

Architecture and Structures of Consciousness

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This version, done in 1988, is an updating of my MArch thesis of 1967.

1. CONSCIOUSNESS

1.1. Seven Pillars

The Primitive lived in the body of Gaia, the earth's biosphere named after the Greek mother goddess and now perceived by contemporary biologists as a living organism. Individual consciousness was not differentiated out from the flow of the earth's consciousness. The Amazon Indian moved in the shadow of a perpetual green canopy, deriving food, shelter, and hallucinogenic drugs from an unbounded organic home. The Australian Aborigine lived under a dome of stars that encoded ancestral stories. There was no monumental architecture, as frozen stone would have blocked the flow of consciousness and disrupted an umbilical union.

Once separated from Gaia, the early monument builders used their stones to direct the flow of energies. Stonehenge is but one of thousands of megalithic structures built to serve as great acupuncture needles, marking first the earth's energies, then the moon's cycles, and finally the sun's movement through the seasons. No longer a part of the earth. Human consciousness now gained a power over it. The umbilical cord was cut and innocence ended. Differentiated consciousness set out on its wanderings of the earth and most recently the heavens.

The Egyptian moved through the narrow corridor of time, with smooth stone walls defining the Path of a linear progression through life and into death. Orderly social customs prescribed activities in life, and the *Book of the Dead* prescribed the precise manner in which one was to advance through successive tests in death. There was no field of action for the Egyptian, no openness of space. Nothing existed outside of the one dimension of the path. The polished faces of the Pyramid in the sun defined the Path across the desert. Likewise, at Luxor, the avenue of sphinxes from the river led directly to the pylon of the Temple, beyond which the court, hypostyle hall, and sanctuary also marked a clear progression. The columns of the Egyptian temple were on the inside to screen the walls and deny the existence of anything beyond them. The outside of the temple, with the exception of the pylon, had no architectural existence.

The Egyptian directional movement contrasted with the flowing Chinese Way of the Tao. Lao Tzu wrote:

The highest good is like water.

Water gives life to the ten thousand things and does not strive.

It flows in places men reject and so is like the Tao.

The Chinese followed this flow, achieving the perfect harmony that comes from non-desire. The Chinese temple and palace complex is not a self-contained building, but rather an open complex that includes hills, water, trees, flowers, and rocks, as well as the building. The openness of the building, the layers of the roof, and the spaces between the bracketed supports over the columns all conspire to let space flow through the building like the breeze.

The Greek experienced the emergence of the individual from society and from nature. In his study of Greek tragedy, Nietzsche wrote:

At the very climax of joy there sounds a cry of
Horror or a yearning lamentation for an

Irretrievable loss. In these Greek festivals,
Nature seems to reveal a sentimental trait; it
Is as if she were heaving a sigh at her
dismemberment into individuals.

The Greek temples at Paestum stood apart from nature, the geometric form of the buildings contrasting to the jagged hills, and the free-standing columns, this time on the outside, representing the emerged individual. Now the interior is hidden by the columns, as the Greek was concerned only with the bodily whole, abhorring the voids of space and time.

The Gothic world was defined by the total presence of a God who had cast our soul into the material world to be tested by the temptations of the body. The test was met by asceticism, the starving away of the flesh. The Gothic cathedral at Chartres was similarly stripped of all unnecessary material, leaving the thin ribs of the vaults and flying buttresses, and opening the walls to allow the luminous presence of God to flood through stained glass windows to fill the interior space of the cathedral in the same way it floods through the body of a person to illuminate the soul.

The Renaissance replaced the centrality of God with the centrality of the human being: "Man is the measure of all things." Newton's uniform space and time defined the crystal clockwork in which people moved, their senses connecting them to nature and mathematics connecting them to nature's laws. Perspective painting measured the lattice of space and time, and the rational symmetry of Renaissance architecture established the setting in which the human being, positioned under the dome, could survey out: front, back; right, left. Palladio's Villa Rotonda laid the Cartesian coordinates onto the landscape.

The early twentieth century saw the fall of a central point of reference with the emergence of an existential relativistic cosmology. Einstein's equations shattered Newton's absolute space, leaving the human observer in referenceless motion. In

architecture, Frank Lloyd Wright, in the Robie House, moved the human being out of the center, now occupied by the chimney core, and placed it in motion, once again a part of nature.

Consciousness, in continual flux, generates a changing world. Architecture, along with other cultural forms, records that change.

1. 2. Consciousness

The term “conscious” can have several meanings. One is awareness of the environment, as in the statement: “She was conscious of his presence in the room.” Another is self-awareness or self-knowledge, as in the statement: “He was not conscious of having picked up the keys.” We also speak of states of consciousness, and in Freudian psychology, distinguish between the conscious and the unconscious workings of the mind: that is to say, those workings of which we are aware and those of which we are not. But the Freudian notion immediately raises larger issues: If the mind has a conscious and an unconscious component, what is mind itself and does it have other components? Also, what is the “we” that is aware of the workings of the conscious mind and unaware of the workings of the unconscious mind? Obviously, the concept of consciousness is in need of complex refining and division into sub-categories. But it is also in need of vast expanding. In this book we will use the term consciousness to include all receptive, active, and contemplative human Activities. But we will find ourselves going much further than this. As we attempt to define consciousness, we will find that it must be understood not as an activity of the human mind, but as a principle of nature. Human beings represent a gathering of consciousness, but it is a gathering of something that is pervasive.

The French philosopher René Descartes (1596-1650) described the world as constituted of two totally distinct substances, mind and matter. Descartes saw the human being as a union of mind and body (matter.) The body was a purely mechanical system occupied by

mind, with the relationship between the two being mediated by the pineal gland. This distinction of mind and matter, sometimes referred to as Cartesian dualism, has pervaded the thinking of Western philosophers since the seventeenth century. Most have either accepted it or attempted to refute it. Immanuel Kant (1724-1804) opposed mind to external reality which he referred to as the thing-in-itself. Kant felt that we can never know the thing-in-itself, only phenomenal reality, that is reality as given to us through the senses and the categories of mind. For example, we find that everything we perceive is characterized by space and time. These are categories of mind and are imposed on all of our experience by our minds.

Kant's approach kept the dualism of Descartes' philosophy, but other approaches rejected it. Friedrich Hegel (1770-1831) saw the world as constituted of one substance, mind, which he referred to as Absolute idea of Absolute Spirit. He felt that this Idea was in a state of evolution or self-actualization, which we experience as human history. Our physical and social sciences today take the other tack, overcoming dualism by diminishing and even rejecting (as in the case of behavioral psychology) the concept of mind. The physical sciences tell us, in effect, that the big bang led to the creation of space, time, matter, and the laws of physics. These in turn led to the elements, to spiral galaxies, our solar system, and our earth. Chemistry led to life, starting with simple organisms which, through evolution, led to higher life forms, central nervous systems, the brain, and consequently, consciousness. Thus, consciousness is a consequence of causes and can be explained by or reduced to these causes, just as the working of an engine can be reduced to and explained by the motion of pistons in response to the expansion of combusting gases. This kind of approach is referred to as reductionalism, and, while it has few adherents among serious philosophers, it pervades the physical and social sciences. The stimulus-response model of behavioral psychology, that we will discuss later, is also a reductive theory.

In *The World as Will and Representation*, Arthur Schopenhauer (1788-1860) rejects the opposition of a world purely of mind to one purely of matter, writing:

The fundamental mistake of all systems is the failure to recognize this truth, namely that the intellect and matter are correlatives, in other words, the one exists only for the other; both stand and fall together; the one is only the other's reflex. They are in fact really one and the same thing, considered from two opposite points of view; and this one thing . . . is the phenomenon of the will or of the thing-on-itself.

Schopenhauer was a brilliant philosopher and beautiful stylist who had a strong appreciation of the role of the arts, and whose thought was a synthesis of Western and Eastern philosophical systems. His approach is similar to the one developed in this book, and it is therefore worth looking at for a moment.

Schopenhauer felt that the material objects we perceive in space and time are underlain by the substance of raw will. This is Kant's thing-in-itself, but unlike Kant, Schopenhauer felt that it is possible for us to know this will. We can start with ourselves. I am an object, a physical entity like my desk or the tree outside my window. I am made of material, am subject to the causal laws of physics, occupy space, and endure through time. But I am also aware of myself from within as a thinking, feeling, self-motivated being. From the outside my actions can be seen as a response to stimuli. From the inside I can see my actions as an expression of my will. We are at once will and matter, not two different things, but the same thing appearing differently depending on how it is observed. The same is the case for all of the world. It also has two faces, that of material representation and that of inner will, both faces expressing the same thing. We can have a direct experience of this fact through introspection. In the Tao Te Ching, Lao Tzu writes:

Ever desireless, one can see the mystery.

Ever desiring, one can see the manifestations.

These two spring from the same source but differ in name . . .

Schopenhauer's approach of seeing will, or an active force, as the primary quality of the world influenced such thinkers as Emerson and Nietzsche. Similar approaches can be seen in the German idealists, in Goethe, and particularly in the philosopher, scientist, statesman, and theologian, Gottfried Wilhelm Leibniz (1646-1716.) Leibniz, who developed the calculus independent of and simultaneous with Newton, opposed Newton's mechanistic notion of space and time as frames for objects and events. In effect, Leibniz asked what lay between two objects separated by Newton's space. Newton's reply would be: nothing. To this Leibniz would retort: if there is nothing between them, they must be touching each other. We have come so fully to accept Newton's notion of space that Leibniz's challenge seems sophistic, but it is not. Newton's space is actually a very complex notion, ultimately built on shaky ground. It completely gave way to Einstein's relativity theories.

In place of space as void, Leibniz proposed a theory of monads, which he stated to be the real elementary units of nature. The monad is a simple substance, different from a material atom or particle. The monad is in effect a unit of consciousness, and every monad has reflected in it all other monads, or all of the universe. Leibniz's notion of monads may sound arbitrary and strange, and may also seem to be refuted by our modern scientific knowledge. But we should not be too quick to give science the role of arbiter of all knowledge. Far from generating knowledge, science more often elaborates on philosophical speculations. For example, we tend to credit scientific observation with our current theory of the formation of our solar system. Yet it was the philosopher Immanuel Kant who, in 1755, proposed that our solar system evolved from a rotating mass of incandescent gas which increased its spin as it cooled and shrank, thus flattening at its poles and throwing off rings which in turn condensed to form the planets.

So Leibniz's notion of monads may have grown out of a sophisticated mind, and, while it lost out in competition with Newton's more mechanistic ideas, it may still have value. Indeed, in 1935 Einstein and two coauthors (Podolsky and Rosen) published a paper that went further than previous quantum mechanics in suggesting that Newton's mechanistic laws would not hold. The authors' purpose was to attempt to support Newtonian

principles, and their work became known as the EPR paradox. The EPR paradox was generally ignored until 1964 when J. S. Bell published a brief paper titled “On the Einstein Podolsky Rosen Paradox.” Bell developed what has become known as the Bell Theorem. It is an extension of quantum theory, and states in its conclusion:

. . . there must be a mechanism whereby the setting of one measuring device can influence the reading of another instrument, however remote. Moreover, the signal involved must propagate instantaneously. . .

Bell’s Theorem has now been confirmed by four major experiments. What the theorem implies, in effect, is that all parts of the universe are instantaneously and simultaneously interconnected with all other parts, and that human consciousness is fully an integral part of all phenomena. To put it concretely, the subatomic particles in the ink in the dot of this “i” contain information about what is happening everywhere in the universe at this very moment. Physics is just beginning to absorb Bell’s Theorem. It is also very similar to Leibniz’s notion of a conscious universe.

Bell’s Theorem is only one of several developments in science that suggest that consciousness is not something generated inside of our skulls by the actions of neurons, but is a pervasive principle in which we participate, or of which our consciousness is a gathering. The physicist David Bohm has developed an extensive model along these lines. As we absorb this notion into our theories of psychology and of culture, we must rethink many of our previous assumptions.

The approach we are developing here is in direct opposition to behaviorism, the school that dominates much of American academic psychology. Behaviorism confines itself to the overt behavior of animals and people, and excludes all references to consciousness or to any mental operation. Indeed “mentalist” is a pejorative term in behaviorism. Behaviorism is highly dependent on a stimulus-response theory in which the organism receives stimulation from an outside source (heat from a candle flame is applied to the finger), a series of electro-chemical-mechanical connections are made through nerves,

and there is a response (the finger is pulled back.) Behaviorism survives by being totally unresponsive to criticism from other fields, by ignoring extensive internal contradictions in its own theories, and by disregarding most of the full range of human experience. While behaviorism has little philosophical standing, it has come to pervade the social sciences and many areas of the arts as well. Through the field of environmental psychology, it has had an impact on architecture.

The environmental psychologist is concerned with the human response to various forms of environmental stimulation. How will red or green walls affect people? What kinds of seating arrangements are conducive to interaction? What kinds of lighting will keep school children quiet? In all cases the assumption is that the human being is a *reactor*, he or she reacts to color, proximity, or light. What is neglected, even denied, is the human being as an *actor*, as one who makes his or her identity and environment. The sad and insidious extension of this way of thinking is that when human beings fail to conform to the psychologists' theories, "behavior modification" is called up to enforce the proper reactions and confirm the theories.

Our view of consciousness, as we shall develop it here, is very different. We will see that consciousness is indeed a component of human experience, and that it is an active force, one generating experience.

No description of consciousness can ever be definitive; it can only be a hypothesis or model. The test comes in how convincing the model is, and how useful it is in enabling us to understand our experience. The model we are developing here can briefly be described as follows:

Human consciousness is that which generates everything human beings, individually and collectively, create, experience and do. Human consciousness is fully isomorphic with human creation, experience and action; it is the negative mold in which the phenomenal world is cast. It is the source of space, time, matter and causality; of color, sound and

smell; of security and fear; of hunger and sex. As the active and generative partner in the dialogue underlying phenomenal reality, consciousness is totally pervasive.

At this point, we seem to have said that consciousness is everything. What use can there be in such a supposition as that? But the hypothesis is useful. First, it recognizes the active and creative role that we play in generating our phenomenal world, rejecting the behavioral model which sees the mind as a computer, programmed by conditioning, and capable only of preprogrammed response to stimuli. Second, this model enables us to decipher the underlying structures of consciousness, as those structures will be the same as the structures underlying the arts and sciences, which are products of that consciousness. The formal properties, such as space and time, of the arts and sciences of a given period, are the structures of the consciousness of the people of that period. One of the things we will see is that consciousness, through its interaction with the world, changes.

1.3. Isomorphism

We can conceive of the wall of a building as facing two ways: inward to be a boundary for the room, and outward to be a boundary for the street. In this sense, architecture is the intermediary between the person and the larger world of the city. Thus architecture is like the shell of a sea animal, the inside of the shell telling us about the form of the organism, and the outside of the shell telling us about the world the animal inhabits.

But architecture is like the shell of an animal in the symbolic as well as a physical sense. It is the intermediary between the person and the cosmos, defining and securing the human place in the larger order of things. The shell of the animal is isomorphic with the animal. Point for point the animal and the shell correspond, with one taking a positive and the other a negative shape. We can say that the shell is as a mold in which the animal is cast, or we can say start with the animal and say that the shell takes on its form, or perhaps most accurately we can say that the two co-form to each other. In a similar

sense, architecture is isomorphic with our consciousness, and we recall Churchill's statement, "First we shape our buildings and afterwards our buildings shape us."

In mathematics, isomorphism is a one-to-one correspondence of one set with another. The principle extends to mathematical operations as well, in which there is a correspondence in the operations. In describing the sea animal as having a one-to-one or isomorphic correspondence with its shell, we are giving the term a more general meaning than it has in mathematics. It might seem then in saying that there is an isomorphic relationship between human consciousness and architecture, that we are using the term even more loosely. In fact, we are not. There is a very precise correspondence, or fit, between consciousness and architecture.

The concept of isomorphism is used by the Gestalt psychologist Wolfgang Kohler, who contends that the order we experience in space is structurally identical with a functional order of underlying brain processes. Our use of isomorphism differs with Kohler's in several ways. First, implied in Kohler's isomorphism is the behavioral stimulus-response model in which neurological functioning responds to situations in external reality. Our model is mutually interactive, with structures of consciousness playing as active a role in generating the world as the world plays in structuring consciousness. Second, it is a reductionist error to attempt to study human experience only through optical and other perceptual experiments. We do not live in a world of white squares on black backgrounds and black squares on white backgrounds, but rather in a world of human meaning constituted as culture. The isomorphic relationship between consciousness and the world is not between objects and mental images, but between the formal structures underlying culture and structures of consciousness.

These formal structures, which we will discuss below, can be seen most readily in properties of space and time. Thus the uniform space and time of the Renaissance is a characteristic of Renaissance consciousness and becomes reflected in Newton's physics, perspective painting, rational architecture, the chronological novel, and Descartes' mathematics.

This notion of an isomorphic relationship between cultural forms and structures of consciousness is similar to Schopenhauer's concept of the relationship between music and the will. For Schopenhauer, will is the inner generating force behind all experience. The phenomenal world of "representation" is merely this same quality of will objectified, or seen from a different perspective. Music for Schopenhauer most directly and immediately expresses the will and therefore speaks "the universal imageless language of the heart." What I will show in this book is that the formal structures in music are not alone in reflecting what Schopenhauer calls the will and I call structures of consciousness, but that the formal structures in all cultural forms—painting, sculpture, architecture, cosmology, physics, mathematics, etc.—reflect this will, which I am calling consciousness.

1.4. The Dialogue And Intentionality

The ancients saw the phenomenal world expressed in pairs of opposites: light and dark, good and evil, up and down, male and female. Passage beyond the world was passage beyond the pairs of opposites, a passage closed off in the Old Testament by the pair of cherubim with flaming swords guarding the gate of the Garden of Eden, but open in Buddhism where the two guardian figures on either side of the temple gate allow one to pass between them, beyond the opposites, to the oneness represented by the central figure of the Buddha.

The pairs of opposites, indeed all qualities that come into relationship, are animated by a dialectic. They are in dialogue with each other; all qualities come from this dialogue. If we take water as an example, we would start by saying it is a liquid. By definition, liquid is that which takes the shape of its container. Thus water receives its quality as liquid in dialogue with its container. One might protest that taking the shape of its container is only one quality of a liquid, and that its other qualities, perhaps more essential, exist in and of themselves, in the absence of any container. Yet when we try to identify these

other qualities, we find them equally dependent on being given only in relationship with something else. Thus weight is given in relation to the gravitational pull of the earth. Mass is given in resistance to a force. Transparency or opacity is given in relation to light, etc. The dialectic process in which one thing gives qualities to another is fundamental.

The rushing stream gives the rock its hardness; the crevices in rocks give the stream its flowing quality. The sun creates shadows, the shadows define the sun's emissions as light. Causality is always interactive, in dialogue. At first we might say that ice in a bucket causes wine to be chilled, but then we see the interactive quality of the relationship. It is both the coldness of the ice and the warmth of the wine which permit the chilling to take place.

The French phenomenologist, Maurice Merleau-Ponty, shows another dimension to this dialogue. A plant's relationship to the soil in which it grows is not just one of equal dialogue, but one in which the plant plays a central role, organizing the soil as meaningful for itself in a way that the soil does not do to the plant. The plant constitutes (or organizes itself) not only the soil, but water, light, and air into an environment for itself, an environment which, as a whole, is meaningful for the plant.

Just as the plant actively organizes its environment, so do we. Our entire world is constructed of meanings which we create. If we look at a desk, and say that it is brown and hard and of medium height, these are all qualities that it has in relationship to our retina, our hand, or our stature. If we say the desk has weight, it is because we read the scale. If we say it is made of wood, it is because we classify materials. If we say it is made up of atoms, it is because we have an atomic theory and electron microscopes.

No things have qualities in themselves. They only have meanings that we give them. Strawberries are food only because we eat them. If we are allergic to them, they are not food, but poison. A man is a man only in a world that includes women, and a woman is a

woman only in a world that includes men. Sexuality is a potential generated by the presence of the other.

On a conscious level, we make the scratchings on a page intelligible because we can read. On an unconscious level we might make a church steeple a phallic symbol because of associations of which we are not immediately aware. And on a preconscious level, we make the ceiling of the room high or low by the fact of our height.

Transcending Cartesian dualism of the body and the mind, we can refer to the body-subject, the wholeness of the human entity including what is conventionally called mind and also body, as the operative meaning generating subject. Thus the organ of consciousness is not the mind, not even the brain. It is the whole person. As we shall see later, this includes the person's culture as well.

We are using here Maurice Merleau-Ponty's term, the body-subject. Merleau-Ponty sees us in a subject-object dialogue with our environment in which we are the subject, that is the meaning giving party. Merleau-Ponty is responding to Jean Paul Sartre, who, in *Being and Nothingness*, had identified the subjective quality deep inside the person, in a gap of pure consciousness, pure nothingness. For Sartre, the complete lack of qualities of this inner subjective core is the source of our potential absolute freedom. If our consciousness had qualities, we would be limited by them and not be free. Merleau-Ponty felt this approach left no way to connect the person to the phenomenal world: to material, culture, and history. Merleau-Ponty pushed out the boundaries of consciousness to include the body as a whole. (Later, we will extend them even further to absorb technology when it acts as extension, and ultimately culture itself.) It is the entire mind-body as a unity, or the body-subject, which plays the active role in giving meaning to the world. Front and back, left and right are qualities of our experience that do not come from our minds, but from the position of our eyes in our head and the locations of our arms on our torso. Similarly, sexuality is not just a function of hormones and upbringing influencing the mind, but of the configurations of our organs and the potential for

procreation. Subjectivity is preconscious, that is to say it comes from qualities we have that come before the conscious and unconscious workings of the mind.

The active role of the body-subject also bears on our understanding of perception. For the behaviorist, perception plays a passive role in the stimulus response arc. The flame burns the hand. Synapses are closed and we respond with the contraction of a muscle, pulling back the hand. In a more complex process, but following the same formula, a man sees an attractive woman—a stimulus. He is aroused—a response. In the behavioral model, perception is passive; information comes in. In our model, perception is active, meaning goes *out*. There is nothing in the woman herself that can arouse the man, just as the ice itself cannot cool the wine. The warmth of the wine must participate in the dialogue to make this happen. If our man has no interest in women, he is not aroused. It is *his* interest that makes her attractive, his maleness that generates her femaleness. It is he who makes her attractive, just as the warmth of the wine makes the ice cold. If we were drawing a diagram, we might show not an arrow from the woman to the man's eye symbolizing stimulus, but an arrow from the man to the woman, symbolizing the projection of meaning, the intendedness of his consciousness.

The understanding of this active role of perception will be important throughout this book, since we will be studying architecture in terms of the meaning projected on to it by the human perceiver, and we will be particularly interested in how changes in this active form of perception lead to change in architecture.

1.5. Structures Of Consciousness

As we have seen, the reality we experience is a consequence of meanings given by our consciousness. Consciousness is an active, meaning generating force. But we must now say more about consciousness. It is not just an abstract or blind force, but rather has character; that is to say, it is structured. It is the structures of our consciousness which give the world the particular form which we experience.

The structure of our consciousness is analogous to the concavity of the container which gives the quality of liquid to water. In the case of the container, the structural principle is simple. It is concave and watertight. That is all that is required. Our own consciousness is infinitely more complex (and also changing) so that it would never be possible to completely describe it. To do so would be a description of all of the physical and chemical properties of the body, all of the workings of perception, all of the workings of the mind, and, as we shall see later, both our cultural and historical backgrounds. However, it is possible to say quite a bit about structures of consciousness, far short of describing them completely. In attempting to describe structures of consciousness, Jerome S. Bruner has suggested that we might think of the mind not as a switchboard, patching together incoming stimuli with the appropriate outgoing response, but rather as a map room. One difficulty with the stimulus-response model is that it is not adequate to describe why certain stimuli are chosen to be responded to and not others. The map room model provides a means of explaining this selectivity which we have earlier referred to as intentionality. All consciousness is of something. There are two sides to this relationship. Consciousness is not simply awareness of something, it is an attitude towards something. The very act of perception must be seen not as a taking in of the world, but rather as a process of selection, already with an attitude, a perspective, as to what will be admitted. This process of selecting what is admitted and what is done with what is admitted is a function of the map room.

Hanging in our map room are sets of “cognitive maps” on which we can plot the available data. Data which finds no place on any map is rejected; it does not exist for the organism. Data which does find places on the maps constitute an experience we have of the world. However, it is not so much “of” the world as “with” the world. Claude Levi-Strauss’s structural studies of culture (kinship, myth, ritual, language, etc.) are an attempt to delineate some of these cognitive maps, that is, structures of consciousness. Likewise, Noam Chomsky’s studies of language in which he has found general mathematical principles of syntax (“deep structures”) are also a delineation of the cognitive maps that organize our experience, gain, the structures of our consciousness.

It is important, however, not to think of these maps (or structures) as circuits of neurons in the brain. They are far more than that. They include everything about the body as a whole and, as we shall see shortly, they include configurations of technology, history, and culture.

Human consciousness has two defining qualities. One is its intendedness, or extension, the ability to reach out and constitute a world of meaning in itself. The other is its *openness*, its lack of permanent structural qualities, its ability to change. In studying structures of consciousness, the German philosopher Immanuel Kant (1724-1804) thought he had detected permanent structures which he called categories. Among these were space, time, and causality in the Newtonian sense. In other words, Kant felt that it was in the nature of our consciousness that we would render all of our experience in the context of Newtonian space, time and causality. The fact that Newtonian space, time and causality have long since given way to non-Euclidian geometries and to Einstein's relativistic continuum, and to quantum mechanics, is all the refutation needed for Kant's position that the categories were permanent.

If we could imagine the container for water of which we have been speaking as changing, say from concave to convex, then its relationship to the water would also change. The same is true of consciousness. As it changes, our relation to the world changes. An obvious example of this occurs in the growth of the child. Change in size alone will change such qualities as near and far, high and low. A more complex change occurs in sexual meaning with the onset of puberty. Situations or other people change their meaning for the adolescent as his or her sexual identity develops. A person who had no sexual significance for a thirteen year old may become the object of a crush for a fourteen year old.

But more than size and sexuality change as the child grows. The structural psychologist, Jean Piaget shows that the child's experience of the world is very different in terms of space, time, and causality. For the infant, an object that disappears from sight has ceased to exist. For an older child, a taller glass contains more water than the fatter glass, even

though he or she has seen the water poured from one to the other. Previously these differences were ascribed to the child's lack of mature intelligence and acquired knowledge. The child was seen as a less intelligent adult, attempting to do the same things adults do but less successfully. Piaget shows that the child has very specific models (cognitive maps or structures of consciousness) which are operative at different ages. The child is as intelligent in the use of its models as is the adult. The difference in the adult's and the child's experience is a consequence of differences in their structures of consciousness.

But we are concerned here with more general and culture wide changes, as for example the change from a spaceless cosmology and flat vase painting among the Greeks to the Newtonian space of Renaissance physics and perspective painting. These different spatial orientations are the consequence of different structures of consciousness. But if we assume that the time between these different modes was not great enough to permit the physical changes in the organs of perception due to evolution, where does the change come from? In other words, if we have assumed that the body is the subjective organ and the body does not change, how does subjectivity change?

1.6. Extensions

If we say that the world of our experience is generated from the structures of our consciousness, and that our consciousness is the human body in its subjective role, we are then faced with the problem of explaining cultural differences and historical change. If the human organism remains basically similar from culture to culture and throughout historical time, why is the world one of linear progression for Western Europeans, and timeless cycles of reincarnation for Hindu Indians? Why is it projected into spatial depth for the renaissance Italian, but flat for the ancient Greek?

The answer to this question comes in realizing that consciousness is not just a function of the mind and body, but encompasses our technologies as well. Marshall McLuhan shows

that both our perceptual and motor abilities are *extended* by our technologies. Our technologies become a part of our body's subjective functioning. Thus in terms of how we confront the world, how we structure our side of the dialogue, we incorporate into the subjective selves the phonetic alphabet, moveable type, the telephone, television, computers, and other technologies. Different cultures have different technologies—the Chinese, pictographic writing, and the West, the phonetic alphabet; the fifteenth century, moveable type, and the twentieth century, electronics. Technological differences between cultures and over time lead to different subjective orientations and different worldviews. McLuhan writes:

After three thousand years of explosion, by means of fragmentary and mechanical technologies, the Western world is imploding. During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned.

McLuhan's point is that technologies (including various means of communication) change not only the external environment, but also our inner experience: the way we think, the way we organize socially, the way we organize the world as we encounter it.

The effect of technology on thought can be seen if we look at speech. When speech was developed for communication, it changed the way we thought: we began to think in words. Writing in turn changed speech, introducing structured rules of grammar, etc., and different writing had different effects. A Chinese pictogram stands for an object or an idea. It is a one-step process of mental abstraction to go from the picture of the thing. The phonetic alphabet gives us a written word that stands not for the object or idea, but for the *sound* of the spoken word which stands for the object or idea. Thus, there is a more complex two-step abstract process involved in reading. The civilization that uses the phonetic alphabet will tend to use different forms of abstraction in its thought. Pictographic writing tends to lead to holistic thinking, while the phonetic alphabet, which assembles words from pieces, leads to linear thinking.

The introduction of moveable type by Gutenberg changed the written word, which then changed the spoken word, and ultimately thought. The page of the book became linear, mechanical, and uniform, made up of identical prefabricated elements, in contrast to the holistic custom-made character of the hand copied medieval illuminated manuscript. The people who read printed books eventually developed the industrial world, a culture and a technology based on linear, rational, uniform, prefabricated element both of thought and of product.

The introduction of electric technologies, starting in the late nineteenth century with the telegraph, and accelerating in the twentieth century with electronics, particularly television and the computer, is again changing the way we experience the world, this time back to holism.

Depth in Renaissance painting is often explained by the invention of perspective. Interior space in ancient Roman architecture is often explained by the invention of the arch and the vault. But reflection will show the inadequacy of such explanations. They require that we assume that inventions are accidental, which would produce a more random result than we actually see, or that technology undergoes a kind of evolution, which would produce a more linear result than we actually see.

In fact, it appears that a change in mental attitude must precede a change or development in technology. Lewis Mumford gives the example of the development of the mechanical clock in medieval Europe as being preceded by several hundred years of monastic life characterized by extremely regular and repetitive habits. Similarly, McLuhan demonstrates that the separation and specialization of tasks characteristic of industrialization was preceded by separation and specialization of the senses of perception, (separating out and emphasizing the role of the eye), then in the individual personality, and then in society.

One of the technologies which has had a widespread impact on our culture is moveable type and the printing press, introduced by Gutenberg in the fifteenth century, and which led to the widespread practice of reading and its accompanying emphasis on the eye, particularly the focused center of vision. One of the complexities of how we see can be illustrated by the following experiment. Stand about six feet from a friend and ask him or her to hold one hand out to the side at arm's length. Also ask him or her to extend some number of fingers. Keeping your eyes fixed on your friend's nose, you will be able to see that fingers are extended, but you will probably not be able to say how many. Research in the workings of vision have shown considerable difference between the focused center of vision (about three spherical degrees) and the more fuzzy peripheral vision. However, the difference is not primarily in the resolution of the retina, it is rather that the nerves from the center and periphery of the retina go to different areas of the brain which have different abilities. One difference is simply that the nerves from the peripheral areas of the retina go to an area of the brain which *can not count*, while those from the center go to an area which can.

Another example of this kind of difference can be seen in a difference between vision and hearing. Vision cannot perceive ambiguously. In the famous Gestalt diagram of two faces in profile, we either see the two faces in profile or the vase in the center. We can snap back and forth, seeing first one then the other, but we cannot see both at the same time. However, hearing can very easily handle this kind of ambiguity. It does so in music all the time. In music we can simultaneously hear a melody line, a sub-melody line, and a third thing that is the totality of the two taken together. The ear is connected to an area of the brain that is capable of dealing with ambiguity. This kind of analysis of the senses could be taken much further, and indeed has been by the psychologist, Anton Ehrenzweig.

The sense of smell is unsurpassed by any of the other senses in its ability to bring up associations. A particular odor can recall vividly the *feeling* of a moment or series of moments in our past. Then by allowing ourselves to be in that feeling, we can begin to reconstruct the images of that moment. Marcel Proust's series of novels, *Remembrance*

of Things Past, was started with just such a feeling coming from the odor and taste of tea and madeleines. They recalled the tea and madeleines his mother gave him as a small boy and the conversations in the next room he overheard while eating them.

If we use one of the senses more than the others, or if we emphasize one in a special way, then the mental operations favored by that sense will be exercised more and will play a more dominant role in the overall balance of perception. As perception is an active intentional force, a constituent in the structures of our consciousness, any change in perception is a change in structures of consciousness. The result of such a change will be a change in phenomenal reality, that is a change in the reality we experience. Earlier we described the difference between how the focused center of vision works relative to the other senses. The common practice of reading the printed word will exercise and emphasize that focused center of vision and therefore the areas of the brain to which it primarily reports. That is the area of the brain that can easily count, that perceives sharply and unambiguously, and in sequential fashion. The invention of the printing press and the widespread practice of reading caused a rapid acceleration of emphasis on linear, rational, sequential, causal thought in Western Europe from the fourteenth century on. Thus the character of the Renaissance, the Enlightenment and the Industrial Revolution.

At the same time, the rational areas of the brain are being exercised, the holistic areas, fed by peripheral vision, are being atrophied. The medieval city was made up not of abstract boulevards and geometric urban squares, but rather a jumble of moving images perceived by peripheral vision, and of sounds, smells, and textures. All of these exercised the holistic parts of the brain. It was this part of ourselves that was sacrificed to permit the emergence of the Renaissance, and it is also this part of ourselves that is reemerging in our new electronic environment.

Each technology will have some effect on structures of consciousness and therefore on phenomenal reality. This was realized by Karl Marx (1818-1883) and Friedrich Engels (1820-1895), and is particularly apparent in Engels' analysis of the effect of the

Agricultural Revolution on the family and Marx's analysis of the effect of the Industrial Revolution on the class struggle. A detailed analysis of the effect of technology on mind and culture is also made throughout Lewis Mumford's writing. The workings of our subjectivity in the generation of reality has been extensively explored by the more psychologically oriented philosophers, particularly Ernst Cassirer, Merleau-Ponty, Sartre, and Suzanne Langer. But it remained for McLuhan to penetrate into the actual connections between technology and the inner workings of intentional consciousness.

2. CULTURE

2.1. Binding Force

The development of our argument thus far leaves open the possibility of radically different realities of "world views" among individuals. Random physical and mental differences between people, and exposure to different experiences in growing up leading to different development of the senses might result in such vast differences between individuals that chaos would prevail rather than social order. Since there is some semblance of social order in the affairs of people, there must be additional forces at work. The consequences of these forces can be termed *culture* and culture can be defined as the mutually arrived at reality or world view of a group of people (usually living in the same place at the same time.)

To understand the binding force of culture, we might look at a problem of mathematical truths. Since mathematical truths seem to have a reality, that reality must be seen as residing somewhere. Either those truths reside externally in the world, and come into the mind, or they reside in the mind and have no validity apart from it. Neither is the case because both positions are the case. Mathematical truths exist in the cultural tradition in to which the individual is born, not in the external-natural world, and they come into the individual's mind from that tradition. This is also the case for our entire mode of seeing the world, The human mind is sufficiently open that in growing up, we absorb not only

information from our cultural setting, but also the actual structures of our consciousness, the ways in which we will experience the world.

Culture is extremely adept at perpetuating itself. To paraphrase Churchill, we make our culture, and then it makes us. Everything in the environment conspires to mold us into the image of our culture. As an example, let us look at something as seemingly innocuous as eating dinner. An American family sits down to its evening meal. The table is made of varnished pine wood. In the center is a turkey, at one side of the bird is a carving set. Everything in this setting is communicating the frontier, rugged individual aesthetic to the family, especially to the impressionable children. The heavy pine table looks handmade and says: “we made this table.” The turkey is a whole animal, its legs and wings still apparent even after cooking. The stag horned carving set is one that a frontiersman might have used to dress a recent kill. The message is: “we killed the turkey and dressed it.” The knotty pine paneling on the wall of the dining room likewise tells us that trees were cut to make the wall. Never mind the fact that the table was made in a factory, the turkey was purchased frozen at the supermarket, and the walls are made of Formica. The message is designed to acculturate us into being Americans. By contrast, we might imagine a Chinese meal. Here the table is lacquered and the meat and vegetables cut into small pieces and covered with a sauce. The message is one of removal from nature. Exposed wood grain and the carcass of an animal are barbaric, not suited for civilization. Is it no wonder that the American chief of a large oil company might be a man who has no qualms about going out into the field, rolling up his sleeves, and getting sprayed with oil as he participates in solving a problem of pipe fittings, while his Chinese counterpart might not even carry his own briefcase, but rather has an assistant to do that? The early lesson comes at the dinner table.

The dinner table is of course only one of thousands of examples we could cite of the ways culture engrains itself into us. It does so in “everyday: ways, such as how we eat, but there are also deeper forces at work. Table manners include in them attitudes towards the human place in nature. And underlying all cultural activities are the basic patterns,

which we call formal structures, the most obvious of which are space, time, matter, and causality.

This process resulting in what we understand as culture has been extensively studied by the French anthropologist Emile Durkheim and his followers. Durkheim coined the term “collective consciousness” and was able to show that various activities which had been assumed to be random or individually motivated were made more likely or less likely by a cultural setting. We tend to think of the violence of the inmate of a mental hospital as the result of mental functions gone wrong. But in *The Lotus and the Robot*, Arthur Koestler describes the traditional Japanese mental hospital as having paper walls. Why do the Japanese inmates not break out or burn the place down? Because they are not violent. Violence is not a characteristic of mental illness, but of mental illness in our culture. In other cultures, mental illness can have other expressions.

We discussed earlier the effects of reading on the balance of the senses. How would the senses of an individual in a literate culture be balanced if he or she did not read? The answer is almost the same as the senses of those who do read. When we realize that thought is affected by speech, indeed much thought tends to be in words and even involves the nerves if not the actual muscles used in speaking (referred to as subvocalizing), and that reading and writing alters speech, then the thought of one who doesn't read or write will still pick up the secondary effects of this technology through speech. From this brief example, we can see how the mechanisms drawing us into the collective consciousness of a culture can be pervasive and also extremely subtle.

Of course there is never complete homogeneity in any culture. There are differences stemming from social and economic status, roles or occupations, individual responsiveness to change, personality types, and different national or ethnic origins. In fact, Joseph Campbell among others has observed that periods of great cultural creativity, growth, and change are motivated by the interaction among diverse groups within a culture. However, there is sufficient possibility of cohesion that culture does exist.

There is ongoing debate among psychologists over the nature of consciousness. Some hold that consciousness is nothing more nor less than the functions of the brain. Others are not so certain, and refer to the “brain-mind problem.” For the most part, efforts to relate consciousness to the brain are sustained only by a massive effort to ignore most of the products of human activity. By observing only the most simplistic of human activities in controlled laboratory experiments, many psychologists claim to have demonstrated the mechanistic nature of human behavior. The vast accomplishments recorded in cultural forms—in mythology, cosmology, the sciences, music, painting, architecture, poetry, literature, etc.—are simply ignored by most psychologists, or belittled by references to “the emotions,” as though the aesthetic senses were inferior to the scientism used in the social sciences.

Psychologists have not successfully located human consciousness in the brain because the brain is not the seat of this consciousness. Culture is the seat of human consciousness. The great constructs in scientific theories, the vast patterns in music, the spatial orderings of architecture, the outlines of human possibilities in mythology, the implements of technology—it is in these that human consciousness resides. Just as the sea creature is as complex as the shape of its shell, so human consciousness is no less than the sum of all that it creates. The shape of human consciousness, its patterns, its *structures* are revealed in all of the intricacies of culture.

Such a statement might at first seem too broad to be of much use. If we are to examine consciousness by examining all of the intricacies of everything human beings do and produce, we would have an endless and meaningless task. But we do not propose to examine all of the intricacies of culture. Rather, we will look for the underlying patterns which characterize the different cultural forms of a given period. These underlying patterns, which we will call formal structures, are a consequence of the consciousness of that period. Through the isomorphic relationship between consciousness and cultural form, these formal structures are also the structures of consciousness of that period.

For the most part, the sciences, the social sciences, and aesthetics in the United States today attempt to describe human experience as though it were culture-free. For example, we speak of the relationship between a man and a woman, a person and a home, or a community and the city as though these relationships were universals. We fail to realize that all of these relationships, indeed all of human experience, is culture specific. They may be very different in the United States today from the way they were in China a hundred years ago, or the way they will be in some place else a hundred years in the future. Culture is *fundamental*. It is the pervasive context for all of experience, rendering meaning. To ignore it is to impoverish our viewpoint.

2.2. History And The Limits Of Experience

There was lively dispute in the late 1960s between the French existential philosopher, Jean Paul Sartre, and the French structuralist anthropologist, Claude Levi-Strauss, over structures of consciousness. Levi-Strauss held that consciousness is structured, is expressed in the patterns of everyday life, and is the same in all societies. For example, he shows that in foods, the relationship between the raw, the cooked, and the spoiled is similar in different societies. Sartre held that consciousness is unstructured, indeed that it has no characteristics whatsoever. This is the source of what Sartre believed to be our absolute freedom.

My position differs from that of both Levi-Strauss and Sartre. It seems to me that in any given culture, consciousness is structured and has the patterns characteristic of that culture. However, these patterns of structures can change from culture to culture or over time, and there are no limits to the possibilities for change, as long as consciousness retains its subjective role in its relationship to the world. We may find universals in structures of consciousness in our own culture, and we may even find generalities in all cultures, as Levi-Strauss claims to have done, but none of these universals or generalities need necessarily hold for the future. To see how this is the case, we can draw an analogy to language, a favorite technique of structuralists and some philosophers.

In his early or ideal language philosophy, the Austrian philosopher, Ludwig Wittgenstein (1889-1951), sought to plot the limits of reality through studying the limits of factual language which he held to be determined by or isomorphic with reality. We might imagine the limits of language as a bubble, outside of which lies nonsense, or more accurately, nothing, for we might think of the bubble as the curvature of space so that it is never meaningful to speak of what lies outside of the curvature. Not having a point of reference outside of factual language (an Archimedean fulcrum) on which to take a stand, Wittgenstein first worked his way in from the inside of the bubble of ordinary factual discourse to elementary propositions, and then using logic, worked his way out again to the limits of expansion of the bubble. Wittgenstein was eventually to reject this approach and in his later philosophy he held that the structure of language determined reality rather than reality determining language, and it is this later position which we hold to in this study, but Wittgenstein's method in both of his philosophies is of interest to us, that is the plotting of the limits to experience. Later in our study of specific cultural periods, we will find ourselves working our way in from the forms (cosmology, painting, architecture, etc.) of a given culture to find the structures of consciousness, and then back out again to determine the limits of experience of that period.

Human being has many defining qualities, but one of the most important is history. Human being is open-ended, subject to real and unpredetermined change. This openness to change can be seen throughout the past and in the possibilities for the future. It can also be seen in the essential openness to change of structures of consciousness. This openness is referred to as creativity in Chomsky's theory of language and is beautifully described in Bronowski's *Ascent of Man* in his chapter, "The Long Childhood." Here Bronowski contrasts the potential openness to change characteristic of human culture and seen in the learning capacity of the child, with those periods in history when learning is dogmatic and by rote in an attempt to deny this openness. Bronowski finds openness and growth fundamental to human being, but also a matter of choice. It can be denied in one culture, but it will eventually be picked up in another.

When we refer to unpredetermined change, we do not mean change without reason or influence. There are ways in which change comes about. If it is to some extent random, it is not entirely random, as entirely random change would not be historical in nature. Nor is it determined by any *a priori* system, as that would not constitute real change. Rather, we might think of the possibilities for change in human experience as analogous to changes observed in biological evolution. Evolution is not teleological, that is mammals did not appear with the purpose of eventually evolving into human beings. Evolution is always open-ended, and the future cannot be predicted from any given point. However, while the future is not *determined* by the past, it is certainly *limited* by it. Thus, at any point, we can say of life in the future that it will probably be DNA generated. This is a consequence of commitments made in the past and of features of the environment, but how this given will be organized remains creatively open.

We can look at the future possibilities for human consciousness from the same point of view. Our past heritage and our current environment certainly limit the possibilities, but they do not determine them. The philosopher of history, Oswald Spengler, describes the different cultures of the world as blooming with the randomness of the wild flowers in the field. We can also explore how limitations work. Gothic cathedrals, for example, were constructed within the limits of existing medieval technology and within the limits of stone. However, while medieval technology and stone would suggest simple, heavy, thick-walled structures, they do not determine such structures. The only determining factor is that stone cannot be used in tension. Gothic cathedral builders were able to construct lacy skeletal structures which never would have been predicted simply from the characteristics of stone.

Human being is open and creative, capable of constituting fundamentally new phenomenal realities through changes in structures of consciousness. While these new structures must be within the limits of the past and the environment, they are no more determined by such limits than were the Gothic cathedrals.

History, then, is not merely a succession of events. History is *real change*. The very possibilities of human experience change, that is to say the limits of experience, determined by structures of consciousness, change. The history of the Egyptians, the Chinese, the Greeks, or Western Europeans is not different merely because of the accidents of circumstances. The histories of each of these people represent different human presences on the landscape, each different from the other, projecting different phenomenal realities, creating different worlds to inhabit and different architecture. History is the record of the changes in that world, generated by changing structures of consciousness.

2.3. Paradigms

We have described here a reality which is generated by consciousness, and which changes as consciousness changes. This reality is different from the reality described by scientific materialism, which sees human consciousness as perceiving a static, objective reality. Scientific materialism holds that although our senses report the world imperfectly, scientific method, with its combination of theoretical speculation, empirical observation, and experimentation, is able to present a model of reality that progressively becomes more accurate.

The objective reality that science claims to be describing is merely *our* reality, that of contemporary Western culture (which is also the culture of much of the world at the moment.) Science's claim to the truth, or to objectivity is nothing more than a belief system, and, when it promotes its truth over all others, it is filling the role of organized religion. When science claims its technological achievements as evidence of its validity, it chooses to ignore the technological achievements of non-scientific cultures. Among the most important technological achievements in history are agriculture, the domestication of animals, pottery, metallurgy, and writing. Yet all of these were achieved thousands of years before Western science. Among the most beautiful structures ever built are the Gothic cathedrals, built three hundred years before Galileo,

the father of modern science, was born. Western building techniques declined after builders became literate and mathematical principles for building were written down.

If the achievements of modern technology do not justify science's claim to the truth, are there other grounds for this claim? There are, and they come from the fact that much of science is founded on mathematics, seemingly a secure foundation. Yet Pythagorean "science" was also based on mathematics, on the belief that the magic of numbers underlies all of reality. The careful interplay of mathematical thought and experimental observation makes modern science a far more powerful tool for the description and control of nature than Pythagorean geometries could ever be, but it does not insure absolute validity. Indeed the internal consistency of any system dependent on mathematics was undermined in 1931 by Godel's proof, which shows all mathematical systems to be necessarily incomplete or inconsistent. This was followed by demonstrations by A. M. Turing and Alonzo Church that logic is ultimately unable to demonstrate the truth or falsity of its own propositions, and Alfred Tarski's demonstration that there cannot be a universal description of nature in a single, closed, consistent language.

The problems that relativity, quantum mechanics and Bell's theorem raise are not, as some assert, the refining of Newton's physics to bring it closer to a true description of reality. Modern mathematics have proven what the poets, the Eastern philosophers, and the psychologically oriented philosophers of the West have always known. Reality is not an independent, objective, external world capable of being described or modeled by mathematics or science. Reality is a dynamic, living flux. Our very awareness of the world, or consciousness, is a part of the world. The scientist is as much a part of the world as is the atom, and any attempt to leave out the flux of the scientist's awareness, or that of any person's consciousness, in a description of reality may be pragmatically useful, but can not be truth.

In *The Structure of Scientific Revolutions*, Thomas Kuhn shows that science does not progress as an orderly discipline, using a rational (scientific) method, responding to the

weight of evidence. Rather, science is a product of culture, subject to historical, political, and personal interactions, much like any other field. Kuhn describes sciences as working through paradigms, which are models or world views. A paradigm is a general conception of how things are, within which theoretical speculation and scientific research takes place. Work outside of the paradigm is suspect. It is denied funding and access to journals. Paradigms are changed through social and political means, not through the weight of evidence. Put another way, new ideas are accepted not when they are backed by overwhelming evidence, but when the guardians of old ideas retire. What Kuhn calls paradigms, we are calling structures of consciousness.

2.4. Formal Structures

We should devote some time here to a definition of “formal structures,” since they will play a central role later in this book.

We have noted the active role that consciousness—the body-subject—plays in generating the phenomenal reality we experience. Consciousness is the mold in which the phenomenal world is cast. All of the particulars of our experience are due to the particulars in this mold—interstices and crevices, extensions and voids. Furthermore, this mold is living. It is a pulsating, evolving organism, in a state of continuous change, which is why we see a world made up of a myriad of changing detail. But behind this flux there are underlying organizing principles. For example, much experience takes place in space and time. Of space, Kant says that it

is not something objective and real, neither substance, nor accident, nor relation, but [something] subjective and ideal; it is, as it were, a schema, issuing by a constant law from the nature of the mind, for the co-ordinating of all outer sense whatever.

The physicist might attempt to define space, telling us that it has properties of extension, and that it is a potential which can be occupied. Further, the physicist might describe space as uniform and continuous. But this would be Newtonian space, and we know from the experiments verifying Einstein's theories that space can be seen as necessarily linked with time, and curved. Furthermore, quantum mechanics describes space as discontinuous. So what can we say about space?

The solution comes in realizing that we can mean two different kinds of things when we use the term space. One is the specific spaces of Aristotle, Newton, Einstein, the quantum theorists, etc. The other is the general category of which the preceding are examples. It is this second concept that Kant's definition refers to. To present Kant's definition in more graphic terms, we might say that space (and time and matter and causality) are the graph paper that the mind lays over the world to make it comprehensible. We should remember that graph paper comes in a variety of patterns, not just uniform squares.

It is these major patterns, such as space, time, matter, and causality that are the consequences, and are expressed as formal structures in the arts and sciences. Thus we see continuous space and time, capable of instantaneous juxtaposition in Renaissance perspective painting, Newtonian physics, and Palladio's architecture. Similarly, we see relative space and time in Cubist painting, Einstein's physics, and Frank Lloyd Wright's architecture. The structures of consciousness create the overall matrices, or formal structures, within which our experience is developed. They define the limits within which we move, the patterns we will follow. Formal structures define culture; their changes define history.

3. BEING

There is, perhaps, an unsettling quality to the approach outlined thus far. It seems to be grounded in shifting sands. Scientific materialism holds to the absolute firmness of

space, time, energy and matter, the laws of physics, and the principles of mathematics. All else can change, but these provide an underlying constancy. Some of the limitations of scientific materialism have been described above, but if we reject scientific materialism, are we not left with a world of subjectivity and flux? Perhaps we are, but there are philosophers and scientists, both East and West, who are fully prepared to accept a world of subjectivity and flux. In doing so, they find a ground of Being which remains even after the firmness of the causal material world evaporates. This ground of being cannot be approached in the same way we approach the physical sciences because of necessity it includes our own consciousness. The physical sciences since Galileo have been founded on the assumption of the separation of the observer and the observed. Once these two are taken together, rational thought is no longer useful. The observer's presence in the observed disrupts both the observer and the observed. A mind can never fully comprehend a universe that includes that mind, since a mind cannot comprehend itself.

The situation becomes fraught with ambiguity. But while logic can be stymied by ambiguity, there are other forms of knowing. Oswald Spengler writes:

The means whereby to identify dead forms is Mathematical Law.

The means whereby to understand living forms is Metaphor.

Because of the denseness and obscurity of his language, the modern philosopher Martin Heidegger (1889-1976), is characterized by some as more of a poet than a philosopher. To such critics Heidegger might have responded: so much the worse for philosophy, so much the better for poetry. Heidegger deals with Being, and asks:

Why is there Being, why is there anything at all, rather than nothing? --obviously this is the first of all questions, though not in a chronological sense.

“Being” has been dismissed by most modern philosophers as a meaningless idea. Heidegger would admit that they have a point, stating that if you place a finger in the air,

you cannot feel Being. But, Heidegger would say, that is because we have gone astray and abandoned our role as shepherds of Being.

Joseph Campbell refers to being as something that must be experienced directly. He says:

...the mystery of Being itself, that something exists. You walk into a forest. You are not in quest of anything. Suddenly you are struck by the wonder of this thing. A palliated wood pecker flies past. My gosh. This tells you something about the wonder of the whole world of birds and nature. If you are a poet you will attempt to render the quality of that experience so far as it pushes right through to the ultimate Being of life itself, that such a creature should be there, that the universe should be here a something to excite your wonder.

Heidegger's notion of being is not unique. It is found in many traditions. In ancient China it is called the Tao, and the Taoists also recognized that it is elusive and must be experienced indirectly, almost by not wanting to confront it. Lao Tzu writes:

The Tao that can be told is not the eternal Tao.
The name that can be named is not the eternal name.
The nameless is the beginning of heaven and earth.
The named is the mother of the ten thousand things.
Ever desireless, one can see the mystery.
Ever desiring, one can see the manifestations.

The American architect, Louis Kahn described the ground of Being as Order, and said of it only "Order is." While Kahn felt that Order cannot be described directly, he did speak of it in an analogy of Silence and Light. Silence is the realm of potential. Through the creative act we bring things from potential into realization in the realm of Light. We could look at the writings of numerous other mystics and artists and find similar

descriptions of their experiences. The ground of Being is experienced by many even though it is not accessible by the methods of scientific materialism.

The Hindus, long used to dealing with the complexities and ambiguities of confronting being, understand our individual minds to be a condensation from the universal ocean of mind, like a drop of dew condensed from the ocean. Mind is in a state of continuous agitation, like the surface of the water in a breeze, its shimmering producing the fragmented reflections we perceive as the changing world of form. The means to experience this underlying Being of universal mind is not rational thought, but meditation or yoga. The Yoga-sutras state that Yoga consists in the (intentional) stopping of the spontaneous activities of the mind-stuff.

Once yoga discipline stills the mind, the water is quieted, the illusion of reality disappears, and Being is experienced, or more accurately, we are able to experience the fact that we are Being.

The noted brain researcher, Karl Pribram has posited a similar model from the perspective of Western science. Pribram worked with Karl Lashley who did laboratory work in which animals were taught how to run a maze. After the animals learned the maze, Lashley selectively destroyed different parts of their brains. No matter what part of the brain he destroyed, short of lethal damage, the animals retained some memory of how to negotiate the maze. Two conclusions were possible: either memory is nowhere in the brain, or memory is everywhere in the brain. Pribram eventually came to the second conclusion and drew an analogy between the mind and a hologram.

A hologram works by illuminating the object to be photographed with half of a beam of laser light, the other half striking a sheet of film directly. When the light from the illuminated object strikes the film, it is slightly off phase from the light traveling directly. The two intersecting beams produce a moiré effect of wave pattern interference, similar to the pattern produced by two pieces of window screen overlapping. When the film is developed and laser light is again shown on it, a three dimensional holographic image is

generated. Two of the more interesting features of the hologram are that the image is generated not from an image, but from wave pattern interference, and that any part of the negative will give the entire picture (with less resolution and with less of the three dimensional effect, but the entire picture nonetheless.)

Pribham stated that the mind is a hologram. He of course means this analogically, as do those who state the mind is a computer. But he was still faced with how this hologram interacts with the external world, until it occurred to him that the world is a hologram also. Or, in the terminology of the Hindus, our minds and the world are both mindstuff.

The physicist David Bohm has been constructing a unified field theory which is in some ways similar to Pribham's holographic universe, but more comprehensive. Bohm's unified field theory is more ambitious than that attempted by Einstein, in that it includes consciousness. In fact, it includes everything. Bohm refers to a holokinetic universe in which reality is *one*, an unbroken, undivided wholeness. This one is the ground of Being, similar to the Hindu ocean of consciousness. It manifests itself in various states: matter, energy, and our individual consciousness. While most physicists remain skeptical of Bohm's work, we are beginning to see evidence of a major paradigm shift in physics and the culture. The notion of pervasiveness of consciousness, the notion described in this book, is on the verge of a massive acceptance.

Viewing culture from the prejudiced position of Western centrality, we remove history and the classics from our education, we define mythology as inept pre-scientific means of explaining natural phenomena, we relegate art to the emotions, we isolate the linear, rational focused center of vision as the dominant mode of perception, and then we say that Being does not exist. Having stripped ourselves of every means of knowing Being, we then construct nihilist or materialist world views as a necessary consequence of the presented evidence. The nihilists and the materialists are right, if we start with the limited experience they will admit. But there is far more to experience.

Being can be perceived, not through the rationalism of science, but through the direct experience of the mystic or shaman, and through the integrating system of a culture when it is whole. The shaman is one who, through personal crisis, gains access to powers which enable him or her to reach beyond the phenomenal world. Mircea Eliade's definition is that the shaman is a technician of ecstasy. In the high literate cultures, this role becomes highly socially organized and becomes the province of the priest. At the time of such a culture's purest statement, the priest is responsible for the architecture of the temple form, and in the temple and temple complexes we can directly feel that culture's encounter with Being. Standing before the great Pyramid, in the Street of the dead at Teotihuacan, in the nave of Chartres Cathedral, in the Temple Compound at Bhubaneswar, at the Ise Shrine, one can sense the transcendent awareness captured by these priest-architects. One can also sense that experience in some of the classics of literature and in the great systems of mythology. Being is perceived by the human organism or by a culture when it is in a state of wholeness.

The role filled by the shaman in preliterate cultures, and by the priest in literate cultures, is filled by the artist in modern culture. Art becomes our means of penetrating the dialogue, of having access to being.

4. ART

4.1. The Hidden Nature Of The Dialogue

Although the world we live in is generated by our consciousness, it appears to us as though it exists independently. We do not directly experience consciousness, whether in the form of Lao Tzu's Tao, Schopenhauer's will, or Heidegger's Being. Rather, we experience the chair, the desk, the book, etc., or what Lao Tzu calls the ten thousand things. This is probably fortunate. It provides the concrete basis for everyday life. In crossing a street, we want to be aware of a flickering light as an approaching automobile

we should avoid, not a phenomenon generated by the way our consciousness has been formed by our upbringing.

We live by prejudices of perception, gathering fragmented bits from our surroundings, and imposing on them what we have decided in advance they are. There are dozens of optical illusions to demonstrate this: two people standing in a room of distorted perspective so that one appears to be twice the height of the other; two identical gray squares, one appearing white due to its black surroundings, the other black due to its white surroundings; the cube that becomes a jumble of sticks when viewed from any but one angle; etc. Other examples are provided by cross-cultural encounters, such as the inability of the Aztecs to perceive Cortez as a military threat, or the islanders who looked at James Cook's ships at anchor in their harbors and saw either nothing or clouds; they had no category of ship in their minds to organize the perceptual material they were receiving.

We referred earlier to an experiment in which you might stare into one eye of a friend extending several fingers. The peripheral vision which sees the fingers cannot count them. Let us now look more closely at what happens when we look at something, a person for example. Text books on perception show us diagrams of an image being projected onto the retina of the eye in the same way that an image is projected onto the film in a camera by the lens. A little bit of thought will show that this is not how we see. The eye does not work like a camera.

As we mentioned above, our vision consists of a fixed focus central vision of about three spherical degrees, and a much larger area of peripheral vision. The central vision sees images in sharp, clear focus, like the image a camera forms on film. The peripheral vision sees images quite differently. If you stare into one eye of a friend standing ten feet from you, you will not be able to tell how many fingers they are holding out from an extended arm. You will also not be able to make out their feet. Of course you eventually can make your friend out clearly by moving your eye over them. This allows the small area of fixed focus to scan over their entire body. We then have a completed image, like

a photograph. But while that is what we experience, it is not what hits the retina and gets reported to the brain. If your eye is scanning over this person, stopping perhaps a dozen times, your brain is actually receiving a dozen small focused images, plus the moving image between the stops, plus the moving peripheral material. In short, a jumble of images. And your friend is probably moving in the middle of all this. The mind processes this material and reports up a completed *memory image*: a whole static, anatomically correct, person in perspective and with shadings of skin tone (chiaroscuro.) If your friend is wearing a green sweater, their skin may look red due to the effect of the green. Your mind will color-correct for this, not unlike the color-correcting on a television. In the end, what you perceive is not what is there, but what you “know” to be there. What you saw was not anatomically correct, it was a jumble. It was not in perspective, since a dozen stops of the eye imply at least thirty-six vanishing points. And the skin was not subtle shadings of skin tone colors, but darks and lights, greens and reds. The memory image we call up is a product of how our consciousness is structured. It is structured differently in different cultures. For example, perspective is not the way all people see, but a convention practiced in Western Europe from the fifteenth through the nineteenth centuries. Chiaroscuro is a similar convention. When Western Baroque painters worked at the Chinese Imperial Court, the Chinese permitted them to use perspective as a pleasing exotic technique, but not chiaroscuro. While the Chinese must receive the same kind of shading information on their retinas when looking at a face as we do, they may correct it out when reporting up their memory image just as we would correct out the red produced by a green sweater. Chiaroscuro looked to the Chinese like some horrible skin disease.

Seeing is an active process of perception. It is intentional. Our consciousness reaches out and imposes an organization on the jumble of fragmented material impacting the retina. How we organize this material is a function of cultural development. Europeans of the Baroque period organize this material differently than traditional Chinese. The arts of different periods reflect different ways of seeing. We are sometimes told that all people see in perspective, that artists before the fifteenth century did not know how to paint in perspective, and artists after the nineteenth century chose deliberately to abandon

perspective and abstract their paintings. *It is our contention that artists paint what they see.* The rich variety of images we see in browsing through a history of art book represents the rich variety of worlds that people live in. Picasso saw the “distortions” he painted just as much as Vermeer saw the camera images he painted. The Dogon sculptor sees the faces of his fellow Africans as the twisted, gaunt forms he sculpts, just as the Hindu sculptor sees his fellow Indians as the full, sensual figures he sculpts. Neither Picasso nor Vermeer, nor the Dogon nor the Hindu, nor we are aware that we are all generating the different worlds we see. We live in the secure belief that we are simply seeing the world as it is.

4.2. What is Art?

We have referred to art as a recording of the way the world is seen. But obviously art is far more than that. What is art? Various definitions seek to describe it as a search for perfect order, as a quality of beauty and harmony in objects, as the product of creativity, or as the product of people who call themselves artists. Some definitions consider all human artifacts to be art. All of these definitions have severe limitations. A square drawn on a square piece of paper may be orderly, but is it art? A tree might be beautiful, but is it art? Baking a cake might require creativity, but is the cake art? The definition of art as that which is done by artists is self-serving, and the definition of art as all things made by humans is too inclusive. So what then is art?

Art cannot be understood in terms of qualities of the art object. We are all familiar with the fact that two people can look at the same thing and disagree as to whether or not it is art. The Impressionists regarded their work as art, while some critics of the day saw them as products of mad men working with brooms. Some Japanese collect stones which they regard as art and for which they pay high prices. Most Westerners would regard them as just stones. Westerners collect Chinese funeral paintings which they regard as Oriental art, while the Chinese had regarded them as only disposable items for a ceremony. The

definition must therefore lie not in the object, but in the experience. *A work of art is that which gives one an art experience.*

While this definition might at first seem like a truism, it is actually quite useful. It takes the emphasis off the object and puts it on the experience of the perceiver. It tells us that when we are talking about art, we are talking about a kind of experience. As we will eventually see, this experience is one in which we penetrate into the dialogue. It remains now to describe the art experience. In doing so, we will follow the general line of thought presented by Morse Peckham in *Man's Rage for Chaos*.

If we flip through the pages of an art history book, one of the most striking features of art we see is that it changes. In Western art, in the span between the thirteenth and eighteenth centuries, we see early, high, and late Gothic; early and high renaissance, Mannerism, baroque, and Rococo. In many cases, the career of one artist spanned several of these periods. What is the function of this change?

Imagine an archaeological site in the desert. We have excavated all kinds of artifacts—personal items, cooking utensils, weapons, tools, religious items, etc. These are all sorted out by type and laid out in the sand in chronological sequence. Some types of artifacts will exhibit no change over time. There are types of plows, for example, which have remained unchanged for thousands of years. Other types of artifacts will exhibit changes related to their function. Oil jars might change if they are now to be used in shipping by boat. Carving tools might change if harder stone is to be carved. But some artifacts will exhibit changes over time unrelated to their functional use. This change we will call *non-functional stylistic dynamism*.

It is quite evident that there are many things that people make that change stylistically over time for no apparent functional reason. Yet vast resources in time, energy, and material may be invested in these products. Since all of the objects selected for inclusion in text books on art also show this non-functional stylistic dynamism, let us for the moment assume it to be a defining quality of art and ask why that is.

We mentioned earlier the prejudicial nature of perception. By the time we reach adulthood, most of the situations we encounter are in fact what we expect them to be. In other words, our prejudices are justified. However, sometimes they are not. Sometimes we encounter things or situations for which we are simply not prepared. To use Bruner's terms, we have no cognitive maps of the territory. We might call such an encounter a *discontinuity*, a difference between what is anticipated and what is encountered. Optical illusions provide excellent examples of discontinuities. So do certain scientific observations, such as the Michaelson-Morley experiment which refuted the ether hypothesis of the propagation of light, and contributed to Einstein's development of the theory of relativity.

Usually when we encounter a discontinuity, we simply do not perceive it. Our perceptual prejudices are so strong that we simply cover it up. There are numerous optical illusions in which we can put something right in front of our eyes, and not see it. Although Einstein's theory of relativity was based on sound observations, many physicists simply would not accept it. While our general tendency on encountering discontinuities is simply to deny them, there is one circumstance in which we are open to them. The art experience. Many forms of art are experienced in quiet settings in which we are protected from the disturbances of the outside, and, through social decorum, from disturbances from fellow viewers. Examples of such places include art galleries, museums, concert halls, theatres, and libraries. The art experience is one in which we do not deny discontinuities, but rather are open to them. This openness is difficult, it requires stripping ourselves of the protective armor of our preconceptions and leaving ourselves exposed to the unknown. The protected environment in which we experience art makes this easier.

As we become accustomed to a given style in art, it no longer produces a discontinuity. What we encounter is what we are anticipating. By changing in style, art keeps ahead of our anticipations. We can see this kind of change in Italian painting, progressing from the late Gothic of Cimabue and Giotto, to the early Renaissance of Botticelli, the high

Renaissance of Leonardo, Michelangelo, and Raphael, to the Mannerism of Parmigianino, the Baroque of Caravaggio. In modern painting, we see the progression from the realism of Courbet to the Impressionism of Monet, to the Post-Impressionism of Cezanne, to the Cubism of Picasso. This change in style is not just arbitrary, done merely to shock, but has a direction. It is aligned with changes in the world, and serves the function of educating the structures of our consciousness into that direction. We will develop this idea further in the next section.

This discontinuity, that is difference between what is anticipated and what is encountered, can take many different forms. In a study of poetry titled *Seven Types of Ambiguity*, William Empson describes the seven basic ways in which poetry violates our expectations: when a detail is effective in several ways at once; two or more alternative meanings are fully resolved into one; two apparently unconnected meanings are given simultaneously; alternative meanings combine to make clear a complicated state of mind in the author; the author is discovering his idea in the act of writing; what is said is contradictory or irrelevant and the reader is forced to invent interpretations; and full contradiction, marking a division in the author's mind.

In a seminal work, *Complexity and Contradiction in Architecture*, Robert Venturi describes various forms of discontinuity in architecture: the phenomenon of both-and, double-functioning element, contradiction adapted, contradiction juxtaposed, and the inside and the outside.

The simplest way to illustrate the experience of a discontinuity is imagine going to the "Independents" exhibition of modern artists in New York in 1917. You are anticipating modern painting, perhaps even shocking modern painting. What you in fact encounter is a urinal submitted to the exhibition by Marcel Duchamp. A urinal is contrary to your anticipations, and produces a discontinuity.

There are several possible kinds of discontinuities. They might be roughly categorized as follows: internal discontinuities, in which the work of art sets up expectations which it

then violates, for example a piece of music exploding with energy after lulling us. Stylistic discontinuity, in which we might anticipate a Post-Impressionist painting, but encounter instead of Cubist painting. A discontinuity in form, as when we go to a concert expecting to hear musicians play, and instead encounter John Cage fooling with a dozen radios. And finally, contextual discontinuity, in which we encounter a work of art outside of an environment in which we expect it, as in the highly sophisticated late nineteenth century quilts by American women which were put in bedrooms rather than in art galleries.

Artists always walk fine lines in the introduction of discontinuities. If they take them too far, their audiences will not be able to bridge the gap and the work will be rejected, perhaps to be rediscovered later and heralded as far in advance of its time. On the other hand, if the discontinuities are too slight, the artists will be criticized for being stuck, no longer developing, or unimaginative.

The question now is what purpose does the discontinuity serve. Why is it an apparently necessary part of human experience? To deal with this question will require a digression.

4.3. The Discontinuity and Changes in Structures of Consciousness

What purpose does the ambiguity or discontinuity characteristic of art serve? We can see that the structures of our consciousness play a major role in determining the world we experience. To use our earlier analogy, the configuration of the maps available in our map room will have as much of a role in determining our experience as the pins which we position on the maps. Yet human experience is dynamic. The objective environment changes, and we eventually respond, both as individuals and as cultures, to those changes. How do we go about changing when we do? Various anthropological studies show us how we grow into our culture, how consciousness is formed, and how cultures differ, or in other words, how structures of consciousness differ. Later in this book we will be surveying such differing structures in different periods in Western culture. We

should also make the point here that cultural difference is not merely a matter of the different knowledge or information held by members of a culture, it is also a matter of how that information is regarded. The issue is as much *how* we see as *what* we see. But once we have been acculturated, once we have learned a way of seeing, can that way of seeing change and if so, how?

The way we see (or hear, or comprehend) can and does change, and such change comes primarily through the art. Thus, in terms of cultural roles, the journalist and the essayist influence *what* we know, that is the *content* of consciousness. The poet, the painter, the musician, and the architect influence *how* we know, that is the *structures* of consciousness.

The artist fulfills this role of updating structures of consciousness through the device of discontinuity. Our prejudices of perception are very strong. We tend to see what we believe to be there more than what the raw data coming in tells us. When there is a conflict in the data (a discontinuity) we tend to ignore or repress it. However, we have learned in the art experience not to reject such conflicting data. In being open to these conflicts, we leave ourselves particularly vulnerable and unable to deal with real world situations (such as crossing a street) which require a high degree of dependence on preconceptions. Because of this vulnerability, art is usually experienced in the highly protected environments mentioned above. In such a setting, we are prepared (if we have learned how to experience art) to let down our guard, to put aside our prejudices of perception, and to experience the discontinuities the artist presents us.

The experiencing of discontinuities affects us in two ways. One, it changes or updates our structures of consciousness, and two, it reminds us of the insecure footings of our reality, thereby helping us to keep our awareness flexible and open. In the first instance, we are speaking of how art, through the discontinuity, changes our structures of consciousness. Earlier we described how we might see a friend standing before us, and referred to the memory image which would be offered up in this experience. We have a concept, an “image” of what a person is, and the memory image we receive is going to be

very much a function of what that concept is. By concept we mean the map on which the pins of detailed features will be placed, or the limits of our experience of a person, within which limits our friend will appear. But this concept or these limits are not universal and unchanging. They are in fact particular to a time and culture and very much changing. One example of the role art has played in how a person is perceived can be seen in Giotto's work.

Giotto's audience would have come to his work with expectations created by Cimabue and the other medieval masters who portrayed their characters in the glow of Byzantine color, but flat, expressionless and unanimated. Cimabue was concerned with the eternal soul of the Madonna and of his other characters, not with their worldly existence. Depth, physical setting, emotion, and animation were lacking not because of a lack of artistic skill, but rather because of a lack of concern for those issues. They were irrelevant compared to issues of the transcendent soul which would soon be released from this earthly state. With these conceptions (anticipations), the viewer approached Giotto's work and encountered physical people displaying emotion, animated, and set in depth in worldly settings. A discontinuity. An experience contrary to anticipation.

Giotto, in looking into his own experience, had found the old conception of human being inadequate. He presented his findings in such a way that his work, along with the work of later artists, would restructure consciousness so that eventually, when their audiences looked at a person, they would see something very different from what they had seen before. This difference between Cimabue and Giotto over what a person is, is not simply a matter of knowledge or information which can be conveyed by explaining a theological or psychological concept and having it understood. It is a matter of specific functionings of consciousness which can be seen as manifest in numerous cultural forms, the limits of which can be seen in the mathematics of the culture in question. Later in this study, we will be exploring the structures of consciousness of various cultures and see in mathematical terms the limits which will contain all of the experience of a given culture including how a person is seen.

4.4. The Artist's Penetration into the Dialogue

From this description we can see the artist's role as an "early warning system," a term coined by McLuhan. In effect, the artists' prime subject is themselves. They are constantly asking, "What am I experiencing?" Unlike the rest of us, they are not content merely to have experiences, they must attempt to penetrate into the origins of experience. When this attempt becomes self-conscious, the artist can be described as a Romantic. However, the attempt to penetrate into one's self is there even if the artist describes it in other terms. On inventing perspective, Alberti exclaimed: "At last, I can see the world as God sees it!" Today we would hold that god probably does not see in perspective. What Alberti had succeeded in doing was to see the world as he, Alberti, sees it. This is not as easy as it may seem, for as structures of consciousness change, the world offered up to us changes. In order to grasp what is happening, we must penetrate into the generation of phenomenal reality, into the dialogue itself. It is on the edge of our experience that we can map our ever-changing limits. The limits Alberti was exploring were later further mapped in Descartes' coordinate algebra and Newton's inertial systems. In Newton's case particularly we know that he was involved in as intense an inner search as any artists. Newton spent four years away from London because of the plaques, and during that time was able to make his exploration, which is well-documented. Indeed, many important advances in science are made in the mind and not in the laboratory. Science delineates in mathematical terms the principles of the workings of the dialogue. While the artist renders the structures or maps of consciousness impressionistically, the scientist later describes them precisely. But the maps are to be found inside of us. Einstein did not use laboratories, in fact he seldom used any technological devices more complicated than pencil and paper. Most of his experiments were done in his head.

Cezanne said of his painting that he was trying to portray the solid world of the paintings of the museums. But if that was what he was trying to do, why did he not merely copy the techniques of the masters? The answer is that he did. The masters looked at the

world with an intensity that revealed the very structures with which their consciousness structured it. Cezanne looked with a similar intensity. The world had changed because the structures of human consciousness generating it had changed, and Cezanne showed us his world rather than an imitation of that of the masters. Cezanne's process was the long way around. He said that he wanted to go back to those confused sensations with which we are born. In so doing, he was able to follow the process of his own experience and penetrate into its origins.

The purpose of the artist's work, or that of the truly creative scientist or mathematician, is to bring to the audience discoveries about the dialogue, about the shape of the limits of our experience. The artist performs this task earlier than the scientist or mathematician, and in such a way as to alter structures of consciousness. The scientist or mathematician performs the task alter and gives precise mathematical definition to the structures.

4.5. Discontinuity and Fundamental Insecurity

The second way in which we are affected by discontinuities in art is to be reminded of our fundamental insecurity. The only reality we can know, which can have a meaning, is phenomenal reality, that is, the reality we experience as a consequence of the dialogue. As a result, we are a party to the world on which we stand; we are, in effect, attempting to stand on ourselves. Any attempt to achieve security in such a situation is ultimately circular and bound to fail. The best we can hope for is to fully understand the nature of our situation. That way we will at least have the comfort of understanding our predicament, even if we never come to fully appreciate it.

This circularity in our experience is recognized in many different fields, some of which attempt precise descriptions of it. This is the case with Wittgenstein's later philosophy which is deliberately complex and impenetrable as a description of a complex and impenetrable situation. Heisenberg's uncertainty principle is another example, in this case using Planck's constant to precisely measure the degree to which we enter into any

situation which we attempt to observe, and thereby mathematically limit the precision with which we can measure either the position or velocity of a particle. It is important to keep in mind that the uncertainty principle does not merely limit the precision of what we can *know*, it limits the precision of what *is*. When combined with the General Theory of Relativity, it defines the limits of the universe we now occupy. A mathematical demonstration of our circular predicament comes in Godel's proof which simply demonstrates that all systems must be either incomplete or contradictory.

There are several disciplines devoted to dealing with the fundamental insecurity of our position, most notably Buddhism. Buddhism is founded on "The Four Noble Truths," the first of which is that all life is suffering. By this is meant primarily the suffering of change. Even if we can find a moment of release from any other suffering, that moment has change inherent in it. There is no way to freeze the moment, although we often attempt to do so. One way in which we attempt to freeze our situation is through the illusion of ego, that is by telling ourselves that we exist as a personality. In letting go of ego, that is not denying its existence but rather ceasing to be attached to it, we can become aware of a "gap," in which we are merely in the world rather than taking a position relative to it. Using our earlier terminology, we might say that awareness of this gap is a momentary penetration into the dialogue. In experiencing a work of art we can have a similar experience, a momentary penetration into the dialogue. Thus the discontinuity in our experience of works of art opens a gap in our experience, momentarily giving us a glimpse of the dialogue.

Exposure to this gap gives us an opportunity to see into the origins of our experience. Having this view is not pleasant, since it brings us in full face of our fundamental insecurity. The existentialists have dealt with this awareness of the gap and have called the feeling resulting from it nausea (Sartre) or dread (Kierkegaard and Heidegger.) Older works of art, once we have become accustomed to them and no longer experience the more violent discontinuities, are more often regarded as pleasing or beautiful than are newer works. Thus we find the same kind of people today collecting Impressionist paintings to hang on their living room walls who, when such art was being painted,

would not have gone near an Impressionist painting, much less spend tens or hundreds of thousands of dollars to buy one. Today a Monet hung in the living room might aid relaxation, while an Oldenberg might not. The Monet would not have aided relaxation when it was first painted. More likely it would have stirred a violent argument.

The gap experienced as the result of a particularly powerful and successful work of art is a wound opened up into the process of the generation of reality. Any artist must constantly deal with the ambiguity of the noble purpose in pursuing the highest form of truth, that is the edge of our experience where phenomenal reality comes into being, and the clinical nature of the festering gap found at that edge. As we shall see in the next chapter, architects are faced with a particularly difficult task in performing the role of an artist, for not only must they find a patron far more wealthy or powerful than the patron for a painting, but they must find one willing to suffer every day an encounter with the glaring truths of existence. Unlike a painting or a book, a building cannot be put aside should its revelations become too intense.

4.6. Formal Structures in Art

The formal structures in a work of art are the principles of relationship among all of the other elements in the work of art which are isomorphic with structures of consciousness.

Formal structures do not refer to any isolatable element or series of elements in a work of art, but rather to the principles of relationship underlying all of the elements. Thus, the formal structures may in no way be apparent in viewing or experiencing the work of art, and of course cannot be reduced out of the work of art into a verbal description.

However, while we cannot adequately describe these formal structures, we can point to them. For example, in a Renaissance perspective painting, the perspective space is not an element represented in the painting as are human figures, but rather a principle of relationships among figures. This principle of relationship, which has to do with the juxtaposition across a uniform and continuous space at an instant in time could also be

represented mathematically with the Calculus. Perspective space in the arts and the Calculus in mathematics are isomorphic with and thereby representative of those structures of consciousness at the outer limit of Renaissance experience. Art, then, is not representative of *what* we see (the phenomenal world), but rather *how* we see (structures of consciousness.)

Schopenhauer gives a central position in his system to the will which operates not unlike what we are calling intentionality. The will and the body are one in the same, simply viewed under different aspects. The will governs our view of the world. The artist's concern, however, is "willess perception."

Schopenhauer placed music as the purest of arts, calling music the will itself. Thus will (or structures of consciousness) can be experienced directly in music, which speaks "the universal imageless language of the heart." Music is notable for the absence of referential signs. Occasionally there will be representations in music when the music refers to a landscape or a mood, but such references are secondary. The absence of referential signs in music make the formal structures readily apparent, since the sounds are meaningless in themselves, and only the principles relating them make them music. The advent of abstract painting has made these principles of relationship evident in painting, and we can now see that such formal relationships are also present in representational art. The point of the figures represented in a painting is not their meanings within themselves, but rather the formal principles relating them. Similarly, when architecture is understood as art, the artistic concern is not with functional solutions in themselves, but the formal structures relating functional solutions.

Thus we can apply Schopenhauer's theory of music to all of the arts. From this point of view we can understand Kandinsky's use of the title "Improvisation No. 30" suggesting that painting might be seen as "visual music," and also the often quoted remark that architecture is frozen music.

Our reference to Schopenhauer was made in order to expand on our notion that art involves seeing into the dialogue. From Schopenhauer we might say that art, through its formal structures, is a direct presentation of intentionality, that is, of structures of consciousness. In the experience of art we gain direct access to this limiting edge of our being, and in the study of art we can see structures of consciousness as they change across cultures and over time. These structures, when imbedded in a powerful work of art, are isomorphic with structures of consciousness. In decoding that changing morphology, in constructing its mathematics, we are also describing structures of consciousness and thereby the changing limits of human experience. In Suzanne Langer's terms, art symbolizes the morphology of human sentience.

5. THE STRUCTURES

There is a new field of study called artificial intelligence. It integrates computer science, philosophy, psychology, and neurophysiology, seeking to understand the workings of the human mind, and replicating those workings in computers. An important part of this research is, of course, to determine what it is that the mind does, which is often approached in terms of logic.

We feel that to approach the mind in terms of its logical operations is far too limited; indeed to speak of mind is itself limiting. Human consciousness is more than the mind. It encompasses the whole body-subject, embraces technology as extension, and includes culture itself. Consciousness can best be studied from the record of what it does, which we see embedded in cultural forms. History shows us that the underlying structures of these forms change, and that structures of consciousness must also change.

Thus we can see the mathematics, sciences, arts, and architecture of each period as the record of the structures of consciousness of that period. There is not one mathematics, one physics, or one architecture. Each is culture specific. Each records the consciousness that created it. Euclid's geometry reveals the solidity of the Greek world,

Rembrandt's portraits record the infinite depth of the Baroque personality, and Beethoven's music reveals the patterns of space through which the Romantic imagination could wander.

Mathematics and science are often credited with objective rigor, while the arts are thought to express the less precise nature of the emotions. This is not the case. Both the arts and the sciences are rigorous records of the possibilities of human consciousness. We might think of the world as configured differently depending on the consciousness confronting it. We readily accept that the spectrum of visible light and the seven distinct colors of the rainbow are a small part of the full range of electromagnetic radiation and only one way to divide colors. It is the physiology of the eye that determines which part of the spectrum we see, and the workings of the mind that divides it into these colors. So it is with all of our perception. The underlying structures of the world we experience—space, time, and causality—are determined by the structures of our consciousness.

From this point of view, let us look at several historical periods and see how the cultural records of each reveal different structures of consciousness.

5.1 Greek

The ancient Greeks lived in a world of absolute being obscured by becoming. Standing behind the changeability of everyday circumstances was as more solid world of permanence. The Greeks were comfortable with the solidity of the bodily whole, while they abhorred the flux of change over time and the vacuousness of space.

The Greek cosmology saw the fixed stars and planets set in crystalline spheres, their motion explained by the fact that the natural resting condition of a sphere is rotation. All things seek their proper place of natural repose; thus smoke rises and solids fall to reach their natural resting places. Force is not an abstraction, but requires direct contact, as in Aristotle's law of motion in which things move as long as they are directly being pushed,

and stop when the pushing stops. This same lack of abstraction is in the *Iliad* where a god must appear directly by a warrior's side and touch his arm to stay his spear.

Greek mathematics was concerned with concrete numbers and forms, not with abstractions. For the Greeks there was only one number between 1 and 3, while for us there is an infinite number. Negative, irrational, and imaginary numbers were unknown, or when encountered, repressed. The Greeks took their mathematics to the limits of x^3 , for a three dimensional figure, but not to x^4 , which implies the dynamic of time. We should also note that the x^3 of the Greeks is a number with solid form, very different from our notion of a function as in $x^3 + ax^2 + bx + c = 0$.

Euclidian geometry is concerned only with what can be scratched in the sand with a compass and straight edge, although within this limit of the concrete the Greeks could achieve great complexity and perfection. Archimedes describes a method for calculating the number of grains of sand needed to fill a sphere whose center is the center of the earth and whose radius reaches the sun. The problem involves eight integral unknowns connected by seven linear equations and subjected to the two additional conditions that the sum of a certain pair of the unknowns be a perfect square while the sum of another pair be a triangular number. Yet Archimedes was known for doing his calculations with scratches in the bath oil on his skin or in the sand, and he titled even this fantastic work *The Sand-Reckoner*.

In Greek vase painting we see a lack of spatial depth, just as in evolution we see a lack of development over time. Aristotle recognized the morphological relationships between many species (both horses and humans have ribs; the struts in a bird's wing parallel human fingers.) We explain these by saying we share common ancestors back in time. Aristotle says that they reflect the pattern of mind of the creator who made all of the creatures at the same time.

In psychology we see a similar lack of development over time. In the *Odyssey*, Odysseus's wanderings bring him in touch with all aspects of human nature in order to

complete him as a person. Yet we do not see him develop in response to these encounters. It is as if these things are already in him and he is merely being reminded of them. It is significant that his mythic journey begins in sleep in the land of the lotus-eaters and ends in sleep when he is delivered to the shore of his homeland.

Against this background of spatially and temporally static structures of consciousness, we can understand the Greek temple as a bodily whole, a freestanding object like the numbers in Greek mathematics. From the archaic “Basilica” in Paestum (550 B.C.) to the refined Parthenon on the Acropolis in Athens (432 B.C.), harmony and proportion tie the building to the freestanding human body. It is experienced as a giant sculpture, with the interior playing no important role. Rituals are held on the outside. The interior space, so important in the Gothic cathedral, is irrelevant to the Greek—indeed the Greek would have felt discomfort in the vacuousness of the Gothic space.

The column of the temple similarly symbolizes the bodily whole of the human being. The columns taken together serve to serene the wall of the temple to distract one from the space within. There is no conceptual connection between outside and inside, no sense of depth or penetration.

5.2. Medieval

In the Medieval world, all of experience is illuminated by God’s immanent presence. God brings the world into being, permeates all things, and is responsible moment to moment for keeping it in being. Should God become distracted, the world would disappear.

God’s presence introduces a kind of perspective. In renaissance perspective, man is the measure. Here it is God, and since God does not view the world from any one point of reference, the perspective is one of luminosity rather than linear convergence. But the fact of this perspective creates the realities of time and space. The world was created

several thousand years ago, was transformed by Christ's coming, and will end with the second coming.

In mathematics, Fibonacci brought Hindu and Arabic methods into European thought to provide expression to new and abstracted structures of consciousness. With Fibonacci, number is not the Greek concrete whole, but an abstraction which permits fractions, square and cube roots, and trigonometry. Fibonacci also introduced indeterminate analysis which paralleled the intuitive methods of the Gothic cathedral builders in making their indeterminate structures.

In Dante's cosmology we see numerous levels, each different from the others. Moving up from hell we see the hemisphere of Earth, then Water, then the seven levels of Purgatory, then the nine spheres of the planets, moon, and sun, and finally the tenth sphere of the Deity, which is the prime mover.

In Medieval painting, we see figures set in non-perspective depth, often, in the case of Madonnas, against a gold background to indicate a spiritual space. While some figures are clearly behind others, there is no systematic indication of their location. The painter's concern is for the immortal soul, and therefore not for such material issues as position in space, anatomical accuracy, facial expressions, emotion, or character.

Perhaps the clearest expression of Medieval consciousness is the Gothic cathedral, with Chartres Cathedral (1220) serving as an example. Unlike the Greek temple, the Gothic cathedral gives full expression to both inside and outside. Roman architecture also had strong interiors as in the vaulted baths and the domed Pantheon, but unlike the Romans, the Gothic builders brought their interior and exteriors into full relationship with each other. From the exterior, the lacy fingers of the flying buttress carried the forces of the ribbed ceiling vaults out to where they could be seen, while from the interior, the stained glass windows brought God's luminous presence into the space. This connectedness requires a degree of abstraction in consciousness not previously present in human history.

The most striking feature of the Gothic cathedral is the soaring space of the interior (157 feet high at Beauvais.) Standing in the nave of one of these cathedrals, one feels oneself in the body of God. The vaulting above follows the complex curves of the lines of force moving through the stone. These forces cannot be directly calculated; they are indeterminate. The cathedral builders, who used no mathematics, felt the curves intuitively. The result was a degree of structural sophistication not duplicated until the nineteenth century.

5.3. Renaissance

Linear thought, which had been developing for centuries under the influence of the Phoenician phonetic alphabet, was greatly intensified by the introduction of Gutenberg's printing press. The rational powers of the mind (those associated with the fixed focus center of vision) were exercised and began to dominate consciousness.

The context for all Renaissance experience became abstract space and time. Space was continuous, uniform, and infinitely divisible. Time also had these qualities. The world was made up of space, time, matter, energy, motion, and causality, all of which could be manipulated through mathematical law.

As cosmology developed from Copernicus through Kant, the universe was seen as having formed from rotating clouds of dust which condensed into the sun, planets, and stars. In physics, Newton's laws of motion, developed out of Galileo's inertia, provided a mechanistic world. Fundamental to Newton's physics is "instantaneous juxtaposition," the notion that one moment in time can be isolated, and the location and velocity (speed and direction) of every object in the space can be identified at that moment. Applying the laws of motion to this situation, it should be possible to determine the past and predict the future.

The mathematics of the renaissance might be seen as beginning with Johann Muller (1436-1476) who developed plane and spherical trigonometry, thus converting the concrete mathematics of the Greeks into abstract thought. Later, Nicolas Chuquet developed computations with irrational numbers, the theory of equations, positive and negative integer exponents, and the solution of cubic and quartic equations. Later, Pascal's pure geometry abstracted the Greek sand constructions, Descartes's analytic geometry provided the means for describing coordinates of space, and Newton's and Leibniz's calculus penetrated into the limits of space approaching zero.

The Renaissance is most clearly represented in perspective painting. Perspective is often described as a discovery that enables the painter to represent the way we see the three-dimensional world on a flat canvas. This is simply not the case. While a camera "sees" in perspective, the eye does not. The fact that our fixed focus center of vision is so small, necessitating moving the eye to encompass a scene, is reason enough to not allow the eye to work the way a camera does. Also, the eye does not freeze an image the way a camera does. Rather than being the way the eye sees, perspective is a convention, a culturally learned way in which the mind puts together a memory image. This convention was dominant in Western Europe between about 1400 and 1900. It is seldom used today, and it is not native to any other culture.

The key to perspective is instantaneous juxtaposition, the same technique which underlies Newtonian physics. The Renaissance painter isolates one instant in time (quite different from the Medieval painter, who depicted a story, not an instant) and shows us the location and action (velocity) of every object in the picture frame at that moment. The invisible perspective grid lines locate the objects in a uniform space, just as a Cartesian grid located objects in a Newtonian space.

The Renaissance architects sought to make the new perspective experience immediately felt in the Renaissance square in Italian towns. Here buildings were arranged regularly on all four sides of the square, their rational classical orders aiding the eye in its appreciation of the vanishing effect as lines came together in the distance. The square

itself was typically paved in a regular pattern to make the perspective effect just as the invisible lines on the canvas did.

Renaissance architecture is perhaps best exemplified by Andrea Palladio's Villa Rotonda in Vicenza, Italy, built in 1550. The building is symmetrical on both axes so that as you approach it from any side, you know what the other sides are like, since they are the same. Thus the building has an existence independent of how nay one observer is seeing it. The central space is domed, marking the positioning of the individual at the center of Cartesian coordinates, able to survey the world in all four directions. ("Man is the measure of all things.") The classical orders are used, symbolic of a human centered world, with the column a model of the human being (base, shaft, and capitol implying the feet, body, and head.) The elements of the building are geometrically clear, being predominantly squares, circles, and triangles.

Thus the architecture of the Renaissance serves both as a model of the rational Newtonian cosmos and as an intermediary between the person and the cosmos, bridging the gap between the two and bringing them into harmony with each other.

5.4. Existential

We are often told that Newton's space and time are those of common sense, while the space and time of Einstein and the new physics are comprehensible only in mathematical formulas. This is a misunderstanding. Far from representing common sense, Newton's concepts were highly sophisticated abstractions which were accepted by many people only after hundreds of years.

For example, Newton's law of inertia states that in the absence of any external forces, a body in motion at a certain velocity will maintain that velocity indefinitely. Aristotle's law, stating that the motion will stop when the initial force that set it in motion is withdrawn, is much more in keeping with our common experience and common sense.

Newton's law requires a tremendous leap of the imagination, picturing a body away from the earth, in a vacuum, and far from the gravitational pull of any body. Such imagining may be easy for those of us who grew up in the space age, but must have been very difficult three hundred years ago.

The late nineteenth and early twentieth centuries saw the introduction of electric and electronic communications, beginning with the telegraph and extending to the radio, light bulb, radar, television, satellites, and the computer. The new technologies obliterated the single point of reference and the fixed viewer as they spread an electronic net around the globe, and they eliminated distance as their messages traveled at the speed of light. The components of Newton's uniform space and time were gone, and consciousness was radically restructured.

In cosmology, the universe takes on a space-time curvature generated by the presence of matter, just as the motion of the observer is central in Einstein's general relativity, and the act of observation becomes crucial in quantum dynamics.

Mathematics loses its firm footing on *a priori* status. With Einstein, geometry is absorbed into physics. Its axioms are no longer self-evident, but rather derive from observations of the curvature of space. Gödel's proof of 1931 shows that no mathematical description of the world can be complete. Mathematical descriptions fall into local patterns, changing at the boundaries of each space-time segment. The flux of experience is now analyzed through set theory, topology, Boolean algebra, and finally fiber bundles that link different geometric realities.

The dissolution of the hard, rational Newtonian world is seen in Impressionist painting where matter fades into light. The Impressionists made this record at the same time the painters of the academy were, in a last gasp, attempting to define the perspective world once and for all with absolute rigor. This situation parallels events in mathematics where attempts were being made to secure the foundations of classical mathematics at the same time non-Euclidian geometries were emerging and shaking those foundations.

A new, existential worldview appears in Cezanne's paintings, where perspective space begins to give way to one in which each object generates its own space. The cubist painters continue this revolution, eliminating a point of view, and substituting a thousand fragmented realities hanging together by a totally new logic. The novels of Proust and Joyce also express this new view, with memory, stream of consciousness, and mythic structure replacing the chronology of earlier novels. Einstein's special and general theories of relativity, along with quantum theory, give precise scientific and mathematical descriptions of this new reality.

In architecture, Frank Lloyd Wright removed human beings as the measure of the world, casing them out to become a part of nature. No longer is our consciousness something special; it is in all things. Wright used the term "organic" to refer to an architecture that recognized the "will" in each material to fully manifest itself, and he created buildings whose existence was dependent on one's experience of it. In the Robie House, built in Oak Park, Illinois, in 1909, he placed the fireplace core in the center of the building, displacing the human being. Windows and irregular corners "break the box," allowing an interpenetration of inside and outside. The asymmetry of the house and irregularity of its rooms make the experience of it different for each person, depending on how they move through it. Rooms are not defined by four walls, but rather flow one into the other. Activities are not predetermined by the designation of the room, but by the users at a given moment, just as human beings do not have a pregiven nature in existential literature, but are continually responsible for defining themselves.

5.5. Consciousness

The existential period does not bring us up to the current moment. Today, in every field, it is evident that consciousness will no longer remain bracketed off within our subjectivity. It is a fundamental part of reality, and the ultimate unified field theory must fully integrate it. David Bohm's physics incorporates consciousness, as does Saul-Paul

Sirag's theory that the coding system the mind uses filters the reality we experience. Jungian psychology draws no line between mythological deities as located in the collective unconscious and those same deities as manifestations of our own personal psychological makeup.

Oswald Spengler, in *The Decline of the West*, writes:

The means whereby to identify dead forms is Mathematical Law.

The means whereby to understand living forms is Metaphor.

All that we see today is alive if for no other reason than our own consciousness is a part of it. Artists today are looking for that path to this consciousness in their work. The modern architect Louis Kahn wrote:

A great building, in my opinion, must begin with the unmeasurable, must go through measurable means when it is being designed, and in the end must be unmeasurable... A work is made in the urging sounds of industry, and, when the dust settles, the pyramid, echoing Silence, gives the sun its shadow.

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