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A NEUROPHYSIOLOGICAL MODEL OF TRANCE
WITH PRACTICAL APPLICATION

BY

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B.A., Wilfrid Laurier University, 1982

M.A., McMaster University, 1987

Submitted to the Department of Religion and Culture
partial fulfilment of the requirements
for the Master of Arts degree
1989

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ISBN 0-315-52747-1

ABSTRACT

Certain techniques are virtually universal in the production of religious trance. Rhythmic drumming, chanting, singing and vigorous dancing, for instance, are all commonly accepted as playing significant roles in the induction of trance states. But the effectiveness of these techniques has yet to be explained fully. Contemporary neurophysiological and brain sciences can provide the basis for a more comprehensive explanation of trance induction techniques and trance states. In accounting for trance within a neurophysiological model, two questions are fundamental. What kind of neurophysiological activity typifies a trance state? And how do trance induction techniques stimulate and generate the neurophysiological dynamics that occur during trance? In attempting to answer these two questions, I consider the functioning of the autonomic nervous system, cerebral lateralization of cognitive functions, ergotropic and trophotropic excitation and the concept of ergotropic-trophotropic tuning. I show that a heightened state of ergotropic excitation is the neurophysiological counterpart to trance. Trance induction techniques thus become stimuli which excite the ergotropic system. Also, I explain why hemisphere-dominant activity is not an inherent feature of trance states. I consider the possession trance of Vincentian Shakers and the shamanic trance of the Kalahari Kung in terms of neurophysiological theory. I also try to account for Michael Harner's technique for inducing a shamanic state of consciousness on the basis of neurophysiological activity.

The neurophysiological model of trance adds a new dimension to the understanding of trance states and trance induction techniques. In some cases the level of ergotropic excitation is high enough that the neurophysiological dynamics evoked by trance induction techniques are clear and unequivocal. In other cases the level of excitation is not sufficiently intense for clear indicies of neurophysiological activity to be readily available. When the latter case exists, specific neurophysiological activity can be suggested but not confirmed. I present the neurophysiological model of trance as one of many tools available for the investigation of trance phenomena. Other avenues of investigation must be followed for an understanding of the experiential component of trance states.

ACKNOWLEDGEMENTS

I extend heartfelt thanks to my advisor, Dr. Ronald Grimes, for his invaluable critique of my work, for his demanding only the best from me, and for introducing me to good mexican food. Thanks also go to Dr. Mathias Guenther for our interesting discussions on culture and trance, to Christopher Ross for his feedback, to Dr. Charles Laughlin for answering many questions and sending me copies of his work not yet in print, and to Dr. Robert Litke who, in the end, helped me to feel like it was all worth it.

Special thanks go to all of the friends who have put-up with me and supported me throughout the highs and lows of writing this thesis.

And a very special thanks to Rado and Thea. I could not have done it without you.

Sasha

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PREFACE

Possession and shamanic trance have been topics of investigation for anthropologists for some time. For the most part, religious studies scholars have seemed hesitant to include trance in their study of mystical, religious, and ecstatic experience. Nonetheless, trance is often religiously contextualized and can be a central form of worship. When trance is enacted as a form of religious expression, it becomes part of the traditional domain of religious studies. One of my aims in writing this thesis, then, is to introduce religious studies scholars to the study of trance.

There exists a wealth of anthropological literature on trance. Ethnographic descriptions and theoretical perspectives are numerous. My intention is not to provide a description of all the theories and kinds of trance. Nor is my goal to analyze every theory of every kind of trance. Rather, after introducing trance, I will detail only one approach to its study.

Investigations of trance states have taken on multifarious guises: sociological, psychological, psychobiological, as well as mystico-religious. Sociological perspectives accentuate relationships between trance, social change and social structure. Analytic-psychological perspectives focus on individuals who enter trance states in relation to psychological illness and/or healing. Psychologists involved in biological psychology take account of neurophysiology and neurochemistry in their study of trance. Mystico-religious interpretations of trance employ culture-specific hermeneutics in accounting for trance behaviour.

Obviously, many approaches are available to those interested in the study of trance. My first chapter briefly touches on many of these approaches and concludes with a brief description of an interdisciplinary analysis of trance.

An area of trance analysis which has not been fully developed is that of neurophysiology. Developments in psychobiology and brain sciences have provided important information central to understanding neurophysiological activity during trance states. One aim in writing this thesis is to relate trance induction techniques and trance states to neurophysiological functioning. But my work is not reductionistic in spirit. Describing trance in neurophysiological terms is not the same as claiming that trance is nothing but neurophysiological activity. It is a highly emotive, significant, spiritual experience, the full content of which can never be understood neurophysiologically. In order fully to understand trance many other avenues of investigation must be considered. The neurophysiological theory which I will discuss is a means by which we might understand trance states based on how our bodies work. It assumes trance is not an aberrant psychological reaction to strange stimuli but a natural biological response to specific kinds of stimuli.

After looking at various approaches to the study of trance in chapter one, the remainder of my thesis is devoted to elucidating the neurophysiology of trance. In the second chapter I describe the functioning of the autonomic nervous system, that part of the central nervous system responsible for involuntary bodily functions. Included is a little used means of characterizing the activity of the autonomic nervous system. Ergotropic and trophotropic systems include the

autonomic nervous system as well as voluntary activity that occurs during autonomic activity. I also discuss the hemispheric lateralization of cognitive functions. I conclude the second chapter with a theory of trance based on the effects of trance induction techniques on the activity of the ergotropic and trophotropic systems.

In the third chapter I illustrate a neurophysiological theory of trance by interpreting three examples of trance within the parameters of neurophysiology. I describe Shaker possession trance and Kung shamanic trance as evoking ergotropic or trophotropic activity. I also apply this theoretical understanding to the shamanic trance technique of Michael Harner as it was taught at a workshop in Toronto, Ontario. The Harner example taxes the theory somewhat and shows its limitations. Concluding this chapter is a brief discussion of some of the merits and shortcomings of a neurophysiological theory of trance. Also included are other avenues of investigation into trance open to neurophysiological analysis, as well as important features of trance analysis that are not embraced by a neurophysiological perspective.

Chapter One

TRANCE: A REVIEW OF THE LITERATURE

Considering the phenomenon of trance within a unified field of inquiry is a difficult task. The use of the term "trance" with a host of preceding qualifiers can lead to an enormous range of trance phenomena with disparate connotations, functions, and methods for their induction. A review of the literature reveals that the term trance is used to denote many states of consciousness that are other than so-called normal states. Possession trance, shamanic trance, meditative trance, hypnotic trance, and common everyday states (like daydreaming, fantasizing, absorption in novels or movies, and "driving" trance) are the most common appellations used to delineate a realm of human experience believed by some to be essentially homogenous. Adding further complexity to the phenomenon of trance is the interchangeability of the terms trance and ecstasy by some scholars (for a discussion of the synonymous use of these terms, see Rouget [1980]). If ecstasy is equated with trance, another realm of experience can be appended, namely, mystical ecstasy and religious experience.

Precisely how to investigate trance phenomena given such a potpourri of possible starting points is a problem. The aforementioned forms of trance are not identical, and yet they are commonly grouped under the same heading. In order to make evident the distinctions between types of trance, an introduction is necessary. I will categorize trance phenomena under the rubric of Alternate States of

Consciousness (ASCs), discuss some theories of ASCs, and point out some difficulties with a general classification of trance in terms of ASCs. After demonstrating how various trance phenomena are homogenized, I will clarify some distinguishing characteristics of these phenomena. Having distinguished trance states to some extent, I will then try to elucidate possession trance (PT) and shamanic trance (ST). Psychological and sociological approaches to the study of possession and shamanic trance will be considered briefly. The possibility of understanding possession trance and shamanic trance within the framework of inter-disciplinary cross-cultural analysis will be raised at the end of the chapter. Two models of inter-disciplinary analysis will be presented, because they seem to me to provide the most fruitful avenues for a comprehensive depiction of trance states.

Trance as a Genre of Consciousness

A common label attempting to provide a unified picture of various trance states is that of Altered States of Consciousness (ASC). A less pejorative appellation, though not as commonly employed, substitutes "Alternate" or "Alternative" for "Altered". An Alternate State of Consciousness suggests an implicitly available *natural* mode of consciousness. An Altered State of Consciousness suggests a modification of *normal* consciousness; a suggestion which can carry the connotation of abnormality (Laughlin, McManus and Shearer 1983). This connotation can be avoided if we understand that a state of consciousness called "normal" is simply a commonly recurring natural state of consciousness. An alternate state of consciousness (ASC) then, is an uncommon but natural state of consciousness.

In his trend setting book, Altered States of Consciousness,

Charles Tart (1969) defines an ASC as one in which an individual

clearly feels a qualitative shift in his pattern of mental functioning, that is, he feels not just a quantitative shift (more or less alert, more or less visual imagery).... Mental functions operate that do not operate at all ordinarily, perceptual qualities appear that have no normal counterparts. (1-2)

An often quoted definition of Alternate States of Consciousness is provided by Arnold Ludwig. He says that an ASC is characterized by

those mental states, induced by various physiological, psychological, or pharmacological maneuvers or agents, which can be recognized...[subjectively or objectively] ...as representing sufficient deviation, in terms of subjective experience or psychological functioning, from certain general norms as determined by the subjective experience and psychological functioning of that individual during alert, waking consciousness (1968:69-70).

Virtually any state of consciousness that cannot be classified as a common natural state can thus be held to be an ASC. It would be fallacious to assume that all ASCs are trance states, but according to the above definitions, all trance states are ASCs. Under the generic heading "ASC", various trance states are unified within a common realm of human experience.

With ASCs being virtually any uncommon state of consciousness, further classifying schemes are required to order and understand such states. Towards this end Ludwig (1968) orders ASCs in terms of the methods and variables of their induction:

- A) reduction of exteroceptive (external) stimulation or motor activity;
- B) increase of exteroceptive stimulation or motor activity or emotion;
- C) increased alertness or mental involvement;
- D) decreased alertness or relaxation of critical faculties;
- E) presence of somatopsychological factors;

These factors (E) include changes in body chemistry or neurophysiological functioning which are unintentional and beyond control (e.g. dehydration, hypoglycaemia, etc.), or deliberately induced by pharmacological agents (71-75).

Roland Fischer (1970) classifies ASCs along a continuum of degrees of central nervous system (CNS) arousal. At the center of this continuum is the common everyday state. On one side of this point lies the continuum of hallucination or increased arousal. Included along this line are states of creativity and anxiety. Culminating at its extremity is the ecstatic state of mystical rapture. On the other side of the center point lies the continuum of decreased arousal or meditation. This line reaches through states of tranquillity and relaxation on to the extreme state of yogic samadhi (in Keup 1970:324).

The diagram below illustrates Ludwig's and Fischer's classification schemes in relation to one another. The presence of somatopsychological factors (Ludwig's "E") would cover both realms of the continuum (e.g., increased arousal produced by LSD, decreased arousal due to sedatives and anaesthetics).

The general categorization of ASC's in terms of increasing or decreasing sensory stimulation, motor behaviour, mental alertness and cortical activity, provide characteristic features for distinguishing classes of ASC's. Before we attempt to plot trance on this diagram, some definitions of trance are in order.

Pattison, Kahan, and Hurd define trance as a mode of consciousness in which one is

seemingly unaware or unresponsive to usual external and internal stimuli. Such persons act as if they are "in their own world" apart from the immediate context of the external reality of the world about them (1986:286).

Mystical Rapture

		hyperarousal
continuum of hallucination		
		anxiety
Ludwig's B and C		creativity

Common Consciousness

		tranquillity
continuum of meditation		
		relaxation
Ludwig's A and D		hypoarousal

Samadhi

Nils Holm, citing Anna-Leena Siikala (1979:39), defines trance as a form of behaviour deviating from what is normal in a wakened state and possessing a specific cultural significance, typical features being modifications of the grasp of reality and the self-concept, with the intensity of change varying from slight alterations to complete loss of consciousness (Holm 1982:8; see also Siikala 1982:104).

I. M. Lewis, paraphrasing the Penguin Dictionary of Psychology, describes trance as

a condition of dissociation, characterized by the lack of voluntary movement, and frequently by automatisms in act and thought

and he adds that

trance may involve complete or only partial mental dissociation, and is often accompanied by exciting visions, or 'hallucinations', the full content of which is not always

subsequently so clearly recalled (1971:38-39).

Scholars interested in hypnotic trance define and describe trance phenomena as a mundane or secular ASC evident in everyday life. Spiegel and Spiegel (1978) suggest that trance involves

an increase in focal attention to one aspect of the total situation and a concomitant constriction of peripheral awareness of other aspects (14).

They say trance is an everyday occurrence, and hypnosis merely formalizes its occurrence and defines its essence. For Spiegel and Spiegel, virtually all religious rites inducing trance states are no different from hypnotic techniques; they all serve to deepen the pre-existing trance states available to most, if not all, persons.

Stephen Gilligan conceives hypnotic trance as

an experientially absorbing interactional sequence that produces an altered state of consciousness wherein self-expressions begin to happen automatically (i.e. without conscious mediation) (1987:xiii).

Phenomenological features of trance states include paradoxical "both/and logic" (for example, being both here and there at the same time), flexible time/space relations, hallucinations, perceptual/sensory distortions, and motor and verbal inhibitions (42-54). Like Spiegel and Spiegel, Gilligan says that trance is a naturally occurring phenomenon in everyday life (like daydreaming, absorption in a novel or movie, and so on).

Ernest Rossi (1986) describes common everyday trances as occurring during quiet times, when one is staring vacantly into the air with a faraway look in one's eyes, when driving without remembering the route, and when daydreaming. Rossi makes use of research in ultradian rhythms to support his theory. He says that "hypnosis is a ritually induced¹ way of enhancing and vivifying certain naturally occurring ultradian

behaviours" (106). Ultradian rhythms, according to Rossi, are psychobiological processes wherein alternating autonomic nervous system and brain functioning occur within a 90-120 minute cycle. The rhythm moves an individual from a state of parasympathetic/right hemisphere dominance to one of sympathetic/left hemisphere dominance. Everyday trances occur when the swing of the ultradian pendulum is in the state of parasympathetic dominance. This state is exemplified by intestinal and urinary activation, slowing of the heartbeat, slower or deeper breathing, fixed stares, slowing reflexes, economy of movement, fewer eyeblinks and less swallowing (Rossi:100-102).

Descriptions of alternate states of consciousness, definitions of trance, and Ludwig and Fischer's classification formulae are useful means of distinguishing trance from common states of consciousness. Can these same definitions however, be used to distinguish between types of trance? Since the focus of this thesis is on shamanic and possession trance, a means of distinguishing between these trance types, and between these and other trance types is essential. If the methods of classification so far discussed are not adequate, other means of distinguishing trance types must be found.

Specifying Trance Types

Ludwig (1968) defines ASCs according to the method of their induction, while Fischer defines ASCs according to a continuum of central nervous system (CNS) arousal. The continuum of hallucination or higher arousal corresponds to an increase in exteroceptive stimulation or motor activity or emotion as well as increased alertness or mental

involvement. Possession trance (PT) and shamanic trances incorporating dance and movement, therefore, would be situated on the higher arousal side of "common consciousness" (see p. 8 for diagram). The continuum of meditation or decreased arousal according to the variables of induction cited by Ludwig, includes reduction of exteroceptive stimulation or motor activity and decreased alertness or relaxation of critical faculties. Thus hypnotic trance, meditative trance, and the common everyday trance as described by Rossi would lie on the lower arousal side of Fischer's continuum.

The main difficulty with the above categories is that they overlap each other in different contexts. The situating of meditation on the lower arousal side of Fischer's continuum is a case in point. Practitioners of Zen meditation maintain a state of "passive awareness" or "active receptivity". So decreased alertness (characteristic of the continuum of meditation) is not a feature of this form of meditation. But reduction of motor activity and decreased arousal (indicated by slow deep breathing) is evident. On the other hand, there are active meditations such as walking and whirling meditations which involve increased motor activity. Such active meditations therefore fall on the higher arousal side of the continuum.

Another area of overlap arises in attempting to plot common everyday trance and hypnotic trance, which is simply a deepening of the everyday trance. Everyday and hypnotic trance are said to exhibit auditory and visual hallucinations (Rossi 1986:101). Rossi also suggests that hypnotic trance states involve parasympathetic nervous system dominance, or, in other words, a state of decreased arousal. Decreased arousal and hallucinations do not correspond to Fisher's and

Ludwig's formulae. Shamanic vision questing and Harner's (1980) shamanic trance technique are similarly difficult to plot. Reduced motor activity and hallucinations or visions are characteristic features of these shamanic trances.

The suggested classification schemes are, if not deficient, at least confusing. The notion of everyday trance further confuses the issue of ASCs. Rossi, Gilligan, and Spiegel and Spiegel say that there exist naturally occurring trance states with a periodicity of as little as 90-120 minutes (according to Rossi). Is it accurate, then, to suggest that there is such a thing as an alternate state of consciousness which is clearly distinct from a common state of consciousness? What, in this case, constitutes common everyday consciousness? According to Rossi, ultradian rhythms are natural biological rhythms. All humans continually enter and exit light states of trance with noticeable differences in mental, physiological and motoric functioning. If light trances are natural, it seems that light trances are more an aspect of common consciousness than evidence of an ASC.

Classifying ASCs according to the method of their induction or along a continuum of arousal is not in itself a sufficient means of categorization: too many questions and problems exist. As noted, some forms of meditation involve heightened awareness and decreased arousal. Other forms of meditation involve heightened awareness and increased arousal. Shamanic trance (ST) can be hallucinatory while being either active or passive in nature. And hypnotic and everyday trance can exhibit hallucinations when arousal is decreased.

A fundamental requisite for classification of an ASC rests with personal description of the experience. A participant's account is crucial in ascertaining whether, for instance, decreased arousal results in a meditative or visionary state. Other essential ingredients for classifying ASCs include the context within which the ASC is achieved (including personal and socio-cultural circumstances), the intent of the individual entering an ASC, the interpretation given to the experience, and the effect of the experience on the individual.

The model sketched on page eight gives inadequate means of distinguishing different trance phenomena. Through a brief presentation of context, however, hypnotic trance can be separated from ST, PT and meditation and thereby omitted from further discussion.

By and large, possession trance and shamanic trance are incorporated within the realm of the sacred or divine (Bourguignon 1973; Lewis 1971; Eliade 1964). Meditation too is often central to religious traditions (e.g. Zen and Yoga). Hypnotic trance as discussed in the psychological literature is not a practice associated with the divine. Rather, hypnotic trance is a secular therapeutic technique (Rossi 1986; Spiegel and Spiegel 1978; and Gilligan 1987). On the basis of the above secular-sacred distinction, hypnotic trance, although it may exhibit qualities similar to those of religiously contextualized trance, should be classified separately.

Some obvious differences between meditation and PT and ST ought to be clarified as well. Possession trance involves the taking over of an individual by a spirit, deity, or power, and may or may not involve amnesia. Shamanic trance can include possession, or as Eliade maintains, the possession of a spirit by a shaman (1964:93, 328). ST

often involves journeys to other realms (see Eliade 1964; Halifax 1979; Larsen 1976; Neihardt 1961; and Lane Deer and Erdoes 1972). The literature on meditation indicates that possession and journeys are not characteristic of meditation. Although religiously contextualized, meditation stands apart from PT and ST on an experiential level.

We should note the relationship between trance and ecstasy. Certain authors make use of the terms "trance" and "ecstasy" as if they were synonymous (Lewis, 1971; Eliade, 1964; Siikala, 1982). But Gilbert Rouget (1985) suggests that the terms are not interchangeable, and he provides a classification scheme for discriminating between ecstasy and trance. Ecstasy is achieved in quietude, immobility, and solitude—in mystical union and yogic ecstasy. States attained by means of noise, agitation, frenzied behaviour and the presence of others are more properly labelled as trance (Rouget:6-7). Rouget claims that trance, whether shamanic or possessive, is characterized by total amnesia and the lack of visions or hallucinations. In contrast, ecstasy is usually accompanied by visions, and memory is retained (9-10). Rouget (11) characterizes trance and ecstasy this way:

Ecstasy	Trance
immobility	movement
silence	noise
solitude	in company
no crisis	crisis
sensory deprivation	sensory overstimulation
recollection	amnesia
hallucinations	no hallucinations

Rouget admits that these states are contrasting poles on an ideal continuum. Therefore, a given state may contain features of each pole of the continuum. Since there is considerable evidence of states that combine features of ecstasy and trance, I consider this means of

classification to be of little heuristic value. Further difficulties with Rouget's categorization are evident in the work of Peters and Price-williams (1980). They state that of 42 societies surveyed, 9 of 18 societies exhibiting only PT report memory of the PT state. Furthermore, 11 of the 42 societies report the existence of both PT and ST, and all of these 11 societies report recall of the trance states (402). These data indicate serious problems with classifying trance states by virtue of total amnesia as does Rouget.

A primary feature of ST is the spiritual journey, or magical flight. Visions or "hallucinations" of the ST variety fall under Rouget's category of ecstasy. Such journeys can be made in solitude and while immobile, thus corresponding to Rouget's scheme, as for example Sioux vision questing (Brook Medicine Eagle, 1979; Lane Deer, 1972; see also Peters et al. 1980). However, visions commonly occur with ST that contains elements of movement, noise, company and crisis (Katz 1982). This latter situation, along with reports of memory while in PT (which is commonly associated with noise, company, frenzied behaviour and sensory overstimulation), attests to the fact that Rouget's distinctions, while they might be useful in some cases, are of no value in the present work. The characteristics used to differentiate between ecstasy and trance can make classification ambiguous. Rouget's distinction between ecstasy and trance will therefore not be adopted here.

Possession Trance and Shamanic Trance

Can shamanic and possession trance be discussed together?

Although they are quite different experiences (spirit flight as opposed

to bodily or soul possession), the literature suggests that they may be enacted to perform similar functions. Both may be used for healing and divination, for instance. Or each may or may not have similar social implications such as providing a vehicle for social stability or upheaval, and each may or may not be brought about by similar inductive techniques. Shamanic trance can be the domain of a few specially chosen shamans. Similarly, possession trance can be exclusive to an elite priestly group, as is the case with the *prekore* Shona of Africa (Lewis 1971:136) and the Palauans of the Western Carolines (Leonard 1973). In contrast, the enactment of ST for the Kung Bushmen and PT for the Vincentian Shakers is not as exclusive. For the Shakers of St. Vincent, all members may become possessed at different times (Henney 1973). In the case of Kung Bushmen, fifty percent of adult men and ten percent of adult women perform shamanic trance healing ceremonies (Katz 1982:33). There may be similar reasons for the enactment of ST and PT (such as healing), similar induction techniques, and similar restrictions about who may or may not enter the trance. Nonetheless, possession and shamanism are commonly accepted as being two quite different categories of experience (for an exception see Winkelman 1986).

On what basis, then, are these two forms of trance to be distinguished? They are distinguished on the basis of a participant's experience. The most salient feature of shamanism is the journey to other realms, or "magical flight" (see Peters and Price-Williams 1980). The most conspicuous feature of PT is the taking over of an individual by some spirit or power. I have yet to find a case of magical flight in the PT literature, so flight can serve as a criterion for distinguishing ST from PT. Peters and Price-Williams (1980) indicate that possession

can be a factor in ST, hence it cannot constitute a criterion for distinguishing PT from ST. Peters and Price-Williams state that an essential ingredient of shamanism is control or mastery over ST. Control means the ability to induce a shamanic trance wilfully. Although control may be essential to ST, it is not a sufficient factor for distinguishing ST from PT. There are many instances in which possession appears to be induced wilfully. Such is the case with Tamang shamanic possession (Peters 1982), Korekore Shona possession (Lewis 1971) and Shaker possession (Henney 1973). The feature of mastery or control over trance does not suffice as a distinguishing factor between PT and ST.²

Neither are methods of induction appropriate classification indices for PT and ST. Similar procedures (i.e., drumming, chanting, dancing) are used for inducing both forms of trance (for shamanism see Eliade 1964 and Guenther 1986; for possession see Henney 1973 and Pressel 1973).

Inquiries into the function of PT and ST ask the question "why enact trance?". When looking at induction procedures, we ask "how is trance induced?". If we look at magical flight and the taking over of a person, the question is "what happens in trance?". Another question that can be asked is "why do some people enter PT and others ST?". The answers to these questions are not found in function or induction techniques, since they can be the same. Rather, the answers are found in cultural paradigms. Rouget (1985:25), Crapanzano (1977: introduction), Siikala (1982:103), and Holm (1982:17) state that possession is a culture-bound concept requiring belief in the possibility of a person's becoming possessed. Quite simply, if there is

no belief in possession, possession will not occur. Other explanatory matrices can be used. Behaviour which in Haiti would be called possession, for instance, might, if it occurred in western society, be called schizophrenic, neurotic, or even pathological. Similarly, if there is belief in possession and no belief in magical flight, magical flight will not occur. Cultural beliefs can thus be a means of distinguishing whether an individual enters PT or ST. There are cases, however, where societies include both forms of trance in their religious ceremonies (Peters et al., 1980). In the later cases, something more than cultural paradigms are necessary for distinguishing between PT and ST. Here again we arrive at the aforementioned essential criterion: the experience of the participant.

Whether one knows the beliefs of a society or not, one can discern whether PT or ST has been experienced on the basis of personal descriptions by participants. Descriptions of trance experiences tell us whether a set of induction techniques has resulted in magical flight or possession; this is a conclusion which cannot be arrived at on the basis of analyzing function or induction techniques alone. Subjective description, in turn, reflects culture-specific concepts, symbols, beliefs and the like. Culture-specific beliefs are thus central in personal descriptions and interpretations of the type of trance engaged in by its members. They are also central to understanding the meaning, significance, and import of the experience for the participant and the audience. Culture-specific or emic classification of the experience on the part of participants is, in my view, the primary means of distinguishing between PT and ST.

In theory, the neurophysiological mechanisms and processes mediating either PT or ST can be a distinguishing criterion to some extent. Visions necessitate neurophysiological dynamics that are not active when visions do not occur. In practical terms, however, neurophysiological dynamics central to visions are not evident in the midst of a trance ceremony in the field. Furthermore, if the same techniques can induce both shamanic and possession trance, the neurophysiological differences between these phenomena are not strictly related to the techniques. Rather, the neurophysiological differences are contingent upon indigenous beliefs. Although this topic leads directly to neurophysiological considerations in a theory of trance, I will first consider psychological and sociological perspectives on trance in order to present a well-rounded picture.

Psychological Perspectives on Trance

There are two fundamental assumptions which direct psychological interpretations of trance. One view considers trance phenomena as pathological and tends to look at persons entering trance states as having deep-seated psychological problems. Holm (1982) cites T. Andrea (1926) who claims that

The phenomena of religious possession and inspiration must be regarded as manifestations of hysteria and ... consequently most mystics must be called hysterics (Holm, 1982:12).

Other theorists who maintain that PT and ST are pathological manifestations include Krader (1954) and Radin (1937), who group shamans together with epileptics and hysterics. Langness (1965) also claims that possession is representative of hysterical psychosis. Silverman (1967) states that a shaman is an acute schizophrenic, while Devereaux

(1956), maintains "there is no reason and no excuse for not considering the shaman as a severe neurotic or even as psychotic" (cited by Lewis 1971:180-181).

The second psychological approach considers PT and ST as a means of maintaining or reinstating psychological health. Whereas scholars such as Silverman and Devereaux see trance as a pathological dissociative phenomenon caused by repression, others consider trance states to be a catharsis of repressed emotions and desires (Peters and Price-Williams 1980; Peters 1982). Mars (1946) and Nadel (1946) (cited by Lewis 1971:192) suggest that the cathartic aspect of shamanism plays an essential role in preventative psychiatry. Through PT and ST, individuals are able to free repressed and traumatic experiences through the process of abreaction (the reliving of events with the aim of relieving problems associated with the events) (Lewis 1971:40).

Peters et al. suggest that the magical flight of shamans is comparable to psychological techniques such as Jung's active imagination, Desoille's directed daydreams and Leuner's guided affective imagery (1980:405). Freudian and Jungian psychology approaches "waking dream therapy" as symbolic of internal processes—an approach which leads to the study of myths and symbols and their internalization in the mythic consciousness (see Larsen 1976).

The various psychological approaches to the study of trance states share common features. Western psychological assumptions about pathology, therapeutic techniques and states of mind are projected onto observable aspects of PT and ST. The trance states are subsequently classified as healthy or unhealthy states of mind or else considered as healing therapeutic techniques. This approach constitutes an etic, that

is, externally imposed categorization of trance states on the basis of western concepts. Emic or indigenous interpretations do not appear to play a part in perspectives that view trance states as pathological. The lack of attention paid to emic interpretations and experiences of trance is a mistake. Only if emic interpretations of trance states are disregarded can western assumptions about pathological behaviour be projected onto observable aspects of trance behaviour. It is unclear whether those maintaining that PT and ST are healthy cathartic processes consider the phenomenon from the point of view of emic interpretations. It is clear that the same phenomenon which is labelled pathological by some can be seen as a healthy cathartic process by others. The label given to a trance state seems to depend on the original perspective of the viewer, namely, whether or not the observer believes the state to be healthy. Once the original perspective is decided upon, psychological approaches grounded in western categories and theories, be they positive or negative in nature, can be projected onto trance phenomena. I am not suggesting that such projections and interpretations are not useful. Rather, I am pointing out that the interpretations and insights drawn from psychological considerations of trance are grounded in the understanding of the western observer. For the most part, an "insider" understanding of the phenomenon is not available through such western perspectives.

Sociological Perspectives on Trance

Sociological studies of trance states are interested in the connections between trance and social structure, social hierarchies and social change. Questions asked by sociologists are these: (1) How does

trance relate, on a personal and experiential level, to the social circumstances of those employing it? (2) Under what social conditions does the incidence of trance increase or decrease? and (3) What functions does trance serve in different types of societies? (Lewis 1971:21).

On the personal level (question 1 above), ST and PT legitimize, authorize or strengthen the individual. Religious leaders, for instance, employ trance to legitimize their authority. Thus legitimized, both a leader's position within a religious hierarchy and the authority of the religion as a whole are maintained (Lewis 1971:34). Individuals of lower economic status are likely to enact trance as a means of escaping the bonds of their social position (Lewis 1971:100;117;128; and Bourguignon 1973:23). Entering trance states elevates individuals to the point of contact with the divine, a status not available to social members who do not practise PT or partake of ST in some form. Henney (1973; 1974) provides an exemplary description of this form of status reversal in her discussion of Shakerism in St. Vincent. The Shakers, comprised of lower class persons, reject the higher class and their desires for worldly goods. They consider poverty a virtue. The Shaker's virtue, worthiness and purity, is affirmed through possession by the Holy Spirit. In the realm of religion and piety, lower class Shakers are superior to the upper echelon of society members (Henney 1973:255-253).

The social conditions in which trance is most likely to manifest itself (question 2 above) are times of social instability, as well as in societies with high levels of social complexity and stratification (Bourguignon 1973:22; Lewis 1971:175). Greenbaum (1973) suggests that

the incidence of trance is more likely to rise in societies which, along with high levels of complexity and stratification, present these status differentiations as fixed and rigid. Individuals in these societies have little or no hope of literally escaping the bonds of their social status, so they are likely to employ trance as a means of symbolically escaping such restrictions through the realm of the spirit.

In times of social instability or crisis, trance might be employed as a way of expressing dissatisfaction. It can also be a vehicle for introducing changes in social conditions and structures (Bourguignon 1973:33). In other instances, for example with the Umbanda of Brazil, trance can serve to mediate social changes already under way (Pressel 1973).

Societies with firmly entrenched religious systems are more likely to act with hostility toward "haphazard inspiration" (Lewis 1971:34), since direct claims to divine insight, knowledge, and experience might threaten established systems. Lewis suggests that the more central a religion becomes, the more hostile it becomes towards the widespread incidence of trance. The inverse is true of peripheral movements (131). Furthermore, he claims that if a peripheral cult becomes a central religion, trance tends to become the property of accredited officers. Often such personnel will be of elite or higher social classes (144; 170; see also Leonard 1973).

The functional attributes of trance states vary within different social and personal circumstances. One of the primary effects of trance is validation of a belief system, an authority, or an individual, regardless of status. Trance can be used to maintain social systems and hierarchical authority by providing an outlet for repressed lower

classes. As evinced by the Shakers (Henney 1973; 1974), trance can circumvent social upheaval by providing a sense of superiority over higher classes through an intimate connection with the divine. To the extent that trance offers individuals of lower economic status with opportunities for action and expression not available to them within a social hierarchy, it can help to maintain a society (Bourguignon 1973:33). On the other hand, during times of instability, religions employing trance can instigate and carry through social reform (Bourguignon 1973:32).

The above observations are, for the most part, more applicable to PT than to ST, since the sources cited deal with possession trance. However, some functional similarities between PT and ST can be discerned.

In North America, Shamanic trance is typically not open to a large group of social members. Underhill (1965) points out that in many cultures in which shamanism predominates there is at least one specialist—the shaman or medicine man—who effects healing through visions and trance. While there can be more than one healer, shaman, or medicine man within a group, a review of the literature makes it clear that shamanic trance is often limited to a few highly regarded members (see Lane Deer and Erdoes 1972; Sandler 1979; and Eliade 1964). Underhill and Eliade suggest that, where it is present, shamanism is the central or dominant form of religious expression of a group. As Lewis points out, in a central or dominant religion, the use of trance is restricted to only a few members of the culture. This appears to be borne out in the case of cultures that embrace shamanism as described by Eliade and Underhill.

There are exceptions, however. Shamanic trance among the Kung Bushmen, for instance, is available to one-third of the adult population (Guenther 1986). Although Lewis's contention regarding the availability of trance in central religions may be true in some cases, it is not true in all cases of ST.

In answer to the first of three questions asked in a sociological exploration of trance, ST performs the function of lending legitimization and authority to those enacting the trance. Effecting a cure for an ailment or correctly divining an answer to a question validates the shaman's position. At the same time, the efficacy of the trance validates the belief system within which the shaman works.

I have said that the incidence of trance will rise during times of social instability and in societies with a high degree of social stratification. Like PT, an increase in the incidence of ST will accompany a rise in the number of social or personal crises, such as ecological problems and illness. The aim in employing trance in reaction to such events would be the maintenance of the group as it exists, as with the Shaker's use of possession trance.

The above observations suggest that ST and PT share the function of validation, but it is not clear whether ST, like PT, can be a vehicle for the overturning of a social hierarchy. It is clear that PT does perform a role in a social system, whether consolidating or revolutionary.

Inter-Disciplinary Cross-Cultural Analysis of ASC's

A perspective more fruitful and well-rounded than a sociological approach to the study of trance is afforded by inter-disciplinary,

cross-cultural analysis. This approach takes into account the social implications of PT and ST while addressing factors not discussed by sociologists.

Investigations of trance phenomena within an inter-disciplinary, cross-cultural framework provide a unifying fabric for the study of trance. Michael Winkelman's (1986) psychophysiological model of trance states, for instance, investigates trance induction procedures in terms of their effects on neurophysiological functioning. Ideally, Winkelman's model is applicable to any occurrence of trance while being compatible with other theoretical perspectives on trance. Ralph Locke and Edward Kelly (1985) propose a model of ASC analysis that incorporates neurophysiological studies into a more inclusive scholarly perspective on trance. A description of these two models of ASC analysis will conclude this chapter. The term ASC used by Locke and Kelly in place of trance, is an inclusive term denoting both trance states and other alternate states of consciousness as well.

Michael Winkelman (1986:175) claims that a model of a single type of religious trance state is more appropriate than a model of many discrete types of trance states. He adopts two premises: (1) that a common set of psychophysiological changes are induced, and (2), that the neurophysiological functioning that occurs in different types of trance states share common characteristics.

Winkelman considers trance to be characterized by a condition of parasympathetic dominance, accompanied by synchronous slow wave EEG activity (alpha and theta) (175-178). He reviews a variety of inductive techniques employed during ceremonial trance in order to determine their common psychophysiological effects. He also considers sleep and dream

states and the production of endogenous opiates. While not being inductive techniques, sleep, dreams, and endogenous opiate production share common features with, and may be involved in, trance states. His investigation includes the following psychophysiological parameters:

1. Auditory driving that results in slow wave alpha activity.
2. Fasting and nutritional deficits that increase susceptibility to driving. Such dietary restrictions also have a direct effect on the pituitary and adrenal glands involved in the secretion or inhibition of neural transmitters such as serotonin.
3. Social isolation and sensory deprivation associated with hallucinations, slower brain wave frequency, and cortical synchronization (in effect, an increase in parasympathetic dominance).
4. Meditation, which culminates in a general shift to parasympathetic dominance.
5. Sexual restrictions that might facilitate trance by reducing testosterone production. The presence of testosterone reduces EEG response to driving. Sexual restrictions may also help to prevent the parasympathetic collapse characteristic of orgasm before the appropriate ritual period.
6. Extensive motor behaviour, which can produce slow wave parasympathetic dominant states.
7. Hallucinogens whose active ingredients closely resemble natural neural transmitters.
8. Endogenous opiates inducing increased slow brain wave activity, and endorphin production which also leads to characteristic features of trance states.

9. Sleep and dream states which exhibit neurophysiological parallels with trance states, including parasympathetic dominance (178-183).

Analysis of the above inductive techniques indicates a common set of changes in neurophysiological functioning. Winkelman concludes that the common psychophysiological effect of trance induction techniques is the evocation of slow brain wave activity and synchronization of the frontal cortex, indices of parasympathetic dominance.

Winkelman suggests that a distinction must be made between possession trance and shamanic trance. The amnesia associated with possession trance allows us to distinguish it from shamanic trance in which amnesia does not occur. Winkelman considers the amnesia that occurs during temporal lobe epileptic seizures (and the discharges that accompany it) to be similar to the amnesia occurring during possession trance, while no such physiological phenomena occur during shamanic trance (193).

Although Winkelman's investigation and analysis are for the most part sound, there exists a point of contention. Winkelman has neglected a fundamental feature of the classification of trance states in his attempt to homologize the field of trance namely, subjective description. In focusing on the psychophysiological dynamics of trance, Winkelman has glossed over the lived world of the participant in his analysis.

Although Winkelman's differentiation of PT and ST may be valid, his criterion are insufficient. As noted earlier, there are cases of possession wherein amnesia does not occur (Peters and Price-Williams; 1980). In a case where there is memory of a PT experience, Winkelman's

model would suggest that we classify the experience as ST. In such cases, the proper classification of the experience as PT requires further information. One source for this information is indigenous belief about trance. If possession is the only trance enacted by a group, and participants remember their experience, one can deduce that PT took place. Another source of information must be tapped if PT, ST and the memory of both states are evident in the same society. In such a case, the most expedient means of discerning what kind of trance was enacted is to ask the participant. Clearly, the incidence of amnesia cannot be used to distinguish between PT and ST in all cases.

Also, Winkelman's theory about the occurrence of amnesia has not taken into account a theory about amnesia noted earlier. Peters and Price-Williams (1980: 403), along with others, suggest that amnesia is a factor of the cultural beliefs about possession trance. If genuine PT is believed to involve amnesia, then amnesia will result. Peters et al. liken this to hypnotic suggestion, and state that "there does not appear to be anything inherent in possession states which would inhibit memory" (1980: 403). If the hypnotic suggestion hypothesis is valid, Winkelman's theory about temporal lobe seizures must play a role in hypnotic suggestion. The latter can be verified by conducting tests on persons under hypnosis. Subjects can be told, while under hypnosis, to forget their experience of being hypnotized. EEG analysis of these individuals should reveal signs of temporal lobe seizures. Similar experiments could be conducted on persons exhibiting amnesia after entering a PT. The validity of either one, or both of these hypotheses will remain contentious until further research in the area has been undertaken.

Locke and Kelly (1985) introduce a comprehensive model of analysis for the inter-disciplinary cross-cultural study of ASC's. Their preliminary model provides an overview of possible features of diverse trance phenomena. Included are factors associated with trance induction, methods of description, characteristics of resultant trance states, and the consequences of entering trance states.

Locke and Kelly subdivide factors of ASC induction into two broad categories: distal and proximal factors. Distal factors are those which pattern or give shape to experience (Locke and Kelly 1985:10). They are intertwined with cultural, social, and ecological aspects of a culture. Proximal factors are more immediate and disruptive forces and relate to induction techniques (Locke and Kelly:10)

Locke and Kelly set out the following distal factors:

1. Ethnoepistemology: The "routine everyday knowledge" of cultural members including beliefs, values, guidelines for action, social structure and roles (Locke and Kelly:10). Ethnoepistemology is the overall context or world-view within which ASCs play specific roles and acquire their meaning and value.

- 2) Cultural Signs, Symbols and Metaphors: In conjunction with ethnoepistemology, signs, symbols, and metaphors give form to expression and signify, locate, and relate ASCs to the overall matrix of a belief system or world view (15). These features make clear the significance of ASC's within a cultural domain from an emic standpoint.

- 3) Predisposing Factors: These factors predispose individuals to take on certain psychological features and social roles. Such factors also influence the society's structure as well as personal and collective development throughout life (Locke and Kelly:18).

An analysis of distal factors involved in ASCs leads to an understanding of the overall cultural fabric of a society. This feature of Locke and Kelly's model includes anthropological and sociological analysis. Anthropological investigations reveal indigenous beliefs, values, symbol systems and the like and provide an emic perspective central to the understanding and interpretation of trance states. Furthermore, emic perspectives can lead to an understanding of the interconnections between trance and its role in a belief system, in the cultural life of members and in the overall social organization of a group. Understanding the role of trance in social organization and structure, in turn, requires the kind of sociological analysis of trance described earlier.

Proximal factors considered by Locke and Kelly include the following:

1) Inversion Procedures: The systematic reversal of status, role or sex (see Turner 1969).

2) Driving Procedures: The use of drumming, chanting, singing, and dancing which appear to be virtually universal in trance induction procedures.

3) Pharmacological Factors: The use of culturally sanctioned, often symbolically significant, agents in the production of trance states (see Harner 1973).

4) Group Ritual versus Individualistic Factors: The relation between culturally prescribed rites and techniques for ASC induction and personal expression. Also considered here are spontaneous trance experiences and the social learning process which guides and controls the entry into trance.

5) Physical and Mental Stress and Illness: Physical stresses that may accompany inductive techniques include those associated with drumming and dancing, pain inflicted by the self or others, and deprivations of various sorts. Psychological stresses can result from social humiliation or isolation, as well as the status ambivalence or liminality of the neophyte's participation in rites of initiation(see Herdt 1987). Shamanic callings and spontaneous trance states are often associated with illnesses for which healing is attempted by means of ritualized control and induction of trance states.

6) Miscellaneous Somatic and Psychological Factors: These factors include virtually any not specified above: sensory deprivation, violence, environmental factors (e.g. temperature), fasting, and a host of diseases.

In effect, an analysis of proximal factors in ASC induction provides a description of the techniques used in a rite of trance. The goal, in my view, is to know which technique plays what role in the onset of trance. Pharmacological agents such as hallucinogens can bring on trance. There is much evidence to suggest that driving procedures bring about trance as well. The precise roles of other proximal factors, however, are not clear.

There may be no direct causal relationship between physical and mental stress, illness, deprivations and fasting and trance. Rather, they may increase one's susceptibility to trance, or augment other induction techniques such as driving. Similarly, inversion procedures may induce psychological or emotional stress, thereby increasing a participant's susceptibility to trance. On the other hand, inversion procedures may also impart a specific meaning to certain ritual acts and

gestures and thereby create little or no stress. It is possible that any or all of the proximal factors discussed play a role in different instances of trance. Identifying each factor in a rite and describing its specific role in the production of the trance is a difficult task. A specific accounting for the role of each factor would entail detailed analysis of the neurophysiological effects of each factor. Such analysis would reveal whether certain techniques (such as inducing stress) excite the central nervous system and make it more likely to respond to other stimuli (such as driving) in a way that would produce an ASC. Barbara Lex has considered this possibility (1978). She describes how intense stress can excite the central nervous system to the point where trance results. Understanding the precise dynamics involved requires fairly extensive knowledge about the human nervous system. Without the necessary background information (provided in chapter 2), I cannot explain Lex's account at this time.

Locke and Kelly also focus their attention on the ASC resulting from the procedures. Their primary aim is to identify and characterize the salient or essential aspects of ASCs by means of the following:

- 1) Pattern: The delineation of "modal ASC episodes ... extending from preparation, direct induction, amplification, peaking, tailing off, recovery and return to the social group" (37). Included is a description of the pattern of an individual's historical development in relation to ASC's.

- 2) Behavioural Description: The description of what an individual in an ASC actually does. This aspect reveals the cultural and social learning of appropriate behaviours during trance while allowing for means of comparison with the behavioural characteristics

of other cultural groups.

3) Physiological Description: One part of this aspect is the description of obvious physiological characteristics such as sweating, pallor, muscular spasms, and so on. The other part is the study of individuals in an ASC through techniques which identify less obvious physiological functioning, for example, EEG analysis.

4) Phenomenological Description: The participant's description of the experience.

The above four aspects of ASC description complement analyses of distal and proximal factors. While distal and proximal factors relate directly to interpretive frameworks and inductive techniques, phenomenological, physiological, and behavioural descriptions relate to the ASC itself. A description of the pattern of modal ASC episodes, when episodes occur within religious rites, constitutes a description of the ritual process in which trance is enacted. A description of the behaviour of individual participants reveals the culturally sanctioned actions appropriate to trance. Comparing different behaviours will then reveal both common and idiosyncratic experiences. Descriptions of trance behaviour from different cultures allow for cross-cultural comparison. Physiological description provides data on the neurophysiological functioning of an individual during trance. For example, excessive sweating indicates intense excitation of the sympathetic nervous system, which can then be followed by collapse which indicates rebound into parasympathetic dominance. Phenomenological description of a participant's experience is one of the most important features of Locke and Kelly's model. Through the participant's description we get a glimpse of the individual's actual religious

experience. When compared with phenomenological descriptions of trance from other cultures, we can see what, if any, features of trance experience are common to different cultures.

The final portion of the model presented by Locke and Kelly addresses the consequences of entering an ASC. Included is the social significance and role of ASCs in the group, the interpretation and relationship of ASCs to the world view, and the social and psychological adaptation of the participant after experiencing an ASC. The consequences of enacting an ASC relate to distal factors, and the assessment of these consequences requires knowledge of ethnoepistemology in order to understand the interpretation of an ASC and its relation to a world view. Ethnoepistemology, coupled with sociological analysis, is necessary to clarify the social implications of ASC enactment within a group. And predisposing factors which impinge on collective and personal development, both social and psychological, must be taken into account when analyzing a participant's adaptation after enacting an ASC.

The systematic categorization of inductive features of ASC's, both proximal and distal, is a heuristic device intended to assist in ASC analysis. In actual cases, inductive factors are intertwined and affect each other such that clear distinguishing lines do not necessarily exist.

In my view, the Locke and Kelly model provides the most cogent framework described thus far for the analysis of ASCs. Rather than adopting a primarily psychological, sociological or anthropological perspective on trance, Locke and Kelly have incorporated these perspectives into a wider model of ASC analysis. They consider the social framework and the role of ASCs in relation to that framework.

They discuss the effect of the social and cultural framework on both the incidence of, and interpretation of, ASCs (distal factors). They investigate the features of trance induction that are evident in the production of trance states (proximal factors). Their model also includes investigation of the ASC itself (pattern of ASC episodes, descriptions of behaviour and physiology, and participant's descriptions of the experience). Their model allows for the inter-disciplinary analysis of ASCs applicable cross-culturally while demanding culture-specific description and interpretation. It remains to be seen how well this model of analysis works in practical application.

Locke and Kelly's model is the most lengthy and difficult model to use. Ideally, a study of any possession or shamanic trance technique would incorporate all the factors delineated by Locke and Kelly. However, I will not attempt that task here. Rather, the following chapter will address one feature of their model, namely, the neurophysiological aspects of trance induction techniques and trance states. The neurophysiology of trance is a topic about which little is written. What has been written is in many cases not adequate. There is a myriad of possible permutations among elements of the central nervous system in response to different stimuli and styles of processing those stimuli. Thus, a definitive statement of neurophysiological functioning during any and all trance states may not be possible. Whether or not a definitive statement is possible, the neurophysiological effects of trance induction procedures, and the neurophysiological mediation of trance states are areas which must be examined.

Chapter Two

TOWARDS A NEUROPHYSIOLOGICAL THEORY OF TRANCE

In contrast to the breadth evident in Locke and Kelly's model for analyzing ASCs, the ensuing neurophysiological account of trance focuses on one aspect of trance from the perspective of biogenetic structural theory. Biogenetic structuralism seeks to understand and explain universal religious behaviour and phenomena on the basis of genetically determined, ontogenetically modified, neuroanatomical structures. One of the main premises of biogenetic structuralism, and the starting point for the following theory, is that all experience is mediated by neural structures operating at the moment of experience. All behaviour is mediated by the central nervous system, including the brain (Laughlin and d'Aquili 1974). A normal state of consciousness is mediated by neurophysiological structures and processes most commonly operative in everyday life. An alternative state of consciousness arises when neurophysiological processes not commonly active begin to function. These latter processes could involve different neurophysiological structures, different combinations of commonly active structures, or a different level of functioning for neurophysiological structures. The neurophysiological dynamics active during trance states are the focus of the following pages.

Scientific studies that investigate neurophysiological functioning during ASCs are, for the most part, directed at meditation. Some of the data pertinent to the neurophysiological dynamics of trance must

therefore be taken from studies on meditation. Other data will be appropriated from theories of neurophysiological functioning applicable to trance states. Central to clarifying the neurophysiology of trance are descriptions of (1) the autonomic nervous system, (2) ergotropic and trophotropic activity within the nervous system, (3) drivers which "tune" ergotropic and trophotropic activity, and (4) hemispheric asymmetry. Possession and shamanic trance will be described as states of ergotropic and trophotropic tuning caused by driving procedures. Asymmetrical hemispheric activity during shamanic trance will be considered as well. In beginning, I think it essential to point out a commonly held view of meditation which has been irresponsibly extended to account for trance states.

The most popular assertion concerning meditation, mystical experience, and by association, trance, has been that these ASCs are mediated by right hemisphere dominant functioning (Ornstein 1972; Lex 1978; 1979; Winkelman 1986). This contention is extrapolated primarily from two sources: (1) neurophysiological studies on meditation in which right hemispheric activity is found to be dominant (as indicated by synchronized or resting cortical activity) and (2) studies of hemispheric asymmetries in relation to cognitive functions. Augmenting these sources is the belief that during parasympathetic nervous system activity, which is dominant during meditation, right hemisphere activity is dominant (Winkelman 1986).

I disagree with this popular belief about ASCs. Right hemisphere dominance and inhibited left hemisphere functioning during meditation and trance is a view much too dichotomized, reductive and simplistic in light of the intricate workings of the human body. Although many

descriptions of mystical and meditative states indicate right hemisphere functioning, descriptions of heightened awareness and concentration are indicative of left hemisphere activity. Shamanic trances which involve visions attest to left hemisphere functioning as well. A more enlightened, less dichotomized view of ASCs is suggested by Laughlin et al. (1985), Davidson (1976), and Lex (1979). The most appropriate model for describing neurophysiological functioning during ASCs must consider global (that is, interconnected) neuroanatomical and physiological functioning rather than discrete hemispheric or autonomic nervous system functioning. Global systemic functioning (called ergotropic and trophotropic activity) subsumes the activities of the autonomic nervous system and its two subsystems. An understanding of the workings of the autonomic nervous system is therefore essential to a clear picture of ergotropic and trophotropic functioning.

The autonomic nervous system (ANS) is responsible for controlling and regulating visceral (involuntary) functions of the body such as the rate and force of heart beat, body temperature, digestion and sweating. The ANS maintains homeostasis within the body, that is, the stable internal environment in which the body normally functions (Noback and Demarest 1981:216). Homeostasis is maintained through two sub-systems of the ANS: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS and PNS work as complementary, opposing systems to excite or inhibit the innervation of various organs and functions of the body. Homeostasis is maintained through a dynamic equilibration, which is to say, through a continual process of excitation and inhibition of bodily functions. In order to make this process of equilibration clear, a general characterization of the

functions mediated by each ANS sub-system is required.

The SNS mediates alert wakefulness and arousal. The classic example of SNS excitation is found in the response to threatening stimuli as exemplified in the "fight or flight" reaction of the nervous system. In cases of fighting or fleeing, the body mobilizes for swift response by increasing respiration, heart beat and blood pressure. Blood is simultaneously redirected from visceral organs, such as the digestive tract, to the skeletal muscles. The net effect of intense SNS arousal in fight or flight situations is the preparation of the musculature of the body for combat or escape. Activities not directly related to this response are halted, or at least considerably lessened (Lex 1979:132; Noback and Demarest 1981:220).

If SNS excitation is sufficiently intense, the depletion of energy stores may well result in total exhaustion, collapse, or in extreme cases, death (Laughlin et al. 1985:41). Since continued SNS arousal would eventually become dysfunctional, a phenomenon known as rebound occurs. While SNS excitation is at its peak, PNS arousal is inhibited. In order to return to homeostatic functioning, PNS rebound occurs. SNS excitation is maximally inhibited; heart beat and respiration is slowed down, blood pressure is reduced, and blood is directed once again to organs such as the digestive tract. The net effect of PNS rebound is relaxation and restoration of the energy consumed during SNS excitation.

In the case of maintaining homeostasis under normal circumstances, the excitation of one system evokes a simultaneous reaction from the opposing inhibitory system. In this manner, a constant balance between the two opposing systems (SNS and PNS) is maintained (as for instance with muscle tonus).

In most cases, the arousal of each system is accompanied by an attendant state of mind. Typically, SNS arousal is thought to be characterized by excitement, fear, anger, anxiety, and any other reaction coinciding with fight or flight situations. PNS arousal is thought to result in the sort of pleasurable states accorded to relaxation, sleep and digestion (Lex 1979:132).

The more inclusive categorization of global physiological functioning hinted at earlier is found in the work of Gellhorn (1969) and Gellhorn and Kiely (1972; 1973). Ergotropic excitation denotes any activity which requires the expenditure of energy. Included is the fight or flight response and any action aimed at acquisition or avoidance. The ergotropic system encompasses the SNS but also incorporates certain endocrine glands (which secrete hormones into the blood stream which act as chemical communication systems for the body and brain) and certain areas and activities of the cortex and subcortex. The areas of cortex and subcortex include portions of the hypothalamus, frontal lobes, and limbic system. The hypothalamus is intimately involved in the excitation of the ergotropic or trophotropic systems depending on which area is activated (Gellhorn 1969). It is also involved in the control of the pituitary gland which secretes opiate-like substances such as endorphins and certain hallucinogen-like neurotransmitters (Atrens and Curthoys 1982; Winkelman 1986). The limbic system is intimately involved with emotion, is connected with the hypothalamus, and is also connected with the frontal lobes. The frontal lobes, and more specifically the prefrontal lobes, are intimately bound up with, and largely responsible for, the maintaining of attention and intention (Fuster 1980; Laughlin n.d.).

Typical ergotropic responses include increased muscle tension, desynchronized cortical rhythms (indicating alert wakefulness and excitation of the cerebral hemispheres), decreased salivation, shivering, and dilation of the pupil of the eye. The primary function of the ergotropic system is the initiation, completion and control of action involved in adapting to and dealing with the world (Laughlin et al., 1985:37-38).

Trophotropic excitation includes any activity connected with the conserving or restoration of energy stores such as relaxation, digestion, and sleep. Included within the trophotropic system is the PNS, some endocrine glands, and portions of the hypothalamus, limbic system and frontal lobes (Laughlin et al. 1985). Trophotropic responses include relaxed skeletal muscles, warmth or blushing, constriction of the pupil, increased salivation, synchronized or baseline EEG activity (indicating lack of cerebral excitation or even sleep), disinterest with the environment and dispassionate concentration on an object (Lex 1979:135; Laughlin et al. 1985:38-39).

Generally, the ergotropic and trophotropic systems work in much the same way as the SNS and PNS, that is, they work as complementary, opposing systems. As one system is activated, the other is inhibited to varying degrees. While a person is anxious, for instance, the ergotropic system is active and trophotropic reactivity is decreased or fully inhibited. After the situation causing anxiety has ceased, trophotropic rebound will occur and the individual will return to a state of energy restoration or conservation.

The characteristic balance between ergotropic and trophotropic activity, which includes homeostasis maintained via the SNS-PNS balance,

is a function of environmental conditions while being based in the learned or conditioned response to environmental stimuli (Laughlin et al. 1985:41). The conditioned balance between these two systems, called the "tuning" of the systems, can be modified through the continual stimulation and excitation of either system beyond an ordinary everyday level. Excessive stimulation alters the reactivity of the complementary system and leads to three possible stages of tuning or sensitization.

Stage one occurs when consistent stimulation results in the excitation of one system while inhibiting the reactivity of the opposing system. The second stage occurs when the stimuli exceed a specific threshold. At this point, the sensitized system continues to respond to stimuli regardless of the nature of the stimuli. A stimulus that would ordinarily evoke a response from the non-sensitized system at this level of tuning precipitates a greater response and increased tuning in the sensitized system. Reversal phenomena or paradoxical responses are indicative of stage two tuning. Examples can be seen in cases where one is in the midst of a heated argument or under severe stress (that is, intense ergotropic excitation). If a friend approaches and rubs the individual's shoulder in an attempt to soothe, (a gesture ordinarily evoking trophotropic responses), the individual responds with hostility, anger or frustration rather than with a sigh of relief. In such cases, the rubbing evokes a greater response of the sensitized ergotropic system.

The third stage of tuning occurs if the stimulus continues unabated beyond that of stage two tuning. The result is a "spillover" of neural impulses with the consequent excitation of both ergotropic and trophotropic systems. Chronic or intense excitation (as in the case of

fight or flight situations), or excess stress can result in stage three tuning. Signs characteristic of this state are strong or ambivalent emotions, trembling hands or weak knees. Simultaneous ergotropic and trophotropic excitation is thought to be extant during orgasm, REM sleep, Zen meditation, Yogic ecstasy, as well as in neuroses and psychoses (and, by implication, hallucination) (Lex 1979:134-140; Gellhorn and Kiely 1973:236-239).

Along with each of these levels of tuning there is an attendant state of consciousness such as anger, anxiety, depression, joy or serenity. Certain states of consciousness will accompany certain states of ergotropic or trophotropic arousal. It is likely that joy does not accompany chronic ergotropic excitation in the case of threatening stimuli, and it is just as likely that anger and depression do not accompany orgasm, although these states may follow on rebound.

Whereas tuning involves excess stimulation of one system, the same phenomena occur when stimuli to one system are absent or blocked. In the absence of stimuli, as for example in sensory deprivation tanks, tuning occurs and one's consciousness is altered (Lex 1978:286).

Along with the concept of tuning and the ability to retune the conditioned ergotropic-trophotropic balance comes the possibility of voluntarily modifying the tuning of these systems. Voluntary modification of ergotropic-trophotropic activity is the key to a neurophysiological account of what occurs during the induction of trance. Central to modifying the conditioned ergotropic-trophotropic balance is the concept of driving. Simply put, drivers force one system into a state of excitation while altering the reactivity of the other system.

Driving is a concept arising from experiments in the effects of rhythmic photic stimulation on Alpha brain wave rhythms as measured by EEG spectral analysis. Neher (1961; 1962) has found that a light flashing at the same frequency as the resting or baseline rhythm of alpha waves, when speeded up or slowed down, causes the frequency of alpha rhythm to increase or decrease. Interior rhythms become synchronized with exterior rhythms. The effects are unusual sensations, strong emotions, hallucinations and muscular jerks. The process of synchronization is called entraining (Lex 1979, citing Neher, 1961; 1962).

Laughlin et al. (1985) and Lex (1978; 1979) suggest that the same dynamics occur with auditory driving as well as with bodily driving (such as dancing), and other forms of repetitive stimulation. Rogers (1975) supports this hypothesis with her studies of chanting and music. She found that external rhythms can drive brain wave frequency. Rogers also suggests that EEG response is partially dependent on other factors such as cognitive style (61-62). Laughlin says that intention is another vital factor in the induction of ASCs. He claims that prefrontal lobe activity plays a central role in the act of both intending a specific state of consciousness, and in the focus of attention required for actualizing such a state (Laughlin, n.d.). Laughlin states that EEG theta waves produced by the prefrontal cortex are associated with sustained attention. It is significant that studies of practised meditators have shown theta activity to be present during deep meditation (Hirai 1978). These studies further support the notion that theta activity is an indication of focused attention. Laughlin et al. (1985) also maintain that driving can be accomplished by way of

higher cortical functioning accompanied by ergotropic-trophotropic tuning. By entraining certain cognitive functioning (focusing the concentration, for example), lower autonomic and endocrine activities follow suit producing a state of tuning.³

The hemispheric lateralization of cognitive functioning ought also to be discussed before moving to a neurophysiological theory of trance. Some implications of lateralized functioning with states of ergotropic and trophotropic tuning also will be suggested. Although a preponderance of evidence suggests differentiated cognitive functioning in the hemisphere-specific processing of information, a few caveats are essential.

Joynt (1985) states that the "exclusive assignment of a function to a hemisphere is not true, so that cerebral preponderance rather than dominance is usual" (427). Sperry (1984) points out that in a normal state, the two hemispheres function together as an integrated whole. The Soviet neurologist Kostandov suggests that the hemispheres have advantages in the execution only of particular stages of mental functions rather than mental functions as a whole. He claims that the "two hemispheres operate in a mutually complimentary `collaboration'" and that mental functions are a result of the brain's integrative activity (Kostandov 1987:17-18). The work of these scholars suggests that we bear in mind that when talking of hemispheric lateralization of cognitive functioning, the preponderance of one hemisphere in a function rarely implies exclusive activity in that hemisphere. Rarely if ever is it the case that one of the hemispheres is "shut off" while the other is "turned on"; both hemispheres are required for complete cognitive functions to be performed.

Most studies of hemispheric asymmetry incorporated in this work are specific to the North American white population. Recent studies have shown that certain operations lateralized to the right hemisphere in North American subjects are, for Japanese subjects, left hemispheric functions (Sackheim et al. 1982). We cannot assume, therefore, that persons from other cultures employ the same hemispheric lateralization processes as persons from North America.

With the above caveats in mind, the following conclusions have been drawn with respect to hemispheric asymmetries and are generally known. In most cases, the left hemisphere, along with controlling movement in the right half of the body, mediates the production of speech, linear, analytic and causal thinking, sequential information processing and the assessment of temporal duration (Otto et al. 1987). Some researchers also claim that the left hemisphere is more involved than the right in processing positive or euphoric emotions as well as indifference (Sackheim et al. 1982; Ahern et al. 1985; Natale et al. 1983). These same scholars suggest that the right hemisphere is involved in negative emotions and depression, however, both of these claims remain equivocal. Farah (1986) suggests that the left hemisphere is essential to the generation of visual imagery, and Greenburg and Farah (1986) suggest that the left hemisphere is central to the construction and generation of dreams and dream images.

Greenburg and Farah's work appears to go against the grain of the popular contention that the right hemisphere is dominant for processing imagery (Ley 1983). An exception to this contention is Paivio (1986). He says that, at least for common objects, both hemispheres are capable of recognizing visual representations. Imaging activity could thus

occur in either hemisphere (260; 271; see also Marks 1986). Farah (1986) aligns herself with the trend by stating that her work does not contradict the claim for right hemisphere predominance in the recognition and recall of imagery, that is, the processing of mental imagery. Rather, her claim is that the left hemisphere is responsible for visual imagery generation per se, and she states that no studies contradict this stand.

Right hemisphere structures are dominant for associating affect with imagery, as well as for spatial, tonal and gestalt perceptions, holistic thought and the recognition of patterns. The right hemisphere has limited linguistic capabilities and no ability to assess temporal duration (Otto et al. 1987; Natale et al. 1983). While having limited linguistic capabilities, the right hemisphere is intimately involved in adding tone and expressions to speech (Sperry 1984) and in the comprehension and use of connotation (Greenburg et al. 1986). The right hemisphere also controls the left half of the body. Some researchers implicate right hemisphere prominence in arousal activities, in the attention to and perception of warning stimuli and in the global perception of the environment essential to fight or flight responses (Otto et al. 1987; Silberman et al. 1986). Otto et al. (1987) suggest that the right hemisphere can activate both hemispheres and quick reaction times during arousal are a result of right hemispheric dominance. Silberman et al. (1986) also suggest that the right hemisphere is predominant in avoidance behaviours and the left hemisphere is predominant in approach behaviours.

Generally, the left hemisphere is specialized for processing information verbally, and the right hemisphere is specialized for

processing information non-verbally. However, even with a general consensus on verbal and non-verbal specialization, many associative functions are mediated by both hemispheres working in concert. For instance, association pathways between different representations (visual, auditory, olfactory, verbal, etc.) can develop within and between the hemispheres so that activation of one hemisphere often involves activation of the other (Paivio 1986:274). Connections can develop between verbal and non-verbal association areas such that verbal stimuli can evoke visual images and visual images can evoke verbal assessments, descriptions and representations.

Although the right hemisphere appears dominant for associating image with affect, Paivio suggests that this may not be solely a function of right hemisphere dominance for emotional associations. Rather, right hemisphere activity could be due to the fact that emotion is usually associated with non-verbal events, and non-verbal processing is a function of the right hemisphere.

Certain claims to special capabilities of the right and left hemispheres seem valid (for instance, verbal vs. non-verbal processing, logical-analytical-sequential information processing for the left and holistic or gestalt perceptions, spatial relationships and tonal perceptions for the right). I do not consider it appropriate, however, to say that one type of experience is mediated solely by one or the other hemisphere. Paivio (1986) even implicates left hemisphere involvement in holistic or gestalt perceptions, although he does admit that certain perceptual functions are lateralized to the right hemisphere. I suggest that, in the final analysis, a proportionately greater involvement of one hemisphere over another in various situations

results in different cognitive styles (see Ley 1983). The cognitive styles can be classified as left hemisphere mediated verbal style with or without visual imagery, and right hemisphere mediated non-verbal style with visual imagery. When these cognitive styles are active, there may be a relatively greater amount of activity in one hemisphere than the other, but activity in the opposite hemisphere does continue.

When the cognitive styles are considered in connection with the distinct operational capacities of each hemisphere, stronger indices of hemisphere-predominant activity arise than are available through analysis of cognitive style alone. Operational processes mediated by the left hemisphere include linear-analytic-causal thinking, and sequential information processing. Right hemisphere mediated operations include holistic, gestalt, spatial and tonal modes of information processing. These operations can be used as indices of left or right hemisphere activity in relation to the basic verbal non-verbal information processing modes. If left hemisphere mediated operations are performed on verbal information, left hemisphere preponderance is clearly indicated. If the same operations are performed on non-verbal information, hemisphere-specific dominance cannot be clearly inferred. When non-verbal information is apprehended in a holistic or gestalt mode, right hemisphere predominance occurs. If verbal information is apprehended in a gestalt manner, both hemispheres are active and statements of hemispheric dominance cannot be made.

When cognitive style or operational functions are the object of lateralized activity, the cognitive style or function must be known before assigning their mediation to a specific hemisphere. Subjective description of a cognitive state is the only way to acquire information

about an individual's cognitive activity. Personal descriptions are therefore central to the possibility of determining hemispheric predominance in an individual's experience.

Certain questions concerning the relationship between hemispheric lateralization of function, inter-hemispheric activity and ergotropic-trophotropic tuning now can be posed. Is there any relationship between ergotropic or trophotropic excitation and hemisphere dominant activity? For instance, during trophotropic excitation (relaxation) is there primarily right hemisphere activity. During states of ergotropic excitation (arousal) is there primarily left hemispheric activity? Does inter-hemispheric activity occurring under normal circumstances change during the stages of tuning explained earlier? In other words, does the altered reactivity of either system during the second or third stage of tuning alter normal inter-hemispheric reciprocity? Is it possible to answer these questions, or is it more appropriate to let questions of hemispheric dominance during tuning fall by the wayside and deal with specifically ergotropic and trophotropic excitation alone?

During a state of typical trophotropic dominant activity, one is calm and relaxed. During exclusively trophotropic activity, one is asleep. In a relaxed state, as when laying down on a couch with eyes closed, one might contemplate visual imagery. For example, one could be visualizing a canoe trip down a river, a waterfall, or a bird flying through the air. Since the right hemisphere has been asymmetrically implicated in non-verbal processing, there is a possibility of right hemisphere predominance in such an example. If the visualization is a gestalt of the whole scene (the canoe, the river, the land, the flying bird, the sounds of water, insects buzzing about, all perceived at

once), right hemisphere predominance is clearly indicated. However, if at the same time that one is visualizing a canoe trip, one is also verbalizing the experience ("this was a peaceful trip, and I'm glad I made it. I remember going around this bend and seeing"), then the left hemisphere is also active in the processing of information in a verbal mode. On the other hand, one might be relaxing and verbally thinking in a logical, causal or sequential manner about a conversation had during the day. In this latter instance, left hemisphere activity would predominate. In the case of trophotropic activity, then, hemispheric lateralization is the result of the cognitive style and operational functions performed on the information presented in a verbal or non-verbal mode. The dominance of one or the other hemisphere is independent of trophotropic excitation itself.

Cognitive style and hemisphere-specific operations determine hemisphericity during ergotropic excitation as well. If one is anxious or being threatened, it is possible that one is processing information non-verbally and taking in the whole situation at once thus establishing right hemisphere predominance. On the other hand, when anxious, one can engage in the verbal processing of information by thinking about the reasons for the anxiety or possible courses of action. Thinking about reasons or possibilities for action involves the left hemisphere mediation of causal thinking and sequential information processing. During ergotropic excitation, right or left hemisphere preponderance depends on the cognitive style and operational processing at the time.

Thus it appears that no a priori connections exist between ergotropic or trophotropic excitation and cerebrally lateralized functioning. Lateralized functioning is contingent upon the cognitive

style (verbal or non-verbal), and the operations performed on the information. Another point worth noting has to do with the content of the information being processed and the effect of content on ergotropic and trophotropic excitation. Di Guisto and Bond (1979) and Laughlin et al. (1985) suggest that the content of images affects ergotropic and trophotropic excitation. If the content of an image is peaceful and serene, trophotropic activity is likely to result. If the content of an image is exciting or arousing, ergotropic excitation will ensue. I suspect that the same holds true for verbal information processing. There have been, for instance, numerous occasions when I have been relaxing (trophotropic state) and I verbally begin to think about a situation I find distressing or anxiety provoking. I become agitated almost immediately. I get fidgety, my muscles tense up and I am no longer relaxed. Similar dynamics are evident in the reading of novels. Exciting and suspenseful novels can create a state of anxiety (ergotropic excitation) even though the actual physical action of reading might suggest relaxation at first glance. Peaceful and serene novels, on the other hand, can create a state of calmness and pleasure. An association between the content of cognitive events (be they verbal or non-verbal) and ergotropic-trophotropic excitation seems inevitable.

The next step in a neurophysiological account of trance is to describe trance induction techniques and hemisphericity within the model of ergotropic-trophotropic tuning. With Laughlin et al., (1985; 1986), Davidson (1976) and Lex (1978; 1979), I agree that trance is the result of either ergotropic or trophotropic tuning. Tuning is induced through the use of drivers which excite either the ergotropic or the trophotropic systems.

Ergotropic tuning is implicit in highly active, exciting and arousing forms of trance induction procedures employed in many possession trances. Examples can be seen with the Shakers of St Vincent (Henney 1973) as well as with many voodoo trances (Deren 1953). Lower ANS drivers are employed in the induction of possession trance while an atmosphere of excitement and anticipation drives higher cortical ergotropic centres. Vigorous dancing, swaying and clapping hands drive the ergotropic system into the second level of tuning wherein all stimuli further excite the ergotropic system. Ergotropic tuning can also be accomplished by continuous and abundant sensory stimulation, a feature evident in many rites of possession trance. Intense concentration and "absence of superfluous thought and fantasy" are characteristic of this state (Laughlin et al. 1985:46). At the same time that ergotropic tuning is employed, trophotropic centres are also being activated. Rhythmic sounds produced at a relatively low frequency will drive the trophotropic system (Gellhorn, 1969). Through the simultaneous driving of the trophotropic system via rhythm and the ergotropic system via excessive motor output, excitement, anticipation, and continual flow of sensory stimuli, trophotropic "eruptions" indicative of stage-three-tuning can occur (Laughlin et al. 1985). Laughlin suggests that this state can be experienced as orgasmic, rapturous or ecstatic (47) and I would further add that intense trophotropic rebound can result. In the latter case, the possession trancer may swoon, fall, or faint, a not uncommon occurrence (Henney 1973; Daren 1953). Trance induction procedures which employ a great deal of body movement induce ergotropic tuning while simultaneously evoking trophotropic eruptions through rhythm. The final result is the

third level of tuning. Simultaneous ergotropic and trophotropic activity results, and in some cases complete trophotropic rebound can follow as indicated by falling and fainting.

The connection between heightened states of ergotropic tuning and hemispheric dominance is not clear. In order to process rhythmic stimuli, right hemispheric activity is necessary (Geschwind and Galaburda, 1984). In order to maintain concentration and attention on the task at hand, namely trance, prefrontal activity (likely in both hemispheres) is essential. In the case of the St Vincent Shakers, a great deal of talking occurs, thus necessitating left hemisphere involvement. The particular cognitive style of processing of different participants will indicate whether more left hemisphere verbal processing or more right hemisphere non-verbal processing is active. In possession trances where amnesia is expected, assessment of hemisphericity is a problem. If a participant has no memory of the trance experience and there is no outward manifestation of cognitive processes (such as verbal communication), it is virtually impossible to assess cognitive style and operations. If, however, an amnesic participant acts as a medium for a spirit, verbal communication indicates some level of left hemispheric activity although the predominance of either hemisphere cannot be discerned. In cases where there is memory of trance experiences, evidence for assessing hemispheric predominance is available. If a participant describes a trance experience as being one of wholeness or absolute unity, or suggests that it is ineffable, right hemisphere predominance is likely. Asymmetrical hemispheric activity is contingent upon factors such as cognitive style, cognitive operations, and cultural expectations about

what a trance experience ought to be like (as for instance the expectation of its being ineffable or laden with verbal communication from deities).

Another aspect worth noting in connection with possession trance is the possibility of endorphin involvement. Endorphins, a naturally produced opiate or morphine-like substance, induces insensitivity to pain, euphoric feelings, and in some cases forgetfulness (Prince 1982A). Endorphins are produced through strenuous physical exertion and possibly during emotional excitement and psychological stress. The absence of pain during hours of dancing (see for instance voodun, Deren 1953; and Sun Dance, Jilek 1982), experiences of well-being after trance (St Vincent Shakers, Henney 1973; see also Prince 1982A; 1982B), and amnesia after trance could all be caused by endorphin production. Since strenuous physical exertion and emotional excitement can cause endorphin production, endorphins are likely to play some role in ergotropically induced possession trances. Endorphins may play a role in ergotropically induced shamanic trance as well. Endorphins may be involved in producing analgesia (the blocking of pain) when excessive drumming and dancing are involved at the beginning of possession or shamanic trance. In less active forms of ST (like the vision quest), the lack of physical exertion suggests that endorphin production may not be a factor. It is possible, though, that a lengthy vision quest, or emotional excitement, if present, could induce higher endorphin levels. During an extended vision quest, endorphins could produce analgesic effects or euphoria on the basis of physical or psychological stress (Prince 1982B). Although Jilek (1982), Prince (1982A; 1982B) and Henry (1982) indicate that endorphins could be involved in the euphoric and

analgesic aspects of trance. Henry is quick to point out that this "is largely conjecture" and stands only as a possibility. Since endorphin production increases with ergotropic activity associated with stress and physical exertion, endorphin involvement in ergotropic trance is a strong possibility. Amnesia after possession trance could be caused by endorphins (Prince 1982A), but amnesia can also be a factor of cultural expectations about trance (Peters and Price-Williams 1980) or possibly the result of excessive electrical discharges in the temporal lobe of the brain (Winkelman 1986). Further research is necessary fully to substantiate the claim for endorphin involvement in the amnesic, analgesic, and euphoric features of trance states.

Shamanic trance must be considered separately from possession trance as a result of the incidence of visionary or hallucinatory phenomena. In neurophysiological terms, visions and REM sleep are similar because ergotropic and trophotropic activity occur simultaneously in both cases (Lex 1978). But simultaneous ergotropic and trophotropic activity also occurs during orgasm, Yogic ecstasy and meditation (Lex 1979; Gellhorn and Kiely in Mendels 1973). Since similar neurophysiological processes are active in all of the above cases, simultaneous ergotropic-trophotropic excitation does not necessarily result in visionary phenomena. Such simultaneous activity is, however, essential to the possibility of having visions. Shamanic trances, therefore, must induce stage-three-tuning in order to elicit ergotropic and trophotropic activity at the same time.

Some shamanic trance techniques are designed to bring about the third stage of tuning in a manner similar to possession trance. Highly active shamanic trances which involve drumming, dancing or singing are

indicative of ergotropically induced trance (see Altaic, Chuchkchee and Achomawa in Eliade 1964; Kung Bushmen in Guenther 1986; and Katz 1982). Through intense ergotropic driving and perhaps simultaneous trophotropic driving through rhythm, the third stage of tuning and the simultaneous ergotropic-trophotropic activity necessary for visions are induced.

At its inception, shamanic trance as described in vision quests is both ergotropic and trophotropic (Jilek 1982; Lame Deer and Erdoes 1972; Niehardt 1961; Halifax 1979). Relaxation and trophotropic activity is heightened by means of laying down or sitting. Closing one's eyes increases alpha brain-wave synchronization⁴ and lack of muscular tension and movement enhances trophotropic excitation (Winkelman 1986; Gellhorn 1969). At the same time, pointed concentration, often with a state of seeking or with a question in mind, is maintained. Concentration on reaching upper or lower worlds involves anticipation, and action in these realms involves arousal and mental effort. Concentration, seeking, anticipation and action are features which induce ergotropic excitation. Reduced muscular activity, and pointed concentration aimed at action, indicate simultaneous trophotropic and ergotropic tuning. Since visionary experiences are characterized by mixed ergotropic-trophotropic discharges, simultaneous excitation of the ergotropic and trophotropic systems produces the requisite neurophysiological dynamics for visions to occur.

While the incidence of visions might suggest greater right hemisphere involvement, this need not be the case. During visions there is diffuse cortical excitation (Gellhorn and Keily 1972). The vividness and nature of perceptual imagery (landscapes, persons, animals, and so on) point to the kind of inter-hemispheric dialogue present in normal

perception, and the left hemisphere is likely essential to the generation of images and dreams (Farah 1986; Greenburg and Farah 1986). Laughlin (n.d.) suggests that no neurological difference exists between the perception of an image and the perception of an object: the same neural structures are used to constitute the representation within the mind. Segal (1970) supports this claim, stating that a percept and an image are indistinguishable; one has the same cognitive experience in either case. If during a vision there is a landscape, an encounter with another being, or visual images which are not simple eidetic images (such as a triangle or circle), then many if not all of the same areas of sensory association that act inter-hemispherically during normal perceptions are active. The fact that there is often a task to be completed during such shamanic journeys suggests frontal lobe involvement in both hemispheres (attention, intention, prospective and retrospective awareness [Fuster 1980]).⁵ Thus, shamanic trances with visions involve both right and left hemisphere activity at the level required for more ordinary perceiving and constituting of the environment.

Shamanic trance can be active and ergotropic as can possession trance. In either case, excessive ergotropic stimulation induces stage-three-tuning and simultaneous ergotropic-trophotropic activity. Shamanic trance of the vision quest variety, through the simultaneous excitation of the ergotropic and trophotropic systems, induces the same neurophysiological dynamics that occur in the third stage of tuning by direct stimulation of both systems. I suspect that the reason similar techniques and similar neurophysiological activity produce ASCs as different as possession trance and shamanic trance is the intention of

the participant. If one is sitting or lying down with the intention of having a vision, one will likely not become possessed. If one is dancing and singing with the aim of being possessed, it is likely that one will not have a vision if visions are not expected. I cannot conceive of any reason other than intention for similar trance inducing procedures producing different trance states, and I therefore believe that the intention of an individual is central to the induction of a specific type of ASC.

Theory begs application in practice. I therefore consider in the next chapter the possession trance of the St Vincent Shakers, the shamanic trance of the Kung Bushmen, and the shamanic trance technique of Michael Harner (1980) from the point of view of their relative degrees of ergotropic and trophotropic excitation.

Chapter Three

APPLIED NEUROPHYSIOLOGY

Clarifying the neurophysiological dynamics of trance is achieved only partly through discussion of theory. Clarity is enhanced by application of theory to practice. In this chapter I describe three different kinds of trance and discuss the neurophysiological activity occurring during them. My neurophysiological account will consider the techniques used to induce trance as stimuli which tune the ergotropic or trophotropic systems. The previous chapter treated both possession trance and active and passive forms of shamanic trance as distinctly different either in their technique of induction (trance dancing versus vision questing) or in their experience (possession or not, the latter with visions). I have used the same distinguishing characteristics in choosing examples of trance for this chapter. For active or ergotropically induced PT and ST, I will describe the trances of the St Vincent Shakers and Kung Bushmen respectively. The example I have chosen for passive trance induction techniques has been taken from a workshop conducted by Michael Harner. His technique utilizes auditory driving and visualization. Since his technique is easily taught in a few hours, and the Shamanic State of Consciousness (SSC) can be induced and ended in a very short time (approximately 15-20 minutes), his shamanic trance technique differs radically from traditional ones. Since I had access to a workshop, I decided it would be a perfect time to see and experience the SSC, and try to understand the experience in

light of the neurophysiological theory I have described. I hope to discover whether Harner's technique induces the second or the third level of tuning. If Harner's method results in tuning, it can provide the necessary neurophysiological conditions for trance or visions to develop.

The Shakers of St Vincent

The Shakers, who call themselves Spiritual Baptists, are a fundamentalist Protestant group of the isle of St Vincent. The congregation consists of persons of lower economic class. Two ritualized forms of trance are central to their religion: possession trance enacted during worship services and visionary trance achieved during periods of seclusion. Possession is believed to be by the Holy Spirit. The following description is based on the field work of Jeannette Henney conducted in 1969-70 (see Henney 1973; 1974).

Services, which begin at 8:00 PM and can run past midnight, are divided into two parts. The first part includes the sequestering of sacred space, preaching, long chanted prayers and hymns, adherence to precise forms of worship, and Bible lessons (Henney 1974:60). During this period of conventional and prescribed activity there is no room for PT to develop.

The second part of the service marks the beginning of improvisation. Any member of the congregation may move to the front of the church and offer prayers or sermonize (the Shaker term for preaching). While sermonizing, a member will often utter a ritualized phrase signalling the congregation to start singing or chanting responses; otherwise, members are providing a steady monotonous

background of low humming or singing. Either on cue from a sermonizer, or gradually throughout this part of the service, the humming and singing become louder and more persistent. Members sit on backless wooden benches with eyes closed or half-closed, apparently lost in their own concerns (Henney 1973:233). Whether standing or sitting, members sway back and forth, side to side, or in a semi-circle. They clap their hands, slap themselves lightly with a small branch, or beat their Bibles with the end of a candle. All continually maintain the steady rhythm of chanting and singing and appear totally absorbed by it.

At this point possession trance is most likely to occur. The first indication of the onset of PT can be a convulsive jerk, a shiver, shudder or trembling, a sudden shout, sob or hiss, a series of unintelligible sounds, or any combination of these. A member who becomes possessed suddenly stands up and begins dancing in one place. The dancing consists of idiosyncratic rhythmic movements that are not synchronized with the dominant rhythm of the congregation (Henney 1973:234). One or more people can develop this level of trance at the same time. Each exhibits individualistic gestures and movements. If the trancers are singing, words become repeated syllables. Persons in this level of trance may return to their common state, oscillate between the two states, or move on to the second level of trance.

In the second level of trance, persons develop a pattern of fixed actions that they repeat in rapid succession. Involved may be an arm, head, or torso movement (for instance, bending at the waist and jerking up quickly over and over again). The repeated syllables sung at the first level of trance become grunts and gasps uttered in unison. The idiosyncratic and random actions and sounds of the first level give way

to a unified group rhythm of fixed action patterns, grunts and gasps. At times, the trancers will engage in standardized movements enacted in unison (Henney 1973:236) In this level of trance, the dancers are moving to the same rhythm. They breathe, grunt, and gasp to the beat. Members who are not in trance continue to maintain a constant steady rhythm. Some trancers have their eyes closed, others have eyes open with only the whites visible. Some sweat profusely; others do not. Eventually, the group's rhythmic patterned movements and sounds are interrupted by loud sighs, yells or breathing out of beat. Trancers begin to revert to their individualistic movements and sounds. Movements and sounds out of beat signal the third level of trance. No longer is there humming or groaning to the music. Rather, trancers are breathless, gasping, groaning, sighing and shouting. They are bewildered (1974:63) and moving about in noisy confusion. The third level lasts a short time. After this brief period, the possessed return to their common state of consciousness.

Members who enter trance say that they feel a trembling within before they begin to shake and move externally. Although they can be distracted while in the first level trance, their attention cannot be diverted externally during the second level. Trancers remember their encounter with the Holy Spirit but have no memory of what has transpired around them. Afterwards they feel relaxed and strong and euphoric (Henney 1973:239-240; 1974:65-67).

The possession trance is quite controlled and orderly. If preceded by emotionally charged circumstances such as severe chastisement for wrongdoing or recent baptism, the trance can become less controlled. The trancer may be unsteady, wobble and fall. She or

he may move about more violently than normal, perhaps with flailing arms. In such cases a trancer may require help from others in the church so as not to be hurt.

In neurophysiological terms, the Shakers' rite of possession induces ergotropic tuning. The first part of the service, with its attention to detail and prescribed forms of verbal response and action, elicits ergotropic activity similar to that required for normal dealing with the environment. This is the first level of tuning. While Henney does not comment on the mood at this time, some level of excitement, or at the least, anticipation of the trance to follow, is in the air. Excitement and anticipation are states mediated by the ergotropic system. Further enhancing ergotropic activity are standing and sitting on backless wooden benches; both require muscular activity. Sitting on a hard bench would induce proprioceptive attention and awareness. Attending to internal stimuli is an ergotropic activity (Gellhorn 1969:97). The sermonizing engaged in after the first part of the service would serve to stir up emotions. A sermonizer may walk back and forth in front of the congregation, become more and more animated, wave his or her hands about and induce a great deal of excitement. The consistent background humming, singing and chanting becomes more spirited and persistent. Continuous swaying, rocking, and clapping for three or four hours requires a great deal of muscular effort. The cumulative effect is sensory bombardment exciting the ergotropic system. At this point, it is quite likely that the ergotropic system has been tuned to the second stage where all stimuli further enhance ergotropic activity and trophotropic reactivity is altered.

Signs indicating intense ergotropic stimulation are stiff jerky limb and trunk movements, facial contortions, twitches, profuse sweating, dilated pupils, decreased salivation, and increased heart beat, blood pressure and respiration. Signs indicating the onset of PT for the Shakers are sudden sobs, shouts, or hisses, convulsive jerks, shivers, shudders and trembling. In the second level of PT, some sweat profusely, and many engage in stiff, jerky movements throughout the trance. The parallels between signs indicating intense ergotropic excitation and the signs indicating trance for the Shakers are obvious. The fact that entering PT after an emotionally charged ordeal causes a less controlled trance supports the notion that trance is due to intense ergotropic excitation. Severe chastisement for sinning, (which can occur during a service), creates fear and anxiety in the perpetrator and enhances the emotional state of witnesses. Baptism preceeding a service creates an atmosphere of intense emotion and excitement for the initiates and the congregation alike. Fear, anxiety, excitement and heightened emotions are states mediated by the ergotropic system. If prior to or during a service baptism and chastizing augment the techniques for trance. The result is stage-three-tuning. Intense ergotropic stimulation spills over into the trophotropic system. Intense activity in both systems ensues. One sign of such activity is the presence of both trembling hands and weak knees. Another sign of strong activity in both systems is muscular rigidity and stupor or bewilderment (Gellhorn 1969:90).

Individuals who sweat profusely during their PT may be in the second stage of tuning. It is possible, however, that they, and those who do not sweat profusely, have moved on to the third stage of tuning.

The steady, monotonous rhythm of chanting and singing, if slow enough, (under 10 beats per second; Gellhorn 1969) should induce trophotropic activity. The hyperventilating which can accompany such chanting, singing or humming also enhances trophotropic activity. Although arousal of the ergotropic system, if sufficiently intense, alters the reactivity of the trophotropic system, one cannot be sure that this dynamic is the case for all trancers. For those who sweat profusely, this dynamic is quite likely. For others, it is possible that trophotropic activity is concurrent with the ergotropic activity inherent in the service and the steps leading up to trance. The chanting and the rhythm may excite trophotropic centres at the same time that movement, anticipation and excitation excite ergotropic centres. Simultaneous activity in both systems ensues with features of activity of each system present at the same time. A trancer may be engaged in stiff jerky movements and exhibit shudders or twitching while simultaneously avoiding heavy perspiration. Since no studies have considered the possibility of simultaneous excitation of both systems inducing the third stage of tuning, this account is speculative.

Neither can the effects of rhythmic driving be clearly distinguished from the effects of ergotropic-trophotropic tuning. Synchronization of interior with exterior rhythms causes muscular jerks and spasms, hallucinations, strong emotions and unusual sensations. After hours of rhythmic humming, chanting, breathing and moving, trancers are likely to have synchronized interior with exterior rhythms. The exact role of such synchronization in the overall matrix of the trance is not clear. The synchronization of rhythms should, in itself, produce behavioural manifestations similar to the Shakers' trance.

Ergotropic excitation, in itself, produces similar behavioural symptoms. If the rhythm is slow (less than 10 beats/second), the trophotropic system is aroused. If the rhythm is fast, the ergotropic system is stimulated (Gellhorn 1969:69). We end up with the possibility of synchronized rhythms and ergotropic tuning working in concert. There is no way to distinguish the effects of either technique, or to determine which, if any, dynamic is dominant. Compounding the difficulty is the occurrence of stage-two-tuning. The altered reactivity of either system causes rhythmic stimuli, regardless of the frequency, to excite whatever system is tuned. Since Henney does not state the frequency of the rhythm permeating the trance, we cannot even begin to unravel the effect of rhythmic driving.

In the Shakers' PT individual responses to the same stimuli can easily induce different stages of ergotropic and trophotropic arousal. Clearly, ergotropic excitation is central to PT for the Shakers. However, different stages of tuning are possible for different persons. Either stage-two-ergotropic, or stage-three-tuning brought on by continued ergotropic activity or simultaneous stimulation of both systems is possible for different people. Gellhorn (1969) and Laughlin et al. (1985) state that individuals have different learned or conditioned levels of ergotropic-trophotropic tuning and reactivity. Stimuli which may induce an intense ergotropic response sufficient to bring about the second stage of tuning in one individual, can, for another, result in a normal stage-one ergotropic response. Stimuli which can induce the second stage of ergotropic tuning in one, may induce the third stage of tuning in another, with either ergotropic or trophotropic activity dominant (for example, anxiety or fainting; see

Gellhorn 1969). Another might, along with ergotropic arousal, be prone to trophotropic arousal via rhythm, chanting, and hyperventilating. In the latter case, stage-three-tuning would arise from simultaneous excitation. Rebound into trophotropic dominance after trance is likely because rebound follows intense ergotropic activity. The feelings of well-being, strength, and relaxation experienced by trancers are emotional counterparts to trophotropic arousal.

The matter of hemispheric dominance cannot be pursued. Henney has provided no detailed accounts of experiences had by trancers. Without knowledge of the cognitive processes during trance, an investigation of asymmetrical hemispheric activity is not possible.⁶

Shamanic Trance of the Kalahari Kung

The primary form of religious expression for the Kalahari Kung of South Africa is the night-long shamanic trance dance. Central to the dance is healing of disease by trance dancers. Following is a description of the dance based on the field work of Richard Katz, conducted in 1968 (Katz 1982). The trance state that the dancers enter is called kia. When in kia, dancers are able to heal. Kia is brought on by activation of an energy called num. The dance stirs up, excites, and causes the num to boil (Katz 1982:41).

Around sunset a fire is lit. Some women sit around the fire and begin to sing num songs. At first only one or two women sing. Soon, depending on the size of the dance, more women congregate around the fire and join in the singing. Adolescent boys often start the dancing. They dance in a circle around the singers. The adolescents are joined by other young dancers. The atmosphere is casual and jovial. The

singers clap their hands and move to the rhythm. Gradually, the atmosphere becomes more intense. The songs, as they "take hold", have clear starts and stops, with conversation arising naturally at the end of each song. Songs last about five minutes, increasing in intensity and volume towards the end. When dancers are in, or about to enter, kia, songs can last longer. Older men and experienced dancers enter the "dance rut" around the singers and begin dancing. The increasing fervour of the songs entices dancers, young and old alike, to dance harder. After the end of a song the dancers mill about the women to keep the momentum of the dance going. Women also may be dancing with the men around the fire. The intensity and excitement mount as the singing and dancing continue with increasing vitality. The healer's dancing is augmented by rapid, shallow breathing which, they say, draws num energy up.

As dancers enter kia, they sweat profusely. They begin to stagger and stumble. The dancers, when in kia, usually shake and tremble violently. Many fall to the ground and require assistance to control their trembling and to move about healing participants. Some will rush into the fire or out into the night. Always, someone is there to make sure no harm comes to the dancer. After the uncontrolled trembling subsides somewhat, the healer moves about laying fluttering, trembling hands on the participants. In order to heal, some degree of control is required, at least enough to stand, walk about and control gestures. Many, if not all dancers, talk to themselves or to the spirits and gods while in kia. They plead and argue with spirits or gods to allow the people to live, to be well. At times, the dancers, while in kia, journey to the home of the gods. While collapsed on the ground, the

dancer's soul leaves the body and travels to the sky. One dancer says that while healing he sees things; he sees people as birds. Another says that he sees spirits hovering around the dance area. In kia a dancers eyes appear blank, and there is often a pained expression on his or her face. When healing, one dancer's body shakes violently, with legs trembling and tendons sticking out. One dancer, after healing, retches. Another experiences dizziness. All dancers say that their hearts pound, that kia burns and causes intense pain, trembling, and sweating. Many experience fear and anxiety before the onset of kia. Rather than wobble, stumble and fall, some dancers will move about with stiff jerky movements. Katz describes one dancer's being dragged back into the circle while rigid as a board, his feet cutting furrows into the sand. Other times, a dancer's body will be limp. The trance dancing continues throughout the night. Some dancers will enter kia two or more times during the dance; others only once. Gradually, as the sun rises, some people collect their blankets and return to their homes. Others sit around talking and relaxing, awaiting the start their day.⁷

The Kalahari Kung's healing dance induces a deep shamanic trance through intense excitation of the ergotropic system. Vigorous dancing arouses ergotropic activity. An experienced healer may, after a short period of dancing (as little as 10-15 minutes), enter the trance state. Others may require one or two or more hours of dancing before entering a trance. Due to individual ergotropic-trophotropic tuning characteristics, similar levels of ergotropic excitation are attained in different lengths of time. An adept healer may also have altered the learned or conditioned responses of the ergotropic and trophotropic systems. After entering trance a number of times, an adept can entrain

a threshold of ergotropic tuning which allows trance to manifest itself after a short period of ergotropic excitation.

The second and third stages of tuning are achieved through stimulation of the ergotropic system in many ways. Initially, anticipation of the night-long trance, excitement, and fear of the pain of boiling num, stimulate ergotropic arousal. Dancing to num songs further arouses the ergotropic system. Even during breaks between songs, ergotropic after-discharges continue to stimulate ergotropic activity (Gellhorn 1969:96). The atmosphere of increasing excitement as the possibility for trance arises, the continual movement of dancers, the singing and conversation between songs, and the endless activity create sensory bombardment that enhances ergotropic excitation. Vigorous dancing, coupled with other factors inducing ergotropic excitation, invokes stage-two-tuning as indicated by stiff jerky movements, profuse sweating, and severe muscular jerks, spasms, and trembling. Stiff rigid muscles also are characteristic of extreme ergotropic activity. The dizziness and retching by some dancers are signs of intense trophotropic activity. Swooning and falling also indicate trophotropic excitation in the wake of extreme ergotropic arousal. The inability of dancers to maintain their balance, their rubbery legs, and their shaking hands are further indications of stage-three-tuning. The incidence of visions attests to simultaneous ergotropic and trophotropic activity as well. Intense ergotropic activity leads to stage-two-tuning. Continued stimulation of this system leads to the spillover of ergotropic discharges into the trophotropic system (that is, stage-three-tuning). The spillover effect leads to intense excitation of both systems at the same time

(Gellhorn 1969).

Katz says that the rhythm of the songs is 4-7 pulses per minute, the same frequency range as alpha and theta brain waves. The rhythm should induce trophotropic activity. However, tuning of the ergotropic system to stage two alters the reactivity of the trophotropic system and the rhythm further stimulates ergotropic activity. On the other hand, it is possible that ergotropic excitation has not yet altered the reactivity of the trophotropic system. The rhythm would then excite the trophotropic system while other stimuli excite the ergotropic system. The same dynamic holds true for the rapid shallow breathing—the hyperventilating—engaged in by dancers. Excitation of both systems thus may lead to the third stage of tuning.

Most often after collapse a dancer's body will be twitching or rigid. At other times, however, it will be limp, almost lifeless (99). In the case of twitching and rigid bodies, ergotropic excitation is dominating with trophotropic excitation intense, but not dominant. In the case of a limp, lifeless body, trophotropic excitation is dominant with ergotropic activity taking a subordinate role. The latter case may indicate that the rhythm of dancing and singing in the alpha-to-theta frequency range, in conjunction with the hyperventilating, has created a deep trance state of simultaneous ergotropic-trophotropic activity with trophotropic activity dominating. Gellhorn (1969:98) says that hallucinogenic substances induce both ergotropic and trophotropic activity with trophotropic activity dominating. Dreaming during REM sleep is also characterized by simultaneous trophotropic-dominant activity. I cannot be sure, but it may be that trophotropic dominant activity during stage-three-tuning, manifested as the trancer's

collapse, may be a neurophysiological dynamic which allows for visionary or dream-like journeys to the homes of gods. In order to confirm this possibility, descriptions of the collapse of different trancers (trembling or limp) must be correlated with the dancer's description of the experience of collapse (whether or not the dancer journeyed to the realm of the gods).

The effect of synchronizing interior bodily and brain rhythms with external auditory rhythms is not clear. It is very likely that the flickering of the fire while dancers move about the circle of women can produce photic driving effects as described by Neher. Photic driving, coupled with auditory driving, can induce hallucinations, muscular jerks, and odd sensations. The role of these driving procedures, however, cannot be distilled from the whole gamut of trance induction techniques since intense ergotropic stimulation alone can account for all of the behavioural manifestation of the Kung trance. Synchronization of interior and external rhythms may serve to intensify and deepen the trance state of Kung dancers by (i) augmenting the stimulation of the ergotropic system, (ii) stimulating the trophotropic system while other stimuli arouse ergotropic activity, or (iii) exciting the trophotropic system while in the third stage of tuning.

The incidence of visions attests to interhemispheric activity during trance. The fact that some dancers talk to themselves, and that all dancers communicate verbally with gods, unquestionably attests to left hemispheric activity during trance. Right hemisphere dominant activity, postulated to be central to trance by Lex (1978; 1979) and Winkelman (1986), is clearly not a feature of Kung trance. For the Kung, interhemispheric activity during trance is essential.

Analysis of the trance dance of the Kalahari Kung provides a clear picture of the dynamics of extreme ergotropic excitation resulting in the second and third stages of tuning. The physiological and behavioural manifestations of dancers (profuse sweating, trembling, rigid muscles, collapse, wobbly knees, dizziness, and so on) clearly indicate that this dynamic is central to the induction and mediation of trance for the Kung.

Michael Harner's Shamanic Trance Technique

Michael Harner, an anthropologist living in New York, considers himself a shaman.⁸ He did field work with the Jivaro Indians of South America in 1956-57. He returned to South America to study with the Conibo in 1960-61. During this second field trip Harner learned the Conibo technique of journeying to the Lowerworld and spirit retrieval. In 1964 he travelled to South America to learn the shamanic techniques of the Jivaro. He has been practising shamanic journeying ever since. From his shamanic work with the Conibo and Jivaro, and from his study of North American shamanism and vision questing, Harner has refined his own technique of attaining a shamanic state of consciousness (SSC).

The workshop I attended was held on September 10-11, 1988, in Toronto, Ontario. About fifty people were assembled in a large, dimly lit room. Harner talked about shamanism, healing, his experiences of shamanic trance (which he calls the Shamanic State of Consciousness or "SSC"), and experiences had by some past workshop participants. He described his technique, which involves both visualization and auditory driving. Throughout his introduction, Harner continually cracked shamanic jokes and created a relaxed, jovial atmosphere. Harner

discussed shamanism primarily as a means of healing both oneself and others through journeys to upper and lower worlds where various spirits are encountered. He discussed illness as a result of soul loss, often caused by traumatic experiences. The role of the shaman is one of retrieving lost power. Harner was always quick to point out that the work undertaken in the workshop and any healing resulted from employing his technique was brought about by the work of spirits. He continually told people not to "ego trip", call themselves shamans, or try to save the world because they were able to engage in the SSC and journey to other worlds.

After a little over an hour of introduction, we began to do the actual work. We were told to lie down, relax, and visualize a place or scene from our past which we found particularly peaceful and relaxing. After we had visualized this scene, Harner had us sit up, and he gave us instructions about how to journey to the "lower world". We were to visualize an entrance into the ground: a spring, a hole in the earth, a hollow tree, a cave. We were told that this would lead to a tunnel or a tube that we should follow until we reached the lower world at its end. We should look around, familiarize ourselves, and then return. The lights were dimmed to the point where we could barely see. We donned blindfolds, lay down, relaxed, and began the visualization. After a couple of minutes of visualizing the entrance, Harner began beating his drum with a constant, monotonous rhythm. Although I did not count the number of beats per second, I assume that, in line with his book The Way of The Shaman, there were about four beats per second (31). After ten to fifteen minutes of drumming, Harner struck the drum with four sharp hits, beat it rapidly for about thirty seconds, and then hit it sharply

four more times. The initial four strikes of the drum were a signal that we should begin our return. the rapid beating was intended to bring us back up the tunnel, and the final four beats were to signal the end of the journey.

The same steps and techniques were repeated for each of the subsequent "journeys" to the lower world, except that alternate instructions were followed after entering the lower realm. One journey was designed to bring us in contact with beings from the lower world; the other to bring back a power animal for a pre-chosen partner. During the second journey, our mission was to traverse the lower world, meet whatever spirits showed themselves in our travels, and then begin our return when Harner struck the drum sharply four times. The third journey was staged somewhat differently. We were lying down beside a partner whose animal companion we were to bring back with us. We were to search the lower world until a former animal companion of the "client" (Harner's terminology) showed itself four times. The animal was to be clasped to our heart, brought back to this world, and blown into the chest of our partner. With hands still clasped, we were to move to our partner's head and blow the remaining aspects of the spirit into his or her head. Bringing back a person's power animal is supposed to heal or empower the person.

The structure of the technique for ascending to the "upper world" was the same as that for entering the lower world. The only difference was the content of visualizations. The drumming was identical in both cases. Our mission was to ascend to the upper world and find our "teacher" which, Harner stipulated, must be in human form. In order to go up, we were told to climb, ride, or jump up in what ever way suited

us. We would pass through a membrane or barrier which led to the first level of the upper world. If at this level we found no teacher, we were to go up another level and continue the search. Once again, four sharp strikes of the drum signalled the time to return. Thirty seconds of rapid beating accompanied the return, and four sharp strikes indicated the end of the journey.

After each journey there was time for discussion and relating of people's journeys. The experiences of participants were many and varied, but all followed the basic cosmological and geographical description portrayed by Harner (tunnels or tubes to lower worlds, one or more upper worlds, and animal spirits.) People described encounters with animal spirits, some had discussions with spirit beings, and one person narrated his experience of a classical shamanic dismemberment (see Eliade 1964).

My own experience of journeying was not profound. Nor did I experience vivid imagery and encounters as did many of the participants. But I did sense definite effects and experiences brought on by working with Harner's technique of visualization and auditory driving. Normally, I am not prone to visualizing a great deal. When I recall past events, when I daydream, when I close my eyes and conjure up the past or project into the future, I do so with words, thoughts, concepts, sensations and feelings. Because my imaginative experiences are not normally pictorial, I experienced little in the way of vivid imagery while under Harner's direction. For example, I experienced difficulty visualizing an entrance into the earth necessary for lower-world journeying. My first attempt was stalled inside the tunnel. I managed to get into a tunnel and follow it for a while. I began slipping

through the tunnel at an accelerated rate. I noticed flashes and ribs of light, and eventually I became lost and could not find my way. My second attempt was quite different. After relaxing and preparing for the journey, I began to see a peaceful and restful place where I liked to swim. At this point Harner began to strike his drum. The sound was loud, resonant, and seemed to pervade my whole body. I found the sound distracting and overly loud at first. I continued to focus on the swimming place. I walked out into the water, dove, and swam underwater for a while. I noticed that the drumming was no longer loud; it became a stable background which seemed to occupy my senses and allowed me to focus on the journey. I continued to swim underwater and found a huge hole in the bottom of the lake. I was not seeing as I normally do. Rather, I was partly seeing and partly feeling. I swam down the hole and found it to be of enormous size with large pillar-like walls creating oval holes between the pillars. The walls were silvery-black and shiny. I continued down the cavern and I felt, not saw, that I was through and in the open. I could not visualize the landscape. Rather, I sensed, felt, and thought at the same time which created a kind of total sensation or thought shape. I was in woods surrounded by hills. I felt myself sitting next to a bird on a branch. I did not know what kind of bird it was. Harner struck the drum sharply four times and I began my return. While Harner rapidly beat the drum, I returned quickly and noticed some muscles twitching in my arms and legs. After removing the blindfold, I found myself looking around in a mildly dazed, clear-headed state. I felt calm and relaxed. I was quite warm, my breathing was relaxed and slow, and my body, after the twitching stopped, was relaxed.

Throughout the journey, I was partly aware of my surroundings, of Harner's drumming, of lying down, of people all around me doing the same thing. The state I experienced was clearly not a common state of consciousness, but it was not what I would call a deep trance. My experience was much like dreaming while awake, but without the vivid imagery and perceptions of dreams. On numerous occasions I have entered a kind of waking dream state wherein I see in vivid pictures, but I am in control of the dream; I can direct my actions as well as the course of the dream. At the same time I am aware of my surroundings. I know that I am lying on my couch, I can hear music playing, and I hear sounds in the room and outside. This waking dream state is quite similar to experiences I have had in sensory deprivation tanks; I am consciously aware of the environment and dream-like scenes simultaneously. With the exception of clear perceptual imagery, my experience in the workshop was virtually identical to this waking dream state. Due to the absence of vivid imagery and encounters with spirits, I doubt that I experienced a "full blown" shamanic state of consciousness. Nonetheless, I did experience an alternate state of consciousness which I characterize as a light or incipient SSC. If the difference between my experience and the SSC is one of degree, then I agree with Harner's statement (1980:21) that the shamanic state of consciousness is like a waking dream with control.

My experience in other journeys was much the same although with different content. I had sensations in my body of ascending or descending. I caught glimpses of landscapes but mostly sensed thought shapes, and I had no communicative encounters with spirits. Both during and after each journey, my muscles twitched for a while and then

stopped.

Of fifty-four questionnaires I sent to participants (see Appendix), thirty questionnaires were returned to me. I found only one person who did not see vivid images while journeying. Rather, she sensed images, places, spirits and the like in much the same way that I did; there was a sensing-feeling perception rather than visual perception. With the exception of two persons who did not enter the SSC at all, the remaining participants had vivid visual experiences and encounters in upper or lower worlds. It is worth noting that twenty-eight people who returned questionnaires had practice with visualizing, and 21 found it easy to visualize. Twenty-six respondents had practice with meditation, 12 of these claimed much practice, and virtually all noted similarities between Harner's work and meditation with respect to the state of attention and focus required. The two people who did not succeed in entering the SSC had no practice with visualization or meditation. It may be that the kind of focused attention necessary for visualization and meditation is central to entering Harner's trance. Everyone who answered the questionnaire stated that focused attention is either essential or very important to entering and maintaining the trance state.

Twenty-eight people who returned questionnaires said they had some form of communication with spirits. Twenty-two communicated verbally or by thought and 6 communicated with signs, gestures, and imagery. Nineteen of these said they gained knowledge or insight. Of the 19, 6 gained insight in a flash, 10 gained knowledge in a logically consistent manner, 1 in both ways, and 2 by other means (metaphor and sensing).

Slightly less than half of the respondents experienced strong emotions during or after their journeys with the remaining half equally divided between weak emotions and no emotional response. After the journey, about two thirds of the respondents had positive emotional responses (such as joy, relief, or pleasure). Two persons experienced sadness, and nine reported mixed feelings such as sadness and elation, relief and fear, and mixed feelings of wanting to cry and laugh. During the workshop, I noticed three persons who, after a journey, broke out in deep sobs, and I also noted a few others who were crying more softly.

On the basis of the above data, some suggestions about hemisphericity can be made. The most salient aspect of Harner's trance is the journey to upper and lower worlds. Both neurophysiologically and experientially, the journeys are much like waking dreams or visions. In the previous chapter we saw that visions and dreams, particularly those involving vivid, detailed or intricate images, require the kind of inter-hemispheric dialogue necessitated by ordinary perceiving and constituting of the environment. While it may be that the right hemisphere enjoys a proportionately higher level of involvement in the processing of images and non-verbal stimuli, images can call up left-hemisphere verbal assessments. Farah (1986) and Greenburg and Farah (1986) provide evidence that the left-hemisphere is active in the generation of dream images. It seems inevitable that inter-hemispheric activity, rather than asymmetrical hemispheric functioning, is dominant in processing the visions central to Harner's shamanic trance.

The fact that 22 persons communicated by means of words thoughts further attests to the fact of left hemisphere involvement during trance. Six persons communicated through signs, gestures and

imagery, and for these six there was likely more right hemisphere activity than those experiencing more verbally oriented communication. It is clear, however, that the majority of respondents were processing information in ways that necessitate left-hemisphere activity. The preponderance of verbally processed information during encounters with spirits while journeying, in conjunction with the inter-hemispheric dialogue indispensable to visions, indicates that the right hemisphere is not dominant in this form of trance.

The relationship of hemispheric dominance to emotional responses during and after the SSC is not clear. Some scholars claim that the right hemisphere is dominant for emotional responses or processing. Others claim that the right hemisphere is dominant for processing negative emotions and the left hemisphere dominant for processing positive emotions and indifference (Sackheim et al. 1982; Ahern et al. 1985; Natale et al. 1983). Depending on the position one takes on these issues, different claims about hemispheric dominance can be made. In short, no unequivocal conclusions can be drawn.

Geschwind and Galaburda (1984) show that the right hemisphere exhibits greater activity in the recognition of, and discrimination between, rhythmic sounds than does the left hemisphere. Although Geschwind and Galaburda's evidence might lead one to postulate some level of right hemisphere processing in response to Harner's drumming, it does little else. The need for left-hemisphere activity cannot be denied. The fact that right hemisphere structures process rhythmic stimuli further supports my position that inter-hemispheric activity is extant during the Harnerian SSC.

I take this discussion as corroboration of my contention in the previous chapter, namely, that hemispheric asymmetry does not provide a fruitful avenue of investigation for uncovering the neurophysiological dynamics mediating trance states. Rather, the concept of ergotropic and trophotropic tuning is the best means of understanding the neurophysiological underpinnings of trance.

In my view, Harner's method elicits both ergotropic and trophotropic excitation at the same time. Trophotropic activity is induced prior to the first journey by complying with Harner's instructions to lay down, relax, and visualize a peaceful relaxing place. Lying down throughout the trance further enhances trophotropic reactivity through the relaxation of skeletal muscles. The mono-rhythmic driving of the drum at low frequency augments trophotropic tuning. In contrast to the technique of the Kung Bushmen which leads the ergotropic system to the third stage of tuning, Harner's method simultaneously excites the ergotropic and trophotropic systems. While lower trophotropic centres are driven by drumming and lying down, higher ergotropic centres are being activated through the cognitive component of the technique. A high degree of concentration, attention, and focus is necessary to enter and maintain the SSC. Furthermore, a high level of intention and active involvement in the visionary environment is essential. In order to achieve the goals set forth in a journey, one must find an entrance, pass through it, attend to the landscape of upper and lower worlds, search out spirits, communicate with them, and in one case, bring a spirit back. These activities act as drivers for the higher cortical centers of the ergotropic system.

The content of visions can excite the ergotropic system as well. From the work of Di Giusto and Bond (1979), it can be discerned that the content of an image evokes an autonomic reaction appropriate to the image. The activity of searching an unknown land in a vision evokes ergotropic responses involved in adapting to, and dealing with, an environment. The incidence of ergotropic stimulation, coupled with the excitation of the trophotropic system through lying down and drumming, indicates that both systems were operating at the same time.

Excessive ergotropic stimulation, as evident in active trance induction techniques like the Kalahari Bushman trance dance, exhibits obvious physiological reactions such as profuse sweating, extreme heat, increased heart beat and respiration. Excessive trophotropic excitation exhibits less obvious but salient characteristics such as slow deep breathing, slow heart beat, warmth or blushing, and relaxation of tension in the muscles (Laughlin et al. 1985). Had excessive stimulation of either system been induced (as with stage-two-tuning), the obvious physiological reactions to such stimulation would have made an impression on the participants. I asked participants if, during or after their experience of trance, they remembered feeling hot, warm, cool, or cold, and whether they remembered their hearts beating quickly or slowly. During the trance, 7 experienced rapid heart beat, 3 slow heart beat. Only two persons remember feeling warm and two, cool. One of the seven who experienced rapid heart beat was also hot and flushed, and experienced muscle spasms. Another noticed no physiological reaction other than twitching muscles. Yet another of the seven was sometimes warm, sometimes hot and sweaty. Of all respondents who remembered physiological responses during trance, 7 reported muscular

spasms, three noticed a tightness in their muscles, three noticed looseness, three numbness, and one person noticed dizziness. Three other respondents noted twitching muscles but did not indicate whether the spasm occurred during or after the trance. Thirteen people did not notice any obvious physiological reactions. After the trance, 6 remembered feeling warm, 3 felt cool, three remembered a slow heart beat, two remembered being hot and sweaty, and 11 did not notice any reaction.

The above data indicate that Harner's technique does not induce a heightened state of reactivity in either the ergotropic or trophotropic system with subsequent excitation or rebound into the opposite system. The low incidence of heightened ergotropic excitation indices amongst participants, (such as profuse sweating, rigid muscles and rapid breathing), and the preponderance of trophotropic stimuli (relaxed muscles and rhythm) indicate that, for most participants, trophotropic activity is probably dominant with ergotropic activity subservient. Although simultaneous ergotropic and trophotropic activity occurs, I question whether the activity is sufficiently intense to induce the third stage of tuning. It is possible that, although an uncommon state of excitation in both systems occurs, the level of arousal is not high enough to induce a trance. Rather, the subtle excitation of both systems may create a neurophysiological milieu that is either more susceptible to, or augments the effects of, auditory driving.

Neher (1961; 1962) found that unusual sensations, strong emotions, hallucinations and muscular jerks were the result of photic stimulation. About half of my respondents recalled feeling strong emotions. Visions were virtually universal. Muscular jerks, twitches and spasms were

experienced by one third of the respondents. The experiences of respondents indicate that auditory driving may elicit the same kind of response induced by photic driving. However, the extent to which auditory driving is responsible for visions and muscular spasms is unclear. It is not possible to single out auditory driving as the primary stimulus responsible for the visionary experience of Harner's trance. Nor can I be certain that simultaneous ergotropic-trophotropic excitation alone is responsible for the experience of participants; the level of arousal may not be high enough to induce visions. Rather, auditory driving and ergotropic-trophotropic arousal may work in concert to produce the Harnerian shamanic state of consciousness. The drumming synchronizes internal brain wave rhythms with the external beat of the drum, a dynamic that can induce visions. In turn, the synchronization of rhythms may somehow augment the dynamics of simultaneous ergotropic-trophotropic activity induced by Harner's technique. In order to discover the actual roles of drumming and ergotropic-trophotropic arousal, experiments have to be conducted in which (i) participants are instructed to visualize and journey to other worlds but are not provided with drumming, and (ii) participants sit or lay down and listen to drumming but are given no instructions regarding visualizations and travel to other worlds. That auditory drumming plays a significant role in Harner's trance technique appears unquestionable, but the degree of its role in effecting the SSC is unknown.

In sum, the above analysis suggests that intense ergotropic or trophotropic excitation is not an element of Harner's shamanic trance. If it were, there would be more obvious indication of extreme excitation. While promoting trophotropic excitation through drumming

and lying down, the twitching experienced by almost one-third of the respondents indicates either some level of ergotropic or simultaneous ergotropic-trophotropic excitation (Lex 1978; 1979). On the other hand, the muscular spasms can be a result of auditory driving. For some people there was more ergotropic activity (signalled by rapid heart beat, tightness in muscles, and perspiring); for others there was more trophotropic activity (indicated by slower heart beat and comfortable, warm feelings). The different reactions of different people suggest that no definitive or universal statement can be made with regard to the heightened reactivity of either system. In fact, the lack of heightened activity may indicate that stage-three-tuning was not achieved. The visionary experience of journeying may be the result of auditory driving augmented by stimuli which induce neurophysiological activity necessary for visions.

Due to the rather subtle excitation of the ergotropic and trophotropic systems, (as compared to trance dancing), only a light state of trance is induced through Harner's method. This lightness is borne out by the respondents' answers to questions about their ability to return to a common state of consciousness. Nineteen people reported their return to normal as quick, with 9 stating their return to be slow. Seventeen found it easy to return to a common state, 11 found it not too hard, and only one found it difficult. Upon returning to a common state of consciousness, 10 stated that they felt drowsy or like they had just woken up, 9 said they were alert, 4 said they were calm and three said they were excited. When asked if they were looking around in a daydream-like stare, 24 said no and only 4 said yes.

Whereas persons in deep trance exhibit bewilderment (Henney 1973) or act in abnormal ways (Guenther 1986, Katz 1982), participants at Harner's workshop did not act abnormally. Most were not dazed or bewildered at all. Harner (1980) states that people often remain aware of ordinary reality while journeying and his claim was borne out by many people with whom I talked.

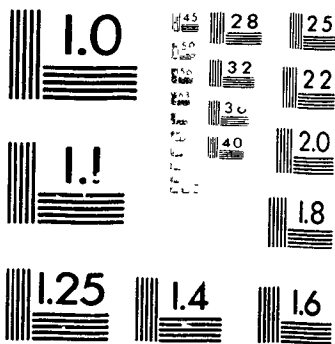
The Harnerian SSC pales in the light of Kalahari Kung and Shaker trance. Nonetheless, an ASC of some sort was experienced by virtually all participants; it is not common, while awake, to travel to upper and lower worlds and communicate with inhabitants of these realms. The visionary journeys, while not proof of trance, parallel visionary experiences had in other shamanic trances. The preceding discussion and interpretation of trance from a neurophysiological perspective leads me to infer that simultaneous activity in the ergotropic and trophotropic systems occurs both in the Harnerian SSC and in the Shaker and Kung trances described earlier. The primary neurophysiological difference rests with the level of arousal. Thus, amplification of ergotropic or trophotropic activity during the SSC should induce a deeper trance. If similar neurophysiological dynamics occur in all of these examples, and if the intensity of activity is the primary difference, Harner's technique can be interpreted as inducing a light or incipient trance state. The trance dance of the Kung exemplifies deep trance achieved through extreme ergotropic excitation, while the trance of the Shakers is not as deep, and the Harnerian SSC is lighter still.

Through a comparison of the techniques used to induce the above ASCs, I will attempt to account for the differences in the trances. My hypothesis is that the depth of trance is directly correlated to the

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intensity of activity in the ergotropic and trophotropic systems.

The Kung technique for trance most clearly acts on the ergotropic system. Vigorous dancing, which can last all night, clearly excites the ergotropic system to stage-two-tuning and leads to the third stage of tuning. Profuse sweating, stiff jerky movements, twitching muscles, collapse, and visions are sure signs of this dynamic.

The Shaker technique also excites the ergotropic system, but not as intensely. In contrast to vigorous dancing inducing trance, the Shakers begin to dance in earnest only after trance has begun to take hold. The Shaker technique may excite both ergotropic and trophotropic systems at the same time. Ergotropic activity is stimulated by sitting on hard backless benches, listening to sermons, swaying and rocking, as well as by general excitement and sensory bombardment. The trophotropic system is aroused through rhythm, chanting, singing, and the hyperventilating that occurs after trance has begun. While in trance, dancing and movement require ergotropic activity; gasping and grunting results in hyperventilating which is trophotropic in nature. The stimuli that induce trance in the Shakers does not lead to the same level of excitation as that caused by the vigorous dancing for the Kung. For the Kung and the Shaker trance, simultaneous activity in both systems occurs, but the level of arousal is different. The Kung trance appears less controlled and more dramatic; running about, collapse, severe trembling and twitching are the result. These characteristics of Kung trance are due to a higher level of arousal in the ergotropic and trophotropic systems. The Shaker trance is more controlled and less dramatic. Shaker and Kung trance exhibit common features such as twitching muscles, shudders and stiff jerky movements. For some

Shakers, there is profuse sweating. According to Henney's and Katz's descriptions, the twitching, shaking, and sweating are not as pronounced for the Shakers as for the Kung, and since this is so, a lower level of arousal must exist in the Shaker's trance. For the Kung there is collapse during the trance, indicating intense trophotropic rebound when the trancer is limp. Collapse of the musculature of the body together with muscular twitching or rigidity clearly indicates extreme and simultaneous ergotropic and trophotropic activity. In most cases, collapse of this sort does not occur with the Shakers. However, if a Shaker has been through an emotionally charged ordeal prior to the onset of trance, the trance is less controlled. The trancer may fall to the ground, walk about as if on the verge of falling, or require assistance from members of the congregation in order to avoid being hurt. An emotionally charged ordeal excites the ergotropic system. Some, due to their conditioned ergotropic-trophotropic balance, may become sufficiently excited by such an ordeal to induce stage-two-tuning. If so, ergotropic activity is heightened, and all stimuli, including trance inducing stimuli, further excite the system. A higher level of ergotropic activity results in the spillover of the same level of activity into the trophotropic system. The result: wobbly knees, trembling, and at times, collapse.

The Shaker's trance, then, is not as deep or intense as the Kung's as a result of the lower level of ergotropic-trophotropic stimulation. When augmented by situations inducing heightened ergotropic activity, the trance becomes less controlled; it becomes deeper and more intense. Although the above discussion is not proof that the level of neurophysiological activity is directly related to the intensity of

trance, the dynamic appears logically consistent and stands as a strong possibility.

I have characterized the techniques used to induce the Harnerian SSC as simultaneously arousing both the ergotropic and trophotropic systems. I have described Kung and Shaker trance as occurring when simultaneous activity in these systems, at the third stage of tuning, occurs. My position is that Harner's technique creates the neurophysiological dynamics necessary for trance, but his technique does not excite the systems enough for the dynamics to result in a deep trance state. I conjecture that a higher level of arousal in either system would have induced a deeper trance. Had there been half an hour, or an hour or more of vigorous dancing prior to lying down, a deeper level of trance would have resulted. Adding dancing to his technique would have created ergotropic activity similar to that achieved in the dancing of the Kung, although, admittedly, not necessarily as intense. If followed by lying down, ergotropic afterdischarges would occur at the same time that trophotropic activity would be induced by relaxation. If the dancing had been long enough, there might even have been a spillover of activity into the trophotropic system. Ergotropic-trophotropic activity would have been higher, and I believe, the trance would have been deeper. If there had been more trophotropic activity, such as one or more hours of lying down and listening to drumming, I suspect that the same dynamics might have applied. Trophotropic activity would have been heightened to the second stage of tuning, perhaps leading to the third stage. On the other hand, the ergotropic component of journeying could have stimulated the ergotropic system enough to induce strong simultaneous activity in both systems.

Although I have not provided conclusive evidence that higher levels of arousal in the ergotropic and trophotropic systems create deeper levels of trance, I hope to have illustrated this to be a strong possibility. It stands to reason, on the basis of the trances described, that higher levels of arousal result in deeper levels of trance.

Conclusion

Attempting to account for the Harnerian SSC in terms of the neurophysiological theory of trance reveals the limitations of the theory. In contrast to Kung trance, which is amenable to clear neurophysiological analysis, analysis of the Harnerian technique presents no clear conclusion. The lack of a solid conclusion should not, however, deter us from analyzing trance from a neurophysiological perspective. Even if we cannot say exactly what neurophysiological activity is taking place, awareness of the structures which may be active, and of their level of activity, is better than ignorance.

Although Harner's technique induces an incipient trance state, I have not stretched the theory to accommodate the SSC. All action and all response to internal or external stimuli requires neurophysiological activity. Since neurophysiological activity is either ergotropic or trophotropic in nature, any action and any response to stimuli must evoke a reaction either from the ergotropic or trophotropic systems. Any stimulus presented by Harner in his workshop, therefore, evokes a response from the ergotropic or trophotropic system. Describing Harner's induction technique in neurophysiological terms is thus a matter of stating which part of the nervous system is aroused in

response to different stimuli. Clearly, this is not stretching the theory. What is evinced through analysis of Harner's technique is the following. When the level of trance is not deep, and when the means of inducing a trance do not involve a high level of ergotropic or trophotropic activity, the neurophysiological activity mediating the experience cannot be clearly discerned. If clear indications of heightened activity such as profuse sweating, stiff jerky movements and the like are not evident, the neurophysiological theory I have described is less able to account for the phenomena. Further developments in brain sciences along with finely honed techniques for discerning the subtle features of ergotropic and trophotropic activity may alleviate this problem.

One of the features of trance which I have not yet discussed is the cognitive matrix or worldview in which trance is situated. For the Kung, num energy brings on the trance state called kia. The whole experience of trance, and the effects of healing, are grounded in the Kung belief system. The experience is interpreted within, and guided by, the framework of their belief. Similarly, the Shaker trance is interpreted within Christian beliefs. The Harnerian SSC is framed within a shamanic world view as portrayed by Harner. It is within the context of a group of committed believers performing a rite of trance that a trance acquires its meaning and import. The meaning, significance, and experience of trance for trancers and audience-participants is something that cannot be gleaned from neurophysiological analysis. The activation of neurophysiological activity characteristic of trance is not, in and of itself, evidence of an ASC which can be interpreted as a trance state. The following example of a personal

experience I had in mid-May will serve to illustrate this point.

One evening, shortly after dinner, a friend and I decided to do a plaster mould of my leg. I had to stand in one position with my leg muscles flexed while the mould was being made. After about fifteen to twenty minutes, a strange numbing sensation began in the foot of the leg being cast. At the same time I began to feel light-headed. The numbness started moving up my leg. I started feeling dizzy. I could no longer keep my leg muscles flexed. I became very dizzy. My whole body, including my head, became numb. I could no longer stand. Luckily there was a table behind me. I fell onto it. I was sweating profusely. My heart was pounding. I almost lost consciousness. I felt far, far away from what was happening around me. It felt as if I were descending down a long tunnel. There was virtually no sensation in my body. Slowly, the numbness subsided and the dizziness left.

It was a very strange and frightening experience at the time. Later that evening and throughout the next day, I tried to make sense of what had happened in terms of neurophysiological activity. I had just eaten dinner. The trophotropic system was active while the food was being digested. I felt tired and had to push myself to make the mould. Standing in one place, with leg muscles flexed excited my ergotropic system. Maintaining this rigid stance for fifteen to twenty minutes continually stimulated my ergotropic system beyond a normal everyday level. The dizziness I felt was mediated by the trophotropic system. The numbness I felt was mediated by the same system. Both ergotropic and trophotropic systems were beginning to function simultaneously. The fact that I was sweating profusely and I could no longer stand clearly indicates that there was intense activity in both systems. My body was

on the verge of complete physical collapse and I had almost slipped into unconsciousness. This experience was certainly the result of intense ergotropic excitation leading to simultaneous activity characteristic of the third stage of tuning.

The similarities between the behavioural manifestation of my experience and Kung trance cannot be overlooked. Intense ergotropic excitation culminating with profuse sweating, wobbly knees, dizziness, and an inability to stand exist in both cases. The above example illustrates the point that the kind of neurophysiological activity that occurs during trance is not, in itself, sufficient for an experience to be interpreted as trance. I certainly did not think that I was entering a trance state. Had my experience been framed within a religious context, and had my intention been to enter a trance state and perhaps have a vision, I am certain that I would have interpreted the experience within the parameters of a spiritual trance. The parallels in neurophysiological activity, and the discrepancy between cognitive experiences in Kung trance and my experience points to the centrality of cognitive frameworks in the guiding and interpretation of trance experience. The parallels also hint at the role of belief and context in interpreting the cognitive experience of intense ergotropic and trophotropic activity as trance. For the Kung, trance is a focal point of their religiosity, and it carries with it an intensity, profundity and significance appropriate to a central rite of worship and intensification. For me, the experience was frightening and carried no significance. I simply wanted it to end.

A world view maintained by a group of like-minded believers—a view which includes trance as one of its spiritual dimensions—is a

requisite framework for interpreting the experience of trance as having spiritual significance and meaning. Only when the neurophysiological activity occurring during a trance state is contextualized within a belief system, and perhaps within an appropriate rite, can the experience mediated by such activity be interpreted as a religious trance.

It is clear that one can voluntarily induce trance by manipulating the activity of neurophysiological systems. The experience had through such manipulation is, however, multifarious. The techniques used to induce trance can be universal (like drumming, dancing, chanting and singing), as can the ergotropic-trophotropic activity occurring during trance. And yet, the experience of trance is different in different cultures, and in different contexts. Culture-specific beliefs their symbolic representation and contextualization are central in guiding and framing the experience. A central avenue of investigation for trance analysis, therefore, is the cognitive matrix with which a trance is imbued. Further in this vein, the rite of trance and its symbolic representations serve to interrelate the trance within the framework of belief. Thus ritual studies and the study of symbols and symbol systems are topics which ought to be considered in a study of trance. Studies of symbol, ritual, and belief systems can take the form of commonly known approaches (e.g., Jung, Ortner, Turner, Eliade and Campbell). More radical avenues of investigation are also available. Analysis of the autonomic effects of symbolic representations and the particular brain structures active in the generation, perception and expression of symbolic images can provide insight into the neurophysiological dynamics of symbols. Biogenetic structural theory can be applied to the study of

ritual and myth. One can take up the cause of biogenetic structuralism wherein all behaviour—trance, ritual and other aspects—can be seen in the light of its adaptive significance. Biogenetic structural theory can be used to interpret and account for myth and ritual, and their interrelations from biological and cognitive perspectives (see Laughlin and d'Aquili 1974; d'Aquili et al. 1979).

No inherent affirmation or denial of spiritual beliefs is implicit in a neurophysiological theory of trance. The explanation of spiritual experiences in relation to biological functioning does not deny the potency of the experiences themselves. It is up to the individual wielding the theory to decide how it is to be applied, that is, whether as a reductionistic foray against the spirit, or as another facet of understanding a spiritual dimension of humankind.

The examples of trance that I have described are religiously contextualized phenomena. Bourguignon (1973) has pointed out the virtual omnipresence of trance throughout the world. Of 488 societies surveyed, 90% have some form of institutionalized trance performed primarily within the context of the sacred (Bourguignon 1973:11). The virtual universality of trance within the religious dimension of humankind throughout the world suggests to me its undeniable usefulness in gaining entry into the mysterious realm of the sacred. Many anthropological treatises have already discussed the varied approaches to the study of trance. Religious studies scholars ought to take advantage of this wealth of information. Not only do we learn about trance, but also we can discover what similarities or differences exist between the experiences of, and techniques for cultivating, trance and "religious experience".

In the first chapter I introduced some theories of trance. My subsequent chapters were aimed at describing a more inclusive and appropriate approach to trance phenomena. Since it cannot be denied that all experience is mediated by the human nervous system, it is essential that trance be understood from the point of view of this perspective. Because recent developments in brain sciences may challenge traditional views of our understanding of the religious dimension, religious studies scholars who avoid this field can be accused of wilfulness or naivete. By acknowledging the scientific perspective, we gain insight into the mechanisms that cause persons to enter trance states. We can show that trance is a natural human state available to virtually anyone. At the same time, the importance of belief and ritual in structuring, guiding and interpreting trance experience is confirmed. Rather than threatening the study of religion, neurophysiological analysis of trance compliments our endeavors to understand the altered states of consciousness inherent in many forms of religious expression.

ENDNOTES

1. Equating religious trance and secular hypnotic inductive ceremonies is a point I take issue with. First of all, Spiegel and Spiegel state that a ceremony, by definition, "is an action usually performed with some formality but *lacking in deep significance*" [italics mine] (Spiegel et al.:35). Secondly, Rossi, like Gilligan, and Spiegel and Spiegel, suggest that a set of hypnotic induction techniques constitute a ritual. Although it may well be that their techniques are formalized and repetitive, and thus might constitute "ritualized" activity, I consider it incorrect to use the term in discussing a secular form of trance induction when the same term is used to denote a sacred form of trance induction. Use of the term "ritual" for describing secular and sacred inductive procedures implies, whether intended or not, that religious trance and hypnotic trance are essentially the same phenomenon. Similar inductive techniques, and similar characteristics of resultant states might lead one to equate hypnotic and religious trance. However, the context within which the phenomenon occurs, and the subjective experience and interpretation of such experience demand that, if we are to do justice to the realm of the sacred, such implications cannot be permitted to exist.

2. Feters (1982), Peters and Price-Williams (1980) and Locke and Kelly (1985) suggest that the degree of control in trance is a function of learning.

3. For a discussion of this dynamic referred to as homeomorphogenesis, see Laughlin et al. 1985.

4. Synchronous alpha activity has been implicated as an indication of, or as a means of enhancing, trophotropic dominance. However, I have some reservations about including synchronous alpha activity in this discussion. Although synchronous alpha activity is often cited as an indication of increased trophotropic excitation, reduced cortical arousal, and therefore central to meditation, the role of alpha waves in trance, in my view, is not at all clear. I am uncertain about what a state of mind is like when characterized by synchronous alpha activity. If alpha activity indicates reduced cortical arousal, how can concentration and attention be central to meditation or trance? Perhaps such synchronous activity is a sign of the right and left hemispheres working in harmony and without superfluous "mind chatter" rather than a sign of their working to a minimal degree. If synchronized alpha waves are a byproduct of pointed, concentrated attention without superfluous thought, then I can imagine heightened states of excitation during which alpha synchrony might be dominant, for example, race car driving, skiing or mountain climbing. While I can imagine such examples, I have encountered no EEG studies conducted with individuals engaged in such activities. Schuman (1980) points out that it cannot be assumed that inducing synchronous alpha activity in the brain (through bio-feedback techniques) results in the kind of experience had while synchronous alpha waves are dominating the brain during meditation. I am also not sure that inducing synchronous alpha activity causes (or is caused by) trophotropic activity. It could be that synchronous alpha activity often accompanies trophotropic activity, but I am not sure that inducing trophotropic excitation would always result in synchronous alpha

activity. With no supporting data, my suspicions are only conjecture. However, the uncertainty about the role of alpha waves in ASCs is sufficient to demand further studies in this field before allowing definitive statements about EEG activity to be included in a neurophysiological theory of trance.

5. When obvious hemispheric prominence during a cognitive experience is evident, (such as a non-verbal experience of absolute oneness) it is not clear whether the prefrontal lobe of one hemisphere is more active than another. It is clear, however, that the prefrontal cortex of each hemisphere is interconnected with its counterpart via reciprocal fibres, and most often, both prefrontal lobes work in concert (Laughlin n.d.). While there may be some difference in inter-hemispheric communication between areas of the prefrontal cortex during obvious hemisphere dominant cognitive experiences, there just as well may not be any difference. Although the above does not constitute proof of inter-hemispheric activity, the possibility of such activity is sufficient to call into question a claim for hemispheric dominance.

6. Barbara Lex (1979:145) might say that attending to repetitive stimuli engages and holds constant the sequential information processing capacity of the left hemisphere. Thus, the right hemisphere is allowed to function freely. She also says that providing stimuli that the right hemisphere is suited to process (like rhythm) induces right hemispheric dominance. Why does attending to rhythm not hold constant capacities of the right allowing the left to function freely? There is a double standard at work here: one that works in favour of promoting right hemisphere dominance during trance. I contend that both hemispheres are functioning to different degrees in different individuals depending on their preferences for particular cognitive styles and the nature of their encounter with the Spirit. If there was communication which required sequential information processing, left hemispheric structures were active. If the experience was non-verbal, gestalt-like, oceanic or one of absolute oneness, right hemisphere activity occurred. That one or the other hemisphere was dominant or temporarily shut off cannot be discerned.

7. For a more eloquent description of a Kung trance dance, I highly recommend Katz's (1982) Boiling Energy, pages 58-79; the source from which the above account was taken.

8. During the workshop, Harner did not say that he was a shaman. He said that a true shaman does not go about advertising the fact. However, the workshop is designed to induce a shamanic state of consciousness (SSC), Harner continually described his experiences during SSCs, described healings in which he was involved, and wrote a book called The Way of the Shaman. Clearly, Harner considers himself a shaman, although he does not make this claim outright.

APPENDIX

Questionnaire Sent to Harner Workshop Participants

Please circle the appropriate answer(s) within brackets. If you circle 'other', please specify if possible.

GENERAL QUESTIONS

You abstained from eating (before, during) the workshop (not at all).
You visualize (easily, with difficulty, not at all).
You have (much, little, no) practise with visualization.
You have (much, little, no) practise with meditation.
You see (similarities, differences, other) between meditation, visualization, and Harner's method. Please explain.

Did you know what to expect from the workshop? (yes, no)

JOURNEY QUESTIONS

Before journeys you were (apprehensive, anxious, nervous, distracted, excited, worried, calm, focused, relaxed, alert, confused, other).

You made the journey the (first, second, third, fourth, fifth) time (not at all).

If you did not make the journey, could you suggest some reasons?

You had (no trouble, trouble) (entering, passing through, exiting) the tunnel or point of ascent.

You were distracted (easily, with difficulty, not at all) (before, during) the journey.

How important is focusing and intention for journeying? (essential, very, somewhat, little, not at all)

During the journey you were (apprehensive, anxious, nervous, distracted, focused, excited, worried, calm, relaxed, other).

During your passage through the tunnel there (were, were not) sounds. There were (rhythmic, melodic, random, other) sounds of (bells, sirens, singing, other).

There (were, were not) lights in the tunnel (flashes, ribs, constant, bright, other).

During the journey time seemed to move (quickly, slowly, normally, did not notice).

There (was, was no) communication with other entities.

Communication was (verbal, by thought, other).

You (did, did not) gain insight or knowledge (in a flash [aha!], along the more usual logically consistent route, other).

You (did, did not) transcend normal (spatial and temporal, causal) limitations.

There were (strong, weak, no) emotions before the journey.

There were (strong, weak, no) emotions during the journey.

There were (strong, weak, no) emotions after the journey.

Strong or intense emotions (before, during, after) the journey were (joy, fear, sadness, elation, pleasure, relief, other).

There (were, were not) strong emotions after the journey which made you (feel like) laughing, crying, jumping, yelling, other).

There (were, were not) physical sensations while journeying (up, down). Sensations of (stress, tightness, looseness, numbness, dizziness, other) were in your (arms, legs, stomach, head, face, other). Please expand if possible.

Bodily sensations were felt (in your body on this plane) (associated with your visual experience) (both). Please explain.

AFTER RETURNING - whether you made the journey or not

You returned to "normal" (quickly, slowly, very slowly).

It was (difficult, not too hard, easy) to reorient yourself.

You felt (drowsy, in a daze, like you just woke up, alert, confused, calm, excited, other). Please explain

You (were, were not) staring around with a fixed stare [i.e. like daydreaming].

There (were, were not) strong emotions (of fear, joy, sadness, relief, excitement, other).

PHYSICAL SENSATIONS

Your stomach was acting up (burping, grumbling, 'passing gas') (before, during, after) the journey (or never).

You felt like going to the washroom (before, during, after) the journey (or not related to journey).

Before the journey you felt (hot, warm, cold, cool, sweaty, clammy, flushed, rapid heart beat, slow heart beat, nothing, other).

During the journey you felt (hot, warm, cold, cool, sweaty, clammy, flushed, rapid heart beat, slow heart beat, nothing, other).

After the journey you felt (hot, warm, cold, cool, sweaty, clammy, flushed, rapid heart beat, slow heart beat, nothing, other).

You noticed (twitching, muscular spasms or jerks) (before, during, after, not at all) the journey in your (arms, legs, spine, stomach, face, cheeks, eyes, feet, other)

If there are any comments or points you wish to expand upon, please do so. Of great importance are any strong emotions, and/or bodily or physiological sensations you can remember and when they occurred. These indicate the physiological counterparts to, and central nervous system functioning during shamanic trance.

If you wish to share any more of your journey, please do so. Any additional descriptive information would be most appreciated.

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