

HUMAN CEREMONIAL RITUAL AND THE MODULATION OF AGGRESSION

by Eugene G. d'Aquili

Abstract. Human ceremonial ritual is considered as an evolved behavior, one of the principal effects of which is the promotion of intragroup cohesion by decreasing or eliminating intragroup aggression. It is seen as a major determinant of what Victor Turner calls *communitas* in human social groups of varying extension. The frequent paradoxical effect of ritual's promoting extragroup aggression at the same time that it diminishes intragroup aggression is considered. A neuroevolutionary model of the development and social effects of ritual behavior is presented, being derived from both ethology and recent neurophysiological studies in humans.

It is generally recognized that some form of religious ritual is a universal phenomenon. Barbara Lex (1979) cites E. Bourguignon's data in which she identifies trance states or other forms of dissociative phenomena associated with ritual in 437 out of 488 societies for which there was relevant ethnographic information. This means that, in almost 90 percent of societies around the world for which there is available data on the subject, some sort of altered states of consciousness manifest themselves in one way or another as a part of ritual behavior. This indicates not only that ritual behavior is universal among human societies but that some form of dissociative state is associated with cultic rituals in nearly all societies. Therefore, in attempting to analyze religious ritual, it becomes obvious from the outset that we are dealing with a true cultural universal similar to marriage, warfare, or even language.

To understand why human ceremonial ritual is in fact a cultural universal one must study the evolved biological basis of human ritual especially with regard to its function of diminishing intragroup aggression.

Eugene G. d'Aquili, associate professor of clinical psychiatry, University of Pennsylvania, University and Woodland Avenues, Philadelphia, Pennsylvania 19104, presented this paper at a symposium on "The Function and Management of Aggression and Cooperation in Biocultural Evolution," sponsored by the Institute on Religion in an Age of Science at the annual meeting of the American Association for the Advancement of Science in Detroit, Michigan, 26-31 May 1983.

[*Zygon*, vol. 20, no. 1 (March 1985).]

© 1985 by the Joint Publication Board of *Zygon*. ISSN 0044-5614

sion and of promoting group unity or cohesion. In pursuit of this understanding let us first consider what we mean by ritual behavior.

FACILITATION OF SOCIAL COHESION BY RHYTHMIC REPETITIVE BEHAVIOR

We define ritual behavior as a sequence of behavior which is structured or patterned; which is rhythmic and repetitive (to some degree at least), that is, it tends to recur in the same or nearly the same form with some regularity; which acts to synchronize affective, perceptual-cognitive, and motor processes within the central nervous system of individual participants; and which, most particularly, synchronizes these processes among the various individual participants tending to eliminate aggression and to facilitate cohesion among the participants. G. H. Manley (1960) has considered this synchronizing function of ritual in the blackheaded gull in some detail. It appears—from the work of M. W. Schein and E. B. Hale (1965) with the domestic turkey, N. Tinbergen (1951) with three-spined sticklebacks and queen butterflies, and J. S. Rosenblatt (1965) with cats—that there is something about the repetitive or rhythmic emanation of signals from a conspecific that generates a high degree of arousal of the limbic system of the brain. With respect to this rhythmic quality of ritual, Konrad Lorenz notes: “The display of animals during threat and courtship furnishes an abundance of examples, and so does the culturally developed ceremonial of man. The deans of the university walk into the hall with a ‘measured step’; rhythm and loudness of the Catholic priests chanting during mass are all strictly regulated by liturgic prescription. The unambiguity of the communication is also increased by its frequent repetition. Rhythmical repetition of the same movement is so characteristic of very many rituals, both instinctive and cultural, that it is hardly necessary to describe examples” (Lorenz 1966, 72).

V. J. Walter and W. G. Walter (1949) and E. Gellhorn and W. F. Kiely (1973) have shown that such repetitive auditory and visual stimuli can drive cortical rhythms and eventually produce an intensely pleasurable, ineffable experience in humans. Furthermore, Gellhorn and Kiely (1973) cite evidence that such repetitive stimuli can bring about simultaneous intense discharges from both the sympathetic and parasympathetic human nervous systems. When one considers the evidence taken from the animal literature together with the limited studies that have been done on humans, one can infer that there is something about repetitive rhythmic stimuli which may, under proper conditions, bring about the unusual neural state of simultaneous high discharge of both autonomic subsystems. Three stages of tuning of the sympathetic-parasympathetic systems are recognized. In the first stage, response in

one system increases while at the same time reactivity in the other system decreases. If augmented reactivity of the sensitized system continues, the second stage of tuning is reached after stimuli exceed a certain threshold. At this point not only is inhibition of the nonsensitized system complete, but also stimuli which usually elicit a response in the nonsensitized system instead evoke a response in the sensitized system. Behaviors resulting from this second stage of tuning are termed "reversal phenomena." If stimulation continues beyond this stage, increased sensitization can lead to a third stage in which the reciprocal relationship fails and simultaneous discharges in both systems result.

Normally, either the sympathetic or the parasympathetic system predominates, and the excitation of one subsystem normally inhibits the other. In the special case of prolonged rhythmic stimuli, it appears that the simultaneous strong discharge of both autonomic systems creates a state of stimulation of the median forebrain bundle generating not only a pleasurable sensation but also, under proper conditions, an elimination of intragroup aggression, a sense of union with conspecifics, and a blurring of cognitive boundaries. We suggest that such driving of the autonomic subsystems by rhythmic stimuli powerfully activates the parietal lobe on the nondominant side allowing various degrees of gestalt perception. The simplest paradigm to explain the situation in humans is the feeling of union that occurs during orgasm. During orgasm, as during other states we shall consider later, there is intense simultaneous discharge from both autonomic subsystems.

Hence, we are postulating that the various ecstasy states, which can be produced in humans after exposure to rhythmic auditory, visual, or tactile stimuli, produce a feeling of union with other members participating in that ritual. This sense of union is diametrically opposed to intragroup aggression. In fact, the oneness of all participants is the theme running through the myth of most human rituals. Probably the sense of oneness and the vagueness of boundaries, which are experienced at certain nodal points in ritual, are what allow symbols used in the ritual to be experienced as that for which they stand. The fusion of symbols and their referents at various points in human religious ritual is undoubtedly accomplished by the general feeling of oneness or unity that obtains when a ritual triggers certain parts of the nondominant parietal lobe. Although it is very difficult to extrapolate from a human model to an animal model, it is probable that some sort of analogous affective state is produced by rhythmic, repeated ritual behavior in other species. This state may vary in intensity, but it always has the effect at least of eliminating intragroup aggression and of unifying the social group.

Put simply, there is increasing evidence that rhythmic or repetitive behavior synchronizes the limbic discharges (i.e., the affective states) of a group of conspecifics. It can generate a level of arousal which is both pleasurable and reasonably uniform among the individuals so that necessary group action is facilitated. We must note at this point that we have said nothing about the communication aspect of this rhythmic signaling. There is a great body of evidence that many rhythmic stimuli serve as communication. The position of most ethologists is that rhythmicity evolved in lower animal species in the service of communication. However, a number of ethologists maintain that the rhythmicity evolved an autonomous effect of its own separate from its signaling function. Thus, Lorenz states: "Both instinctive and cultural rituals become independent motivations of behavior by creating new ends or goals towards which the organisms strive for their own sake. It is in their character of independent motivating factors that rituals transcend their original function of communication and become able to perform their equally important secondary tasks of controlling aggression and of forming a bond between certain individuals" (1966, 72).

DIFFERENTIAL HEMISPHERIC FUNCTIONING AND RITUAL UNION

Let us see how the recent discoveries of differential hemispheric functioning fit into our system of thought. Permit me to remind the reader in two or three sentences of the recent discoveries concerning the functions of the nondominant hemisphere. What is new is the discovery that the so-called nondominant or minor hemisphere has extremely important nonverbal, nonanalytic functions. First, it is related to the perception of visual-spatial relationships. Over and above this, there is good evidence that it perceives the world not in terms of discrete entities but in terms of *gestalts* or nondiscrete, holistic perceptions. The perception of wholeness or unity which this hemisphere controls is extremely important to this discussion as we have seen. Furthermore, there is evidence that the minor hemisphere may be chiefly responsible for creative or artistic ability.

Jerre Levy-Agresti and R. W. Sperry (1968) and Colwyn Trevarthen (1969) have obtained evidence that in the normally functioning individual both hemispheres operate in solving problems via a mechanism of reciprocal inhibition controlled at the brain-stem level. Put simply, the world is approached by a rapid alternation pattern of function of each hemisphere. In other words, one hemisphere is flashed on and then turned off, the second flashed on and then turned off, the first flashed on, and so on, in rapid alternation. The rhythm of this process, and whether one side or the other tends to predominate in this process, may account for various cognitive styles, from the extremely analytic

and scientific to the extremely artistic and synthetic. There is some evidence reviewed by Lex (1979) that this duality of cerebral functioning may parallel the duality of autonomic functioning we have just considered.

Actually, it is easier conceptually to integrate the two modes of consciousness into a more general duality of patterning within the central nervous system. Lex (1979) does this by utilizing W. R. Hess's model of an energy-expanding or ergotropic system and an energy-conserving or trophotropic system operating in a complementary fashion within the human organism. In this model, the ergotropic system consists of not only the sympathetic nervous system, which governs arousal states and fight or flight responses, but also any energy-expanding process within the central nervous system. Conversely, the trophotropic system includes not only the parasympathetic peripheral nervous system, which governs basic vegetative and homeostatic functions, but also any central nervous system process that maintains the baseline stability of the organism. Thus, the ergotropic-trophotropic model represents an extension to the central nervous system of the sympathetic-parasympathetic peripheral nervous functioning. We are presenting an extended model beyond this according to which the minor or nondominant hemisphere is identified with the trophotropic or baseline energy state system and the dominant or major hemisphere, which governs analytical verbal and causal thinking, is identified with the ergotropic or energy-expending system.

Alteration in the tuning of these systems from the peripheral autonomic level to the cerebral level has been offered as an explanation for various altered states of consciousness by varying investigators, including Gellhorn (1967), Gellhorn and Kiely (1972, 1973), and R. E. Ornstein (1972). These investigators present evidence that at maximal stimulation of either the trophotropic or ergotropic systems there is, as it were, a spillover into the opposite, complementary system. It has been postulated that the rhythmic activity of ritual behavior saturates the ergotropic or energy-expending system to the point that not only is the trophotropic system simultaneously excited by a kind of spillover but, on rare occasions, may achieve nearly maximal stimulation of the trophotropic system as well so that, briefly at least, both systems are intensely stimulated. The positive, ineffable affect which this state produces with the concomitant suppression of intragroup aggression was alluded to above.

In humans, concomitant with the simultaneous stimulation of the lower aspects of both systems, we propose that their cerebral representations, that is, both hemispheres of the brain, may function simultaneously. Cognitively, this is manifested by the presentation of polar

opposites by the analytic hemisphere (i.e., the presentation of a problem to be solved in terms of the myth structure associated with the ritual) and the simultaneous experience of their union via the excitation or stimulation of the minor hemisphere, specifically areas of the parietal lobe. This could explain the often reported experience of the resolution of unexplainable paradoxes by individuals during certain meditation states on one hand or during states induced by ritual behavior on the other. In one of the few experiments carried out in any kind of controlled manner on the experiences of meditation, A. J. Deikman (1969) notes that one of the phenomena common to all subjects is what appears to be simultaneity of conflicting perceptions during relatively advanced meditation states:

The subjects' reports indicated that they experienced conflicting perception. For example, in the third session, subject B stated, about the vase, "it certainly filled my visual field" but a few minutes later stated "it didn't fill the field by any means." In the seventh session referring to the landscape he commented, "... a great deal of agitation ... but it isn't agitation ... it's ... pleasurable." In general, subjects found it very difficult to describe their feelings and perceptions during the meditation periods—"it's very hard to put into words," was a frequent comment. This difficulty seemed due in part to the difficulty in describing their experience without contradictions (Deikman 1969, 208-9).

It appears that, during certain meditation states and ritual states, logical paradoxes or the awareness of polar opposites as presented in a myth appear simultaneously both as antinomies and as unified wholes. This experience is coupled with the intensely affective, "oceanic" experience which has been described during various meditation states as well as at certain nodal points of ritual. During intense meditative or ritual experiences, such as yogic ecstasy and the *unio mystica* of the Christian tradition, the experience of the union of opposites, or *conjunctio oppositorum*, is expanded to the experience of the total union of self and other, or, as it is expressed in the Christian tradition, the union of the self with God.

Thus it appears that the core central experience of human religious ritual, when it works for an individual, is a marked attenuation of intragroup aggression and the experience of union or oneness. As with meditation, the experience of oneness is not further specified in the ritual effect itself. The most specific the experience is in itself is a vague sense of union with other ritual participants. Beyond this, what the oneness signifies and unites is expressed by the mythic system of meaning in which the religious ritual is embedded. Thus, in addition to the sense of union with other participants, the cognitive elements associated with the ritual may specify that the feeling of oneness refers to oneness with God, oneness with the ancestors, oneness with mankind, oneness with all being, oneness with a folk hero, or whatever else

the understood cognitive purpose of the ritual is. Needless to say, these specifications of the meaning of the experience of oneness are after the fact and derive from an interpretation of the experience arising from the mythic system in which the ritual is embedded.

STRUCTURAL AND ANTI-STRUCTURAL USES OF RITUAL

From this, we can easily see how ceremonial ritual is ideally suited to symbolize the union of contrasting cultural elements. Thus, a member of a social group is united to divine power via a coronation or investiture ritual. In fact, ceremonial ritual is almost always used to unite persons with specific powers and responsibilities, the resulting union giving rise to a social role. This use of ceremonial ritual as a symbol for uniting contrasting cultural elements is responsible for what Victor Turner (1969) calls the structural functions of ritual in a society. Again, the fundamental reason for its use in defining complex social institutions is the central sense of union and hence of joining which can arise at nodal points in ceremonial ritual.

But this structural use of ceremonial ritual in society seems to be more derivative from a sense of oneness, implying the power to unify. Hence the structural uses of ritual in a society are more elaborately culturally evolved than what Turner calls the anti-structural uses of ritual in a society (1969).

The anti-structural uses of ritual involve the generating of what Turner (1969) calls *communitas* or the subjective sense of oneness or similarity of all members of a society regardless of their structural role definition. This sense of oneness with other participants in a religious ritual and, by extension, with all the members of the social group is a function of ceremonial ritual much closer to the biological basis of ritual. Hence, the anti-structural sense of *communitas* is present to some extent in all ceremonial ritual, even that used for structural purposes. However, often the very point of a human ceremonial ritual is precisely its anti-structural character and the generation of a sense of *communitas*. An example of a benign form of the sense of *communitas* is the Christian celebration of the Lord's Supper, a central aspect of which is the development of a sense of a people of God and followers of Christ among the participants, no matter what their social status might be. A malign example of the sense of *communitas* arising from ceremonial ritual is the sense of "one people" generated by Nazi rituals, particularly the famous torch light ceremonies of the Third Reich. Whether for good or evil, the primary effect of human ceremonial ritual is very much in touch with the biological base of ritual, and it involves the elimination of intragroup aggression and the formation of a sense of group oneness and cohesion. Thus it seems that the most powerful

effect of human ceremonial ritual is anti-structural, although in a more elaborated sense, ceremonial ritual can be used for structural and role defining purposes in society.

RITUAL AND MYTH PROMOTE AGGRESSION AND COOPERATION

In discussing the attenuation of aggression in the formation of *communitas*, we must remember that the sense of *communitas* applies only to the ritual participants or the social group which is represented by the ritual participants. Hence, a ritual may be performed to promote *extragroup* aggression. The ritual itself decreases or eliminates *intragroup* aggression, but the defined cultural purpose of the ritual is to generate the cohesion necessary to attack one's enemies. Thus, we are faced with the paradox of ritual being used on the one hand to decrease and eliminate *intragroup* aggression for the specific purpose, in certain circumstances, of promoting *extragroup* aggression. This sad state, we would propose, can only be changed if the myth in which ceremonial ritual is performed defines the *communitas* to be achieved not as the *communitas tribus* or the sense of union of the limited social group but as the *communitas hominis*—the unity of humankind. Only by an ideological change of the meaning of what is being effected by human ceremonial ritual can the assurance be gained that ritual will be used for peaceful and not aggressive purposes. Indeed, in some religious ritual the defined meaning of the *communitas* achieved is of an even greater scope, being a sort of *communitas universalis* or a unity of all things, whether animate or inanimate. This sense of unity, which is at the heart of all mystical traditions within the world's great religions, is the most antithetical to any sort of aggression. But once again, it involves the redefinition of what it is that is being unified by the primitive sense of oneness arising from the performance of ritual.

Ritual is usually performed to solve a problem presented by and to the verbal analytic consciousness. The problem may be between good and evil, life and death, or the disparity between God and humans. The problem may be as simple as the disparity between humans and a capricious rain god or as subtle as the disparity between humanity's existential contingent state and the state of an all-knowing, all-powerful, unchangeable "ground of being." In any case, the problem is presented in the analytic mode which involves ergotropic excitation. Like all other animals, humans attempt to cope with the environmental situation via motor behavior. The motor behavior humans choose goes back far into our phylogenetic past. It is usually a repetitive motor activity with visual, auditory, or other sensory stimulus feedback which, as we have just seen, strongly drives the ergotropic system. Even the

cadence and chanting of words contributes to this repetitive quality. The slow rhythmicity of a religious procession or the fast beat of drums or rattles all serve to drive the ergotropic system.

With prayers and chanting, this system is often driven in two ways. The myth may be presented within the ritual prayer, thus exciting by its meaning the cognitive ergotropic functions of the dominant hemisphere. The rhythmicity of the prayer or chant, by its very rhythmicity, drives the ergotropic system independent of the meaning of words. If the ritual works, the ergotropic system becomes, as it were, supersaturated and spills over into excitation of the trophotropic system, resulting in the same end state as meditation but from the opposite neural starting point.

This unusual physiological state, produced by both approaches (meditation and ritual), produces other aesthetic-cognitive effects besides diminution of intragroup aggression and a sense of union of opposites. Numerous reports from many religious traditions point to the fact that such states yield a feeling not only of union with a greater force or power but also an intense awareness that death is not to be feared, accompanied by a sense of harmony of the individual with the universe. This sense of harmony with the universe may be the human cognitive extrapolation from the more primitive sense of union with other conspecifics which ritual behavior also excites in prehuman animals.

Thus we see that the phylogenetic origins of ritual carry through in an unbroken line to the most complex human religious rituals. However, to these primitive functions are grafted, as it were, other adaptive functions, namely those of higher cognition. Humans are not simply the sum of neural mechanisms, independently evolved under various selective pressures. Rather, humans function as integrated wholes. Although our higher cognition may have evolved as a very practical, adaptive, problem-solving process, it also carried—indeed it requires—the formation of myths which present problems for which the ancient rhythmic motor behaviors help generate solutions. In other words, when ritual works (and it by no means works all the time), it powerfully relieves our human existential anxiety, and at its most powerful it relieves us of the fear of death and places us in harmony with the universe. It allows individuals to become incorporated into myth, and conversely it allows for the very incarnation of myth. And this generation of the myth-ritual complex is always associated with the modulation and attenuation of intragroup aggression with strong implications for social cohesion. It is no wonder that any behavior so powerful has persisted throughout the ages. Indeed, it is likely to persist for some time to come.

REFERENCES

- Deikman, A. J. 1969. "Experimental Meditation." In *Altered States of Consciousness*, ed. C. T. Tart, 208-9. Garden City, N.Y.: Doubleday.
- Gellhorn, E. 1967. *Principles of Autonomic-Somatic Integration: Physiological Basis and Psychological and Clinical Implications*. Minneapolis: Univ. of Minnesota Press.
- Gellhorn, E., and W. F. Kiely. 1972. "Mystical States of Consciousness: Neurophysiological and Clinical Aspects." *Journal of Nervous and Mental Disease* 154:399-405.
- _____. 1973. "Autonomic Nervous System in Psychiatric Disorder." In *Biological Psychiatry*, ed. J. Mendels, 235-62. New York: John Wiley & Sons.
- Levy-Agresti, J., and R. W. Sperry. 1968. "Differential Perceptual Capacities in Major and Minor Hemispheres." *Proceedings of the National Academy of Science* 61:1151.
- Lex, B. 1979. "The Neurobiology of Ritual Trance." In *The Spectrum of Ritual: A Biogenetic Structural Analysis*, by E. G. d'Aquili, Charles D. Laughlin, Jr., John McManus, Tom Burns, Barbara Lex, G. Ronald Murphy, S.J., and W. John Smith, 117-51. New York: Columbia Univ. Press.
- Lorenz, K. 1966. *On Aggression*. New York: Bantam Books.
- Manley, G. H. 1960. "Displays of the Blackheaded Gull." Ph.D. diss., Oxford Univ.
- Ornstein, R. E. 1972. *The Psychology of Consciousness*. San Francisco: W. H. Freeman & Co.
- Rosenblatt, J. S. 1965. "Effects of Experience on Sexual Behavior in Male Cats." In *Sex and Behavior*, ed. F. A. Beach, 416-39. New York: John Wiley & Sons.
- Schein, M. W., and E. B. Hale. 1965. "Stimuli Eliciting Sexual Behavior." In *Sex and Behavior*, ed. F. A. Beach, 440-82. New York: John Wiley & Sons.
- Tinbergen, N. 1951. *The Study of Instinct*. London: Oxford Univ. Press.
- Trevarthen, C. 1969. "Brain Bisymmetry and the Role of the Corpus Callosum in Behavior and Conscious Experience." Paper presented at the International Colloquium on Interhemispheric Relations, 10-13 June, Prague, Czechoslovakia.
- Turner, V. 1969. *The Ritual Process: Structure and Anti-structure*. Ithaca, N.Y.: Cornell Univ. Press.
- Walter, V. J., and W. G. Walter, 1949. "The Central Effects of Rhythmic Sensory Stimulation." *Electroencephalography and Clinical Neurophysiology* 1:57-85.