Geometric Extensions of Consciousness

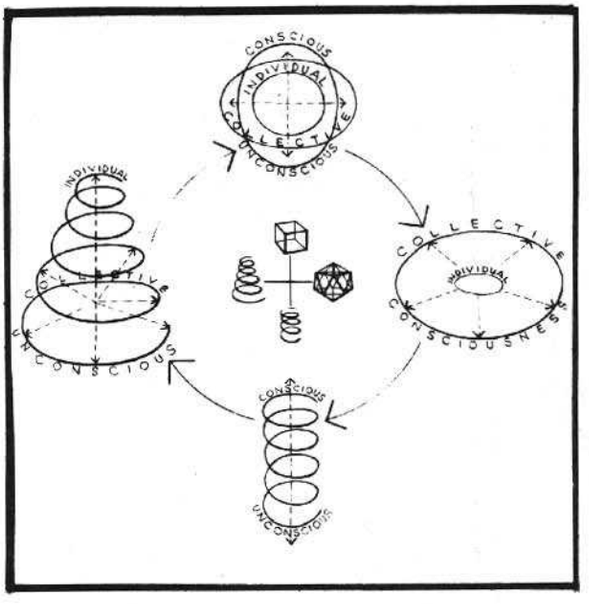
excerpts from Anne Griswold Tyng's article

This was first printed in *Zodiac 19—a review of contemporary architecture.*

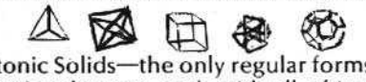
The evolution of man's consciousness was built, atom by atom, into the configurations of matter and mind. Both for our understanding of its evolution and for its own extensions of consciousness, the form of mind-matter finds clues in geometry.

The difficulty of tracing the history of man's consciousness of space in a continuous sequence lies in the cyclic nature of the evolution of total spatial awareness—a repeating cycle in which man's perception and understanding have been stretched asymmetrically in different shapes of tension between the individual and the collective, and between consciousness and unconsciousness. Thus the more introverted phases of the cycle tend to appear as a regression (a "return to the unconscious" when vitality is renewed through a reunion with primitive natural sources) instead of being seen as part of a continuous process of expanding spatial awareness.

The cycle itself proceeds from simplicity to complexity and from a balanced axial *bilateral* order to the movement of *rotation* to the serpentine flow of the *helix* to the animated form of the *spiral*—a building up of form and energy which are integrated in a new cycle. (The synthesis of *bilateral* symmetry, a new simplicity of order which includes and integrates the previous complexity, begins a new cycle of spatial awareness from *bilateral* (synthesis) to *rotational* (space) to *helical* (time) to *spiral* (space-time).) As "generative molecular elements" inherent in man's own evolution, these principles may provide geometric links in the extension of man's consciousness.

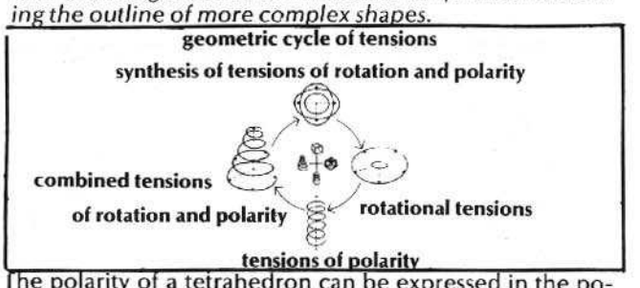


In 450 B.C., in his search for an 'atomic' order of spatial concepts, Empedocles proposed as the building blocks of everything fire, air, earth and water. On mathemetical grounds Plato, in his *Timaeus*, determined the 'exact' forms of the smallest parts of these elements as the five shapes we now call the Platonic Solids; fire the tetrahedron, earth the cube, air the octahedron, water the icosahedron, and as the symbol of the cosmos, the dodecahedron. This intuitive concept is given a measure of validity today when we know that the relationships of form expressed in these five Platonic Solids are involved in the way in which 'fundamental' particles—protons and neutrons—are built up into atoms of about a hundred different elements (according to Pauling's Close-Packed-Spheron Theory and Fuller's proposals of atomic close-packing)[1] and are involved in the way in which different arrangements of these atoms form the building blocks of a million or so different forms of matter, both natural and synthetic.



These five Platonic Solids—the only regular forms possible in three dimensional space, each with all of its faces the same and with the angles at which the faces meet each other the same—are involved, not only in the spatial organization of forms at the level of nuclei of atoms and molecules, but also in cells, organs, plants, animals, the human embryo, the psychic structure of man, the works of man and in the astronomical forms of the universe which pre-existed man. Previously invisible ordering of the primordial atoms within us, revealed by the electron microscope, gives proof of internal geometry in natural forms.

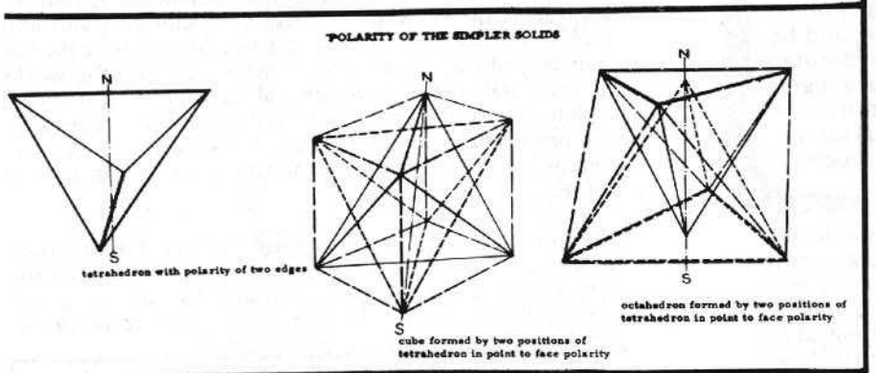
The four stages of symmetric form in this geometric progression, as in the cyclic extensions of human consciousness, I have called *bilateral, rotational, helical,* and *spiral,* with each stage seen as the *motion of simpler forms defining the outline of more complex shapes.*

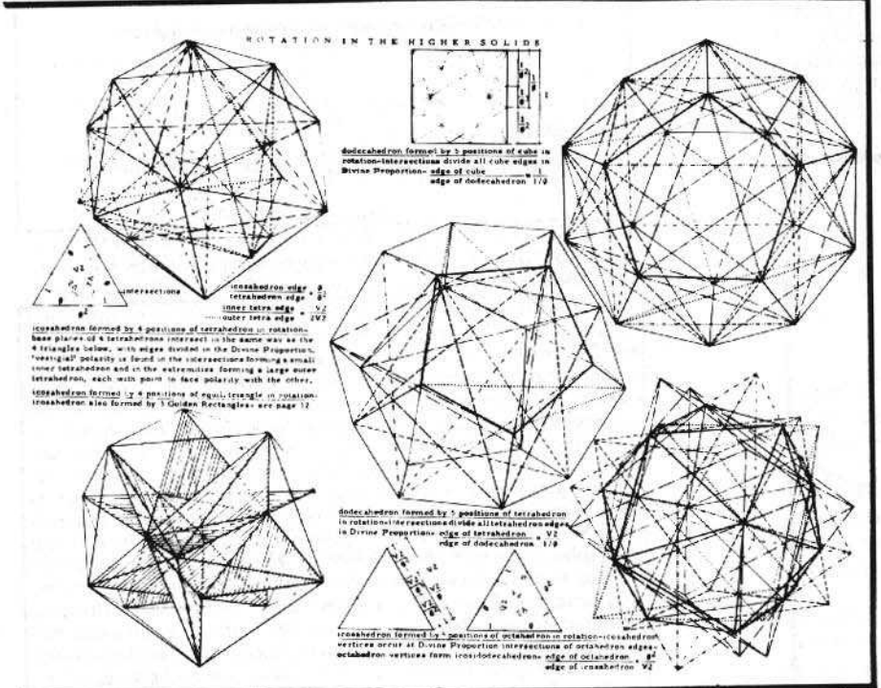


The polarity of a tetrahedron can be expressed in the polarization of two of its four edges (as Fuller has suggested). One tetrahedron in two positions, which have a

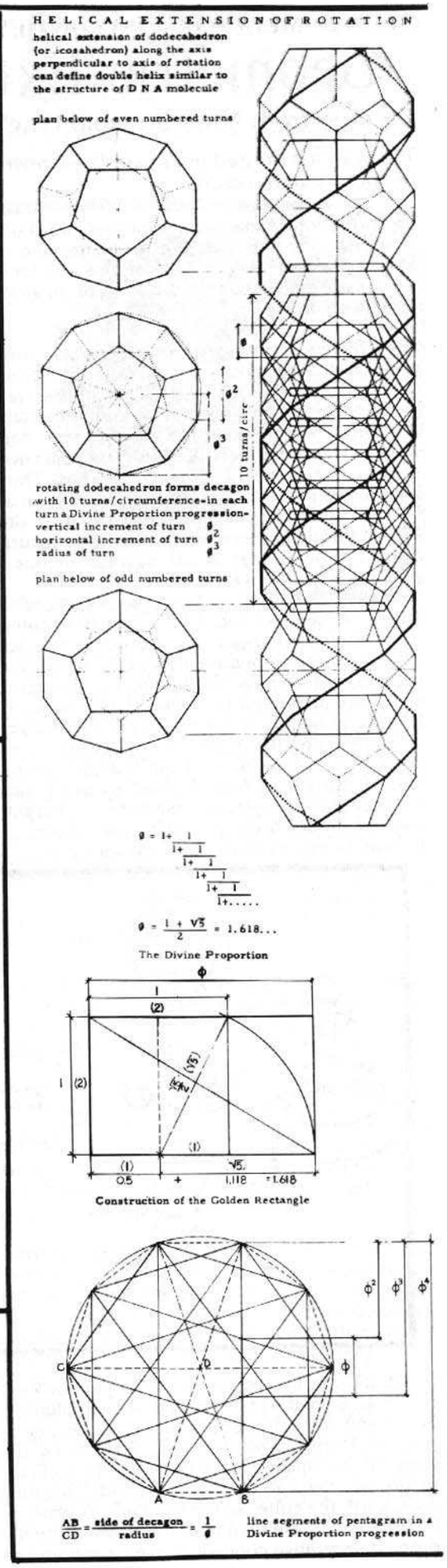
Anne Tyng was one of the first women to receive an architectural degree (M. Arch.) from the Harvard Graduate School of Design. She has worked for a number of years for and with the architect Louis Kahn, associating with him on the "Project for a City Tower", featured in the Museum of Modern Art exhibit "Visionary Architecture". Based on a triangulated three dimensional system which had been used previously only as structure separate from usable space, as in Bucky Fuller's "octet truss", the undulating geometry of this tower, which appears to have a life of its own, is probably the first to be conceived as occupiable space as in a bee's honeycomb. Her independent research in forming principles, for which she received a Graham Foundation grant in '65, has been oriented primarily toward principles of asymmetry, proportion, and hierarchical ordering of form. As Maria Bottero, editor of Zodiac, states, "It is geometry, with its oscillations between symmetry and asymmetry, which, according to Anne Tyng, offers the key to the reading of the processes and phases of organic and cognitive becoming." Inspired by Louis Kahn, Bucky Fuller, Lancelot Law Whyte (Accent on Form & Aspects of Form), *the zoologist Adolf Portmann* (Animal Forms and Patterns), *and the work of the psychologist Carl G. Jung* (Man and His Symbols & Memories, Dreams and Reflections), *as well as by recent developments in molecular biology, her work is one of synthesis. In her articles,* Urban Space Systems as Living Form *(published in the R.A.I.C. Journal* Architecture Canada) *and* Geometric Extensions of Consciousness *(in* Zodiac 19), *she has found links between basic geometric principles (which Bucky Fuller has called "her discovery of Golden Mean relationships between the whole family of Platonic Solids not previously known by man.") and atomic structure, molecular configurations, biological forms, psychic structure and human creativity.*

point to face *polarity*, can establish the corners of a cube. Two other positions of a tetrahedron, also in *polarity*, define the corners of an octahedron. These three simpler Platonic Solids—the tetrahedron, the cube, and octahedron—represent the *bilateral* forms of the geometric progression. The cube in five positions, in *rotation*, defines the twenty corners of the dodecahedron, and five positions of the octahedron, again in *rotation*, establish the twelve corners of the icosahedron. The tetrahedron in four positions, with *rotational* ordering, also defines the twelve corners of the icosahedron and, in addition, one corner of each of the four positions extend beyond the icosahedron to form the corners of a larger tetrahedron, disclosing a 'vestigial' polarity in this arrangement. These more complex of the Platonic Solids, the dodecahedron and icosahedron, represent the stage of *rotational* forms in the geometric progression and, in the way they are formed, express Divine Proportion ratios (1:1.618) in their relation to the simpler solids, the dodecahedron to the cube and the icosahedron to the octahedron.





The 'fourth dimensional' extension of these *rotational* forms along an axis perpendicular to the radius of rotation, expressing again the *tension of polarity*, defines the *helical* forms of the geometric progression. Since both of the *rotational* forms have pentagonal symmetry around a center, the plan of their *helical* extensions is based on the decagon with its side in Divine Proportion to its 'radius' (of the circumscribed circle). The vertical extension of each turn is in Divine Proportion ratio to the side of the decagon, making a Divine Proportion—vertical turn = ϕ, horizontal turn = ϕ^2, and radius of turn = ϕ^3.



A proportional increase in the radius of rotation of the *helical* forms, expressing *rotational tensions,* results in *spiral* forms, the fourth stage of complexity in the cycle. The only ratio which satisfies the condition of a logarithmic spiral in which width of turns increases at a fixed ratio to length is again the ratio of the Divine Proportion. The shifting order of these forms between polarity and rotation includes the previous order within the new order, so that *rotational* includes the polarity of *bilateral, helical* with its own polarity includes rotation plus polarity, and *spiral* with its own dominance of rotation includes polarity plus rotation plus polarity, with the new bilateral phase including all the ordering of form of the previous cycle.

While it clearly appears to be a special achievement of living forms, the repeating cycle of *bilateral, rotational, helical* and *spiral* apparently is not valid for non-living or 'inorganic' forms. The energies and configurations *progressively* built up in the rhythmic interplay of rotation and polarity result in the *gradual* intensification of structure and the flexible vitality which is a special achievement of 'higher' living forms. 'Inorganic' form is based on a generally more rigid *bilateral* symmetry, as in such atomic structures as graphite, salt, peronskite, copper, diamond, carbon dioxide, and cristabalite.

An example which does indicate *evolution of form through a complete cycle is the structure of hemoglobin,* which took the 22 years work of Perutz and his associates to uncover. This extraordinary configuration of 10,000 atoms includes the *bilateral* tetrahedral bonding of carbon atoms in the glycine molecules, the *rotational* clustering in the heme molecules, the intricately *helical* alpha and beta chains which in turn are folded into irregular *spirals,* and finally, each of the four spiralling myoglobin-type parts nestled and interlocked in a symmetrical tetrahedral arrangement to form an overall *bilateral* symmetry. This *bilateral* symmetry reaffirms a basic simplicity of organization over the complexity of differentiated parts to start a new cycle—a hierarchy of form. With all the internal complexity of this structure, we can barely conceive of the fantastic number of hierarchies within hierarchies which include and give meaningful organization to the 280 million such hemoglobin molecules contained in a single red blood cell—which in itself takes the *rotational* form of a disc. Not only does there appear to be a progress in the life forms corresponding to the geometric progression toward complexity and increase in scale, but this progression can be seen as a repeating one with each new cycle building *hierarchy upon hierarchy which indicate at each stage of development the record of its earlier evolution,* the hierarchies of form and the hierarchies of energy *evolving from the interplay of polarity and rotation.*

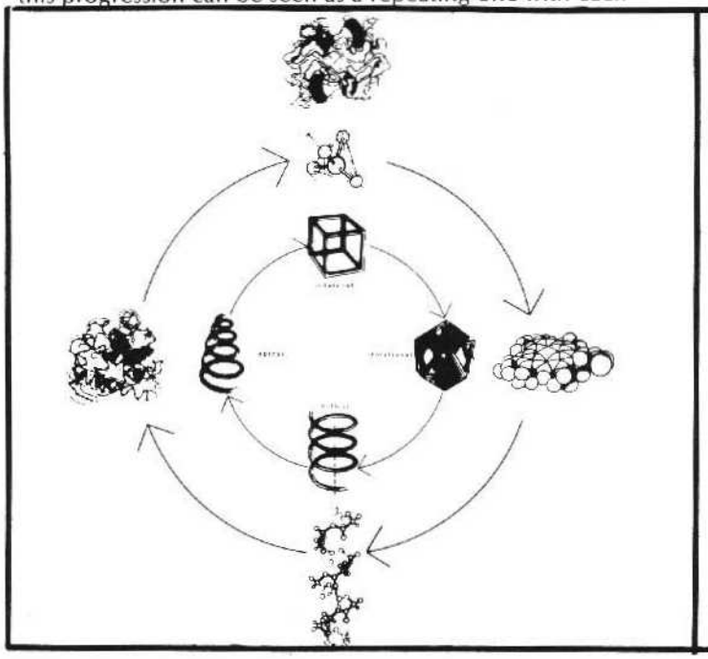
Form thus finds its own form, extending feelers, gills and tentacles to the world around it, in its *rotational* tensioning, expanding its magic circle to new concepts of *space*—from the first articulation of fin or finger to the spiritual dimensions of human creativity.

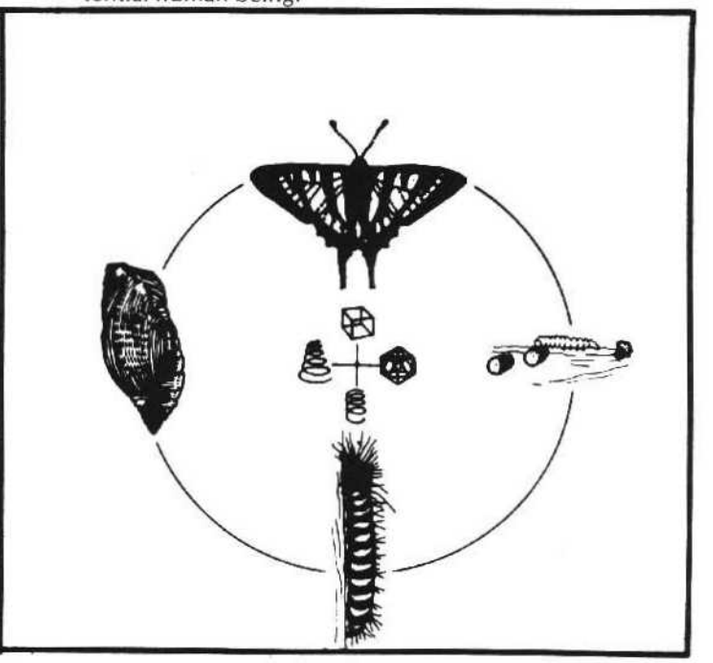
Form finds new *helical* dimensions, elongating to differentiate intake and output, strengthening backbone between tusk and tail, head and anal poles, articulating the tensions between spirituality and sexuality, stretching to new concepts of *time* between awareness of darkest origin and highest aspiration, between the depths of the unconscious mind and conscious thought.

Form stretches to elaborate both length and breadth in *spiralling* shells and branches, antennae and antlers, dividing and subdividing into the intricate filigree of blood vessels and delicate nerve ends, tensioning in *space and time* toward an infinity of matter.

In the fleeting moments of balance between the tension of rotation and polarity, *the tensions of space and time are resolved* in *bilateral* living form, the transformation of the end of complexity to a new beginning of simplicity—a higher order—*the discovery of the cycle.*

The life cycle of the butterfly is clearly defined in four phases: the *rotational* symmetry of its eggs, the *helical* symmetry in its form as a caterpillar or larva, the *spiral* symmetry of the pupa of chrysalis form and its dramatic rebirth in a magnificent form of bilateral symmetry. The frog follows a cycle from the *rotational* symmetry of the zygote, to *helical* embryonic bodystalk, to *spiral* form of the tapering tadpole to bilateral symmetry of the mature frog. The *bilateral* human being evolved from numberless hierarchies of cycles of form, from the primordial ordering of atoms and molecules, goes through the cycle again in the early stages of embryonic development from the *bilateral,* then *rotational* cleavages of the ovum, to the *helical* bodystalk of 18 or 19 days, to the *spiral* embryo of about 4 weeks to the miniature complexity integrated into ultimate *bilateral* form as a 10 week 2 inch embryo of potential human being.





The psychic synthesis of 'rebirth' is far removed from the structure of hemoglobin, but in each case the simplified relationship of complex internal structure creates a new unity, and, in the process of psychic individuation, a new involution of structure creates from all the complexity of a collective and primitive origin an uniquely individual form. So a relationship to the principles of *space, time, causality* and *synchronicity* is valid for the psychic cycle, *space* expressing the tension of individual man with collective consciousness of external environment, *time* the tension between conscious thought and unconscious memory, *causality* the interrelated and combined tensions of both space and time, between the individuating conscious psyche and the vast reaches of primordial memory in the collective unconscious, and *synchronicity* the balancing of tensions, the synthesis of space and time in concepts such as immortality. Jung wrote " . . . The feeling of immortality, it seems to me, has its origin in a peculiar feeling of extension in space and time."[2]

Generally in cycles of human creativity the periods of *rotational tension* relate to periods of external ordering of the psyche, periods of expansion, of materialism and practicality, of openness, *space*, of concern with life, light, sun, of physical comfort and pleasure, of rationalism, of belief in the essential goodness and creativity of man; the phases of *helical tension* relate to periods of internal ordering of the psyche, of subjectivity and instinct, of containment and verticality (polarity), of concern with origins, with past and future and the element of *time*, with death and the principle of evil, of darkness, of emphasis on irrationality, emotion and inner spirit; the phases of *spiral tension* relate to periods of increased tension and containment of opposites, of complexity, of bizarre and exotic styles, of fascination with the occult, of exaggerated motion and energizing of form, forms with complex curves, pointed arches, ovals, winding processionals and labyrinths, tapering towers and spires, forms dematerialized by light, forms with weightlessness, with progressively diminishing horizontal and vertical dimensions, of the *combined tensions of space and time;* and the phases of *bilateral synthesis of tensions* relate to periods of serenity and balance, of unity, of cubic forms with emphasis on horizontality and planar surfaces, forms with rectilinearity, simplicity, axiality and solidity, forms expressing the integration of tensions in equilibrium, forms embodying *the principle of abstraction free of space and time.*

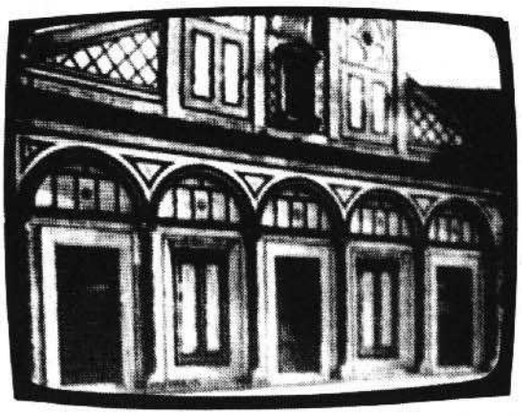
From countless levels of such hierarchies the brain of man was formed, the evolution of human consciousness and the psychic potentials of 'individuation' and rebirth, man's search for the secret of creation, for concepts of immortality free of time, space, causality—for *synchronicity*[3] for the immortal 'static' synthesis of mortal 'kinetic' concepts.

1. Buckminister Fuller lectured on and illustrated relationships of close-packed spheres as proposals of atomic configurations in 1949, printed as "Item O" prepared by North Carolina State School of Design students in 1955. Linus Pauling's *Close-Packed-Spheron Theory of the Nucleus* **appeared in** *Science* **October 1965.**

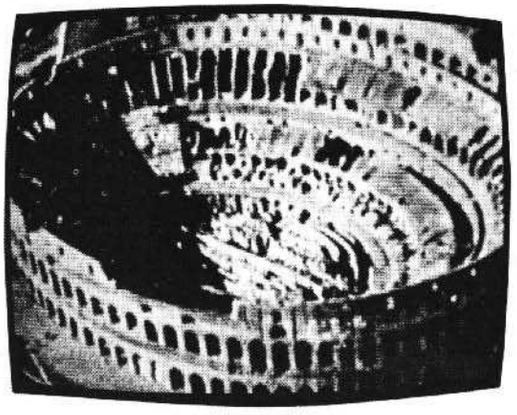
2. P. 142, C. G. Jung, *The Archtypes and the Collective Unconscious.*

3. See C. G. Jung, "Synchronicity—An Acasual Collection Principle," in *The Interpretation of Nature and the Psyche,* **with W. Pauli, Bollingen 1955 Pantheon.**

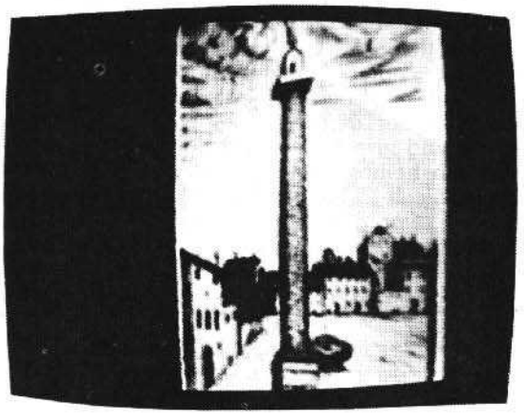
Videotapes of lecture by Anne Griswold Tyng at Parson's School of Design available. Contact Beryl Korot, P.O.B. 135, Ruby N.Y. 12475 for further information.



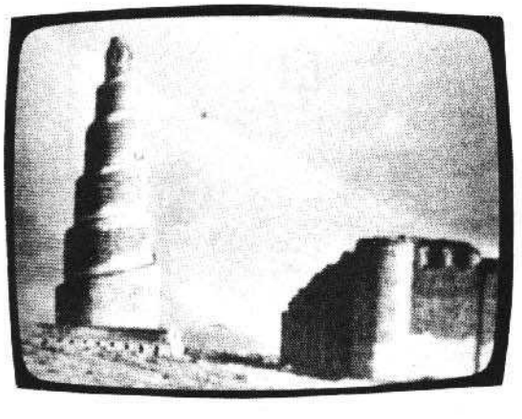
Bilateral



Rotational



Helical



Spiral

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