevant to culture. Thus for example the basic structure of all languages is hierarchical, but different languages interpret and map reality in different ways; the speakers of every language use it in different ways to one extent or another, and in every language different combinations of phonemes are used in order to denote the same things. Moreover poets, philosophers and scientists try persistently to extend language and renew it so as to match an existing or hypothetical reality. Similarly, every

figurative painting is a hierarchical symbol system depicting real or fictitious entities by means of a specific symmetry that enables us to identify the painted object. However, in every such painting there are, alongside structural, syntactic, material and other constraints, also not a few factors which contribute to the open-endedness both of painting as an artistic domain, and to the open-endedness of the painting as a specific work. Thus for instance the special use that, throughout the history of painting, every artist makes of colours and shapes; shades and configurations that occur by chance alongside those that are planned; the special interpretation which he gives to the symbols and to divergences of one kind or another from the figurative syntax; all of these and others contribute to the creativity, originality, renewal and richness of the art of painting. In abstract painting there is by contrast only an indeterministic, subjective or idiosyncratic element, but no deterministic inter-subjective element at all, so that it is very doubtful whether it is art. It may thus be said in conclusion that Determinism–Indeterminism is a mindprint in art and in every other area, and can therefore serve as one of the parameters for distinguishing between art and pseudo-art.

h. Negation–Double negation, Comparison–Imparison

Negation–Affirmation (or double negation) would appear to be the most basic mindprint, since negation is immanent in every mindprint in the sense that it is the necessary condition for the generation of complementarity in all mindprints. In other words, negation is what creates otherness, and in this case the reciprocal connection and opposition between the poles that form each of the mindprints. From a psychological viewpoint, we tend to think that affirmation is more basic than negation. But from a logical point of view, negation is more primary, for negation cannot be derived from affirmation, whereas affirmation can be derived from negation by means of double negation. At the same time, affirmation has no meaning without negation, and not the contrary, for the one always assumes the other and they are therefore complementary. Thus for instance, in a proposition such as: “This table is made of wood”, we explicitly affirm that the table is made of wood but we implicitly deny the possibility that it is made of some other material. such as iron, for example. As against this, when we maintain that: “This table is not made of iron”, we explicitly deny the possibility that the table is made of iron, but we implicitly affirm that there are other materials of which it may be made, such as wood or stone, for example.

Without negation no kind of thought is possible in any area, nor the most basic laws of thought such as the law of contradiction, and the law of the excluded middle, already formulated for the first time in the sixth century B.C., by Parmenides. In a wider sense, without negation no noetic activity would be possible—whether perceptual, instinctive, symbolic or emotional. Negation and double negation accompany all processes of thought at all levels, and every comparison and every state of consciousness. For there is no awareness without consciousness of difference, and there is no difference without negation. Explicitly or implicitly, negation and affirmation are inseparable from every proposition, judgment and predication. Without negation and double negation there is no meaning to truth and falsehood, and evidently no logic; there is no possibility of verification and refutation in any domain; there is no certainty and no uncertainty, and there can be no order, organization or orientation of any kind. Not only is epistemology impossible without negation and double negation, but neither is ontology possible without this mindprint. That is to say, there is no Being at all levels without its complementary opposite, nonbeing or nothingness. In both cases, in the noetic world and also in the material world, negation creates *otherness*: it splits unity and simplicity and thus creates diversity and complexity. Negation creates the complementary classes: thus the class of “*not-blue cars*” is the complementary class of the class of cars which are blue. Without negation there can be no inclusion-exclusion relations, classification, differentiation of any kind or individuation; there will be no process or entropy, no evolution or negentropy and no variance or time. However, without these there can be no intelligibility or coherent view of mind or reality. In short, eventually, negation grants the emergence of mind and reality.

The wonder of Creation is perhaps the wonder of the creation of negation. Everything else is derived from it. The first verses of Genesis describe the first distinctions that God made, which are also the creation of the first complementary pairs: heaven-earth, light-darkness, etc., but no distinction is possible without negation, and negation and double negation therefore preceded all distinctions that followed. For the same reason complementarity too, which was generated by negation, preceded the complementary pairs that were created. Actually, the first Asymmetry, which according to the Big Bang theory is the moment of creation, could not be without negation. In a humorous vein, one might suggest a different opening for the first chapter of the Bible: In the beginning God was very bored amidst Perfect Symmetry, in which absolutely nothing happened. Then accidentally He sighed, “Oh No!” This created the first Asymmetry, which brought into being the other mindprints... and the rest is History. In other words, there is no symmetry without asymmetry, and there is no asymmetry without negation, therefore

negation is a precondition for Symmetry--Asymmetry, and the same can be shown with regard to all the other mindprints. In a final regression, the negation of negation is perhaps what created Being, and this is perhaps the significance of the proposition that Being was created from nothingness. There is nothing new about this, since the idea already arose in the creation myths and in philosophy, in Western and Eastern cultures, and also in modern physics.

It is doubtful whether there has in the history of philosophy been an issue whose implications for the history of Western thought have been so decisive as in the case of the concept of negation, and mention should therefore be made in this case, of the context within which this issue first arose. It is perhaps not by chance that Heraclitus and Parmenides, who largely established the main channels of the development of Western philosophy, presented in a polarized manner two opposing world views, the essential difference between which was a different view of negation. Heraclitus does not appear to have discussed explicitly the problem of negation, but since the world view that he presented is constructed upon principles of transformation and complementarity, then implicitly negation and affirmation, and also being and non-being, must be two opposing but complementary aspects, as with all the other opposites. By contrast, in the view of Parmenides, opposites and complementarity are only an illusion connected to the Way of Seeming and not to the Way of Truth, whereas the problem of negation was the main axis in his philosophy, and his conclusions had a decisive influence upon the subsequent development of Greek philosophy.

For Parmenides there was no clear distinction between subject and predicate, and no distinction between negation and nonbeing, and therefore the negation in 'what is not' is not the negation of a specific attribute of the subject, but rather the negation of the existence of the subject. Another assumption of his, was that there exists an identity between the content of thought and the reality of the object of thought: "...for it is the same thing that can be thought and can be" (fr.3), and it is therefore impossible to think about 'what is not', or what does not exist. Thus in his explanation of the impossibility of the becoming of the One or of 'what is', out of what is not, he argues: "I shall not allow thee to say or think 'from what is not', for it is not to be said or thought that 'it is not'. (fr 8.6; the fragments are from Guthrie, 1965, p.14, 26.) But as a result of the identity between negation and non-being, and because of the absence of the distinction between predicate and subject, for Parmenides a double paradox was created: on the one hand he argued that it was impossible to think of 'what is not', but the greater part

of his philosophy deals with thinking about the negation of the possibility of thought regarding what, according to his conception, it is impossible to think about. On the other hand, in his opinion it is possible to think only about 'what is'. However, it is not possible to think anything regarding that utterly indifferenced transcendent Unity, without introducing a multiplicity of words and predicates—something that is opposed to his own view. And indeed he too is obliged to characterize this unity mainly by way of negation, with the aid of a few predicates, for otherwise he could not have said or thought anything regarding that unity. Parmenides was aware of the fact that because of our essential need for names and words, which for him were only conventions that did not necessarily describe a true reality, it is then possible in actuality to think only about contents or subjects which he considered it impossible to think, and impossible to think about what he considered it possible to think.

The polar opposition between Heraclitus and Parmenides is not only with regard to negation, but also in that they emphasized in their philosophies the different poles of another mindprint: Complementarity–Mutual exclusiveness. Heraclitus emphasized complementarity and ignored the other pole, which is mutual exclusiveness, whereas Parmenides denied complementarity and emphasized only mutual exclusiveness. For this reason there can also be for him only total negation or only total affirmation of the content of consciousness, which is for him identical with the object of thought: that is, for Parmenides there can be only absolute negation with regard to the perceptual world, or absolute affirmation with regard to the One, and there is no possibility of his affirming one aspect and denying another aspect in one of these two worlds (Scolnicov, 1988, p.151.)

The conclusions of Parmenides concerning negation led for the first time to a distinction between phenomenal reality as an illusory reality, and transcendent reality which is true, but with no possibility of bridging the gap between the two. Indeed, the chief life work of Plato was the attempt to forge a compromise between the opposed world views of Heraclitus and Parmenides, and in particular to bridge the abyss created by Parmenides. The key to his solution lay in showing that negation does not relate to a thing, but to characteristics or predicates which can be related to a thing, so that there is no problem of negative things (Plato. *Sophist*, 257-258.) Aristotle agreed with his opinion in the matter of the nature of negation, but he rejected the rest of the implications of the Platonic solution which created three worlds, of which he attributed to the phenomenal world an intermediate status of between 'what is' and 'what is not': between the true world of Ideas whose attributes are similar to those of the Parmenidean One, and the

world of illusion. On the one hand Plato's solution introduced multiplicity or negation into the world of unity of Parmenides, through the plurality of ideas, and on the other hand introduced unity into the world of diversity, since the objects in the world owe their existence to the fact that they partake of the Ideas or imitate them. Plato anchored the Ideas or Forms in the transcendent level, whereas Aristotle considered that they were immanent to the things themselves. This was the central point of disagreement between these two giants, and the subsequent history of philosophy up to Kant is to a great extent the continuation of the argument between them. The problem of negation in its wide sense was the point of departure for Parmenides, but the discussion of it and its derivatives laid the foundations for epistemology and ontology, metaphysics and logic; the complete separation of the perceptual and the conceptual and their relation to the possibility of knowledge; the assumption of rationality as the point of departure for philosophical method and as a criterion for reality itself, and other issues. Here it can be seen to what extent the problem of negation indeed determined the character of Western philosophy for more than two thousand years. (Scolnicov, 1988, p.162.)

On a superficial view it is hard to see in what way the Negation–Affirmation mindprint could have importance in relation to the problem of demarcation lines between art and non-art. However, on deeper inspection its importance is revealed at two levels: firstly, with regard to figurative art it is very easy to establish whether some thing belongs to figurative art or not. By contrast, in non-representational or abstract art, there is no way of *denying* some thing its inclusion in this art, and thus in principle *any thing* can be accepted as a work of art of this type. In other words, modern art is not skeptical, as many try to present it, but rather is it nihilistic and therefore in the end also self-nullifying: it negated figurative art but it has no alternative of equal value, let alone a better one. Secondly, one of the functions of negation is the creation of differentiation on different planes. Thus for example there is always in figurative art a differentiation between figure and ground, and likewise a rich and well distinguished system of symbols each of which serves as a pictorial class-name for certain entities. As against this, in abstract art negation is not necessary at all: there is no necessity at all for a distinction between figure and ground, and a picture may well contain only unity, with no differentiation at all, as occurs in monochrome paintings. In the light of all this, it is clear that the Negation–Affirmation mindprint may be one of the parameters for the distinction between art and pseudo-art.

I have some doubt as to whether Comparison–Imparison is indeed a mindprint in its own right, or whether it is not an internal organisation, or nested mindprint of other mindprints such as Negation–Affirmation. For, at least in the area of predication, propositions and judgments, no negation or affirmation is possible without comparison between at least two states of affairs regarding the extent of difference, resemblance or identity of the attribute or attributes one is attempting to negate or affirm in relation to some subject. Thus for example, according to the law of contradiction a proposition cannot be true and false at the same time. Or, two propositions, p and not- p , cannot both together be true. However, the law of contradiction is not meaningful without an explicit or implicit comparison between p and not- p . Negation and affirmation are, then, not possible without *comparison* between two opposing possibilities regarding the same matter and the rejection of one of these possibilities. Thus for instance, for a person to be able to maintain rightly or wrongly : “This painting is not by Vermeer”, he must compare the observed characteristics of the given picture with the totality of characteristics that there would be in an authentic painting by Vermeer. In the light of the difference between the characteristics of the given painting and those of a typical Vermeer, he rejects the possibility that the given painting is indeed a painting by Vermeer. By contrast, when a person maintains: “This painting is by Vermeer”, he compares the characteristics observed in the given painting with the totality of characteristics that there would be in a typical painting by Vermeer, and in the light of the great similarity or identity of the two classes of characteristics he rejects the possibility that the given painting is not by Vermeer. That is to say, he affirms that the given picture is indeed a painting by Vermeer. We have seen, then, that at least within certain areas there is no negation without comparison. But comparison is not possible without negation, in the sense that there is no comparison without the perception of variance or duality between things or between two appearances of the same thing. Similarly, there is no point in the act of comparison if it is not accompanied by an affirmative, negative, or dubious decision regarding the degree of variance, the similarity or identity of the characteristic considered in the objects of the comparison. It would seem that in the epistemological realm at least, negation and double negation are conclusions from comparison. However, I am by no means certain that this is so in all domains. In this, as in other matters connected with mindprints, I am still groping in the dark, and hope to understand them better in the future.

To summarize:

In order to understand art as a product of the mind, it is necessary to understand the structural patterns or mindprints that the mind stamps upon all phases of Being: in the physical, the biological, and the noetic world, of which art is one aspect. Seen in this light, human culture, including art, is not antithetic to nature, as suggested by some anthropologists, but is in a profound sense the latest phase in the evolution of nature itself. In this phase, the main product is not matter or life, but the unfolding of intelligence itself and its structures, which are implicit in nature from its beginning. An adequate theory of the origins of art must therefore indicate at least the linkage of art with the tremendous process of the emergence of intelligence. Seen in this way the characterization of art cannot be another particular theoretical caprice to be lightly accepted or rejected. Rather such a characterization of art is needed that anchors it in the broadest possible context - to cosmology itself, which is the grand objectivation of mindprints. In fact, a characterization of art in this way is to my mind a direct derivative of the most sublime principle that science has yet discovered: the *anthropic cosmological principle* (Barrow and Tipler, 1986) according to which many of the extraordinary properties of the universe constitute a necessary condition for the existence of life and of an intelligent observer of that universe. Intelligence is according to this view a purpose of the universe, and on our tiny planet this purpose began to materialize explicitly through culture and the stages which preceded it: footprints literacy at least four million years ago; tool making some two and a half million years ago; through image making or prehistoric art some 40,000 years ago; and through language and all of its products, which crystallized at some time between the emerging of tool making and image making, and has been to this day the main bearer and propellant of cultural evolution. If the mindprints are indeed basic structures of the mind as argued here, then the real test of this idea will be whether people from domains different from art will also identify the mindprints that have been indicated here as meta-structures in their domains as well. If this in fact happens, then the mindprints theory may indeed be able to serve as the structural basis for a transdisciplinary view of culture, or as the basis for a philosophy of culture. It can be seen from this essay that Symmetry-Asymmetry is only one out of nine or ten other mindprints, and not the most essential of them. In the light of this, I hope that the Society for the Interdisciplinary Study of Symmetry (ISIS) will widen its platform to include the rest of the mindprints as well, or the general investigation of the basic patterns of the mind and the mutual relations between them.

REFERENCES

- Aristotle (1941 edition) *De Anima*, translated by W.D. Ross, in McKeon, R. ed. *The Basic Works of Aristotle*, New York: Random House.
- Avital, T. (1996) Symmetry: The connectivity principle of art, *Symmetry: Culture and Science*, 7, 1, 27-50.
- Avital, T. (1997) Figurative art versus abstract art. Levels of connectivity, In L. Dorfman, C. Martindale, D. Leontiev, G. Cupchik, V. Petrov, & P. Machotka (eds.), *Emotion, Creativity, & Art*, Perm: Perm Cultural Institute, pp. 134-152.
- Avital, T. (1998) Footprints literacy: The origins of art and prelude to science, *Symmetry: Culture and Science*, Vol. 9 (1998), No. 1, 3-46. Published also electronically by *Visual Mathematics - (VisMath)*, <http://members.tripod.com/vismath/> and <http://www.mi.sanu.yu/vismath/> Vol. 1 (1999), No. 2.
- Avital, T. (Under review) *The Origins of Art: An Archaeological or Philosophical Problem?*
- Barrow, J. D. and Tipler, F. J., (1986) *The Anthropic Cosmological Principle*, Oxford: Oxford University Press.
- Bateson, G. (1978) The pattern which connects, *The CoEvolution Quarterly*, Summer, 9.
- Bateson, G. (1980) *Mind and Nature: A Necessary Unit*, New York: Bantam Books.
- Fraser, J. T. (1975) *Of Time, Passion, and knowledge*, New York: Braziller.
- Guthrie, W.K.C. (1965) *A History of Greek Philosophy*, Vol 2, Cambridge: Cambridge University Press.
- Hamilton, E. and Huntington, C. (eds.) (1996 edition) *Sophist*, in Plato: *The Collected Dialogues*, Princeton: Princeton University Press.
- Kant, I (1933, originally published in 1787) *Critique of Pure Reason*, N. Kemp Smith's translation, London: The Macmillan Press, B 134-135.
- Koestler, A. (1967) *The Ghost in the Machine*, London: Pan Books LTD.
- Koestler, A. (1978) *Janus: A Summing Up*, London: Picador.
- Leakey, M. D. and Harris, J. M. eds. (1987) *Laetoli: A Pliocene Site in Northern Tanzania*, Oxford: Clarendon Press.
- Leakey, M. D. (1981) Tracks and tools, *Philosophical Transactions*, London: The Royal Society, B 292, 100.
- Prigogine, I. (1980) *From Being to Becoming: Time and Complexity in the Physical Sciences*, New York: W.H. Freeman and Company.
- Russell, B. (1985, originally published 1959) *My Philosophical Development*, Chapter 7, London: Unwin Paperbacks.
- Scolnicov, S. (1988) *Heraclitus and Parmenides*, (Hebrew edition), Jerusalem: Bialik Institute.
- Sheldrake, R. (1981) *A New Science of Life: The Hypothesis of Formative Causation*, London: Blond & Briggs Limited.
- Simon, H.A. (1962) The architecture of complexity, *Proceedings of the American Philosophical Society*, 106, 467-82.
- Stamps, J. S. (1980) *Holonomy: A Human System Theory*, Seaside, California: Intersystems Publications.
- Waddington, C. H. (1977) *Tools for Thought*, Frogmore, St Albans: Paladin.