

MYTH, RITUAL, AND THE ARCHETYPAL HYPOTHESIS

by Eugene G. d'Aquili

Abstract. This paper reexamines the myth-ritual complex, considering myth as a psychobiological stereotype, the neurobiology of myth structuring, the neurobiology of myth transformation, and some religious implications of the myth-ritual complex. Relevant points of comparison between this neurobiological analysis of the myth-ritual complex and Jungian psychological theory are made throughout. Finally the neurobiology of transcendent experiences is considered along with a brief neuroepistemological consideration of the possibility of transcendence itself.

This paper represents an extension of our previous investigations into the psychobiological bases of myth and ritual. In this paper we shall reexamine the myth-ritual complex, partially from the perspective of Carl Jung's archetypal hypothesis, and shall undertake this reexamination under four headings: myth as psychobiological stereotype, the neurobiology of myth structuring, the neurobiology of myth transformation, and beyond the myth-ritual complex: some religious implications.

We have previously presented a model integrating recent split-brain research with W. R. Hess's ergotropic and trophotropic model of neural tuning in order to explain the emotional resolution of opposites presented in a myth which has been integrated into ceremonial ritual (d'Aquili & Laughlin 1975; d'Aquili 1978). Briefly put, we postulated that the repetitive aspects of ceremonial ritual, whether they be solemn movement, dance, chanting, drum-beating, and so on, drive the ergotropic-dominant hemisphere system to the point of third stage autonomic tuning. Thus, at nodal points during ceremonial ritual, third stage autonomic tuning results in spillover from the ergotropic-

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major hemisphere system to the trophotropic-minor hemisphere system, so that both systems fire maximally. At the same time antinomial elements of myth are presented in the ritual, further driving the ergotropic-major with subsequent spillover. The simultaneous firing of both systems creates a brief "oceanic" sense of ineffable unity, during which the logical opposites of myth elements are briefly but powerfully united.

This model has been very fruitful in explaining both the psychological benefits to the individual and the sociological benefit to the group of integrating myth and ceremonial ritual. This integration produces the universal myth-ritual complex so important in the expression of both religious and political values in all societies. Our overall approach up to this time has been that, with the advent of the genus *Homo* and with the evolution of those parts in the neocortex which enabled humans to formulate myths, who simply grafted mythic formulations onto the already phylogenetically ancient ritual behavior, because they found that, by trial and error, powerful integrating emotional effects could be achieved by so doing. Essentially, we conceived of two, essentially separate, neuroevolutionary lines, leading, on the one hand, to primate ritual behavior and on the other hand to the development of neocortical functions. Their integration was seen as an essentially hominid *cultural* event uniting two separate neuroevolutionary sequences. In other words, so far as the myth-ritual complex was concerned we tended to see the myth as primary and the ancient rhythmic ritual behavior as being added to it to effect certain desirable ends in terms of affective resolution of antimonious mythic elements. Metaphorically speaking, in the beginning was the word which danced its incarnation.

MYTH AS PSYCHOBIOLOGICAL STEREOTYPE

While there is little doubt that ceremonial ritual does indeed resolve mythic antinomies, one wonders whether the relationship between myth and ritual is not far more intimate and primordian than we heretofore suspected. In other words, is it possible that the dance gave birth to the word which *then* danced its incarnation?

Bits of evidence from various disciplines began to impress us with the probability that the brain evolves as a more or less integrated whole. It is certainly no news that all parts of the brain and central nervous system are integrated in the functionally intact organism. Why should it be surprising that evolutionary development over time should proceed in a more or less integrated fashion? There are three lines of evidence which suggest that this integrated evolution of the brain may have resulted in primitive stereotyped thought patterns arising from the earliest development of the neocortex out of the paleocortex and

subcortical structures. We must keep in mind that these ancient parts of the brain mediate not only emotional discharge but, more anciently, both physiological homeostasis and the repetitive and rhythmic motor behavior about which we have written at length previously (d'Aquili & Laughlin 1975; d'Aquili 1978; d'Aquili 1983). Thus the earliest glimmerings of what would be recognizable to us as thought may have arisen out of, and in intimate juxtaposition to, the repetitive and rhythmic behavior that goes back to our premammalian ancestors. It should not be surprising, therefore, that such thought might be stereotyped and repetitive in character, and that mythic themes have a general and universal character.

At any rate the lines of evidence that point to this conclusion are, first, the increasing evidence that whatever is present in one neural system is present in all others. This leads to the conclusion that what is acted tends to thought as thought becomes possible. Second, there is evidence of the overwhelming input of rhythmicity into the developing fetus and neonate. Thus rhythmicity and repetitive movement is seen as the very matrix in which perception and cognition develop ontogenetically. Third, there is direct evidence for prepared recognition and prepared learning. We shall now consider each of these lines of evidence in a bit more detail.

First of all, there are data suggesting that whatever is present in one neural system seems to be at least virtually present in all other neural systems. For the purposes of this paper, let us consider five major neural systems: visual, auditory, tactile, conceptual/cognitive, and motor. Thus, for example, it has been known for some time that whatever is heard tends to be repeated. In normally functioning individuals actual *physical* repetition of whatever is heard is inhibited by mechanisms within the frontal lobe leaving only an internal repetition within our heads. When the frontal inhibitory mechanisms are released in certain pathological states, the phenomenon of echolalia occurs in which individuals obligatorily repeat whatever they hear. Likewise there is an inbuilt tendency to have a representation in the motor system of whatever movement appears in the visual system. As one might suspect such imitation is ordinarily inhibited in normally functioning individuals. There are certain pathological conditions, however, in which patients exhibit what is known as echopraxia. Such individuals necessarily perform any action they see. In a recent article in *Science*, T. M. Field et al. demonstrated this visual motor connection in the imitation of neonates of facial expressions presented to them (Field et al. 1982). The auditory-motor connection is seen in the rare condition of *latah* in which the patient obligatorily obeys whatever he hears. There is also a very clear cognitive-verbal-motor connection.

The motor manifestation of cognitive-verbal expression is ordinarily inhibited. However, it tends to break through in normal individuals when we "talk with our hands." Thus there appears to be a powerful inbuilt mechanism not only to act out our thoughts but even to think our actions.

Furthermore, since the advent of mammals upon this planet every mammal fetus is exposed throughout the period of its gestation to the rhythmic ebb and flow of amniotic fluid as its mother moves. Nor does the rhythmic interchange between mother and child end with birth. Licking behavior, grooming, cuddling, rocking, cooing, and singing among humans, all surround the newborn infant with a veritable ocean of rhythmicity. Is it possible that the evolving paleocortex and later neocortex could have developed their complex image-forming and cognitive abilities totally divorced from this deluge of rhythmic input? We propose that not only do we think our actions but that higher cognition itself may arise out of action. Perhaps the dance did give rise to the word after all which later appropriated the dance to its own ends.

Jung, of course, maintained that instinctive behaviors were always associated with potential images and feelings of a general and rather stereotyped nature. The crucial question to be asked is: Is there any evidence aside from Jungian clinical and cultural data to point to primitive and universal thinking patterns intermediate between the purely unconscious motor response and the complex gamut of neocortically mediated learning? In other words, is there evidence for a stereotypic and general organization of thought which might have its origin in the paleocortex or even in subcortical structures? Such evidence would powerfully support the hypothesis of primitive cognitive organization evolving out of brainstem, midbrain, and extrapyramidal structures which are primarily involved with the modulation of repetitive and rhythmic motor behavior as well as with physiological homeostasis. In short, such evidence would go a long way toward supporting, in broad outline at least, Jung's archetypal hypothesis.

In 1968 P. Brown and H. Jenkins demonstrated that pigeons learn to peck a lighted key that is paired with grain even though pecking the key has no effect on grain (Brown & Jenkins 1968). Although somewhat startling in itself in terms of the classical laws of learning, this result failed to produce full appreciation of its significance. This had to await the publication the following year of a paper by D. R. Williams and H. Williams entitled "Auto-Maintenance in the Pigeon: Sustained Pecking Despite Contingent Nonreinforcement" (Williams & Williams 1969). This paper reported the results of four experiments conducted as a follow-up to those of Brown and Jenkins. The first showed that pecking was sustained even when pecks turned off the key and thus

prevented reinforcement. The second experiment controlled for the possible effects of stimulus change and generalization. The remaining two experiments explored procedures that manipulated the tendency to peck the negatively correlated key by introducing other response keys that had no scheduled consequences. It became clear that the pecking behavior becomes established and maintained by stimulus-reinforcer relationships independent of explicit or adventitious contingencies between response and reinforcer. This is simply a technical way of saying that there is something about the stimulus (the lighted key) in and of itself that reinforces the pecking behavior whether or not food is dispensed. It may be simply that the lighted key looks like a kernel of corn. The conclusion is that there is a built-in mechanism that markedly facilitates learning when a lighted key (or something similar in size and shape, etc.) is the stimulus. The work of Brown and Jenkins and of Williams and Williams has led a number of investigators to reevaluate certain "anomalies" in learning experiments that had either been ignored, considered as error variance, or explained away by mechanisms more in keeping with orthodox learning theory. What has emerged is recognition that certain behaviors are very easily learned by some species, often even after only one trial, while they require the usual or "normal" number of trials to be learned by other species. Furthermore, those behaviors for which there is "preparedness" to learn seem to have marked survival value for that particular species. Thus it has been postulated that the similarity of the lighted key to a grain of corn or other cereal is sufficient to activate the prepared learning mechanism once it has been paired with a real grain of corn on only one or two occasions. Thus the pecking of the key is very rapidly established and is maintained over very long periods of time even when no food is forthcoming. Considering the diet required by a pigeon to survive, the existence of neural connections that markedly facilitate learning in this area is of obvious evolutionary significance for the species.

In a critique of what has become the accepted learning theory explanation of the genesis of phobias, M. E. P. Seligman writes:

According to Pavlov's view of conditioning, the choice of CS (conditioned stimulus) is a matter of indifference. "Any natural phenomenon chosen at will may be converted into a conditioned stimulus. . . any visual stimulus, any desired sounds, any odor and the stimulation of any part of the skin" (Pavlov 1928, 86). This is the heart of the general process of learning and, by this widely held view, any CS which happens to be associated with trauma should become phobic. But a neglected fact about phobias is that, by and large, they comprise a relatively non-arbitrary and limited set of objects: agoraphobia, fear of specific animals, insect phobias, fear of heights, and fear of the dark, etc. All these are relatively common phobias. And only rarely, if ever, do we have pajama phobias, grass phobias, electric-outlet phobias, hammer phobias, even though

these things are likely to be associated with trauma in our world. The set of potentially phobic events may be nonarbitrary: events related to the survival of the human species through the long course of evolution (Seligman 1970, 312).

From a biogenetic structural point of view, "preparedness" would seem to imply the existence of specific neural structures that, once activated, determine the alignment of the organism to its environment both cognitively (insofar as this may be present in less developed organisms) and certainly behaviorally. Interestingly, Seligman considers the possible significance of "symbolism" in terms of preparedness. He writes:

So, for a biologically oriented learning theorist, to what can the notion of symbolism account? A is symbolic of B, if and only if human beings are prepared in the sense defined, to learn that A is associated with B. If humans can acquire with A the properties of B after only minimal input, then it is meaningful to say that A is symbolic of B.

Even more speculatively, does preparedness range beyond simply symbolic associations? Are there ways of thinking in which humans are particularly prepared to engage, as [E. H.] Lennenberg (1967) has argued for language and cognition? If association, causal inference, and forms of cognition are prepared, are there stories that man is prepared to formulate and accept? If so, a meaningful version of the racial unconscious lurks close behind (Seligman 1971, 317-18).

The last sentence is rather startling coming from a learning theorist, but it does indicate that biological science may be at the threshold of being able to offer a solid empirical explanation for the legitimate findings of such diverse scholars as Jung and Claude Lévi-Strauss. Although the evidence is not yet conclusive, all of this presents us with the very real possibility that there is some sort of prepared recognition of important persons or elements in our environment, that is, a prepared recognition for persons or objects in our environment which from a phylogenetic and evolutionary perspective are either essential for our survival or represent serious threats to our survival. Furthermore, we must face the very real possibility that not only is there a prepared recognition of elements in our environment which are related to fundamental survival but that there also may be a prepared way of relating these elements to each other and to the ego. Such a prepared way of relating these elements would presumably be the optimal or most adaptive configuration for survival. The organism would be driven as much as possible to organize the real world to conform to that configuration which would maximize the chances of survival. In order to consider properly this theme, however, we must first consider the general neuropsychological mechanisms for the structuring and transformation of cognitive structures such as myth themes whether or not there is prepared recognition for any of the elements of the cognitive

structure and whether or not there are prepared ways of relating the various elements. To jump ahead for a moment we will suggest that myths, whether dream myths or social myths, differ from general cognitive structures only in that there may be a degree of preparedness in the recognition of at least some of the structure's elements and a degree of preparedness or preferential selection for a particular surface structure of a myth under certain psychological and/or environmental conditions. Other than for this element of preparedness, myths are structured and undergo transformations in the same way that general cognitive structures do. To understand the dynamics of myth structuring, therefore, we must first attempt a neuropsychological understanding of cognitive structures in general. In the process of doing this we hope that we will be able to suggest a fundamental relationship between the thought of Jung and that of Lévi-Strauss.

COGNITIVE STRUCTURES AND THE NEUROBIOLOGY OF MYTH STRUCTURING

A cognitive structure may be defined as all the possible primary, logical or affective relationships which obtain between elements comprising a single semantic domain. For example, the set of all the cognitive elements which together comprise the semantic field of "social organization" and all their possible relationships comprise the social organization structure. Thus myth themes would also be cognitive structures. By this definition a structure is an abstract entity. No single cognizing individual possesses the total cognitive structure encoded within his central nervous system, usually because all the possible cognitive elements which theoretically comprise the semantic domain of the cognitive structure have not been "fed into the computer" so to speak. It is certainly true that any single cognizing individual does not possess within consciousness the totality of the structure even if he perchance possesses all the elements of the set, simply because his *conscious* understanding of, for example, the myth of the solar hero necessarily relates the elements in a given way. This must exclude the other potential ways of relating the elements from stable or structural consciousness under normal conditions.

In a previous paper (d'Aquili 1978), we have suggested at least six operators within the brain which operate upon sensory input, organizing it in specific ways producing cognitive structures such as myth themes. Space does not permit a review of the neuroanatomical and neurophysiological properties of each operator. Figure 1 summarizes the neural correlates of the cognitive operators. We will briefly list and describe each of the six operators at this time with specific reference to the structures and relationships depicted in figure 1. The causal

operator (A) permits reality to be viewed in terms of causal sequences of abstract elements. The abstractive operator (F, G, H) permits the formation of a general concept from the perception of empirical individuals. The binary operator (inferior parietal lobule) permits the extraction of meaning by ordering abstract elements into dyads involving varying degrees of polarity so that each pole of the dyad derives meaning from contrast with the other pole. This operator is particularly important in the generation of myth. The formal quantitative operator (angular gyrus) permits the abstraction of quantity *per se* from the perception of empirical individuals, generating arithmetic and mathematics. The value operator (D, E) permits an affective valence to be assigned to various elements of perception and cognition. The holistic operator (I, J, K) permits the world or significant portions of the world to be viewed as a whole or as a gestalt.

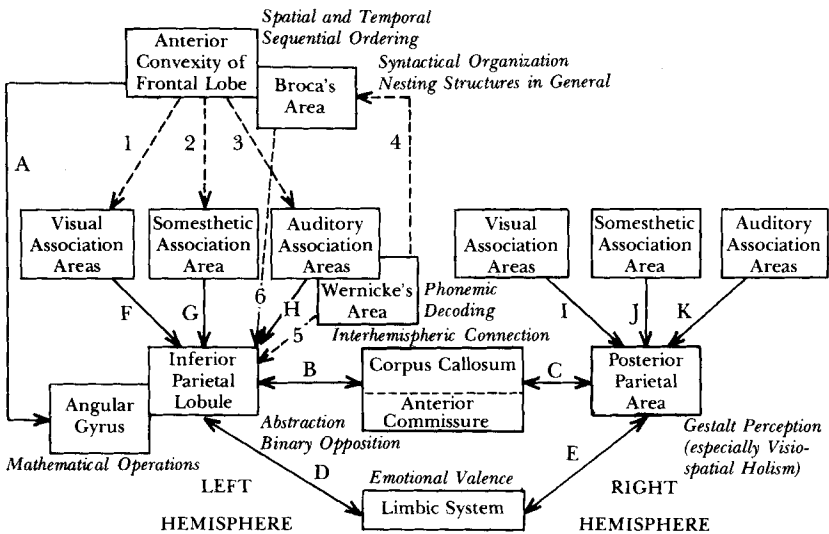


FIG. 1.—Functional diagram of neural correlates of cognitive operators. This diagram represents the direct (solid lines) and indirect (dotted lines) neural connections underlying Cognitive Operators.

- 1, 2, 3 Spatiotemporal ordering of sense percepts.
- 4, 5, 6 Cognitive-language interpretation.
- 6 Hierarchical ordering of cognitions into nesting structures.
- A Sequential ordering of abstract concepts underlying causal thinking.
- B, C Mechanism of "compression" of sequential elements into perceived unity (related to underlying meaning).
- E, D Mechanism of communication of gestalt perception to left hemisphere via emotional discharge.
- D Emotional valencing of individual conceptual elements.
- F, G, H Sensory input into "cross-modal" system resulting in abstraction (generation of conceptual elements) and binary opposition.
- I, J, K Sensory input into "gestalt" mechanism resulting in holistic perception (visio-spatial element especially strong).

These cognitive operators, or if one wishes to be more precise, the neural structures which operate on quanta of experience to organize them in specific ways, produce cognitive structures of which myth themes are a subset. Cognitive structures are simply the subjective manifestation of ways in which reality is organized by the operators. In other words, depending on which operator is functioning, the world is perceived in terms of abstract casual relationships, relationships of binary opposition, synthetic unity, and so on.

We must emphasize here that in ordinary day-to-day cognitive functioning these operators function in concert, each relating its function to that of the others in order to abstract maximal meaning from experience. In other words, the brain operates as a functional unit. Predominant function of any single operator to the exclusion of the others is a rare, although as we shall see not altogether impossible, event.

These operators allow us to propose that the most sophisticated mathematical, logical, or grammatical operation can ultimately be reduced to the simplest spatial and spatiotemporal analysis, which in itself can be understood as an evolutionary elaboration of the more gestalt operation of the nondominant hemisphere of the brain.

Consequently, we would argue that the apparent multiplicity of relationships between elements of a cognitive structure such as a myth theme can be reduced to a relatively small list of ultimately basic analytic relationships including inside-outside, above-below, left-right, in front-behind, all-nothing, before-after, simultaneous-sequential, and so on. These relatively few basic spatiotemporal relationships can be enriched by combining them with affective or emotional valence. Thus, "within" is usually identified with good and "without" with bad, "above" with good and "below" with bad, "right" with good and "left" with bad, "in front" with good and "behind" with bad, "all" with good and "nothing" with bad, and so on. These affective valences are *not* absolute and the reverse of any of them may occur. It is interesting to note, however, how frequently the relationships just mentioned do in fact culturally receive the affective valence stated. We feel that there is a reason for this association which involves issues of simple preservation, "above" usually being safer than "below" and therefore good, "within" being usually safer than "without" and therefore good, and so on. Nevertheless, we must reiterate that these associations are not absolute and the reverse associations can theoretically occur and occasionally, in fact, do occur.

Instead of embarking on the impossible task of listing all the possible complex relationships that can exist between elements of a cognitive structure, we have chosen rather to attempt to reduce them to a handful of simple spatiotemporal relationships. We feel that it can be practically demonstrated that all complex relationships whether they

be mathematical, logical, or grammatical, can be reduced to either one or a combination of the basic spatiotemporal relationships we have just considered. This is true with respect to all relationships with the single exception of the category which we have already briefly alluded to, that is, affective or emotional relationships. These latter represent feeling states and are of crucial importance since they, in one way or another, enter into moral and value judgments and underlie the emotional impact of myths. On the most primitive level they can be resolved into whether a stimulus is positive or aversive for an organism. Simply put, that which is good is that which provides either immediate or delayed gratification for the organism; that which is bad is that which the organism experiences as unpleasurable or not conducive to survival. As with the spatiotemporal relationships the basic affective relationships can be elaborated into a number of subtle feeling states and can be related to perception and cognition in various ways. The neurophysiological substrate for such affective-cognitive-perceptual linkages is the numerous connections which exist between various limbic structures and either the secondary sensory association areas (in the case of perceptions) or the inferior parietal lobule (in the case of cognitions).

THE NEUROBIOLOGY OF MYTH TRANSFORMATIONS

The issue of the biological base of transformations within a structural system is one which has received little or no attention by structuralists whether they be anthropologists (e.g., Lévi-Strauss), linguists (e.g., Chomsky), or developmental psychologists (e.g., Piaget). Before we consider the problem, however, we must attempt to unravel some of the confusion concerning the concept of transformation itself, which arises from its being used in the contexts of various systems all of which purport to be structuralist in a general sense. Thus, for biologists who deal generally with "open structures," the concept of transformation often means replacing one set of elements (*A*) with another set of elements (*B*), with a one-to-one correspondence obtaining between a given element in set *A* and a given element in set *B*. Thus they will often speak of subjective perceptions as transformations of incoming sensory stimuli. In a theoretical vein Freudian psychoanalysis uses the same meaning of transformation in the replacement of elements of cognition and affect with a totally different set of elements resulting in the symbology of dreams and fantasy material. This is not the sense in which we are considering transformation here.

A second meaning of transformation is best exemplified by the sense given to the word by Lévi-Strauss. The elements of a structure are invariant. The meaning of transformation is associated only with the rules for their recombination. Structures understood in this sense are

"closed" systems; the meaning of transformation here is the polar opposite of the sense just given for "open systems." The "closed" systems sense of the word transformation is more in keeping with what we are attempting to understand in this paper, but we would dispute the Lévi-Straussian position that such transformations occur within completely closed structures.

A third, more comprehensive meaning of the word transformation is the one given most often by developmental psychologists. In this sense more complex cognitive structures such as myth themes (in which are embedded potential models of the world) evolve from simpler structures. More specifically, developmental psychology is viewed as the progressive elaboration of a series of nesting structures of increasing complexity. The relationship of the more complex to the less complex structures involves rules of transformation which include, first, possible alteration or substitution of one element for another as in the case of the fully open structures, second, addition of new elements of content which were not previously present in the structures, and, third, specific rules of reorganization of all the elements of content such as is conveyed in the Lévi-Straussian understanding of transformation.

Such a complex system of transformation allows for the classical Piagetian model of nesting structures which has often been described as the form of the simpler structure becoming the content of the more complex. Recent evidence suggests that the human capacity to organize data in terms of the nesting of hierarchically organized structures may be generally organized by the inferior frontal convolution more generally known as Broca's area (Grossman 1980). It has been known for some time, of course, that the syntactic structure of language is organized by this area of the brain, and it has been presumed that the nesting structures which generate language in N. Chomsky's model likewise reside in this area. What is exciting about this new evidence is that it seems to indicate that the inferior frontal convolution on the dominant side may be generally responsible for any organization of thought into hierarchical structures (not just linguistic organization). Such a structural system may be called a "semiclosed" system. We choose to call such structures semiclosed because we feel that this term emphasizes the fact that they are highly stable neural and cognitive systems, not easily changed, but not absolutely and permanently fixed in either an ontogenic or in a phylogenetic sense as the Lévi-Straussian model would seem to imply.

The major question with which we are concerned here is, given the principal cognitive elements contained within a semantic field (surface structure of a myth in this case) and given a number of possible relationships between each dyad of the cognitive elements (the possible

relationships being generated by the neural structures which we have discussed above), why is it that any given set of relationships in fact obtains and under what circumstances will these relationships change? Put in other words, this last question could be formulated: Under what circumstances does the surface manifestation of a structure (myth) undergo a transformation?

THE QUESTION OF MYTHIC TRANSFORMATION

If the accumulating evidence with regard to prepared learning and prepared recognition holds up so that the archetypal hypothesis is vindicated, it would seem that, at least in the case of myths which are archetypically important, a specific configuration of myth elements represents the optimal surface structure at a particular point in the life cycle of the developing individual. Reorganization of the myth elements into other surface structures is possible, and under the stress of traumatic external circumstances set reorganizations can and do occur. Thus the myth of a nurturing mother would seem to be appropriately activated under conditions of sufficiently good mother-infant bonding. But variations on that surface structure are always possible and in fact are virtually present even when the nurturing mother myth is dominant. Under certain circumstances the nurturant mother can undergo transformation to become the devouring mother or terrifying monster. This is clearly not another myth but an alternative manifestation of the mother myth, albeit a negative one. Jung implies that the transformation of the early dominant myth may occur as a function of the normally progressing archetypal program, or as an attempt to correct the situation should a negative form of the myth be generated by what Anthony Stevens calls a frustration of archetypal intent. Whether Jung's exact formulation of archetypal dynamics is correct or not, is not what we wish to address here. What does seem probable in the light of the prepared learning evidence is that all the possible permutations of a myth structure are not equivalent but that one surface structure is optimal at any given point of psychological development. Here Jung differs from Lévi-Strauss in that the latter would see all the surface manifestations as inherently equivalent, any one being singled out at a certain time and place only because of environmental circumstances. Although Jung may be correct in that all surface manifestations of a myth do *not* seem to be equivalent, nevertheless he does not seem to make clear that perennial possibility of transformation of surface structure under certain environment exigencies. It was Lévi-Strauss's supreme accomplishment that he saw the formal equivalence of all the possible surface structures even if he did not attend to their differences in psychobiological import.

Nevertheless Jung and Lévi-Strauss seem to have been onto much the same thing, the differences between them often being one of emphasis.

Considering the work of Lévi-Strauss and his followers, as well as the finding of a number of cognitive psychologists (Lévi-Strauss 1963a; 1963b; Piaget 1970a; 1970b; Harvey, Hunt & Schroder 1961), it seems not only that structures such as myths are composed of relationships between dyads of cognitive elements, such relationships setting one element off against another for semantic clarity, but furthermore that the relationships *themselves* can be grouped into dyads involving opposing the spatial, temporal, or affective relationships which we have considered above such as up-down, left-right, before-after, good-bad, and so on. One of the few ways in which the work of cognitive psychologists and anthropologists such as Lévi-Strauss (1963a; 1963b; 1964) can be made to make sense is if we postulate that it is inherent within the machinery of the brain to relate the cognitive elements of a structure in such a way that for every pair related by one aspect of a relationship such as "up" *at least* one other pair must be related by the opposite relationship, that is, "down." Preliminary results from our research into dream structure with patients indicates that this may well be the case. Furthermore, one must postulate that these relations obtain in such a way that, if the elements related by "up" are changed so that they are now related by "down," then at least some of the elements formerly related by "down" must now become related by "up," unless, of course, the reciprocal change would result in nonsense. If one does not postulate some such system of *reciprocal change* attendant upon transformation, one simply cannot explain, for example, the almost algebraic neatness of Lévi-Strauss's famous solution of affective valence between son-father and sister's son-mother's brother (Lévi-Strauss 1963a; 1963b). Note that in the myth of a nurturant mother there may be a number of elements of prepared recognition, but the mother element is certainly one. The core prepared relationship in this myth is a positive affective valence between the mother element and ego. By the postulate of reciprocal change, once the valence between the mother element and ego is changed from positive to negative there must automatically be at least one compensatory change from negative to positive between other elements in the myth structure. If the postulate of reciprocal change proves true, then one or two changes of valence between core elements could have a dramatic effect upon the overall surface structure of the myth.

We stated that the postulate of reciprocal change is operative only when the reciprocal change involves a new surface structure that has meaning. Certain combinations can obviously involve nonsense. It would appear at this point that we are invoking the subjective entity of

meaning to be the constraint within which basic neurophysiological processes operate. If this were true, then the phenomenon would be dependent upon the epiphenomenon, and we would be reduced to absolute idealism. On the contrary, we would state rather that those constellations of relationships between cognitive elements of a structure which we consider meaningful possess the quality of "meaningfulness" simply because they are the subjective manifestations of inherently stable relationships within the neural microstructure. The locus of such relationships possibly resides in various configurations of post-synaptic slow wave potentials. The very stability of the overall constellation of relationships and of the neural events which generate them is precisely what we mean when we state that a given surface manifestation of structure is meaningful. Meaningfulness, therefore, derives from the stability of neural connections. This stability, in turn, derives from the selection of certain combinations of neural configurations as being adaptive and thus conducive to survival. It is only in this sense of the word *meaning* that we will say that meaning imposes constraints upon the postulate of reciprocal change during a transformation. Thus any given cognitive (and by extension social) structure is limited in the number of its possible transformations not by the theoretical total of all the permutations generated by the postulate of reciprocal change but rather to a number which represents a subset of that total set, that is, those possible transformations which are also meaningful subjectively, that is to say those which have adaptive properties and represent a high degree of isomorphism with the external world.

The answer to why any given constellation (surface structure) of relationships among elements of a semantic field (myth) is present and stable at all at a given time is simply because it is adaptive psychophysiological for an individual or socioecologically for a group. It is both the genetic program and the environment which ultimately impose the constraints which define exactly which surface manifestation of a deep structure will obtain, either cognitively or socially, at any given time. It is change in the environment, ultimately, which causes a disconfirmation of a given surface structure as representing the optimal alignment of the ego with the external world and which forces a change in one or more relationships between cognitive elements. Once one change is forced the entire system becomes rearranged by the postulate of reciprocal change, generating a number of possible configurations, until one which is more adaptive to the circumstances becomes fixed (either for the individual or for the group). It seems to us that, when Anthony Wallace (1961) speaks of maze-way resynthesis, he is essentially talking about the rearrangement of relationships between multiple dyads (usually under the influence of intense limbic arousal) of a superordinate structure involving the relationship of the individual to the

universe as a whole. Thus, maze-way resynthesis can be seen as a transformation of the most encompassing superordinate cognitive structure under conditions of intense stress. It is a testimony to the stability of cognitive structures that only the most severe stresses, the most intense states of limbic arousal, are able to facilitate the transformation of important superordinate structures.

Myths are a subset of general cognitive structures. They seem to obey general rules of transformation similar to language, such rules for the most part deriving from the neocortex and limbic system. Where they differ from general cognitive structures is that they seem to possess at least one and maybe a number of elements of prepared recognition. They further differ in that each myth theme seems to have an ideal, or at least optimal, surface manifestation at a given point in psychological development. All the possible surface manifestations are not inherently equivalent, although the nonideal forms can be generated under adverse environmental conditions. When we say that there is an optimal or preferred surface structure, what we mean is that the core elements of the myth are related to each other in a "prepared" fashion. Thus myths can be seen as transitional structures containing "prepared" elements and even relationships, presumably arising from paleocortical and even subcortical levels of the brain but nevertheless fully incorporated into the system of cognitive structures and transformations governed by the neocortex and by direct neocortical-limbic connections. Humans may use rhythmicity as one way powerfully and affectively to resolve the polarities of myth structure, but myth itself arises, at least partially, from the elaboration of those parts of the brain which generate and moderate rhythmicity in the ritual behavior of lower animals. Thus it appears that the word arises from the dance only to use the dance for its incarnation both in psyche and in society.

BEYOND THE MYTH-RITUAL COMPLEX: RELIGIOUS IMPLICATIONS

In this section we will see how the myth-ritual complex we have been discussing fits into an aesthetic-religious continuum, one pole of which is represented by the evanescent aesthetic sense and the opposite pole by the epistemic state of absolute unitary being.

In a previous paper we described eight primary epistemic or knowing states, and particularly contrasted our baseline epistemic state with a rare mystical state which we called absolute unitary being (d'Aquili 1982, 361). AUB is a state described in the mystical literature of all the world's great religions. When people are in that state, they lose all sense of discrete being; even the difference between self and other is obliterated. There is no sense of the passing of time, and all that remains is a perfect timeless undifferentiated consciousness. When such a state is

suffused with a positive affect there is a tendency to describe the experience after the fact as personal. Hence, such experiences are often described as a perfect union with God (the *unio mystica* of the Christian tradition) or else the perfect manifestation of "God" in the Hindu tradition. When such experiences are accompanied by neutral affect they tend to be described after the fact as impersonal, generating concepts such as the abyss of Jakob Böhme, the Void or Nirvana of Buddhism, or the Absolute of a number of philosophical traditions. There is no question that, whether the experience is interpreted personally as God or impersonally as the Absolute, it nevertheless possesses a quality of transcendent wholeness without any temporal or spatial division whatsoever.

We have postulated that these rare states of AUB are attained through the "absolute" functioning of the holistic operator. In all likelihood the neurological substrate for the holistic operator involves the function of the parietal lobe on the nondominant side. It is clear from the split-brain work which has been quoted at great length in these and other issues of *Zygon* that the nondominant hemisphere is certainly intimately involved in the gestalt perception of external reality. In certain rare cases, often induced by meditation, ritual behavior, starvation, hypoxia, prolonged sensory deprivation, or various drug effects, the holistic operator can function as if it were on its own, independent of content upon which to impose wholeness. In these rare states of absolute function the operator generates simply the sensation of wholeness itself devoid of any specific content. P. Bakan (1976, 66-68) has shown increased EEG activity in these areas during the period of inevitability just prior to and during orgasm. It is interesting that during orgasm there is often a very brief period of the sense of obliteration of personal boundaries and of general wholeness. We are not implying that the state of AUB is simply a protracted orgasm. But the activation of the same right-brain centers does impart some of these characteristics, however brief, to both states. Nevertheless the state of absolute unitary being does have certain unique properties.

In 1975 my coworkers and I first presented a model, since considerably elaborated, which attempted to explain the attainment of absolute unitary being by integrating Hess's ergotropic-trophotropic model with the then relatively new split-brain research which was coming out of Roger Sperry's laboratory and was being elaborated by J. Levy, J. E. Bogan, C. Trevarthen, and others. In this model we proposed that the ergotropic system be extended upwards to include the dominant hemisphere and that the trophotropic system be extended upwards to include the nondominant hemisphere. By driving either one or the other system to a state of saturation we postulated that the other system would be briefly stimulated as we know occurs in third state autonomic

stimulation such that, for a brief period, there would be maximal firing of both systems. Thus, during absolute unitary being not only would there be maximum discharge from the holistic operator and other neural structures on the nondominant side generating a sense of absolute wholeness, but there would be an intense firing of structures on the left or dominant hemisphere associating with that wholeness the intense consciousness of the reflexive ego associated with normal left-hemispheric functioning. Therefore, the experience of absolute unitary being is not a vague sense of undifferentiated wholeness but a state of intensive consciousness since both systems are maximally firing.

If this model is correct it should be obvious that AUB involves an *extreme* state of functioning of the holistic operator. More usual or ordinary perceptions reflect some sort of balance between analytic and synthetic or gestalt perception. We would propose, however, that even in more normal perceptions, whenever the sense of wholeness exceeds the sense of parts or discrete elements, there is an affective discharge via the right brain-limbic connections which G. E. Schwartz and others have shown to be of such importance (Schwartz, Davidson & Maer 1975, 286-88). This tilting of the balance towards an increased perception of wholeness, depending on its intensity, can be experienced as beauty, numinosity (religious awe), religious exaltation, and finally AUB. We are proposing that there is an aesthetic-religious spectrum, and the point on this spectrum that any perception has depends on how far tilted it is in the direction of wholeness. In other words, the more the holistic operator functions in excess of a state of balance with the analytic functions of the left hemisphere, the stronger will be the associated emotional charge. Thus in any aesthetic perception, whether of a piece of music, a painting, a sculpture, or a sunset, there is a sense of meaning and wholeness which transcends the constituent parts. In aesthetic perceptions, however, this transcendence is slight to moderate. In the next stage along this aesthetic-religious continuum the holistic operator functions with a degree of intensity which generates a very marked sense of meaning and wholeness expanding well beyond the parts perceived or well beyond the image generated. This experience Jung characterized as numinosity or religious awe. It is often experienced when an archetypal symbol is perceived or when certain archetypal elements are constellated in a myth. It is an experience during which the connotation of what is perceived vastly exceeds the denotation.

In applying this material to Jungian concepts we should note that, although the neurological substrate of archetypes may be found in the paleocortex and even in subcortical structures, the imaginal representation of these archetypes in *Homo sapiens* must clearly involve the right or nondominant hemisphere of the neocortex. Hence the intense

association of powerful functioning of the holistic operator with archetypal images and symbols should not be surprising since both are primarily located in the right hemisphere. It is at this second stage along the aesthetic-religious continuum that the myth structuring and transformational system described in the first two parts of this paper is located. Insofar as the myth-ritual complex is always involved in the integration of opposites, fairly strong activation of the holistic operator is required to achieve the numinous sense of wholeness.

As we move from numinosity along the spectrum, that is, as the function of the holistic operator more and more overwhelms synthetic perception, we reach the state of religious exaltation which R. M. Bucke has called cosmic consciousness (Bucke 1969). This state is characterized by a sense of meaning and wholeness to all discrete being whether subjective or objective. The essential unity, purposefulness, and goodness of the universe is perceived as a primary datum in spite of knowledge and perception of evil in the world. During this state there is nothing whatever that escapes the mantle of wholeness and purposefulness. But this state does not obliterate discrete being, and it certainly exists within a temporal matrix.

As we move beyond the state of religious exaltation and cosmic consciousness we approach absolute unitary being. This represents the extreme of the aesthetic-religious continuum and the absolute functioning of the holistic operator. During this state there is nothing but a timeless and perfect sense of meaning and wholeness without any perception of discrete entities.

Jung makes much of what he calls the transcendent function as the goal not only of therapy but of life. By transcendent function Jung means the perfect balance between the rational and the nonrational, between the ego and the self. Put in terms of the split-brain neurophysiology we have been discussing it means inhibition across the corpus callosum resulting in maximal integration of the left and right hemispheres. This integration is expressed in Jungian thought by the archetype of the self and its symbols including mandalas and various quarternary structures as the cross. But for Jung *conscious* integration of opposites cannot occur. It can occur at an unconscious level and is expressed in consciousness only via a symbol. Thus he writes: "It must be remembered, however, that division is only true within the sphere of consciousness, where it is a necessary condition of thought. Logic says *Tertium non datur*, meaning that we cannot envisage the opposites in their oneness. In other words, while the abolition of and obstinate antinomy can be no more than a postulate for us, this is by no means so for the unconscious, whose contents are without exception paradoxical or antinomial by nature, not excluding the category of being" (Jung 1954, 86).

However, we have maintained that it is possible for humans to experience the unity of opposites existentially in consciousness, not only during the fairly rare state of AUB but much more commonly at brief nodal points during ceremonial ritual via neurophysiological mechanisms which we have presented elsewhere (d'Aquili & Laughlin 1975). There is no doubt that the transcendental function is an extremely desirable state, and a difficult one to achieve, but in terms of the aesthetic-religious spectrum we have been discussing, it represents the second stage of that spectrum. Thus it seems that the symbols of the self and indeed the transcendent function itself can be looked upon as signs beckoning us forward to the experience of absolute wholeness. We might even say that every incremental taste of wholeness is a greater taste of God. If it is true that in AUB we get intense simultaneous functioning of both hemispheres, then one experiences not only the sense of absolute wholeness from the holistic operator on the right side but also the sense of perfectly conscious reflexive ego from the left united to it. Presumably the absolute functioning of the holistic operator by itself will generate only a dimly conscious sense of absolute wholeness. This is not to say that there are discrete elements to it but only that the quality of its consciousness is at best dim. This is the sea out of which we were born. This was the ocean out of which consciousness developed by the process of discriminating individuated being. But the ocean to which we are called is one of intensely luminous though undifferentiated consciousness. It is the perfect being conscious of itself. It is the substantive wholeness of left and right of which Jung's transcendent function is but an intimation. The Gnostics referred to what Jung would call the symbol of the *Self* as the *enkekalymnenos* or the veiled one. That is because it points beyond itself, indeed beyond the archetypal system itself, to what those who have experienced it feel to be perfect being.

Considering these various states of consciousness makes one wonder if Plotinus's system of emanation and epistrophe (or return) was so far from wrong. Perhaps we are all called upon a journey which very few of us can complete. We arise from an absolute wholeness which is unconscious, proceed through a world of decreasing wholeness and increasingly individuated being, all the while becoming more and more conscious and developing an intensely conscious reflexive ego in a world of individuated beings. We are then *biologically* called to seek that wholeness from which we emerged once again—but this time illuminated with the blazing light of perfect reflexive consciousness.

I have had the privilege of studying aspects of these phenomena with a few people who have completed the journey. Be assured that they are not madmen. In fact they seem to be exceptionally well adapted to the

world, a blessing to those around them and to society. Unfortunately there are very few of them, and they have attained their state in spite of a hostile and ridiculing culture. Perhaps if we understood that this journey, though very difficult, has a biological base and, as a society, encouraged rather than discouraged people from embarking on it, we would have more sorely needed saints in the world. We might then be able to add enough leaven to the loaf of human culture that it would gently rise instead of exploding.

Let me close with a final metaphor. The dance has formed the word and the word the myth which has guided the dance to an awareness of itself. We are called to that *conscious* dance, and perhaps a few of us may even be given the grace to become the dance itself.

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