

ENCOUNTER WITH NEUROBIOLOGY: THE RESPONSE OF RITUAL STUDIES

by Edith L. B. Turner

Abstract. Knowledge of the working of the brain is of prime importance to anthropologists studying ritual and symbol. The play between the neocortical hemispheres can be inferred from the varying styles at different stages of ritual; one can begin to hypothesize archetypes for general processes such as self-healing social dramas that are at the roots of ritual; the concept of preparedness as a genetic endowment residing in the brain appears to confirm the fundamental importance of image making; while the shamanic skills of inhibition and disinhibition, releasing latent religious powers, can be grasped for what they are.

In this era of neurobiological discovery, what has a symbolic anthropologist to say about the new findings? Victor Turner became interested in 1981 when he first read *The Spectrum of Ritual* (see d'Aquili & Laughlin, Jr. 1979), and in his article in *Zygon* entitled "Body, Brain, and Culture" (1983, 221-45; see also 1985, 275-89) he dealt with many of the issues related to the study of ritual, particularly brain levels and lateralization. He knew that as anthropologists we have to come to terms with the recent discoveries: that there are two hemispheres in the neocortex, the left being the domain of speech, logic, and sequentiality, and the right the domain of visual recognition, pattern, the holistic, and metaphor—information of importance to the study of symbols. Moreover, neurobiologists such as Barbara Lex (1979, 117-47) tell us that there is deeply involved in ritual a brain process stimulated by tuning and driving techniques such as drumming, dancing, and music which arouse the ergotropic left capacities of the brain, which at climax cause a spillover effect into the right hemisphere and the trophotropic system, bringing both to a consciousness of wholeness—the unitary

Edith L. B. Turner, collaborator with her husband Victor Turner until his death in 1983, is lecturer in anthropology at the University of Virginia, Charlottesville, Virginia 22903. She presented an earlier version of this paper at the Thirty-first Annual Conference ("Recent Discoveries in Neurobiology—Do They Matter for Religion, the Social Sciences, and the Humanities?") of the Institute on Religion in an Age of Science, Star Island, New Hampshire, 28 July-4 August 1984.

[*Zygon*, vol. 21, no. 2 (June 1986).]

© 1986 by the Joint Publication Board of *Zygon*. ISSN 0044-5614

experience. Furthermore, new hypotheses have been put forward concerning archetypes, hinting of patterned relationships rather than primordial figures in the unconscious of an individual. Anthony Stevens (1982, 143-47, discussing John Bowlby; 1986) gives as a good example the infant-mother system. Then there are some interesting developments on the brain and body's preparedness for social as well as physical action, and lastly certain implications about the brain's processes of inhibition (the control of its wild powers) and the opposite process of disinhibition (their release under the controls that make the process safe) so that valuable rare moments of ritual disinhibition can be protected and performed in a linked situation with other members of the group, thus harnessing the brain's powers.

In this paper I will explore how knowledge of brain research can enrich the study of symbolic and religious anthropology, and I will bring to the task some of my experience of ritual in many parts of the world over a period of thirty-five years. Of necessity I have had to use the findings of an unfamiliar discipline when I cross into the field of neurobiology and must make my way cautiously, for the implications are truly exciting.

PREPAREDNESS

Starting logically with the theme of preparedness let us begin at the beginning and see what Colwyn Trevarthen says about the human embryo. "The paths taken by the first nerve fibres in the body of a one-month-old human embryo show that the brain in which the nerve cells germinate already contains an invisible image of the body in cell microstructure, and this governs the affinities of nerve cells for body parts, and their selective affinities for each other as well. It thereby defines a preadaptive and generative map of behaviour in a variety of modes" (Trevarthen 1980, 56). "In fact, the brain becomes an image of what the body cells might do together, and then, after birth, having gained the capacities for imagination and memory of experiences, it employs the body as an instrument" (Trevarthen 1980, 52). Are we here at the roots of the symboling process? There is a double picture—action and its image—but what is significant is that the image comes first. The subjunctive mood of "might be" (see Turner 1982, 82-84) seems to be written into the incipient form of an embryo.

Let us turn to the behavior of the seven-week-old baby, discussed by Trevarthen at the 1984 Institute on Religion in an Age of Science conference. He gave slides of the familiar arm-waving activity of seven-week-old babies; the right hand is held out higher than the left. Trevarthen has ascertained that this is a gesture of communication and has no direct prehensile function. It is a symbolic act, performed

untaught at a very early age. In an experiment on social interaction Trevarthen arranged a live video system between a mother and her baby of eight weeks, so that each saw the other live on a screen. The two soon recognized each other and began to make cheerful mother-and-baby communication. Later Trevarthen had the pair look at the same screens, but this time each saw merely the videotape of the past interaction. Because this new situation was not live, it was useless to gesture and try to elicit response, and both mother and baby became distressed. Thus true interaction exists very early in a baby's life, arguing an early and extremely subtle predisposition to interaction in the baby's makeup. The implication for the social scientist is that the social faculty does not have to be taught from scratch: there is preparedness, readiness.

Preparedness and image making appear in another fundamental area of human physical action. H. Kornhuber (quoted in Restak 1979, 243-44) measured brain potentials preceding voluntary movements. Formerly it was thought that an action of the right hand should record a simple potential over the left motor cortex of the brain. But Kornhuber detected, at 8/10 second before the movement, a bilateral potential (the "readiness potential") which is widespread over both hemispheres. This is followed by yet another premotion positive potential, also throughout the brain, about ninety milliseconds before the action. Finally, a motor potential was recorded over the left motor cortex, and the hand moved. One could call this a preimagining subjunctive view of how something might be done. The brain is accustomed to perform this routine at every turn.

New ideas in evolution bespeak of preparedness. Stephen Gould has proposed the theory of punctuated equilibria, that evolution proceeded in rapid spurts followed by long periods of equilibrium. His theory casts doubt on gradualistic Darwinian survival of the fittest by competition, with random mutation as the cause of variation. James W. Valentine (see Rensberger 1984) suggests another agent of mutation, which produces "hopeful monsters" who might do well in an environment made empty by rapid mass extinctions. He calls this agent a "virus," which invades an individual carrying new and possibly regulatory genes to the gonadal cells, thereby producing hereditary change at a possibly rapid rate. This theory appears to have more parsimony as an explanation than Darwin's. It looks as if the existence of these special microorganisms for the task of speeding evolution is another example of preparedness deep in the web of nature: some microorganisms have a stimulating function; others, it is suggested, have a necessary inhibiting effect, clearing away species (such as—in the latest example—Caribbean sea urchins) to make room for new

ones. A similar process exists in a baby's growing brain: "star" cells develop which are both inhibitory and sensitive to selective stimulation; they are part of the mechanism whereby the innate structures of the brain are differentiated (Trevarthen 1980, 69-70, quoting Jacobson 1974).

At every turn in nature some such little tugboat guides the great ship into the safe route—directors which are prepared beforehand for the trouble they sense. And this is preimaging again. Random change and random rapid extinction would long ago have wrecked evolution. Randomicity in nature is less and less an explanation, preparedness is coming to the fore.

Taking a step forward to the adult human, Eugene d'Aquili (1986) often refers to preparedness, reminding us that archetypal material contains prepared elements and relationships. He implies that the appearance of a big symbol in human culture has been prepared beforehand, has been made way for. (Does that mean that we have been "steered" into "taking up the cross," or into the ecstasy of the lingam and yoni of India, or the total comity of all at Mecca, or the bliss of the lotus? The archetypes that did the steering have not been taken into our pantheon yet. I am suggesting *relational* archetypes here, not the psychologists' ones of anima, animus, and so on.) We are quickly able to recognize hints and archetypes connected with religion. This sense is important. Stevens (1986) says that our preview of things matters a great deal. "If we conceive of the earth as dead, we kill it. It needs us to believe in it, in order for it to live." The theme of preparedness found in the work of neurobiologists may be telling us that, if we do not use the subjunctive, the "as-yet-uncreated," if we do not use the premotion and premonition gift, we harm the future.

ARCHETYPES AND RITUAL

Carl Jung's archetypes were bundles of broad tendencies, not consciously perceived in the absence of cultural clothing. They are powerful directives that come into play when their triggering occurs, for instance in the mother-child pattern, in the male-female pattern, or, as Stevens (1986) reminds us, in the Self—the integrated personality—sometimes constellated as in an individual, a great man, sometimes as all humanity, "Anthropos," or even as the entire earth as a living organism, "Gaia." Can such archetypes be located in the brain? Ernest Rossi (1977, 47) claims they are right hemisphere material, concerned with pattern and the holistic faculty. However, there are hints that some archetypes may also be matters of social relationships per se, not limited to the experience of an individual psyche. For instance, Trevarthen (personal communication) suspects that what he is finding in the tiny baby is an

innate capacity for *communitas*, Turner's term for the sense of I-Thou, humankindness, communion (Turner & Turner 1978, 250-51).

A further hypothesis about archetypes concerns a universal pattern of social action, the pattern of the social drama. Conflict occurs in the animal kingdom, of course, but among human beings who have evolved culture and religion in a social environment, it has a more definite form, the social drama with phases of breach, crisis, redress, and reintegration. The breach is breach of the norm, a social matter; and redress is a means to return to social unity—with the consciousness of that unity far more brightly lit than in the animal kingdom. Because the process of the social drama gave us this consciousness, we are half in the cultural world already. Yet, it is a circular process. We have been given our sociality: we are covered with a great variety of prepositional plugs as Turner called them (probably another genetic endowment) that enable us to make connections of all kinds to the outside world, particularly to society—plugs that enable modes of relationship labeled “to,” “for,” “by,” “with,” “from,” “of,” “in,” “against,” and so on. When these connections are developed into a social weave, the irregularities or troubles that produce social drama (including sickness, a great cause of social unease and vice versa) call for even greater consciousness in order to find ritual or mythic means for redress and reintegration, thus producing that very ritual or mythic sphere which can elaborate and generate a world in itself. I suggest that the social drama with its progressive stages may be based on a social archetype linked to some brain-located operator seeking to restore equilibrium in disturbed social milieus. Redress and reintegration may even be assisted by certain types of people—judges, healers, or even clowns—who might be seeded in our social continuum, born into it by some preparedness mechanism, just as the special viruses and star cells mentioned above occur when needed.

I shall not deal here with the well-known archetypes of courtship and sex or with their ritualization; their origins in the animal kingdom have been described by Julian Huxley and Konrad Lorenz. Instead I shall proceed to the more problematic ritualization of puberty. Puberty rites do not occur in the animal kingdom; yet they are the paradigmatic rites of passage of Arnold van Gennep's study ([1909] 1960). A child reaching puberty is not yet an adult, and his or her situation is fertile ground for archetypes. Their pressure creates a wide liminal period between the start and finish of puberty, full of strange nonfunctional phenomena such as the showing of sacred objects, monsters, reversals of the normal, clowning, *communitas* relationships, much rhythmic music, and the visitation of spirits. (The same processes occur in other life crisis rites, and in healing seances.) There may be union with the sacred,

empowered by the spillover effect that ritual produces in the brain and resulting in joy, healing, clairvoyance, or the gift of wisdom. All these link with our myth-producing propensity to create a pantheon of wonderful beings, whose effects actually reach us. We may ask, why do the tendencies to perform rites of passage exist? Are they not a package deal bound up with the archetypes that invade at times of change?

We are provided with—there is a preparedness for—some strange faculties. Yet, it is apparently by means of stable neural connections that we can tame and domesticate our mental wilderness, the door into which certain stable archetypes allow us to open. D'Aquili (1983, 257) reminds us that “in the neurobiology of archetypes with reference to their different appearances in different cultures, surface structure and core elements may change, but are described by constellations of relationships which possess a quality of meaningfulness and are subjective manifestations of stable neural connections.” So the archetypal patterns that result in expression of our unconscious, and even in religious revelation, are themselves stable. Stability and daring complement each other.

How deep dare we go here? Frank Duffy (1984) discusses the problem of epilepsy that originates in the temporal lobe of the brain, becoming a severe pseudoreligious diseased condition. It is caused by lack of the normal inhibitory processes of the brain, constituting a pathological failure of the control system; far too many neurons fire at once. Larry Peters (1981), Yvonne Velho (1975) and others, in their descriptions of the training of shamans and trancers, show how the gift strikes first in a wild form and is then carefully guided and controlled by a guru or cult leader, until what seemed pathological becomes a gift, with joy, healing, and clairvoyance as the outcome. It is clear that the two necessary and opposite effects of inhibition and disinhibition have to be in balance. Inhibition is basic to our functioning. D'Aquili shows that there is an inbuilt mechanism to repeat physically whatever we hear, to copy physically what we see done, and so on. This is usually inhibited leaving only an internal repetition in our heads. It is released for myth and ritual (d'Aquili 1983, 160-61). The litanies, songs, and repeated actions such as the dance steps of ritual are a matter of controlled disinhibition of a deep social propensity. By this control the brain has provided us not with repression but with freedom—with the power, as Jung put it, “to surrender our consciousness to the indeterminate and indeterminable,” which is, he said, “the spiritual adventure of our time.” “We are programed for the sacred,” said Philip Hefner. “Our hardware is so made that we are open to the sacred” (1984). When one considers this freedom and the freedom implied in the number of

synaptical connections in the brain—a thousand million million—we need no longer fear that neurobiology is reductionist.

How far is ritual functional for humanity? Getting down to basics, first, the rhythm of ritualization is useful for communication. D'Aquili points out that in ritual behavior there appears a sequence that is structured and patterned; is rhythmic and repetitive; acts to synchronize affective, perceptual-cognitive, and motor processes within the central nervous system of individual participants; and generates limbic arousal, for example, in three-spined sticklebacks, turkeys, queen butterflies, and cats (d'Aquili 1983, 261-62). Such heightening of communication is directly functional. Second, rhythmic ritual creates new goals for which participants strive as objectives to be desired for themselves but which have the function of controlling aggression and creating bonding (see Lorenz [1963] 1969, 159-211). At this level ritual is indirectly functional. Third, and here we cross into the field of symbolic anthropology, human ritual may contain ludic deconstructions and recombinations, reversal symbols, the bizarre, and clowns who may be Symbolic Types like the Tewa clown, who have no effect on the social order, who are amoral and cannot be penalized, and whose home is the liminal sphere itself. These manifestations create a pool of subjunctive material, a "might-be" repertoire. They teach flexibility and may suggest new life modes. At this level ritual has a possible indirect function. Fourth, the elements of ritual spun out by a generous genetic and cultural overplus, which one could argue remain as a supply of possible abilities in unforeseen emergencies, constitute a new type of manifestation which is strongly desired in its own right and which keeps itself in existence for its own sake. Large numbers of humankind report such experiences of the absolute associated with ritual—breakthroughs to the knowledge of the "sacred." This aspect of ritual is not functional in any known way and may derive from archetypes that do not have survival value (Schmitz-Moormann 1986). Thus ritual can truly "transcend our capacity for receiving and exploiting" (Hefner 1984).

So, in light of the right hemisphere's power to make leaps and discoveries, in light of the archetypes that ease our way into patterned action or relationships and visit us with sages or guiding dream figures, in light of the genetically based skills for safely controlling the altering and raising of consciousness, and in light of ritual itself, which has grown in autonomy and desirability and is empowered by the spillover phenomenon, we begin to see a picture of a sociogenetic provision for a full socioreligious life as a desired goal in itself—whose attraction may become greater than any desire to destroy the world.

CASES OF RITUAL

Now I propose to try out these ideas on actual cases involving ritual. Let us begin by considering a prehuman rite, the chimpanzees' rain dance observed by Jane van Lawick-Goodall (1971, 52-54). From the point of view of ritual studies, their behavior might be regarded as the forerunner of rites of passage. The rain itself is like an enclosure in which all are equal. The animals enter a ritual mode, establishing a simple dance area, and then perform bearing branches. The immediately work up a kind of driving effect, and excitement grows to a climax of running downhill. The performance is noneconomic, having nothing to do with survival, and it strongly resembles liminal behavior.

No one knows the links between this and a true rite of passage. The acquisition of various simple techniques must intervene, such as drumming, moving or dancing in time, or the focus on some simple symbolic object such as a stone or tree. To generalize about rituals in simpler societies, they are usually triggered by sickness or by children reaching the troubled years of adolescence. The group is conscious of the need for ritual; group members discuss long and finally get into the spirit of it. The group also *feels* the need to perform this particular pattern of action. As Ronald Grimes says, a ritual may simply "transpire," like breathing (1982, 55). The image of what to do exists already in many heads, from way back. It is a dramatic pattern, and at the culmination hemispherical spillover occurs, giving that sense of unity which people might attempt to describe but which can only be fully understood when experienced.

An example taken from my field notes on a modern tribal ritual that I witnessed in Africa will illustrate this. Manyosa is sick. The diviner, in his controlled trance, regards his basket. He sees among the basket's objects that she must have the trembling ritual. (The trance is trophotropic, involving the restorative, resting state of the body; and it is produced in peace and quiet, starting with a brief meditative prayer. In divination it is the arrangement of the objects in the basket that informs the diviner of the gestalt, and this might well be a matter of the right hemispherical activity. The left supplies control and interpretation.)

The people bring drums for the trembling ritual; they beat them and sing and dance all night, with Manyosa sitting in the center in the firelight. (Here we have driving techniques of various kinds—sonic, photic, and kinetic—firing the ergotropic energy system of the body.) The doctors urge Manyosa to shake and tremble, but at first she cannot because the logical left brain so far will not let her. She looks angry, too, as if she cannot forgive the way they delayed treating her. But suddenly the ritual takes hold and she starts to shake: the water spirit, the osprey, has come to her. She begins to shake beautifully and sway deeply like a bird diving into the water. On seeing this someone puts a large bowl of

water in front of her so that she can splash into it. (The spillover from left-brain ergotropic excitation has occurred, bringing trance with trembling and possession. Left-brain control ensures beauty, safety, and appropriateness; the right brain provides the holistic and timeless sense; and the unity of both in their greatest excitation opens her to the experience of something from out there coming into her—the bird, possible archetypal in origin.)

She comes around. Then she is taken to a “hidden treasure” test, a mound of soil under which tiny objects are hidden here and there. She discovers the objects at once (clairvoyance). She is dressed in fine clothes and feels much better. She visits me in my hut—she is my best friend—and tells me of the joy and wonder of the spirit’s presence (healing and joy).

The whole pattern—sickness, supernatural guidance, the performance of the ritual itself in a time and space set apart, driving techniques, spillover, unitary experience, healing, and clairvoyance—is quite complex, but it is also remarkably similar in many cultures throughout the world. I will now turn from Africa to Israel and cite the scenario for the pilgrimage to the tomb of Rabbi Shimon Bar Yohai, a second-century divine. A woman with a sick baby, living in Tel Aviv, has a dream in which she is visited by the old rabbi, Bar Yohai himself. He tells her that, in order for her child to be cured, she must make the pilgrimage to his shrine. (This dreaming may correspond to the diviner’s seance, when the trophotropic system with the mind at rest allows the brain to come up with a guide to action.) The woman journeys to the shrine and attends the great fire ritual on the roof of the tomb; singing and a deep tranced dancing is going on, performed by black-coated hasidim. As morning breaks an experience of light, the “Zohar,” comes to the people (a spillover effect, an “illumination”). Her child is healed, and she calls him Shimon after the saint.

These rituals are not only religious; they also are essentially social. Manyosa cannot be cured without the crowd of participants; neither can the Israeli woman and her child find what they need in their bare apartment in a high rise in Tel Aviv—nor in the rationalist secularist hospitals. D’Aquili regards the ritualistic nonutilitarian actions of conspecifics as important: “There is something about the repetitive or rhythmic emanation of signals from a conspecific that generates a high degree of limbic arousal; there is something about repetitive rhythmic stimuli that may, under proper conditions, bring about the unusual neural state of simultaneous high discharge of both [the sympathetic and parasympathetic] autonomic subsystems (d’Aquili & Laughlin, Jr. 1979, 156, 157).

Anthropologists might ask, how far along in evolution do these givens, these genetic factors, extend; and how complicated do they become before we find ourselves in the domain of learned culture? It is

a truism that both genetic endowment and culture mingle, but it is becoming important to be able to recognize where one leaves off and the other begins.

A much modified, modern, but still interesting example of the pattern we have been illustrating was found near home in Virginia, the University of Virginia and Wake Forest basketball match of Spring, 1984. Virginia's Othell Wilson had just returned after treatment for a sprained ankle. The team had lost the giant Ralph Samson the previous year, so Wake Forest now had taller players, and very good ones. Along with Othell, Ricky Stokes and some juniors were playing. It was in the consciousness of everybody that it was the last game of the two seniors, Othell and Ricky, and that the team was weak. But it was also in our consciousness that, although UVa was a non-sports-scholarship school, we had been managing brilliantly on mere honor for years. The honor was the "Spirit." It came into University Hall palpably that night, riding the organ's throbbing beat. Our people were on their feet howling, clapping, and stamping. Again and again our howls wafted the ball into the basket, and at the end, after cliffhanging suspense, it was certain: *We had won!* Communitas flooded the hall; all present knew they had had "An Experience."

The pattern is as regular as the phases of childbirth. (I do not use the word *structure* for *pattern* because *structure* implies something static.) Is the pattern itself imprinted in the nervous system by the genes, or is what is imprinted merely the tendency to perform "something or other," the pattern having been culturally evolved? Why the universal distribution of the pattern? It may be that there is some preparedness within us for such a sequence.

I am puzzled by the odd manifestation that I mentioned earlier, the Symbolic Type, which appears to be seeded within the liminal domain of certain rituals or their derivatives, but for what purpose it is hard to say. Don Handelman (1981, 367), following Richard Grathoff (1970), has isolated Symbolic Types and has described their characteristics. Punch is one of these types; so are the Sri Lankan Demon, the Kutiyattam Clown that cheeks the king, Ravana in the Ramlila play, the Topeng Clown, the "Little Old Men" in Mexican fiestas, the transvestite giant in Carnival, Guy Fawkes, Harlequin, Falstaff, and the Hobby Horse. The Symbolic Type is a catalyst in the service of the liminal domain, a time of indeterminacy, which itself is almost functionless from a utilitarian point of view. The Symbolic Type defines that domain and emphasizes its peculiar anomalous existence. Sometimes he heralds in deity, as in the case of the Pueblo Clown; sometimes he heralds in the sacred time (Santa Claus). He seems simply to *appear* and is given a great welcome wherever he pops unexpectedly into the scene. There is a Symbolic Type in the UVa game I mentioned earlier, a

cloaked, masked figure wearing a large plumed hat and carrying a sword, the Cavalier who dances in the interval. The mascot is a symbol of sidedness, yes; but he is more than that, he is the nonathletic figure who yet inhabits the arena. Just because of his nonparticipation in the game, he mediates between the nonathletic crowd, which is forbidden the sacred arena, and the athletes themselves, the untouchable gods of the genre of sport.

Another ritual that possesses a Symbolic Type is the ritual of circumcision among the Ndembu. What is genetic here is intimately interdependent with the physiological changes in the body. When puberty arrives (which is effected by a natural triggering of change in the body), a rite of passage may be triggered as well; these two, the physical and the social, probably constitute a two-stage process. There are the hormonal effects of testosterone within the adolescent boys and then the awakening, within the brains of both subjects and members of the concerned social group, of the dormant pattern of the rite of passage—much as the dormant muscles of childbirth start contracting when “the time has come.” But this awakening is social, not physical; it is a matter for performance—the depiction *and* the inducing of a strange in-between state which takes over the neophyte according to a time-honored pattern. There are many anomalies. Are the neophytes boys or men? They are taken into the bush, into an enclosure which is no ordinary homey safe place but which is frighteningly paradoxical, for it is there that they are to be circumcised. Further paradoxes are piled one upon another. Within the enclosure the painful operation is associated with three holy trees, standing for the milk of human kindness, for maturity, and for the ancestors. The pain is hardly as important as the paradox or the strong antinomy itself, which is not only a circumstance of nature that has to be overcome but a puzzle fabricated for this purpose—a koan as it were, a conundrum presented by the right brain to the left, the answer to which is to be found only in the unitary experience.

Riddling songs are sung to the boys in deep sombre voices. The drums produce the spillover effect. Later, toward the end of the healing period, an “ikishi” appears. This is a tall, masked, grotesque human figure, a Symbolic Type, dancing like a dead thing—again the paradox—a spirit from way back, no one’s relative, quite independent of the affairs of humans. This figure is impossible to analyze. You just have to accept it in its thereness, the Symbolic Type that will not change anything and whom you cannot change. Its understanding seems to reside in the nonverbal right hemisphere of the neocortex; moreover its meanings might well be vitiated by attempts to analyze them. Still, we are continually tempted; the causal operator, existing in the left hemisphere, leaves us no choice but to be inquisitive, to ask.

So, why are these conundrums presented by ritual traditions to the individual? Perhaps it works this way. Situations often arise, such as in social dramas, during sickness, or where problems to do with maturation exist, when no logical solution is found. In other words, the left hemisphere cannot reply. The right side, particularly the holistic operator, is then allowed access. It responds, and empowered by its capacity to make a leap and extrapolate, it conjures up a new thing in embryo. But it cannot conceptualize it, say it, embody it, because of this hemisphere's lack of focus. It needs the sharp jab of the left brain, the Word (as the Christians see it), to incarnate that thing (possibly in some symbol or "inspired" symbolic act or rite), to seize it, to lift it out of the timeless flat picture of the right brain and articulate it. It is the way the imagination searches to find words, a familiar struggle in the minds of poets and verbal creators.

At the beginning, when the left hemisphere relinquished the problem to the right, the left had an impression of a gap in its logical world. That is the liminal domain in which accumulate, from those fertilizing jabs and events, sacred memories that are appropriate to the liminal space—ludic recombinations, the germs of the Symbolic Type. When these are brought out in actual performed ritual, there is a sense of wonder and relief such as after a great dream. Thus, in Roy Wagner's words, "language and image stand in an enabling relationship to one another" (1983, 3).

CONCLUSION

Anthropology may well find further investigation of these problems rewarding. However, mainline anthropologists still claim their field to be the culturally inherited world of human facts: culture, for them, predominates over nature and genetics in almost every sphere. Lévi-Straussians see the mind as possessing many givens which are not explicitly described as genetic, but the implication that they are genetic is there. For instance, binary oppositions are "good to think," and so they are, for a binary operator exists in the left hemisphere just for that. But as d'Aquili (1986) says, "structuralists have only used the functions of the dominant, that is, left side of the brain." Some structuralists have mentioned the existence of silent symbols without exegesis; I suggest that these may well be rooted in the right hemisphere. The way the left brain talks about these symbols is always illuminating. I believe there is a considerable field open for sensitive investigation by structuralists on neurobiological lines.

The sociobiologists are clearly interested. Robin Fox (1984) had this insight: "Transcendental experiences or the ineffable are a reintegration back to the time prior to the specialization for speech in the left

hemisphere"; is this the theme of preparedness again, the capacity of transcendence given afresh to the children of each generation? Fox describes how categories intervene between us and our actions, we never act directly on things, but how in *communitas* action is far more direct. Fox's words support the concept of the release effect (disinhibition) of *communitas*, felt for brief moments in the liminal sphere.

Some symbolic anthropologists such as Victor Turner have long taught that the verbal and structural are not all. Nonverbal actions and symbols take pride of place in ritual—which is first and foremost an action process. The new brain research can enable anthropologists to see how cultures at all levels have found ways to use both hemispheres, to ride the heightening of both as they respond to the kind of performative mode they seem to be prepared for (just as the speech areas are prepared for speech), achieving what Emile Durkheim could only call "effervescence" of generalized social sentiment; but this is the very unitary experience that religions have been trying to describe for millennia. The skills of trancers and shamans, by means of which practitioners can employ, let loose, and rein in at will strong religious sensations, become more respected. The practitioners' way of life need not be regarded as a pathological mode. Finally, the work of neurobiologists throws into relief many details of ritual which were not clear before, particularly the prime importance of drumming and rhythm.

Social scientists are in an ironic position. Some are taking religion seriously partly because of their own new symbolic studies, partly because of discoveries in the brain. It is our cognitive imperative to map our causal strips, an operator built into the brain. But religious perception has been at work from way back. Only in the last two hundred years has science been in a dominant position, and its leaders have been teaching us: "Mistrust those religious faculties. We will test them and as like as not they are all superstition." Now science is speaking differently. At a time when most anthropologists still followed the doctrine of disbelief, certain brain scientists were busy getting down to the nuts and bolts of what constitutes the religious experience. As a result our respect for the brain and also for the acts of ritual has grown. And we are learning to focus more closely in our ritual studies. We need not only make reports about rituals, or read about them, we can join in and sense for ourselves the climax, the *communitas*. Science now says: "Take the plunge, participate, observe; there are further discoveries to be made."

REFERENCES

- d'Aquili, Eugene G. 1983. "A Biogenetic Structural Analysis." *Zygon: Journal of Religion and Science* 18 (September):247-69.

- . 1986. "Myth, Ritual, and the Archetypal Hypothesis." *Zygon: Journal of Religion and Science* 21 (June):141-60.
- d'Aquili, Eugene G. and Charles D. Laughlin, Jr. 1979. "The Neurobiology of Myth and Ritual." In *The Spectrum of Ritual: A Biogenetic Structural Analysis*, by Eugene G. d'Aquili, Charles D. Laughlin, Jr., John McManus, Tom Burns, Barbara Lex, G. Ronald Murphy, S.J., and W. John Smith, 152-82. New York: Columbia Univ. Press.
- Duffy, Frank. 1984. "The Neurology of Hyper Religiosity." Paper read at the Thirty-first Annual Conference ("Recent Discoveries in Neurobiology—Do They Matter for Religion, the Social Sciences and the Humanities?") of the Institute on Religion in an Age of Science, Star Island, New Hampshire, 28 July-4 August.
- Fox, Robin. 1984. "Brain, Memory, and Society." Paper read at IRAS conference. See Duffy 1984.
- Gennep, Arnold van. [1909] 1960. *The Rites of Passage*. London: Routledge & Kegan Paul.
- Grathoff, Richard. 1970. *The Structure of Social Inconsistency*. The Hague: Martinus Nijhoff.
- Grimes, Ronald. 1982. *Beginnings in Ritual Studies*. Washington, DC: Univ. Press of America.
- Handelman, Don. 1981. "The Ritual Clown: Attributes and Affinities." *Anthropos* 76:321-70.
- Hefner, Philip. 1984. "The Brain and the Sacred." Paper read at the IRAS conference. See Duffy 1984.
- Jacobson, M. 1974. "A Plenitude of Neurones." In *Aspects of Neurogenesis*, ed. G. Gottlieb, 151-66. New York: Academic Press.
- Lawick-Goodall, Jane van. 1971. *In the Shadow of Man*. Boston: Houghton Mifflin.
- Lex, Barbara. 1979. "The Neurobiology of Ritual Trance." In *The Spectrum of Ritual*, 117-47. See d'Aquili 1979.
- Lorenz, Konrad. [1963] 1969. *On Aggression*. Toronto: Bantam.
- Peters, Larry. 1981. *Ecstasy and Healing in Nepal: An Ethnopsychiatric Study of Tamang Shamanism*. Malibu, Calif.: Undena Publications.
- Rensberger, Boyce. 1984. "Extinction Gaining Force in Theory of Evolution." *Washington Post* (November 24).
- Restak, Richard M. 1979. *The Brain: The Last Frontier*. New York: Warner.
- Rossi, Ernest. 1979. "The Cerebral Hemispheres in Analytical Psychology." *Journal of Analytical Psychology* 22:32-59.
- Schmitz-Moormann, Karl. 1986. "Philosophical and Theological Reflections on Recent Neurobiological Discoveries." *Zygon: Journal of Religion and Science* 21 (June): 249-57.
- Stevens, Anthony. 1982. *Archetypes: A Natural History of the Self*. New York: Morrow.
- . 1986. "Thoughts on the Psychobiology of Religion and the Neurobiology of Archetypal Experience." *Zygon: Journal of Religion and Science* 21 (March):9-29.
- Trevarthen, Colwyn. 1980. "Neurological Development and the Growth of Psychological Functions." In *Developmental Psychology and Society*, ed. J. Sants, 46-95. London: Macmillan Press.
- Turner, Victor. 1982. *From Ritual to Theater*. New York: Performing Arts Journal Publications.
- . 1983. "Body, Brain, and Culture." *Zygon: Journal of Religion and Science* 18 (September):221-45.
- . 1985. *On the Edge of the Bush: Anthropology as Experience*. Tucson: Univ. of Arizona Press.
- Turner, Victor and Edith Turner. 1978. *Image and Pilgrimage in Christian Culture: Anthropological Perspectives*. New York: Columbia Univ. Press.
- Velho, Yvonne. 1975. *Guerra de Orixá: Um Estudo de Ritual e Conflito*. Rio de Janeiro: Zahar Editores.
- Wagner, Roy. 1983. "Visible Ideas: Towards an Anthropology of Perceptive Values." *Essays in Honour of Victor Turner (Special Issue), South Asian Anthropologist* 4 (March):1-7.