

NEUROLOGICAL BASES OF REVITALIZATION MOVEMENTS

by *Barbara W. Lex*

Ethnographic reports and historical accounts document the existence among human capacities of a broad range of psychophysiological states. To illustrate, Erika Bourguignon's extensive analysis of data in George P. Murdock's *Ethnographic Atlas* indicates that people in 437 of the 488 societies for which adequate ethnographic information is available engage in some institutionalized form of "dissociation."¹ Reviewing these findings, Felicitas D. Goodman concludes that "we are dealing with a capacity common to all men."² The near universality of such states (which I prefer to designate as "ritual trance"), frequently manifested in conjointly altered muscle movements, speech patterns, and responses to external stimuli, points to a complex but discernible biological substrate.³ Techniques for establishing these states commonly are associated with religious rituals.⁴ But apart from traditional religious contexts extraordinary psychophysiological states are also dramatically evident in the spontaneously occurring behavioral alterations of individuals whose inspirations innovate reformulated belief systems, whether sacred or secular.⁵

In a broadly encompassing processual model Anthony F. C. Wallace terms such individuals leaders or "prophets" and the new moral and social orders innovated by their revelations "revitalization move-

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ment."⁶ Identifying these prophetic experiences as responses to conditions of widespread social and physical stress, Wallace finds the salient characteristics of both prophets and their followers homologous to the behavioral consequences of certain physiological and psychological disorders.⁷ However, recent advances in behavioral biology further illuminate the biological substrates underlying a wide range of normal as well as aberrant human behaviors. Thus there are now available more precise descriptions and analyses of numerous human psychophysiological states, thereby permitting revisions of previous explanations of their etiologies.

This paper makes no attempt to review the enormous literature on cultural (especially symbolic) or social-structural aspects of revitalization movements but instead specifically reanalyzes the salient experiences of both prophets and converts by incorporating findings in neurophysiological research that (1) point to the sensitizing impacts of stressors on the nervous system, (2) assess the significance of the differential functions attributed to each of the two hemispheres of the human brain, and (3) distinguish the neural structures and linkages in the human brain that are likely to be focal in reorganizing cognitive elements.

Approaches adopted here are admittedly speculative. Moreover, I am fully cognizant of the pitfalls inherent in assuming a human "biological constant," especially in regard to subtle individual or population differences in neurochemistry.⁸ But in the absence of adequate cross-cultural studies which would permit analysis of relevant processes at the microlevels of neurophysiological function, this more general assessment must suffice.

REVELATION

Essential to a revitalization movement is the emergence of a leader or prophet, a person characterized as possessing strong emotional appeal. Often the prophet is an ordinary individual for whom social or physiological stress personally erupts in an out-of-the-ordinary psychophysiological state that generates a design for a new moral order. This new way of life is enunciated in both prescriptions and proscriptions of behaviors and beliefs. Little detail may be known about the life of a prophet prior to the time of revelation because of the very nature of the social milieux out of which such persons arise. Of course, these events are likely to become apocryphal in retrospect, finding their exegesis in the doctrine of the movement, although, in general, biographical accounts of prophets' earlier lives evidence stress-provoking experiences and stress-elicited behaviors. Particularly significant, however, is that these revelations usually have their

genesis in some state of consciousness (sudden "trances," vivid dreams, hallucinations, or profound insights) which differs radically from that of "ordinary" awareness. Moreover, the content of the revealed instructions for the establishment of the new social and moral order is often complex and elaborately detailed. Defined as "deliberate, organized, conscious effort by members of a society to construct a more satisfying culture," the revitalization process, according to Wallace, originates in the prophet's "resynthesized mazeway," or restructured cognitive system.⁹ If one accepts the assertion that the structure of one's culture rarely rises to awareness, then these spontaneously emergent capabilities of prophets are indeed exceptional.

Concrete illustrations of the circumstances attending prophets' revelations provide a basis for beginning this analysis. Although Wallace examined the evidence from a large number of historically and geographically distributed revitalization movements, his interest in the revitalization process appears to have been sparked by his ethnohistorical research on the life of the Iroquois prophet Handsome Lake (as well as by his investigation of human response to disasters). For this reason a brief summary of the salient psychological and physiological conditions described for Handsome Lake at the time of his revelation is presented here. For comparison a distilled version of the experiences of John Slocum, founder of the Indian Shaker Church, as told to Homer G. Barnett, also is provided.

Handsome Lake. Prior to his first revelation, Handsome Lake personally was overshadowed by his more illustrious half-brother, Cornplanter. And, like many of his fellow Seneca after the American Revolution, he was often drunk and despairing. Whiskey drinking and bereavement seem to have exacerbated his deteriorating health and shifting emotions, so that his sudden collapse in the spring of 1799 was no surprise to those who knew this middle-aged man. All vital signs appeared to cease. His kinsmen, assuming him about to die, if not already dead, had started to prepare his cold, immobile body for the grave when he slowly began to recover. First a "warm spot" on his chest attracted notice, then respiration resumed, followed by the return of a discernible pulse. Within two hours he opened his eyes and attempted to speak. At that point he began to recount the vision of supernatural beings who had approached him during his apparently lifeless state and imparted to him an elaborate list of injunctions from the Creator. This experience, however, did not aid Handsome Lake in regaining his health, for he remained weak until his next vision, which occurred about two months later.

It is noteworthy that on the day of his second vision he seemed to have anticipated the arrival of the supernatural entities because he dressed in his best clothing and, after a brief faint, informed a companion that although he was to depart again he would not die at this time. On that occasion his transcendent state is said to have lasted approximately seven hours during which time his body remained warm but his extremities were cold to the touch and his respiration seemingly was arrested. The journey he reported forms a lengthy text, complete with elaborate imagery of the punishment of evildoers reminiscent of Dante's inferno. Six more months elapsed before Handsome Lake's next vision, and by that time his health had improved markedly.¹⁰

John Slocum. An account of the "resurrection" and revelations of Slocum, who founded the Indian Shaker Church among tribal remnants residing near Puget Sound, is strikingly similar to the experiences reported for Handsome Lake. According to statements recorded by Barnett, in November of 1881 Slocum broke his neck in a logging accident. One alternative version of the story attributes his "death" to witchcraft, and another to tuberculosis. Whatever the cause, Slocum lay inert for "several hours" until bystanders who had wrapped his body in a shroud were startled to see him move. At this juncture, Barnett writes, "he began to push the sheet away from his face. He sat up, rubbing the back of his neck and moving his head from side to side. Then he began to speak." After requesting a clean garment, water for bathing, and the removal of objects symbolizing death from the room, Slocum asked all present to shake his hand and to kneel as he prayed and recounted the journey to heaven which had transpired while his body appeared to be lifeless. Preaching, he revealed the instructions for living which the supernatural force had imparted to him.¹¹

Slocum later fell prey to the very temptations against which he had warned. After about a year, while returning from a funeral, he collapsed following his participation in a canoe race and again was expected to die. On this occasion his wife, Mary, caught up in intrafamilial controversies about the efficacy of shamanism, became distraught, collapsed, and entered a hyperkinetic state in which she effected the cure of her husband by her "shaking." Initially Slocum forswore the practice as "devil's work." However, after his relapse, Mary with others' help again ministered to his ills. This time "the shaking went on for several days and nights," and soon the behavior became firmly established and formed the focus of the Indian Shaker Church.¹²

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Evidence for Neurobiological Substrates in Revelation. Both of these prophets and numerous others underwent profound behavioral changes at the time of their revelations. These unexpected alterations in behavior and their marked aftermath in certain cases appear so swiftly and vividly in prophets that, as in the case of ritual-trance states, many investigators have failed to probe for mechanisms possibly underlying such states and instead have adopted established medical models of physical and mental illness.¹³ Of course such models are readily available and provide convenient, authoritative "explanations" that account for otherwise inexplicable behavior. Ward H. Goodenough, however, contends that there is little distinction between the "flash of insight" of the prophet and that of the innovating scientist. Analyzing revelations, he writes: "Cognitively the sudden conception of a new order or 'key' to all existing problems is no different from that which scholars and scientists experience when they suddenly perceive a new pattern in their data or get the insight by which everything with which they have been working at last makes sense."¹⁴ The major difference between scientific creativity and religious revelation, according to Goodenough, lies in the strength of the emotional response in the individual's experience. Resolution of social and moral problems through such an insight, whatever the form, at the same time resolves the inner, emotional conflicts of the revitalization prophet, bringing a therapeutic sense of extreme relief and exalted well-being.¹⁵

Goodenough's comparison suggests two promising domains for further exploration of prophets' experiences. Neurobiological substrates of emotion have occupied the interests of many students of the life sciences for more than a century; and recent investigations of the differential functions of the two cerebral hemispheres of the human brain shed light on the relationships between emotionality and rationality as well as on the process of creativity.

NEUROBIOLOGICAL EXPLANATIONS

Subjective reports of the experiences of prophets are potential evidence that extreme and profound emotions have occurred. "Heavenly" visions can be identified with accompanying pleasurable feelings, while painful scenes of "hell" (such as in Handsome Lake's second vision) can be attributed to acute guilt, fear, or anxiety. Likewise the presence of both kinds of imagery in a reported vision can be interpreted as indicative of oscillations from one emotional extreme to another or an intense ambivalence. This type of explanation is not uncommon. According to Wallace, Handsome Lake's

“deathlike trance” was the product of his prolonged guilt, chronic anxiety, excessive use of alcohol, and bereavement.¹⁶

Neurobiological Substrates of Emotion. Conventionally we speak of “levels” of consciousness as though numerous strata, from lowest to highest, characterize human thought. Similarly the rational thought processes of human beings are said to emanate from the cerebral cortex, greatly enlarged and elaborated in *Homo sapiens* and therefore “higher” than those of emotional responses arising in phylogenetically earlier, “lower,” subcortical brain structures. Oversimplified and misleading, these notions do not acknowledge the significance in human neurophysiology of reciprocal innervation in the nervous system, biologic homeostasis, or the differentiated complementary functions of the two cerebral hemispheres.¹⁷ However, an equally reductive and deceptive representation of a “state of consciousness” is the location of a point somewhere between the poles of a unilinear continuum. Biologic homeostasis does not characterize all physiological states.¹⁸ In addition the finer subtleties of human emotions remain to be disentangled and identified through laboratory procedures.¹⁹ It must be remembered that symbolic factors are inextricably intertwined in human emotions. Findings of a classic series of experiments on American subjects show that “given a state of physiological arousal for which an individual has no immediate explanation, he may well ‘label’ this state and describe his feelings [emotions] in terms of cognitions [‘knowledge’] available to him.”²⁰

But even the emotional impact of symbols aside, a realistic, neurophysiologically derived model of human consciousness simultaneously accounts for the multifarious complexities of the central, autonomic, and somatic nervous systems as well as the degrees of neural excitation and variations of neurochemical processes possible there. The most appropriate cybernetic model is that of a homeostatic control mechanism which describes a given state as a locus in n -dimensional space at a specific point in time.²¹ To some of these distinct loci, or states, individuals return again and again. Orgasm, daydreaming, and rapid-eye-movement (REM) sleep are among several different states of consciousness experienced by the human species. To these more prosaic states can be added the phenomena of visionary trances, spirit possession, and the revelations of revitalization prophets, which among other experiences are known popularly as “altered states of consciousness.” Although some anthropologists have attempted to classify these phenomena solely according to their observations of motor behavior, the autonomic and central nervous

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systems also play a powerful role in the alterations of body functions involved in ritual trance and other unusual psychophysiological states.²² However, it should be remembered that the nervous system is an interactive, interconnected, immensely complex structure, and therefore emphasis on any single subsystem is useful only as a convenient heuristic. Underlying any behavior is the action of a nervous system functioning in concert, not in discrete segments.

The Autonomic Nervous System. More than thirty years ago two anthropologists, Eliot D. Chapple and Carleton S. Coon, established the importance of the autonomic nervous system in human interaction.²³ Interconnected with both the central and the peripheral somatic nervous systems, the autonomic nervous system largely regulates vegetative processes and the emotions.²⁴ Moreover, although the exact causal mechanisms are as yet incompletely known, the functions of the autonomic nervous system are not completely "automatic" but can be modified through voluntary efforts. Manipulations of the autonomic nervous system play an integral role in the performance of ritual, especially in states of ritual trance.²⁵ The autonomic nervous system is the major system maintaining homeostasis in the body, rapidly responding to internal and external stimulation through appropriate excitations in the parasympathetic or sympathetic (sub-)divisions. However, these two neural systems are not independent, for with few exceptions organs are innervated by both the parasympathetic and the sympathetic systems. Although qualitatively different in structure, in general stimulation of one system dampens or inhibits functioning of the other.²⁶

Anatomical and neurochemical differences account for the distinctive functions of each subdivision of the autonomic nervous system. Characterized by internal connectedness, the entire sympathetic system can be excited if only a few of its nerves are stimulated. Moreover, sympathetic response is synergistic because neural stimulation in turn releases adrenal hormones as well as the neurohumoral hormones epinephrine and norepinephrine. In contrast the parasympathetic system manifests less internal connectedness, usually reacting as a whole in response to relatively simultaneous stimulation of its components. It releases acetylcholine and serotonin.²⁷ Among other stimuli, sound or cold evokes response in the sympathetic nervous system, while warmth, grooming, or ingestion of food stimulates the parasympathetic nervous system.²⁸

Intensity of stimulation is also an important factor. Up to a specific threshold, stimulation of the parasympathetic nervous system generally results in more pleasurable states, but intense stimulation causes

discomforts—among them frequent urination, diarrhea, peptic ulcers, and other visceral disorders. Although alert wakefulness is mediated largely by the sympathetic nervous system, sudden or threatening stimuli resulting in, for example, anger, similarly involve greater sympathetic response.²⁹ In “fight or flight” situations as described by Walter B. Cannon the body mobilizes for swift response as the sympathetic nervous system halts or reduces activity in organs not immediately needed for combat or escape: Blood shunts from the viscera to the skeletal muscles, heart and respiration rates increase, digestive activity ceases, and perspiration cools the body.³⁰ However, unabated mobilization is dysfunctional and ultimately could precipitate death. Instead parasympathetic compensation or rebound normally follows and inhibits sympathetic reactivity, slowing respiration, reducing the heart rate, diverting blood to the viscera from the striated muscles, and thus promoting restorative rest and renewal of energy. In sum, under normal conditions a dynamic equilibrium prevails between sympathetic and parasympathetic arousal whereby stimulation of either system inhibits the other system. However, it is important to note, as Chapple has pointed out, that the quality of human interactions can perturb this equilibrium easily.³¹

Individual Differences in Emotional Reactivity. Measurable individual differences in specific autonomic reactions have been observed to underlie variations in psychophysiological reactivity to several types of stimuli.³² These potentially affect emotional reactions. This “autonomic factor” also subserves the behavioral component termed “temperament,” that is, sensitivity to sensory stimulation and consequent intensity and form of emotional response.³³ Ample data show that both newborn and older children vary in their motility and responsiveness to stimuli.³⁴ Furthermore, studies of white American children and adults reveal at least five different central tendencies of response in the autonomic nervous system.³⁵ And tests of Chinese and American newborns indicate statistically significant differences in temperament. Sensory or motor development, central-nervous-system maturity, or social responsiveness shows no difference between these two populations.³⁶ Some portion of biologically influenced, individual psychophysiological variation can be attributed to nutritional and maturational differences, but another, indeterminate segment involves genetically derived disparities in nervous-system excitability.³⁷ Hence it is tempting to postulate that genetic difference among individuals may predispose some persons to unique emotional states.

However, numerous investigators have demonstrated that emotional response patterns are species specific and that any

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heterogeneity in emotional reactivity within a species is quantitative rather than qualitative. According to Jan Bruell all members of a given species resemble one another in their emotional response patterns, and phenotypic disparities among individuals result mainly from genotypic variation influencing the frequency, magnitude, or speed of these responses.³⁸ Furthermore, it is likely that these observed disparities derive from biochemical factors rather than from discrepancies in the structure of the nervous system.³⁹ Alternatively there is a strong possibility that variation may lie in the microstructure of the nervous system, more specifically in neurochemical processes to be found at the synapses as well as in postsynaptic discharge patterns. But the precise chromosomal locus and mechanisms of inheritance of all genes determining biochemical influences on reactivity in the nervous system are not known.⁴⁰ The discovery of quantitative individual differences in emotional responses in all animal populations studied thus far indicates that the genetic component is polygenic and heterotic, that is, involving several genes having a number of alleles.⁴¹ Moreover, the complex influences of environmental factors on human phenotypes are still largely uncharted and undefined.⁴²

Thus the present state of knowledge in behavior genetics demonstrates the inheritance of general tendencies toward certain emotional behaviors, although the precise locus and mechanism of inheritance as well as the impact of environmental forces remain to be discovered. In addition work in behavior genetics discloses that within a species, in this case *Homo sapiens sapiens*, despite seemingly idiosyncratic differences, through identical mechanisms all members are capable of manifesting similar emotional response patterns. Hence any genetically determined differences exhibited in seemingly unusual psychophysiological states are in the direction of degree rather than form, with environmental forces constituting a not specified but significant factor. In short, emotional reactions involved in prophets' revelations and adherents' conversions fall within the range of behavior typical of contemporary scientific accounts of the human species. Persons who become neither prophets nor converts, despite the highly evocative emotional conditions concomitant with revitalization movements, are unlikely to differ dramatically in genetic makeup from those who do.

Sensitization of the Nervous System. A more fruitful domain for neurobiological analysis of revelation and conversion is found in the sensitization, or "tuning," model of nervous-system excitation proposed by Ernst Gellhorn and his collaborators.⁴³ This approach pro-

vides insights useful in the interpretation of transcendent states of consciousness and has been applied to analysis of Zen, Yoga, transcendental meditation, "voodoo" death, and trance occurring in religious rituals.⁴⁴ *Mutatis mutandis*, the concept of tuning the nervous system also can form a basis of an explanation for the revelation experiences of prophets and the conversions of followers. In this model, derived from W. R. Hess's early recognition of integrated behavioral response in the central, autonomic, and somatic nervous systems at the subcortical level, a tonically active, mutually reciprocal balance—or dynamic equilibrium—prevails between the ergotropic and trophotropic systems.⁴⁵ An example of equilibration in these systems is found in the cycle of wakefulness and sleep. These two terms, ergotropic and trophotropic, like many other scientific terms, can become readily meaningful by recognizing the meaning of their Greek roots. "Tropic" signifies turning and here signifies particularly a tendency to turn toward or a tendency to move in the direction of something. The "erg" is from the Greek for energy, and hence "ergotropic" signifies something that produces a tendency toward energizing the body, such as to protect it by fight or flight. "Troph" is from the Greek signifying nourishment, and hence "trophotropic" denotes something which produces a nutrient or upbuilding situation, such as feeding and digesting.

Ergotropic response consists of augmented sympathetic discharges, accompanied by increased muscle tonus and "desynchronized" rhythms of neural excitation in the cerebral cortex; the trophotropic pattern includes heightened parasympathetic responses, together with relaxed skeletal muscles and synchronized (resting or baseline) cortical rhythms.⁴⁶ William F. Kiely points to an interconnected "tripartite hub," consisting of the limbic system, hypothalamus, and reticular formation of the paleocortex, as the neural structures which integrate purposive, foresighted behavior in man by mediating subcortical responses in the ergotropic and trophotropic systems to the cerebral cortex; biochemical processes pertinent to these structures are also affected.⁴⁷ According to Kiely, equilibration in these systems modifies neural responses in perception of external and internal stimuli as well as in the processes of memory and fantasy.⁴⁸

Deviations from biologic homeostasis occur when stimulation of either the ergotropic or trophotropic system alters reactivity of the reciprocally interconnected opposing system, resulting in a state of "tuning," or sensitization.⁴⁹ Sensitization may be accomplished through direct stimulation of either the sympathetic or parasympathetic nervous system, use of drugs which excite (additively or

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synergistically) or block one or the other system, or mental activity.⁵⁰ The sensory stimuli associated with rituals are actually elaborate means of sensitizing the trophotropic system.⁵¹

In Gellhorn's model moderate stimulation of one system results in equivalent inhibition of the other, and this degree of excitation is termed stage 1 tuning. Further stimulation past a certain threshold elicits "reversal" reactions whereby stimuli which ordinarily would evoke a response in the nonsensitized system instead precipitate greater response in the system already sensitized. This tuned state, in which excitation in the opposing system is inhibited maximally, is termed stage 2. Maximal stimulation, however, causes reciprocal inhibition between the two systems to break down at stage 3, resulting in a "spillover" of neural impulses into the previously inhibited system, thereby creating conditions in which simultaneous, or "mixed," discharges occur in both systems.⁵²

Behavior in the first stage is characteristic of an individual's usual response to some ordinary stimulus, such as ergotropically orienting to a sound while falling asleep or trophotropically salivating at the smell of food preparations while one is hard at work; in both cases the nature of the stimulus evokes one system and, at least temporarily, inhibits the other. In the second stage a typical ergotropic response might be the apparently hostile reaction of an angry person to the gentle caress of a loved one and an example of trophotropic response the outpouring of affection of a rejected lover. The third stage also appears paradoxical, for the individual experiencing mixed neural discharges may suffer from the effects of strong or ambivalent emotions or simultaneously manifest trembling hands and weak knees.⁵³ Table 1 charts the responses associated with the trophotropic and ergotropic systems.

The Prophet's Revelation. Although his early assessments attributed these behaviors to some form of mental disorder, more recently Wallace has suggested that prophets' "mazeway resyntheses," or reworkings of cognitive elements, transpire in states of consciousness which are "extreme forms of the reorganizing dream processes which seem to be associated with REM (rapid-eye-movement) sleep."⁵⁴ REM sleep (the sleep stage in which most dreaming seems to occur) sometimes is referred to as "paradoxical sleep" and also can be viewed as a state in which mixed discharges occur.⁵⁵ In REM sleep, curtailed muscle tone in the limbs and trunk is accompanied by cortical and visceral arousal; the balance in the ergotropic-trophotropic system has shifted to dominance of the trophotropic component. Similarly in Zen, Yoga, and transcendental-meditation states muscular relaxation indicates

that there is diminution of arousal in the ergotropic system in the presence of cortical and visceral arousal, again demonstrating a shift to the trophotropic side of the ergotropic-trophotropic balance.⁵⁶ Yoga ecstasy exhibits a comparable pattern, although greater cortical arousal is present.⁵⁷

Thus under sensitized conditions balance in the ergotropic-trophotropic system shifts, altering the magnitude of excitation in particular neural structures. In other words, while we may speak of a relationship between ergotropic and trophotropic reactivity in a specific individual, frequency and intensity of excitation in different locations in the body vary. The specific intensities, frequencies, and loci involved have psychophysiological and behavioral effects which

TABLE 1*

SOME EFFECTS OF STIMULATION OF THE ERGOTROPIC AND TROPHOTROPIC SYSTEMS

STIMULATION OF THE ERGOTROPIC SYSTEM	STIMULATION OF THE TROPHOTROPIC SYSTEM
Autonomic Effects	
Augmented Sympathetic Discharges	Augmented Parasympathetic Discharges
Increased heart rate, blood pressure, sweat secretion; pupillary dilation; inhibition of gastrointestinal, motor, and secretory function	Reduction in heart rate, blood pressure, sweat secretion; pupillary constriction; increased gastrointestinal, motor, and secretory functions
Somatic Effects	
Desynchrony of electroencephalogram, increased skeletal muscle tone, increased secretion of catabolic hormones: epinephrine, norepinephrine, cortisol, thyroxine, growth hormone, antidiuretic hormone aldosterone	Synchrony of electroencephalogram, loss of skeletal muscle tone, blocking of shivering response, increased secretion of insulin, estrogens, androgens
Behavioral Effects	
Arousal, heightened activity, and emotional responsiveness	Inactivity, drowsiness, and sleep

*After William F. Kiely, "From the Symbolic Stimulus to the Pathophysiological Response," *International Journal of Psychiatry in Medicine* 5 (1974): 517-29.

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are expressed commonly as “states of consciousness.” Anger, depression, sleep stages, ecstasy, and anxiety are some names for states which we subjectively can recognize (or “label”) as well as identify in the laboratory.⁵⁸

It has been shown that sensitization of either the ergotropic or trophotropic systems results in changed responsivity to stimulation. As successive thresholds are passed, reactivity of the sensitized system increases until reciprocal inhibition between the two systems fails and simultaneous neural discharges ensue. Ergotropic response, by nature synergistic, is more likely to occur than trophotropic response because of the reticulate structure of the sympathetic nervous system as well as the mobilizing effects of the hormones and neurohumors which this system releases. Furthermore, because perception of stimuli—alertness—is largely a function of ergotropic reactivity, prolonged, excessive, noxious, threatening, or otherwise disruptive stimuli readily can generate sensitization of the ergotropic system.⁵⁹ Through this process, psychophysiological disorders result from unremitting, unresolved stress, prompting individuals to seek relief from their discomforts.⁶⁰

From a neurobiological perspective chronic stress exacerbated by additional stimulation can lead to trophotropic reactivity in the form of collapse.⁶¹ Generally effective stress reduction mechanisms in animals including man, apart from sociocultural inputs, are organically regulated. In sociocultural systems also stress reduction strategies are culturally defined as well as socially institutionalized and often are accomplished through the emotionally evocative techniques of ritual.⁶² But the inadequacy or prohibition of traditional coping procedures characterizes the “cultural distortion” phase of the revitalization process.⁶³ Overburdened, prophets such as Handsome Lake or Slocum collapse; their state is the product of acute trophotropic rebound.⁶⁴ To observers the prophet-to-be lies near death, motionless, speechless, cold to the touch. Seemingly vital processes are diminished below the level of normal sleep, if not fatally arrested. Yet the stricken individual arises and promulgates a vision of a regenerated society to be established through adherence to new rules of living mentally acquired while the prophet’s body lay inert.

Meditation, REM sleep, and the collapsed state of the prophet all have common characteristics. Diminution of muscle tone, alteration in one’s sense of spatial orientation, and vivid perceptual imagery characterize both meditation and ecstasy as well as sleep.⁶⁵ In these respects the circumstances attending prophets’ visions are strikingly similar. Furthermore, in meditation, ecstasy, and REM sleep, the trophotropic system predominates, and at the same time a limited

degree of ergotropic excitation (somewhat greater in ecstasy) occurs in the cerebral cortex. However, these phenomena are not manifestations of mixed discharges resultant from prolonged, stress-induced sensitization.⁶⁶ The techniques of meditation and ecstasy must be learned, in some cases requiring lengthy training, and the causes and functions of REM sleep, although thought by most to be largely physiologic, are still debatable.⁶⁷

Thus these states of mixed discharges with trophotropic dominance involve the same neurophysiological structures but have their genesis in three different precipitating conditions: REM sleep is a normal physiologic process, ritualized meditation and ecstasy are learned, and prophets' transcendent states are generated by exacerbated chronic stress. Even more striking, however, is the observation that in many societies such states are associated with religion. This conjunction is not inexplicable, for mixed neural discharges almost inevitably entail strong emotions.⁶⁸ Not only are profound emotions inextricably evoked by religious rituals, but also the practice of ritual, whether involving active movements or sedentary postures, serves to elicit mixed discharges in which those of the trophotropic system predominate.⁶⁹

It is only fair to state, however, that numerous neurotic and psychotic disorders also are manifested by mixed neural discharges of both the sympathetic and parasympathetic systems, but this commonality has misled various theorists to believe that religious behaviors stem from or parallel the course of certain mental illnesses.⁷⁰ Moreover, it is noteworthy that numerous therapies employed by clinicians in the treatment of mental illness incorporate measures which evoke the trophotropic system.⁷¹ Therefore, although it is impossible psychiatrically to evaluate every historically known prophet, the weight of the neurophysiological evidence underscores the essential validity of these individuals. This assessment does not exclude from possibility the occurrence of debilitating "mental illness" in certain of these persons but instead points to the necessity of avoiding any pejorative conclusion about the psychiatric status of prophets.

A more crucial issue in the analysis of revelations, however, is that a prophet announces a complex system for the reorganization of beliefs and behaviors in order to transform an entire society from seemingly intractable chaos to a utopian order. Not only does the prophet's vision surpass ordinary dreams in complexity and vividness, but also the content and circumstances of occurrence of this vision frequently attract considerable attention from persons who become aware of it.⁷² Thus in both intensity and scope of impact the prophetic experience departs from the more private imagery of commonplace dreams. It is

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also probable that the prophetic experience structurally differs from ordinary dreams.⁷³ Prophetic dreams are often direct and explicit, with their manifest content contributing the message, and in prophetic dreams there do not appear to be as much condensation and displacement of content as those usually identifiable in normal dreams.

According to Ernst L. Hartmann REM sleep permits neurochemical processes to repair and reorganize connections in the cerebral cortex, thereby restoring normal homeostasis.⁷⁴ It is clear, however, that the collapse of the prophet involves more than simple homeostasis, for the dynamic equilibrium which usually prevails in the nervous system has been perturbed by sensitization. By extension it follows that the reorganization of cognitive elements which occurs in revelation also must exceed that which transpires in ordinary sleep and that the pertinent neurobiological processes are located primarily in the cerebral cortex.

Differentiation of the Two Cerebral Hemispheres. Abraham H. Maslow includes the experiences of prophets among the transcendent states which he terms "peak experiences" and has examined at length their emotional and cognitive features.⁷⁵ Particularly remarkable among these are the qualities of holism, gestalt, timelessness, and well-being, which according to Joseph E. Bogen and Robert Ornstein are all attributable to the special capacities of the right cerebral hemisphere.⁷⁶

New data on the differing capacities of the two cerebral hemispheres necessitate revision of our understanding of human problem solving; furthermore, the distinctive capacities attributed to the right cerebral hemisphere aid in resolving the paradox of antithetical emotional states reported for prophets' transcendent states. For example, although Maslow identifies well-being, goodness, rightness, and god-like feelings with peak experiences, and Marghanita Laski in her treatise on ecstasy notes that seemingly unrelated events ranging from childbirth to hearing symphonic music evoked transcendent experiences in her respondents, Wallace asserts that prophets' revelations emanate from acute, unrelieved stress, feelings of anxiety, frustration, guilt, helplessness, and hopelessness.⁷⁷ The inherent contrast between these two apparently extreme or polar aggregates of emotions permits no resolution unless the special features of the right cerebral hemisphere are incorporated in the neurophysiological model of emotion previously presented. At the simplest level of commonality all of these disparate emotions share roughly equivalent departures from ordinary homeostasis. But additionally and complexly the right cerebral hemisphere is involved directly in emotional experiences. According to Norman Geschwind the right hemisphere

should be considered "dominant" for emotion and "is primarily responsible for learned, highly complicated expression of [the] finer aspects of emotion."⁷⁸

Within the last decade numerous researchers in the neurosciences have focused their attention on the functions of the right cerebral hemisphere.⁷⁹ Previously prevailing opinions viewed the right cerebral hemisphere as "mute," unspecialized, and largely subordinate to the "dominant" left hemisphere, which long has been known to be the locus of speech production (in most right-handed and in the majority of left-handed individuals). Considerable evidence now shows that in most humans the left hemisphere is also the site of linear analytic thought, sequential information processing, and assessment of temporal duration. In contrast the specializations of the right cerebral hemisphere comprise spatial and tonal perception, recognition of patterns, including emotions and other body states, and holistic, synthetic thought; however, linguistic capability is limited, and the temporal capacity is believed absent. Ordinary task performance requires alternation between the cognitive functions of each hemisphere.

In a popularized account of these findings Ornstein, having examined a number of anthropological writings, concludes that the neurobiological basis for religious experience resides in the functions of the right cerebral hemisphere.⁸⁰ More particularly he suggests that meditation or trance states are instances of temporary, right-hemisphere dominance and that the rituals which promote such states are designed implicitly to free the right hemisphere from subordination to the left. Although Ornstein does not address the generation of new, religious belief systems (nor is he aware of the implications of nervous-system tuning), in one of his main sources it is argued that creativity occurs when previously unrelated, incoherent cognitive elements are synthesized into new configurations by the right hemisphere and their relationships then are expressed effectively (rendered into words) by the left.⁸¹

Taken together, the interpretations of Ornstein and of the Bogens (Joseph E. and Glenda M.) can be compared with the properties of perception and organization of experience ascribed to right-cerebral-hemisphere function. According to these analyses in one sense a prophet is a vatic, or seer, who perceives an alternative future because the state of consciousness generating revelations frees one from the time-bound mode of ordinary, left-hemisphere-dominant, sequential thought. Correlatively the unity and cyclical nature of life, including holistic perception of the interrelationships among stress-provoking conditions, rise to a prophet's consciousness because holism is intrinsic to the quality of right-hemisphere cognition. Moreover, symbolism abounds in enunciating the vision, often

phrased in metaphor and parable, because ordinary speech—a left-hemisphere activity—cannot render faithfully the functionally ineffable thoughts of the right hemisphere.

Other investigators provide further insights. The emotionalism of revitalization movements, manifested in the initial revelations, prolonged harangues by the prophet, sudden dramatic conversions, and later vivid revelations, is present because the right hemisphere analyzes and gives rise to the subtle complexities of emotion.⁸² God-like feelings, oceanic sensations, and reports of contact with supernaturals can be attributed also to right-hemisphere capacities. Geschwind reports that experiences of *déjà vu* most often are associated with the right hemisphere, and Maitland Baldwin notes that the majority of hallucinations emanate from the right hemisphere.⁸³ The sensations of religious ecstasy, according to Ornstein, are rendered symbolically by the right hemisphere through nonverbal means such as art forms, verse, song, and dance.⁸⁴ Postural movements in dance also may reflect right-hemisphere specialization, for the right hemisphere appears to innervate nonpyramidal motor systems responsible for axial movements.⁸⁵ Furthermore, as I have proposed elsewhere, although the ecstatic vocalizations of glossolalia may arise from the right hemisphere, in ordinary speech the left hemisphere alone governs communications of experience perceived in the right; hence labels for aspects of supernatural presences, such as “power,” “faith,” *mana*, or “baptism in the Holy Spirit,” may be interpreted as examples of right-hemisphere perceptions rendered into words by the left hemisphere.⁸⁶

There is some evidence that the cortical rhythms of the right hemisphere are generally those of resting or baseline states.⁸⁷ If this is the case and if the techniques of ritual are indeed means of evoking the trophotropic system, then effectively the rhythmic stimulations which are very much a part of religious rituals also may elicit resting rhythms in the left hemisphere. In this way synchronous patterns of excitation may permit short intervals of right-hemisphere dominance, linking together the model of sensitization in the nervous system with that of cerebral-hemisphere differentiation.

But the state of trophotropic sensitization, or collapse, which characterizes the experience of the prophet is not produced through institutionalized rituals; it is said to be precipitated by chronic stress aggravated by additional stressful circumstances. The content of imagery in ritual trances constitutes conventionalized representations of traditional cultural elements rather than innovative reformulations combining both novel and traditional symbols. Moreover, there is strong resistance to change rituals perhaps because the cortical

arousal necessary to acquire new forms of behavior might disrupt patterns of trophotropic excitation in appropriate neural structures.⁸⁸ Hence a prophet's revelation occurs in a neurophysiological state that bears some resemblance to ritual trance but does not occur in exactly the same form or with the same patterns of neural excitation in specific structures of the nervous system.

NEUROBIOLOGICAL DETERMINANTS OF REVELATION

Eyewitness accounts of the collapse of Handsome Lake and of Slocum, although subject to distortion, suggest that the vegetative processes of both men were so greatly inhibited that bystanders assumed each of them to be dead or dying. Indeed in each instance the dramatic impact of the prophet's startling recovery was of crucial importance to adherents because to them it underscored the veracity of the revelations that were reported subsequently. Superficially viewed, these events might appear to be mythopoeic devices deliberately employed in order to heighten the significance of a prophet's initial and later revelations. However, it would be extremely short sighted, for example, to presume that the Seneca, accomplished in hunting and in warfare, could not distinguish sleep from death. One cannot assume that the prophets in these instances were sleeping or feigning sleep. Instead the circumstances of each case indicate that attainment of a special neurophysiological state underlies these revelations.

Furthermore, one can postulate that response to external and internal stimulation also is curtailed in such states. In the two examples presented the prophets were each immobile and unresponsive for long periods of time. Yet later each man reported vivid "stimulation" of all sensory modalities, suggesting that cortical activity is high, at least in some centers of the brain. Following Geschwind, Charles D. Laughlin, Jr., and Eugene G. d'Aquili have suggested that there is an important relationship between the generation of myth and neural impulses in two specific brain structures. These are (1) the inferior parietal lobule, a complex sensory (auditory, somesthetic, and visual) association area of the brain involved in concept formation and antinomic thinking, and (2) the anterior portions of the frontal lobes, which order perceptual and cognitive elements as well as sequences in time and in space.⁸⁹ In their view comparisons appear to be localized in the inferior parietal lobule, and abstract causal thinking is localized in the anterior convexity of the left frontal lobe. These regions of the cerebral cortex, reciprocally interconnected, are said to be intimately associated with "antinomic thinking" and "causal thinking," re-

spectively, and as such subserve the major cognitive processes underlying the structure of myth. Moreover, these structures are identified as essential in the human "cognitive imperative," defined as the innate human necessity to order sensory experience.⁹⁰ In other words, these areas of the brain promote fundamental comparisons (e.g., "larger than" or "better than") via cross-modality sensory association and are basic to the process of abstraction, whereby elements are broken down into their constituent parts and then recombined.

Given the mixed neural discharges characteristic of the other states with which the prophet's condition has been confused, it can be assumed that excitation in the autonomic and somatic systems is reduced greatly during collapse and that cortical activity is likely to be comparatively high. These inferences must remain tentative, but if this is the case excitation may be enhanced greatly in the brain structures identified by d'Aquili and Laughlin as integral to the generation of myth. Furthermore, inhibition of response to internal and external stimuli also may create conditions resembling those of sensory deprivation (known to stimulate pseudoperceptions), thus augmenting the content of accompanying mental imagery.⁹¹

Although antinomic and causal thinking appears to reside in the left cerebral hemisphere and holistic synthesis is thought to be characteristic of the right hemisphere, Laughlin and d'Aquili suggest that under special circumstances both hemispheres may function simultaneously to the greatest extent of their capacities.⁹² What remain to be identified are the neurophysiological processes in which these circumstances might develop. Suggestive models are provided by the neurophysiological states characteristic in a conjunction of cataplexy and sleep paralysis.

According to Roger Broughton some persons on occasion manifest cooccurrence of cataplexy, that is, "sudden loss of postural tone and falling, which is usually precipitated by intense emotions such as laughter or fright," and sleep paralysis, in which one awakens lacking body sensations and the power to move—often a terrifying experience.⁹³ Significantly either ordinary REM sleep or hypnogogic hallucinations (imagery in the transitional phases leading to sleep) also may accompany such states.⁹⁴ All of these features implicate nervous-system sensitization: In sequence reversal phenomena are followed by mixed discharges.⁹⁵

From this perspective, under chronic stress a prophet-to-be undergoes ergotropic sensitization to the point where intense cerebral and limbic discharges result in some degree of "tuning." Additional stimulation, via intense emotion, triggers acute trophotropic rebound, or collapse in the peripheral somatic (motor) nervous system. During

collapse muscle tone, peripheral vasodilation, and response to external stimuli, generally mediated by the ergotropic system, are curtailed. If, however, as in the case of cataplexy, the subcortical mechanisms controlling sleep are disturbed, an individual may experience vivid dreams or hallucinations, states characterized by mixed cortical excitation.⁹⁶ Moreover, because fear first elicits trophotropic response and then ergotropic rebound in sleep paralysis, greater trophotropic inhibition of sensory and motor responses is accompanied by augmented cortical excitation through simultaneous trophotropic and ergotropic discharges.⁹⁷ In short, while the prophet's body lies insensate and immobile, the prophet's brain undergoes intense stimulation, and in this way dramatic mental imagery attends the extraordinary condition of somatic paralysis.

Thus, despite arcane appearances, the conditions immediately antecedent to prophets' revelations are explicable through the application of established neurobiological principles. However, in view of competing interpretations of pathology versus normalcy, it is useful to review the medical position on such states. Patients exhibiting the narcoleptic syndrome, or "tetrad," of which cataplexy and sleep paralysis are two components, have received the attention of clinicians and sleep researchers; the literature also includes reports of hallucinations accompanying sleep paralysis offered by naval officers on watch or even by the clinicians themselves.⁹⁸ Given the multifarious, intricately interconnected neural and biochemical processes involved in sleep (as well as in attention and arousal), divergences in function, especially under stressful conditions, are not always interpreted as aberrant occurrences. The functions of cortical and subcortical structures are subject to alteration if even minute deviations in respiration, blood supply, oxygen, glucose, or salinity levels occur, thereby hinting that aspects of the narcoleptic syndrome are less than rare events. Often long vigils are sufficient to promote these states in sleep-deprived (stressed) individuals, as in the case of "night-nurses' paralysis" described by Ian Oswald.⁹⁹ When such an episode is brief and happens during intervals of sleep it may be summarily dismissed as "a bad dream," but incidents occurring during periods of wakefulness are more noticeable and memorable to the individual as well as to observant bystanders; and, if disruptive to ordinary behavior patterns, narcoleptic phenomena are likely to be deemed pathological. Furthermore, the duration of such states varies from a few seconds to as long as two-and-a-half hours.¹⁰⁰ Hence, while momentary paralysis might be regarded as a transient "dizzy spell," a prolonged state of deathlike immobility interposed in wakefulness presents an obvious disjuncture in ordinary behavior that requires more elaborate expla-

nation. Therefore the point at which the episode occurs in an individual's usual sleep-wakefulness cycle, its duration, and the response of the individual and bystanders are all relevant factors in interpreting the prophet's collapse.

If during collapse cortical activity is both mixed and high, affect from the limbic system is strong, and the two hemispheres of the brain simultaneously are engaged to analyze the weighty problems preoccupying the prophet-to-be and to synthesize their solution, then the imagery in the prophet's dreams or pseudoperceptions may be drawn from psychological, cultural, or social dilemmas and the reorganization of elements which occurs is thereby focused on their resolution. d'Aquili argues that the basic elements of cognitive structure reside in the series of abstract spatiotemporal oppositions cerebrally analyzed via neural activity in the inferior parietal lobule and the anterior convexities of the frontal lobes. These relationships, ascribed emotional valences by the limbic system, can be said to yield a topography of cultural distortion which is reshaped through realignment of its elemental features.¹⁰¹ Also attendant psychophysiological sensations are sufficiently distinctive to elicit the explanation that a visitation from admonishing supernatural entities or an informative journey to supernatural realms has provoked the experience.

These factors considered, the contention that the prophet dies, obtains instructions from beings in or from an ultramundane world, and returns to life is highly appropriate for many reasons. First, the combination of cataplexy and sleep paralysis renders the body immobile and insensate, characteristics obviously shared, at least superficially, with death. Second, the conjunction of hypnogogic imagery or dreams concomitantly heightened with sensory deprivation, fear of death, and unusual configurations of mental images elicits extremely unique emotional sensations. Third, if the content of these pseudoperceptions includes pressing difficulties, then the increased and simultaneous excitation in both analyzing and synthesizing cerebral hemispheres may contribute to the reorganization of cognitive elements into a new configuration, perhaps metaphorically expressed by the topography of the prophet's odyssey. Fourth, at some point during this process, perhaps during recovery, the prophet may experience pleasurable trophotropic sensations; correlatively resolution of personal and social problems dispels tensions and promotes a feeling of relief and well-being. And fifth, the "cognitive imperative" which impels human beings to classify sensations operates to attribute all of these experiences to some source or agent. If powerful, "ultrasensory" emotions are associated with religion, then in their efforts to explain the experiences of the prophet people are likely to resort to

notions of supernatural causes, except in the presence of strongly pervasive, secular belief systems.¹⁰²

Charisma, Conversion, and Ritualization. One might question whether all prophets impart to others their revelations. Wallace's original work on revitalization states that "the prophet feels a need to tell others of his experience, and may have definite feelings of missionary or messianic obligations" but does not elaborate on causes underlying this "need."¹⁰³ It also might be claimed that we cannot know of prophets who felt no such urge, for obviously they would not have disclosed their experiences. However, Chapple, a student of the biological bases of interaction, points to the fundamental role of cholinergic (trophotropic) effects on certain types of human behavior. According to him a "burst of speech" often accompanies intense discharge in the parasympathetic (trophotropic) system, and this burst "loads the action with symbolic material," thus continuously expanding and enhancing the emotional content of the oration.¹⁰⁴ Moreover, the context is decidedly interactive—the speaker, in this case the prophet, both affects and is affected by responses among hearers, and the other persons involved respond to the prophet as well as to one another.

Because of the strong emotional discharges intrinsic to revelation, the prophet's own internal equilibrium, underlying emotional reactivity, has been reset at some conjunction of intensity, frequency, or duration quantitatively different from any former state; the mixed discharges have affected profoundly the trophotropic-ergotropic balance of the person in whom they have been evoked, and the result is a new base line.¹⁰⁵ In addition, the special character of collapse has attracted a great deal of attention, some of it nurturing, from other people. Thus it is not surprising that prophets' behaviors in interactions occurring after revelation depart from those predominant in prior states because the speed, frequency, and duration of responses—a product of neurobiological factors—have been altered by the sensitization of the nervous system. The extent to which a newly emerged prophet can analyze and explain this change is difficult to address; because emotional factors are of such great importance the recognition is more likely to be in nonverbal, right-hemisphere cognition—expressed as "feelings"—perhaps again attributed to external supernatural agents. In any event the experience itself may have initiated subtle changes in the prophet's sensitivity to the emotional qualities of interaction whereby the prophet has become more precisely "attuned" to the frequency, intensity, and duration of emotional reactivity in others.

ZYGON

This form of sensitization appears to underlie the elusive label of "charisma" often attached to individuals who exhibit the ability to manipulate emotional responses in others. Speculating about the phylogenetic origins and anatomical differences of the right-cerebral hemisphere, Geschwind suggests that some persons may be "emotional geniuses," adept in assessing the emotional states of others and expressing highly appropriate responses.¹⁰⁶ However, the notion that individuals somehow "possess" charisma ignores the significance of social contexts. Charismatic qualities cannot derive solely from innate properties of prophets' biological characteristics. Charisma essentially refers to evocative skills expressed not in solitude but interactively in specific social settings. To some extent it also must reside in the senses of the people with whom a prophet interacts. One can think of numerous examples of supposedly charismatic persons whose followings have remained small perhaps because the symbols used in their messages have failed to persuade, that is, evoke appropriate emotional responses, or perhaps because they were unable to adapt their techniques to elicit responses in persons differing widely in emotional reactivity.

CONVERSION

In Wallace's revitalization model disruptive forces subject many individuals to emotional strains during the two phases immediately prior to the prophet's revelation—"the period of increased personal stress" and that of "cultural distortion."¹⁰⁷ As one might suspect, there is increased reactivity of the sympathetic nervous system (and by extension in the entire ergotropic system) if usual interaction patterns are interrupted, customary nurture patterns are blocked, or people are relegated to subordinate status as a result of conquest, invasion, colonization, or shifts in economic production systems.¹⁰⁸

The topic of subordination deserves special attention because this condition is identified commonly as the impetus of revitalization movements.¹⁰⁹ In Chapple's view both dominance and nonresponse in human interaction are experiences which stimulate the sympathetic nervous system, and ultimately (here Gellhorn's model is incorporated) ergotropic sensitization results. Furthermore, persons or groups subordinated, exploited, ignored, or otherwise ascribed inferior status strive to reassert themselves in consonance with their usual emotional response repertoire, but their failure to reestablish equilibrium results in increased stress.¹¹⁰ However, subordination resultant from economic or political domination in itself need not be seen as the sole source of stress, or "cultural distortion." Certainly if rites of passage and rites of intensification evoke shared feelings of

relief and other pleasurable emotions among participants, and if an emotional equilibrium necessary for harmonious interaction ensues from these rites, then domination may incur proscription of such rituals or render their results less than efficacious.¹¹¹ These appear to be the very circumstances, fomented by the American Revolution, which the Iroquois encountered prior to Handsome Lake's revelations.¹¹² Other examples are readily found.¹¹³

Thus a neurobiological perspective also explains the behavior of converts. If widespread, chronic stress disrupting institutionalized interaction patterns does indeed precede the prophet's revelation, then the welcome news of a new lifeway excessively can stimulate sensitized persons, providing the additional stimulus necessary to provoke extreme trophotropic rebound. Some persons faint, alternatively laugh and cry, or themselves enter into transcendent states; all of these behaviors exhibit extreme emotional lability with strong trophotropic components. Thus the prophet's revelation itself stimulates trophotropic rebound in persons whom stress has predisposed through sensitization of the nervous system. Furthermore, because emotional responses commonly are evoked by perceptions of emotive behavior the predominance of such highly aroused feelings among even a few members of a group can precipitate similar states in numerous others.¹¹⁴ The excitement spreads, and members of a group thus affected appear to observers to be undergoing an "epidemic" of "bizarre" actions. For those who have no appreciation for the tensions antecedent to these actions or who are uncomfortable about expressing emotions, the prevalence of such behaviors is inexplicable as well as alarming, and the participants are "silly looking" if not "lunatics," "epileptics," or "madmen."¹¹⁵

Institutionalization of New Rituals among Converts. It has been shown that if stress has been great then emotionalism among converts is also likely to be great. As with the prophet's initial revelation, the trophotropic components of nervous-system sensitization evoke pleasurable sensations in converts' bodies as well as the inextricable feelings of relief or well-being which result when powerful tensions are relaxed. Soon the behavior spreads, and, as it is imitated or simulated, individuals begin to conventionalize the circumstances and methods of its appearance.

Because the reconstituted moral and social order significantly departs from the status quo ante in structure as well as in content, the establishment of new social roles is inherent in the prophet's message. The society and culture are not designed completely *de novo*, but if Chapple's contention that each social role is underlain by unique pat-

terns of autonomic excitation is correct, then additional emotional changes occur as both prophet and followers strive to apply new formulae.¹¹⁶ These new roles ideally alleviate and forestall stress by reshaping equilibrium and establishing harmonious interactions. As new interaction forms develop, expressions of emotional responses become both regularized and incorporated into the new social fabric.

According to Chapple rituals are precisely performed emotional-interaction forms which ensure that persons with disparities in reactivity enter a state of emotional synchrony, or harmony.¹¹⁷ Efficacious rituals, by tuning the trophotropic system, reset trophotropic-ergotropic balance, and this hysteretic process is such that the prior state is never exactly reattained.¹¹⁸ In order to bring about the new social order, that is, to retain the salutary benefits of the prophet's message, specific rituals become necessary. Not only do the new social roles, generated by a revitalization movement require the establishment of new patterns in the ergotropic-trophotropic system, but also all varieties of life circumstances which perturb usual (basal) patterns—often stresses of high intensity or chronic duration—call for mechanisms which restore individual or group equilibrium. Thus the rituals which develop from the prophet's revelation simultaneously (1) initiate and sustain new forms of behavior in order to relieve stress in the daily lives of adherents and (2) institute accessible means for alleviating the stressful effects of life crises. In both cases the balance of the ergotropic-trophotropic system is manipulated.

Inherent as well in the new moral and social order are beliefs concerning legitimate and illegitimate sources of power and authority.¹¹⁹ Furthermore, upon analysis distinctions between "political" and "religious" power are shown to be more apparent than real. If supernatural sources are thought to cause unusual psychophysiological states, then the aggregate prophets' pre- and proscriptions, in addition to their instructions regulating and curtailing conditions which threaten the life processes and continued effective functioning of individuals, can be understood as mechanisms which ordain the establishment of precisely defined, essential, and sanctioned emotional feeling states in individuals and among groups. To illustrate, both Handsome Lake and Slocum, almost a century and a continent apart, banned among other activities gambling, drinking alcoholic beverages, and the use of certain traditional curing methods (medicine societies and shamanism).¹²⁰ Each of these behaviors shares with the others some form of contact with the supernatural—through luck, intoxication, or curative powers—which the respective prophets ordered supplanted by new modes of access ordained through their revelations. It might be argued that self-evident group and individual

dysfunctions are wrought by gambling and drinking as well as by the uncontrolled machinations of shamans. But the interdiction of formerly desirable—even pleasurable or salutary—modes of access to supernatural forces, strongly emphasized by both of these prophets, points to the fundamental importance of regulating approaches to the supernatural through emotional responses in these revitalized cultural systems. In other words, revitalization movements redefine the sources of and the avenues to power. It is as if the prophet proclaims that only certain sensations and strategies for evoking these sensations are permitted to adherents and that henceforth all other types and strategies must cease. The old rituals are to be discarded because the sensations which they elicit and the mechanisms employed to do so not only have proved unsatisfactory but also, if allowed to persist, would interfere with the evocative procedures and accompanying responses inherent in and fundamental to the new moral and social order.

To summarize, recognizing the emotional qualities in the impact of the prophet's revelation on the conversion of followers and in the rituals which emerge in a revitalization movement illuminates the heretofore puzzling or paradoxical behavior of converts. The readiness to abandon well-entrenched, traditionally sanctioned rituals suggests that participants themselves associate strong feelings with the old as well as the new forms of their culture.¹²¹ In order to promote newly discovered feelings of enjoyment, if not exultation, brought by a prophet's revelation these newfound experiences must be made permanently accessible, although the psychophysiological sensations inherent in "old" rituals may be countervailing to those of the new movement. Even movements that embrace a "return" to discarded or interdicted rituals—whether the reinstated rituals exactly replicate those of the past—manifest comparable notions about licit and illicit power.

Subsequent Revelations. It is often the case, as in the example of Handsome Lake, that a prophet undergoes a series of revelations. On the one hand, it is necessary to consider that introspection, whether through lonely contemplation or as the result of discussions with disciples, prompts a prophet to elaborate vague or indistinct aspects of the initial revelation. Upon reminiscence of the content of this experience it is not unlikely that the emotional qualities, that is, the unique psychophysiological sensations, of the precipitating episode and attendant events also are recalled. The prophet thus draws upon memory in order to reproduce transcendence. In institutionalized rituals numerous devices, including repetition of music and gestures, fix-

tion of attention on visual symbolic forms, or other stimulation of the senses, are sufficient but not always necessary means of achieving desired trance states.¹²² These devices, or "driving behaviors," need not appear elaborate or require obvious preparation as long as they are efficacious—a single word may facilitate trance.¹²³ Given the redundancy of sensory stimulation characteristic of many rituals which appear to facilitate trance states, any one of a number of stimuli may be employed for the purpose of evoking the appropriate sensitized state in the nervous system.¹²⁴ Therefore once an individual, in this instance a prophet, has achieved a state in which unusual psychophysiological sensations occur the likelihood of reentry into that state is increased, but the conjunction of stressors which spontaneously elicited the initial vision is not specifically necessary for subsequent revelations.

On the other hand, the elaboration or revision of doctrinal statements may require the sanction of supernatural power as manifested by further, mystically imbued revelations. Novel circumstances, new questions put to the prophet, or impinging conditions remaining unabated necessitate additional consultations with the ultramundane world. The continued exalted status of any prophet may depend, at least in part, on sustained access to supernatural sources of information and legitimation. Hence successive revelations may be required by the beliefs of the movement, and consequently a prophet must be able to control and manifest the appropriate state. However, prophets—it may be expected—seem to vary in their ability to meet these demands. Although stress has been shown to play a significant role in precipitating initial revelations, paradoxically it appears that those who urgently strive or attempt to force themselves into transcendent states are likely to fail; one amply documented example is provided by Goodman.¹²⁵ In such instances internal body tensions, perhaps engendered by or attended by minute variations in neurochemical processes, appear to prevent achievement of the cherished goal. Striving, anxiety, or other expressions of "willful" attitudes and behaviors have strong ergotropic aspects, and if certain forms of transcendent states require precisely combined ergotropic and trophotropic excitation, as Gellhorn and Kiely suggest, then in the absence of appropriate trophotropic components these transcendent states are not reasonably to be expected.¹²⁶ Correlatively an anxious person, as previously noted, is less able to acquire new forms of behavior, and perhaps, more important, if an individual is overcome by guilt, dread, or fear of the experience these powerful emotional states may preclude effective remembrance of the original ecstatic state in which prior revelation transpired. Identical processes may be at work whereby converts

“lose” their ability to enter the requisite psychophysiological states or perhaps are never able to do so in spite of their earnest strivings.

EMOTIONS IN REVITALIZATION MOVEMENTS

Heretofore I have assumed generally that all prophets undergo collapse, that their messages are grasped eagerly and seized by willing hearers, and that the fervor of conversion quickly leads to the institution of new ritual forms. For heuristic purposes my approach thus far has ignored almost completely the existence of secular revitalization movements, or failed prophets, preposterous or otherwise unfeasible revelations, and unmoved audiences. In short, the application of neurobiological principles to the topic of revitalization movements is based upon an ideal model, but departures from the model should be seen as instances in which the neurobiological prerequisites are somehow unfulfilled. Even in secular movements the operation of emotional enthusiasm, the formation of new rituals through rallies, and the spread of slogans can be noted. And those who dissemble, or “fake” some aspect of the process, must be viewed as having compelling reasons for their attempt.

Requisite neurobiological processes also must be assessed. Clearly it cannot be presumed that a collapsed, cataplectic-state-*cum*-sleep paralysis is in itself sufficient to stimulate prophecy. A background of chronic personal and social stress seems necessary but again not sufficient to promote revelation. A preoccupation with widespread cultural and social “distortion” adds an essential element to prophets’ vivid pseudoperceptions, and simultaneous arousal of both cerebral hemispheres appears likely to prompt distinctive cognitive reorganization. But it must be recognized that the trophotropic components of mixed neural discharges at certain intensities in themselves evoke pleasurable sensations, as do the relaxation of tensions and the relief from stress that a remedy for personal and social disorder would provide to either a prophet or a convert.

Major theorists have sought the wellsprings of revitalization movements in the unpleasant emotions of fear, guilt, anger, and anxiety, but scant attention has been addressed to the pleasurable emotions that are educed by participating in such movements.¹²⁷ As a result of emphasizing the unpleasant David Aberle, for example, shifts the focus from absolute to relative deprivation in an attempt to stretch theory to fit data, for hardly any individual who does not want for some desideratum can be found.¹²⁸ But even relative deprivation cannot account for the emergence and popularity of all revitalization movements. Goodman provides a case in point, for she finds that her observations of a localized Pentecostal “upheaval” in Yucatan are ex-

plained imperfectly by prevailing theories and models. She distinguishes three interpenetrating categories of "traits," which she terms "moral code," "supernatural premise," and "trance behavior."¹²⁹

Goodman notes that although theorists have emphasized social factors in the spread of Pentecostalism her informants "are unanimous in their claim that for them the 'baptism of the Holy Spirit,' that is, the trance behavior [associated with glossolalia] was the deciding factor."¹³⁰ Adherents in the congregation which she studied believe their trances to emanate from supernatural sources. In her analysis the mutually reinforcing elements of trance and this supernatural premise hold the key to understanding the entire process of the "upheaval," including its decline as the trance behavior becomes elusive. Details of the moral code, although important, remain subsidiary. The accessibility of trance behavior to participants substantiates their contact with the supernatural and becomes of paramount concern. Numerous issues of morality beset this congregation, but their overriding focus appears to be maintaining contact with the supernatural, thereby sustaining the availability of trance states. Furthermore, Goodman considers trance as an adaptive if not salutary behavior rather than pathologically aberrant.

Perhaps it is too simple an explanation to suggest that trance states become desirable elements in many revitalization movements because of the pleasurable sensations which these behaviors afford. Yet, as Goodman notes, trance behavior is perhaps the most distinctive common feature of revitalization movements, and, as Wallace, Weston La Barre, and other serious students have observed repeatedly, these phenomena are historically prevalent. Trance states are a pleasant departure from prosaic or stressful states, but one need not invoke the strains produced by clashing cultures or the boredom of modern civilized life to understand the attractiveness of transcendent ecstasy, whatever means are employed to that end, to human beings in any society at any time.¹³¹ Although trance behaviors certainly do not accompany every conversion or every revitalization movement, it is my contention that in each historical example an alteration in the emotional qualities of participants' lives can be discovered. In some instances the trance experiences may be absent, transitory, or less noticeable than in others, but the emotional responses of leaders and followers undergo some modification in the direction of trophotropic dominance and the accompanying pleasures of these excitations.

NOTES

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4. Eliot D. Chapple and Carleton S. Coon, *Principles of Anthropology* (New York: Henry Holt & Co., 1942); Eliot D. Chapple, *Culture and Biological Man: Explorations in Behavioral Anthropology* (New York: Holt, Rinehart & Winston, 1970).

5. Anthony F. C. Wallace, "Mazeway Resynthesis: A Biocultural Theory of Religious Inspiration," *Transactions of the New York Academy of Sciences* 18 (1956): 626-38; idem, *Religion: An Anthropological View* (New York: Random House, 1966); idem, *Culture and Personality*, 2d ed. (New York: Random House, 1970); Mircea Eliade, "'Cargo Cults' and Cosmic Regeneration," in *Millennial Dreams in Action: Studies in Revolutionary Religious Movements*, ed. Sylvia L. Thrupp (New York: Schocken Books, 1970); Weston La Barre, "Materials for a History of Studies of Crisis Cults: A Bibliographic Essay," *Current Anthropology* 12 (1971): 3-44; idem, *The Ghost Dance: The Origins of Religion* (New York: Delta Books, 1972).

6. Anthony F. C. Wallace, "Revitalization Movements," *American Anthropologist* 58 (1956): 264-81; idem, *Religion*; idem, *Culture*. Here I do not attempt to summarize the vast literature examining messianic movements (Bernard L. Barber, "Acculturation and Messianic Movements," *American Sociological Review* 6 [1941]: 663-69), nativistic movements (Ralph Linton, "Nativistic Movements," *American Anthropologist* 45 [1943]: 230-40), revitalization movements (Wallace, "Mazeway Resynthesis," "Revitalization Movements," *Religion*, and *Culture*), millenarian movements (Norman Cohn, *The Pursuit of the Millennium* [New York: Harper Torchbooks, 1961]; Thrupp [n. 5 above]), charismatic movements (Kenelm Burridge, *Mambu* [London: Methuen, 1960]), cargo cults (Peter Worsley, *The Trumpet Shall Sound* [New York: Schocken Books, 1968]), crisis cults (La Barre, "Materials" [n. 5 above]), and related processes as well as the discussion of overlapping phenomena in the broad range of ecstatic religious behaviors (Wallace, "Mazeway Resynthesis"; Eliade, "'Cargo Cults'" [n. 5 above]; La Barre, *Ghost Dance* [n. 5 above]). The most recent reviews are found in La Barre's "Materials" and Ralph W. Nicholas's "Social and Political Movements," in *Annual Review of Anthropology*, ed. Bernard J. Siegel, Alan R. Beals, and Stephen A. Tyler (Palo Alto, Calif.: Annual Reviews, Inc., 1973), pp. 63-84; these are exhaustive and can direct the reader to details of specific movements. In this paper I have elected to refer to "revitalization movements" because both the term and the model are sufficiently well known and nonpejorative to suit my present purposes.

7. Wallace, "Mazeway Resynthesis," "Revitalization Movements," *Religion*, and *Culture*.

8. Ronald Wallace, "The Biological Constant: Is It Time for a Reevaluation?" *Human Organization* 34 (1975): 321-25.

9. Wallace, "Revitalization Movements," p. 265.

10. Anthony F. C. Wallace, *The Death and Rebirth of the Seneca* (New York: Alfred A. Knopf, Inc., 1970), pp. 239-45.

11. Homer G. Barnett, *Innovation: The Basis of Culture Change* (New York: McGraw-Hill Co., 1953), pp. 5-7.

12. Homer G. Barnett, *Indian Shakers: A Messianic Cult of the Pacific Northwest* (Carbondale: Southern Illinois University Press, 1957), pp. 31-34.

13. Note, however, the forty days and forty nights of Jesus' privation. In such instances onset appears deliberately induced rather than spontaneous, although the outcome appears equally dramatic.

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14. Ward H. Goodenough, *Cooperation in Change* (New York: John Wiley & Sons, 1963), p. 293.

15. *Ibid.* By implication major scientific syntheses occur within an astringently dispassionate framework.

16. Wallace, "Mazeway Resynthesis" (n. 5 above), p. 637. For James Mooney (*The Ghost-Dance Religion and the Sioux Outbreak of 1890* [Chicago: University of Chicago Press, Phoenix Books, 1965]) the most satisfactory explanation of the source of Wovoka's revelations stemmed from that prophet's conjoint illness, delirium, and fixed attention, while the visions avidly sought and experienced by Ghost Dance adherents were readily explicable as the results of an observable, ritualized "hypnotic process." In a similar vein Francis Edgar Williams's report ("The Vailala Madness" [1923], in *The Vailala Madness and Other Essays*, ed. Erik Schwimmer [London: C. Hurst, 1976]) includes a section specifically describing the "nervous and physical symptoms" which overtook people enthusiastically caught up in the Vailala madness, in addition to several subjective statements about the extraordinary psychological sensations that were elicited from those participants known as "head-he-go-round men."

17. C. S. Sherrington, *The Integrative Action of the Nervous System* (New York: Charles Scribner's Sons, 1906); Walter B. Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage: An Account of Recent Researches into the Function of Emotional Excitement* (New York: D. Appleton & Co., 1915); Stuart J. Dimond, *The Double Brain* (Edinburgh: Churchill Livingstone, 1972); Michael S. Gazzaniga, *The Bisected Brain* (New York: Appleton-Century-Crofts, 1970).

18. Ernst Gellhorn, "Further Studies on the Physiology and Pathophysiology of the Tuning of the Central Nervous System," *Psychosomatics* 10 (1969): 94.

19. Laverne C. Johnson, "A Psychophysiology for All States," *Psychophysiology* 6 (1970): 501-16.

20. Stanley Schacter, "The Interaction of Cognitive and Physiological Determinants of Emotional State," in *Anxiety and Behavior*, ed. C. D. Spielberger (New York: Academic Press, 1966), p. 197.

21. Kenneth Gaarder, "Control of States of Consciousness," *Archives of General Psychiatry* 25 (1971): 429-41. Unfortunately Gaarder's model does not acknowledge the differentiated functions of the two cerebral hemispheres, although the less inclusive model employed by Roland Fischer ("Reply from Dr. Fischer," *R. M. Bucke Memorial Society Newsletter-Review* 5 [Fall 1972]: 42-45) does. A synthesis of these two models would be exceedingly complex and difficult to render in two-dimensional form. Eugene G. d'Aquili's analysis of the differential functions of the cerebral hemispheres ("Structural Transformations: A Biogenetic Structural Analysis" [paper presented at the 74th annual meeting of the American Anthropological Association, San Francisco, California, 1975]) permits one to infer a topography of cultural distortion, a metaphorical mental landscape that is reshaped dramatically through mazeway resynthesis. However, none of these models accounts for either neurochemical variability or symbolic interpretations of stimuli.

22. Bourguignon (n. 1 above); Goodman (n. 2 above); Ernst Gellhorn and William F. Kiely, "Mystical States of Consciousness: Neurophysiological Aspects," *Journal of Nervous and Mental Disease* 154 (1972): 399-405; Lex (n. 3 above).

23. Chapple and Coon (n. 4 above).

24. For the purpose of simplification afferent and efferent nerves in the autonomic nervous system are not discussed here. Details are available in Raymond C. Truex and Malcolm B. Carpenter, *Human Neuroanatomy*, 6th ed. (Baltimore: Williams & Wilkins, 1969), chap. 11.

25. Chapple and Coon; Chapple (n. 4 above); Gellhorn and Kiely; Lex.

26. Ernst Luekel, *Introduction to Physiological Psychology* (Saint Louis: C. V. Mosby, 1972).

27. *Ibid.*; William F. Kiely, "From the Symbolic Stimulus to the Pathophysiological Response," *International Journal of Psychiatry in Medicine* 5 (1974): 517-29.

28. Ernst Gellhorn and G. N. Loofbourrow, *Emotions and Emotional Disorders: A Neurophysiological Study* (New York: Harper & Row, 1963).

29. Ibid.
30. Cannon (n. 17 above).
31. Chapple and Coon (n. 4 above); Chapple (n. 4 above).
32. Marion A. Wenger et al., "Autonomic Response Specificity," *Psychosomatic Medicine* 23 (1961): 185-93.
33. Marion A. Wenger and Thomas D. Cullen, "Studies of Autonomic Balance in Children and Adults," in *Handbook of Psychophysiology*, ed. Norman S. Greenfield and Richard A. Sternbach (New York: Holt, Rinehart & Winston, 1972), pp. 535-70; John J. Honigmann, *Personality in Culture* (New York: Harper & Row, 1967); Eliot D. Chapple, "The Standard Experimental (Stress) Interview as Used in Interaction Chronograph Investigations," *Human Organization* 12 (1953): 23-32; idem (n. 4 above).
34. P. Bergman and S. K. Escalona, "Unusual Sensitivities in Very Young Children," in *Psychoanalytic Study of the Child*, ed. W. Hoffer, 33 vols. (New York: International Universities Press, 1949), 3-4:333-52; Lois B. Murphy, *The Widening World of Childhood* (New York: Free Press, 1962); W. H. Bridger and B. Birns, "Neonates' Behavioral and Autonomic Response to Stress During Soothing," in *Recent Advances in Biological Psychiatry*, ed. J. Wortis, 14 vols. (New York: Plenum Press, 1963), 5:1-6; Stephen G. Vandenberg, "Hereditary Factors in Psychological Variables in Man, with Special Emphasis on Cognition," in *Genetic Diversity and Human Behavior*, ed. J. N. Spuhler (New York: Wenner-Gren Foundation for Anthropological Research, 1967), pp. 99-133; Hanuš Papoušek, "Genetics and Child Development," in *ibid.*, pp. 171-85.
35. Wenger and Cullen.
36. D. G. Freedman and Nina Chinn Freedman, "Behavioral Differences between Chinese-American and European-American Newborns," *Nature* 224 (1969): 1227.
37. Elizabeth Duffy, "Activation," in Greenfield and Sternbach (n. 33 above), pp. 577-622; Bernard Engel, "Response Specificity," in *ibid.*, pp. 571-76; Wenger and Cullen (n. 33 above).
38. Jan Bruell, "Heritability of Emotional Behavior," in *Physiological Correlates of Emotion*, ed. Perry Black (New York: Academic Press, 1970), pp. 270-86.
39. John L. Fuller, "Physiological and Population Aspects of Behavior Genetics," *American Zoologist* 4 (1964): 101-9.
40. *Ibid.*; James S. Thompson and Margaret W. Thompson, *Genetics in Medicine* (Philadelphia: W. B. Saunders Co., 1973).
41. Jan Bruell, "Behavioral Heterosis," in *Behavioral-Genetic Analysis*, ed. Jerry Hirsch (New York: McGraw-Hill Book Co., 1967), pp. 270-86; idem (n. 38 above); Jerry Hirsch, "Individual Differences in Behavior and Their Genetic Roots," in *Roots of Behavior*, ed. Ernest L. Bliss (New York: Harper & Row, 1968), pp. 3-23.
42. Richard C. Lewontin, "Race and Intelligence," *Bulletin of the Atomic Scientists* 26 (March 1974): 2-8.
43. Ernst Gellhorn, *Autonomic Imbalance and the Hypothalamus* (Minneapolis: University of Minnesota Press, 1957); idem, *Principles of Autonomic-Somatic Integration: Physiological Basis and Psychological and Clinical Implications* (Minneapolis: University of Minnesota Press, 1967); idem, "Attempt at a Synthesis: Contribution to a Theory of Emotion," in *Biological Foundations of Emotion: Research and Commentary*, ed. Ernst Gellhorn (Glenview, Ill.: Scott, Foresman & Co., 1968); idem, "Central Nervous System Tuning and Its Implications for Neuropsychiatry," *Journal of Nervous and Mental Disease* 147 (1968): 148-62; idem, "Neurophysiological Basis of Homeostasis," *Confinita Neurologica* 30 (1968): 217-38; idem (n. 18 above); idem, "The Emotions and the Ergotropic and Trophotropic Systems," *Psychologische Forschung* 34 (1970): 48-94; Gellhorn and Kiely (n. 22 above); Ernst Gellhorn and William F. Kiely, "Autonomic Nervous System in Psychiatric Disorder," in *Biological Psychiatry*, ed. Joseph Mendels (New York: John Wiley & Sons, 1973), pp. 235-61; Gellhorn and Looftbourrow (n. 28 above); William F. Kiely, "Critique of Mystical States: A Reply," *Journal of Nervous and Mental Disease* 159 (1974): 196-97; idem (n. 27 above).
44. Gellhorn and Kiely (n. 22 above); Kiely, "Critique"; Barbara W. Lex, "Voodoo Death: New Thoughts on an Old Explanation," *American Anthropologist* 76 (1974): 818-23; idem (n. 3 above).

45. W. R. Hess, *On the Relations between Psychic and Vegetative Functions* (Zurich: Schwabe, 1925).
46. Gellhorn and Kiely (n. 22 above).
47. Kiely (n. 27 above).
48. Ibid.
49. Gellhorn (n. 18 above), p. 94.
50. Gellhorn and Loofbourrow (n. 28 above).
51. Lex (n. 3 above).
52. Gellhorn (n. 18 above); idem, "Emotions" (n. 43 above).
53. Kiely (n. 27 above).
54. Wallace, "Mazeway Resynthesis" (n. 5 above); idem, "Revitalization Movements" (n. 6 above); idem, *Religion* (n. 5 above); idem, *Culture* (n. 5 above), p. 193.
55. Gellhorn and Kiely (n. 22 above), p. 403.
56. Ibid.; Kiely, "Critique" (n. 43 above); Robert K. Wallace and Herbert Benson, "The Physiology of Meditation," in *Altered States of Awareness: Readings from Scientific American* (San Francisco: W. H. Freeman & Co., 1972), pp. 125-31.
57. Gellhorn and Kiely (n. 22 above), p. 403.
58. Gellhorn and Kiely, "Autonomic Nervous System" (n. 43 above).
59. Ibid.
60. Edward F. Foulks (*The Arctic Hysterias of the North Alaskan Eskimo* [Washington, D.C.: American Anthropological Association, 1972], pp. 31-32) attributes psychophysiological disorders to stresses that result when culture contact renders ineffective traditional decision-making and coping methods.
61. Gellhorn and Kiely, "Autonomic Nervous System" (n. 43 above); Kiely (n. 27 above).
62. Chapple and Coon (n. 4 above); Chapple (n. 4 above). Robert A. LeVine (*Culture, Behavior, and Personality: An Introduction to the Comparative Study of Psychosocial Adaptation* [Chicago: Aldine Publishing Co., 1973], pp. 140-42) notes that psychophysiological palliatives, i.e., "forms of recreational behavior involving alcohol, narcotics, or strenuous exercise," are employed to discharge tensions resulting from coerced conformity, whereas ideological palliatives are beliefs offering relief from suffering, such as religious doctrines promising a heavenly life after death. It easily can be seen that ritual trance is an expression of these two types in combination.
63. Wallace, "Revitalization Movements" (n. 6 above); idem, *Death and Rebirth* (n. 10 above).
64. Since this writing I have become aware of another, independent attempt to draw parallels between Gellhorn's model of stages of nervous-system tuning with Wallace's ideal model of the revitalization process (Henry Beck and John Stampfl, "On the Use of Trend-Surface Models in the Spatial Analysis of Political Crises and Biobehavioral Phenomena," Social Science Working Paper 37 [School of Social Sciences, University of California, Irvine, 1973]).
65. Gellhorn and Kiely (n. 22 above), p. 403.
66. Ibid., p. 402.
67. Marion A. Wenger and B. K. Bagchi, "Studies of Autonomic Functions in Practitioners of Yoga in India," *Behavioral Science* 6 (1961): 312-23; N. Kleitman, *Sleep and Wakefulness*, 2d ed. (Chicago: University of Chicago Press, 1963), p. 107; Ernst L. Hartmann, *The Functions of Sleep* (New Haven, Conn.: Yale University Press, 1973).
68. Gellhorn, "Emotions" (n. 43 above), pp. 70-71.
69. Chapple and Coon (n. 4 above); Chapple (n. 4 above); Wallace, "Mazeway Resynthesis" and *Religion* (n. 5 above); La Barre, "Materials" and *Ghost Dance* (n. 5 above); Lex (n. 3 above).
70. On disorders being manifested by neural discharges see Gellhorn and Kiely, "Autonomic Nervous System" (n. 43 above). Of misled theorists a prime example is Edward F. Foulks who suggests (in his "A Sociobiologic Model of Schizophrenia" [manuscript, 1976]) that revitalization prophets so strongly resemble acute schizophrenics that the pool of schizophrenics, for whom the prevalence of this dis-

order is assumed to be strikingly constant in all societies, provides the genetic substrate from which arise potential prophets. However, prevalence and incidence rates of schizophrenia often combine the differential diagnosis of chronic and acute schizophrenia. The confounding effect of this practice is illustrated by the tendency of British-trained psychiatrists to employ more precise nosological criteria than those utilized by their American-trained counterparts.

71. Gellhorn and Kiely, "Autonomic Nervous System." These therapeutic measures include the use of drugs to stimulate or inhibit the nonsensitized or sensitized systems, respectively. In some disorders the trophotropic system is sensitized, e.g., in depression, so that manipulation of the ergotropic system is the target of therapy.

72. Wallace, "Revitalization Movements" (n. 6 above).

73. d'Aquili (n. 21 above).

74. Hartmann (n. 67 above), pp. 145-50.

75. Abraham H. Maslow, *Toward a Psychology of Being* (New York: Litton Educational Publishing Co., 1968).

76. Joseph E. Bogen, "The Other Side of the Brain (I: Dysgraphia and Dyscopia Following Cerebral Commissurotomy)," *Bulletin of the Los Angeles Neurological Societies* 34 (1969): 73-105; Robert Ornstein, *The Psychology of Consciousness* (San Francisco: W. H. Freeman & Co., 1972).

77. Marghanita Laski, *Ecstasy* (London: Cresset Press, 1961); Wallace, "Mazeway Re-synthesis" (n. 5 above).

78. Norman Geschwind, "Localization and Lateralization of Emotion" (paper read at McLean Hospital, Belmont, Massachusetts, 1975).

79. Roger Sperry, "A Modified Concept of Consciousness," *Psychological Review* 76 (1969): 532-36; Bogen (n. 76 above); Joseph E. Bogen, "The Other Side of the Brain (II: An Appositional Mind)," *Bulletin of the Los Angeles Neurological Societies* 34 (1969): 135-62; Joseph E. Bogen and Glenda M. Bogen, "The Other Side of the Brain (III: The Corpus Callosum and Creativity)," *ibid.*, pp. 191-220; Joseph E. Bogen et al., "The Other Side of the Brain (IV: The A/P Ratio)," *ibid.* 37 (1972): 49-61; A. H. Morgan, P. J. McDonald, and H. McDonald, "Differences in Bilateral Alpha Activity as a Function of Experimental Task," *Neuropsychologia* 9 (1971): 459-69; David Galin and Robert Ornstein, "Lateral Specialization of a Cognitive Mode: An EEG Study," *Psychophysiology* 9 (1972): 412-18; Dimond (n. 17 above); Gazzaniga (n. 17 above); Jerre Levy, "Lateral Specialization of the Human Brain," in *The Biology of Behavior*, ed. John A. Kiger, Jr. (Corvallis: Oregon State University Press, 1972), pp. 159-80; Doreen Kimura, "The Asymmetry of the Human Brain," *Scientific American* 299 (March 1973): 70-78; Gary G. Tunnell, *Culture and Biology: Becoming Human* (Minneapolis: Burgess Publishing Co., 1973); Robert D. Nebes, "Hemispheric Specialization in Commissurotomized Man," *Psychological Bulletin* 81 (1974): 1-14.

80. Ornstein (n. 76 above).

81. Bogen and Bogen (n. 79 above).

82. Geschwind (n. 78 above).

83. *Ibid.*; Maitland Baldwin, "Neurologic Syndromes and Hallucinations," in *Origin and Mechanisms of Hallucinations*, ed. Wolfram Keup (New York: Plenum Press, 1970), pp. 3-12.

84. Ornstein (n. 76 above).

85. Norman Geschwind, "The Apraxias: Neural Mechanisms of Disorders of Learned Movement," *American Scientist* 63 (1975): 188-95.

86. See my "Neurobiology of Ritual Trance" (n. 3 above). A close reading of John N. B. Hewitt ("The Term *Haii-Haii* of the Iroquois Mourning and Condolence Songs," *American Anthropologist* 11 [1898]: 268-87; "Orenda and a Definition of Religion," *ibid.* 4, no. 3 [1902]: 33-46) and Raymond Firth ("The Analysis of *Mana*: An Empirical Approach," in *Cultures of the Pacific: Selected Readings*, ed. Thomas G. Harding and Ben J. Wallace [New York: Free Press, 1970], pp. 316-33) on these topics, compared with Ornstein's and Bogen's description of right-hemisphere functions, provides a basis for this hypothesis.

87. Morgan, McDonald, and McDonald (n. 79 above).
88. Some degree of ergotropic excitation is required in rituals because of the need to attend precisely to details (Chapple, *Culture and Biological Man* [n. 4 above]; Lex, "Neurobiology of Ritual Trance" [n. 3 above]).
89. Norman Geschwind, "Disconnexion Syndromes in Animals and Man," *Brain* 88 (1966): 237-94, 585-644; Charles D. Laughlin, Jr., and Eugene G. d'Aquili, *Biogenetic Structuralism* (New York: Columbia University Press, 1974), pp. 52, 58; d'Aquili (n. 21 above).
90. Also these are the last areas of the brain to myelinate.
91. William Sargant, *The Battle for the Mind* (Garden City, N.Y.: Doubleday & Co., 1959); Arnold M. Ludwig, "Altered States of Consciousness," in *Trance and Possession States*, ed. Raymond Prince (Montreal: R. M. Bucke Memorial Society, 1968), pp. 69-95.
92. Laughlin and d'Aquili, pp. 52, 58; d'Aquili (n. 21 above).
93. Roger Broughton, "Sleep and Clinical Pathological States," in *The Sleeping Brain*, ed. Michael H. Chase (Los Angeles: Brain Research Institute, 1972), pp. 364-65.
94. Robert L. Williams and Ismet Karacan, "Clinical Disorders of Sleep," in *Sleep Research and Clinical Practice*, ed. Gene Usdin (New York: Brunner/Mazel, 1973), pp. 25-57.
95. Gellhorn and Kiely, "Autonomic Nervous System" (n. 43 above), p. 244.
96. Broughton; Gellhorn and Kiely, "Mystical States of Consciousness" (n. 22 above) and "Autonomic Nervous System."
97. Gellhorn, "Emotions" (n. 43 above).
98. Ian Oswald, *Sleeping and Waking: Physiology and Psychology* (Amsterdam: Elsevier Publishing Co., 1962).
99. *Ibid.*
100. *Ibid.*
101. Cf. Anthony F. C. Wallace, "The Trip," in *Psychedelic Drugs*, ed. Richard E. Hicks and Paul Jay Fink (New York: Grune & Stratton, 1969), pp. 151-56.
102. Although the experiences of scientists and prophets can be seen to overlap, the segregation in Western thought of emotion from reason until recently has precluded the attribution of scientific insights to supernatural intervention, and scientific explanations of causality scarcely have provided penetrating analyses of religious experiences (Lawrence Le Shan, *The Medium, the Mystic, and the Physicist: Toward a General Theory of the Paranormal* [New York: Viking Press, 1974]). Yet descriptions of the insights of creative scientists, also involving reconfiguration of problematic systems, similarly point to some form of trophotropic activation. E.g., Arthur Koestler (*The Act of Creation* [London: Hutchinson, 1964]) reports that scientists, while fixedly gazing at the dancing flames of a fire or in a "dreamlike reverie," have had such insights manifest themselves during repetitious physical exercise. Subsequently both the scientist and the prophet ascribe their insights to antecedent events, but each employs a different sort of belief system in formulating an explanation of the event. The form taken may derive partially from the distinctive patterns of hemisphere alternations characteristic of science and of religion. In other words, innovation in each domain requires simultaneous excitation in both hemispheres, or at least intervals of right-hemisphere dominance or rapid alternation. The explanatory process in either case nonetheless requires verbal expression via the left hemisphere. Although Goodenough (n. 14 above) has suggested that the emotionally evocative processes involved in resolving social problems are more likely to be designated as "religious" and thus find more elaboration in nonverbal (right-hemisphere) expressive modes and that the "logic" of science requires sequential communication forms (rendered by the left), this is not to suggest that creativity in either domain is substantially different. The scientist's "Eureka!" upon synthesis may derive from exactly the same sorts of processes and experiences as religious inspiration (Stanley West, "Creativity, Altered States of Awareness, and Artificial Intelligence," *Journal of Altered States of Consciousness* 2 [1975]: 219-30). It appears most likely that neither the scientist's nor the prophet's innovations occur in a social vacuum; in order that their ideas might be adopted by others each must express his insights in a manner comprehensible and acceptable to an audience.

103. Wallace, "Revitalization Movements" (n. 6 above), pp. 270-71.
104. Chapple (n. 4 above), pp. 90, 266.
105. Gellhorn and Loofbourrow (n. 28 above); Gellhorn and Kiely, "Autonomic Nervous System" (n. 43 above).
106. Geschwind (nn. 85 and 78 above).
107. John Lofland (*Doomsday Cult: A Study of Conversion, Proselytization, and Maintenance of Faith* [Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966], pp. 7-8) provides a model of the conversion process that not only emphasizes the importance of stress on potential converts but also intersects well with Wallace's model of revitalization. According to Lofland in order for full conversion to take place people must "experience enduring, acutely felt tensions"; perceive these "within a religious, problem-solving perspective"; identify themselves as "religious seekers"; discover the movement "at a turning point" in their lives; form or draw upon "an affective bond to adherents"; limit or "neutralize" interaction with persons outside of the movement; and, through "exposure to intensive interaction" with fellow adherents, serve as "deployable agents" of the movement's message. Lofland's model also fits well with Chapple's observations about the impact of interaction on the emotional status of participants.
108. Chapple and Coon (n. 4 above), p. 401.
109. David Aberle, "A Note on Relative Deprivation as Applied to Millenarian and Other Cult Movements," in Thrupp (n. 5 above), pp. 209-14; La Barre, "Materials" and *Ghost Dance* (n. 5 above).
110. Chapple (n. 4 above). In the face of subjugation or prejudice the attractiveness to women of participation in "cults" is comprehensible in this light as a mode of restoring emotional equilibrium rather than as the product of some ill-defined, innately feminine proclivity for religiosity (I. M. Lewis, *Ecstatic Religion: An Anthropological Study of Spirit Possession and Shamanism* [Middlesex, England: Penguin Books, 1971]).
111. Chapple and Coon (n. 4 above), p. 401; Chapple (n. 4 above), p. 302.
112. Wallace (n. 10 above).
113. Here one might argue that the popularity of "neo-Hindu" movements, such as the Divine Light Mission, transcendental meditation, or Krishna consciousness, among middle-class American youths stems from perceptions of adult resistance to the "counterculture" of the 1960s.
114. See n. 4 above.
115. Williams (n. 16 above), pp. 1-14. Colonial administrators, Indian agents, and missionaries all have expressed their dismay at the rapid spread and institutionalization of trance behavior among adherents of revitalization movements. In his report on the Vailala madness, e.g., Williams noted that persons called "head-he-go-round men" could be found manifesting trance behavior in almost all villages in the territory surveyed. Because the subjective sensations described to him by participants were said to arise in their abdomens and mount to their heads, these people tried to encourage or hasten the experience by fanning their midsections, whirling, and hyperventilating. Williams did not suppress his personal shock at these behaviors and wrote at great length about the need to reinstitute the traditional ceremonies in their stead.
116. Chapple (n. 4 above).
117. *Ibid.*, pp. 292-95.
118. The process of hysteresis is such that the "history" of prior effects exerts modifications on a system to the extent that the original state is never replicated. See also Gellhorn and Loofbourrow (n. 28 above), p. 297.
119. Nicholas (n. 6 above).
120. The message delivered by John Slocum also proscribed tobacco and horse racing, while Handsome Lake's good message enjoined the Iroquois to cease practicing abortion, to treat the elderly and the young with compassion, and to adopt orphans. The emotional impact of both the practices and their proscriptions or prescriptions should be apparent.
121. Williams (n. 16 above); Margaret Mead, *New Lives for Old* (New York: Mentor Books, 1956).
122. See n. 3 above.

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123. Goodman (n. 2 above), pp. 74, 84–85.
124. Edmund R. Leach, "Ritualization in Man in Relation to Conceptual and Social Development," *Philosophical Transactions of the Royal Society of London* 251 (1966): 403–8; Chapple (n. 4 above); Lex (n. 3 above).
125. Felicitas D. Goodman, "Disturbances in the Apostolic Church," in Goodman, Henney, and Pressel (n. 1 above), pp. 227–364. Goodman had the extremely good fortune to make field observations of a localized Pentecostal "upheaval" in various stages of development. Among her data are descriptions of the physical means employed in order to sustain or attempt to regain trance.
126. Gellhorn and Kiely (n. 22 above).
127. Wallace, "Mazeway Resynthesis" (n. 5 above), "Revitalization Movements" (n. 6 above), *Religion* (n. 5 above), and *Culture* (n. 5 above); La Barre, "Materials" and *Ghost Dance* (n. 5 above); Aberle (n. 109 above).
128. Aberle.
129. Goodman (n. 125 above), pp. 362–63.
130. *Ibid.*, p. 351.
131. Even extreme asceticism can be viewed as a route to ecstatic experience.