

## SCIENTIFIC FOUNDATIONS FOR THE STUDY OF ALTERED STATES OF CONSCIOUSNESS

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One of the most significant trends in American culture today is what might be considered an anti-intellectual or anti-scientific trend, two of whose main highlights are the tremendously widespread use of psychedelic drugs, such as marijuana and LSD, and the tremendously increasing interest in various oriental and mystical religions. The states of consciousness produced by drugs or meditation are phenomena we know very little about, scientifically. The volume of research on such subjects, though rapidly increasing, has been quite small, compared to the extent of social involvement in them. Further, one can strongly argue that much of this research, while well-intentioned, is relatively trivial compared to the nature of the phenomena.

*present anti-  
intellectual, anti-  
scientific trends*

To cite one example, a recent Gallup poll indicated that approximately half of American college students had tried marijuana, and a large number of them use it fairly regularly. They do this at the risk of several years imprisonment and ruined careers. Why? *Conventional* research on the nature of marijuana intoxication tells us that the primary effects of marijuana are a slight increase in heart rate, reddening of the eyes, some difficulty with memory, and small decrements in performance on complex psychomotor tests.

Would you risk going to jail in order to have your heart speed up, your eyes redden, your memory slip, and your performance on complex psychomotor tests decline? Somehow these "objective" facts about the effects of marijuana intoxication seem rather trivial in accounting for why people

*trivialities in  
conventional  
scientific  
research*

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use this drug. A marijuana smoker who hears a scientist or a physician talk about these findings as the *basic* nature of marijuana intoxication *is* likely to simply sneer and have his anti-scientific attitude further reinforced. To the marijuana user this *scientist* is wasting his *time* on trivialities and has no real understanding of what marijuana intoxication is all about.

*some reasons  
for alienation  
from  
conventional  
science*

To express the above observations in a more formal way, in our culture today an increasingly significant number of people are personally and unsystematically experimenting with inducing *altered states of consciousness* in themselves, and they often find the results of extreme importance in their philosophy and style of life. The perceptions and experiences (e.g., ecstasy, mystical union, other "dimensions," rapture, beauty, space/time transcendence, transpersonal knowledge, and the like) in these altered states of consciousness conflict with the attitudes and intellectual-emotional systems that evolve in ordinary states of consciousness. This unresolved conflict appears to be a major factor behind the increased alienation of many people from conventional science.

*conflict  
unnecessary*

The usefulness of much current *conventional* research on *problems peripherally* related to altered states of consciousness is not to be denied. However, it is my purpose in this paper to show that the conflict discussed above is *not necessary*, and that it is possible to investigate and work with the important phenomena of altered states of consciousness in a manner perfectly compatible with the *essence* of scientific method.

*definition of  
"state of  
consciousness"  
and "altered  
state of  
consciousness"*

#### STATES OF CONSCIOUSNESS

Very briefly, a *state of consciousness* (SoC) is here defined as an overall *patterning* of psychological functioning. An *altered state of consciousness* (ASe) may be defined as a qualitative alteration in the overall pattern of mental functioning, such that the experiencer feels his consciousness is radically different from the "normal" way it functions. Note that an ASC is not defined by a particular content of consciousness, behavior, or a physiologic change, but in terms of overall patterning. ASes experienced by almost all ordinary people are dreaming states, borderline sleep states (the hypnogogic and hypnopompic, the transitional states between sleep and waking), and alcohol intoxication.

In our culture some of the relatively new ASCs now having

an impact are states such as those produced by marijuana, the more powerful psychedelics (LSD, etc.), narcotic-induced states, meditative states, possession states, and hypnotic and autohypnotic states.

*relatively new  
ASCs in culture*

#### STATES OF CONSCIOUSNESS AND PARADIGMS

It is illustrative to compare this concept of different states of consciousness with Thomas Kuhn's (1962) concept of *paradigms* in science. A paradigm, according to Kuhn, is a kind of "supertheory," a theoretical formulation of important data of wide enough scope that it organizes most or all of the major known phenomena of its field. Yet it is open-ended enough so that there are important problems still to be solved *within* that framework. It is an intellectual and scientific achievement, underlying normal science, that attracts and guides the work of an enduring number of adherents in their scientific activity. Examples of important paradigms in the history of science have been Copernican astronomy, Newtonian dynamics, and the theory of evolution.

*definition of  
"paradigm"  
in science*

All paradigms are first introduced as theories, and, as such, they are subject to the requirement of making predictions that are empirically verifiable. By virtue of being extremely successful at prediction, a paradigm comes to be an all-embracing framework that organizes known data and guides a scientist in his research into the unknown, in his search for research topics that are "likely" to yield useful results. Because of their tremendous success, however, paradigms undergo a change that, *in principle*, does not happen to an ordinary scientific theory. An ordinary scientific theory is *always* subject to further questioning and further testing as it is extended: it is always tentative. A paradigm, however, because of its tremendous success, becomes an *implicit* framework for most scientists working within it, that is, it becomes the "natural" way of looking at things and doing things, rather than a tentatively held theory that is always subject to further test. It does not seriously occur to its adherents to question it any more (until the effects of a scientific revolution are felt).

*historical  
limitations of  
paradigms*

As an historical example, elementary physics textbooks do not teach the "theory" of gravitation, but rather the "law" of gravitation. That particular theory has worked so well that we believe it as a law. When we drop something, we "know" that it will fall in accordance with certain principles. Actually, all we really know is that untold numbers of observations have accorded with this particular theory, and we

can *assume* that it is highly likely that the next observation will also fit the theory, but we don't really *know* it.

*advantages and disadvantages of paradigms*

A paradigm has advantages and disadvantages. It serves to concentrate researchers' attention on "useful" problem areas, "sensible" problem areas, and thus keep them from wasting their time on what might be trivial problems. On the other hand, by implicitly defining some lines of research as trivial or impossible, it acts as a set of blinders.

*similarity between a paradigm and a state of consciousness*

The similarity between a paradigm and a state of consciousness is clear. Both a paradigm and an SoC are a complex, interlocking set of rules and theories for interacting with and interpreting experiences within a certain context. In both cases, the rules and theories have largely become implicit. They are not recognized as tentative working hypotheses, they operate automatically, and the person feels he is doing the "obvious" or "natural" thing.

#### *Paradigm Clash*

*human element in scientific endeavor and possible consequences of emotional attachment to paradigm*

Kuhn's concept of the importance of paradigms in science is a way of bringing the human element into the scientific endeavor. The stereotyped image of the scientist is that of a cold, unemotional calculating machine which constantly re-computes all its data, alert for the smallest discrepancy. In point of fact, human beings become emotionally attached to the things that give them pleasure, and a scientist making important progress within a particular paradigm becomes emotionally attached to it (Maslow, 1966). The valued paradigm may sink below the level of consciousness, becoming implicit; when data that "make no sense" in terms of the paradigm are brought to his attention, the usual result is *not* a reevaluation of the paradigm but a rejection or distortion of the data. This rejection seems "rational" to others sharing that paradigm and "irrational" or "rationalizing" to others committed to a different paradigm. An example of this, concerning data supposedly proving the existence of extrasensory perception, is Price's article "Science and the Supernatural" (1955) some years ago. His article stated, in essence, that no intelligent man could read the evidence for extrasensory perception and doubt that it existed, *but*, since we know that extrasensory perception is impossible, we must conclude that all the evidence was due to error and fraud. Thus, within a paradigmatic framework certain kinds of results are impossible, and if such results are claimed to have been found, there must be something wrong with the claim or the claimant.

*example*

The conflict now existing between those who have experienced certain ASCs (whose ranks include many young scientists) and the scientists who have not is very much a paradigmatic conflict. For example: A subject takes LSD, and tells the investigator that "You and I, all of us, we are all one, there are no separate selves." The investigator reports that his subject showed a "confused sense of identity and distorted thinking processes." The subject is reporting what is *obvious* to him, the investigator is reporting what is *obvious* to him. The investigator's implicit paradigm, based on his scientific training, his cultural background, and his normal SoC, indicates that a literal interpretation of the subject's statement *cannot* be true, and therefore, it must be interpreted as mental dysfunction on the part of the subject. The subject, his paradigm radically changed for the moment by being in an ASC, not only reports what is obviously true to him but perceives the investigator as showing mental dysfunction, by virtue of being incapable of perceiving the obvious!

Historically, paradigm clashes have been characterized by bitter emotional antagonisms and total rejection of the opponent and his view by each side in a paradigm dispute. Currently we are seeing the same sort of process: the respectable psychiatrist, who would not take any of those "psychotomemetic" drugs himself or sit down and do that "crazy" meditation, carries out research to show that drug takers are escapists and meditators are mentally ill. The drug taker or meditator, on the other hand, views the same investigator as narrow-minded, prejudiced, and repressive; consequently he may drop out of the university or otherwise avoid becoming involved in the scientific enterprise, which he judges critically from the activities of such investigators. Communication between such individuals is almost nil, because the *implicit* meaning in so much of their attempted communications is so different that they literally talk *at* each other rather than *with* each other.

It is my conviction that this mutual rejection is not necessary and that science can come to terms with the important aspects of ASCs by using the *essence* of scientific method.

*current  
examples  
of paradigm  
clashes*

#### THE ACQUISITION OF KNOWLEDGE

Although I do not wish to get into difficult philosophical questions, some basic assumptions that underly my entire approach to expanding our concept of science should be

f|Note that confusion or Impaired functioning Is certainty an aspect of *some* drug-induced states, but this is not our primary Interest here.

*some basic  
assumptions  
underlying  
authors  
approach to  
expanding  
the concept  
of science*

spelled out. First; while I, as a scientist; do not fully understand my own nature or the nature of things around me, I nevertheless take it as a given that I have awareness; not only of myself but of many other "things," things I may consider as aspects of myself or as aspects of "something else" out there, an external reality. The latter is, of course, an unprovable assumption; nevertheless, my experiences with certain types of phenomena have been so consistent that I have no doubt that there is a reality that exists totally independently of my perceptions of it.

Second, it is also clear that we *live* in a big universe; the range of experiences is incredibly wide, if not infinite; and since we, as scientists; are relatively new at this game of trying to figure it all out, it behooves us to be rather humble about the current level of our knowledge.<sup>3</sup>

*working  
definition of  
knowledge*

What is the nature of our knowledge? For a working definition; we may regard knowledge as a *feeling of congruence*, a matching, between two different kinds of experiences. One set of experiences may be regarded as perceptions of the external world, or of oneself. The other set of experiences is usually regarded as a theory, a scheme, or a system of understanding. The *feeling* of congruence is something immediately given in experience; although many refinements have been worked out for judging degrees of congruence.

*experiential  
nature of  
knowledge*

All knowledge, then, is basically experiential knowledge. Even my personal knowledge of the physical world is based on certain sets of experiences that I, by assumption, attribute to the external world activating my sensory apparatus. I may compare these with purely internal experiences (memories, previous knowledge) and predict with a high degree of reliability other experiences that I also attribute to the external world.

*predictability,  
reliability  
and degree  
of reality*

Because the experiences I attribute to the external world have led to predictions that achieve incredibly higher degrees of reliability than predictions about my internal processes, I; in common with the majority of people in my culture; tend to attribute a greater degree of "reality" to the physical world. However, the philosophical position that the physical world is somehow more real than experiential worlds is not accepted in this paper. Predictability is not equal to reality.

<sup>3</sup>One of the most interesting aspects of the history of science has been the innumerable times when prominent scientists have predicted that such and such was impossible. Only to have the impossible become an everyday reality within a few years. By and large, scientists do not seem to have learned from this historical fact.

Basically, the everyday process by which I acquire new knowledge, or expand my present knowledge, begins with an experience, an awareness of "something." If I am not curious, or if there is an immediate congruence between this awareness of something and another experience that I label preexisting knowledge, I will probably accept the experience as it is.

If, on the other hand, for some reason I feel puzzled about this experience, if I have a feeling of incompleteness or incongruence and want to know more, I attempt to understand more thoroughly and/or otherwise acquire more knowledge. I will then usually make some attribution of the experience into a type, say that pertaining to the physical world, to my own internal, psychological world, or, in some cases which are of great interest, I may attribute it to an *independently* existing, but nevertheless nonphysical world (Tart, 1971b). This attribution is useful in deciding which sort of tools are useful in working on the problem, and which sort of historic knowledge is most appropriate to bring to bear on the problem.

*the role of  
incongruence  
in seeking  
knowledge*

*selection  
of tools*

Next I shall begin a problem-solving process that consists of varying combinations of three basic things. I may want to somehow augment or expand my observations if I feel I do not have an adequate perceptual grasp of whatever is puzzling me. And/or, I may decide to augment my experience of the problem by referring to others' experiences, either by talking with them or referring to more permanent records. And/or, I may think about the problem, try to "figure it out," in some fashion that will "make sense" to me. These three basic processes are tried in various ways, recycled in various ways, until I have a feeling of a new understanding, a feeling of congruence between the original something that was in my awareness and the (new) knowledge I have now acquired about the something. I may be satisfied with this feeling of cognitive congruence, and/or I may attempt to generalize this new understanding by observing its applicability in similar situations.

Unfortunately, as satisfying as the knowledge-acquisition process can be, it is now generally recognized that we are often wrong. What seems like congruence at first turns out later to be incongruence, or has no generality. Putting it another way, man has learned that his reasoning is often quite faulty, that his observations are often incomplete and faulty, and that emotional and other nonconscious factors can seriously distort both his reasoning and his observational

*tentative nature  
of congruence  
and non-  
congruence*

processes. Reliance on authorities, formal rational elegance -these are no sure criteria of achieving truth."

*science as  
institutional  
distrust of  
the "obvious"*

The development of science, or, more specifically, scientific method, may be seen as a determined effort to systematize the knowledge-acquisition process in such a way as to minimize, and, in the long run counteract, the various pitfalls of observation and reasoning. In one way, science can be viewed as an institutionalized distrust of the "obvious."

#### THE ESSENCE OF SCIENTIFIC METHOD

The founders of science emphasized that all ideas must be tested to be in accordance with one's *own experience*. This rather quickly came to mean *physically* provable, provable by recourse to external observation. Many of the characteristics that have developed in science because of their particularly successful applicability to studying the external world have come to be seen as an *essential* part of science. My thesis is that these accretions are *not* essential, but rather they are special developments for dealing with a particular subject matter, namely the external world. I shall attempt to show that the essence of scientific method is perfectly compatible with the study of various altered states of consciousness.

*four basic rules  
of scientific  
method*

There are four basic rules of scientific method:

Rule one, *good observation*. The scientist is committed to observe the phenomena of interest as well as possible, and to be constantly on the lookout for better ways of making these observations.

Rule two, *public observation*. The scientist is obligated not only to report what he observes, but to report the techniques and conditions of observation in enough detail so that any *trained* observer can replicate the observations.

Rule three, *theoretical consistency*. A scientist may theorize, hypothesize about his observations as much as he wishes to, but the theory he develops must consistently account for all that he has observed up to this point, and should have a logical structure that other scientists can comprehend.

<sup>4</sup>Historically speaking, we might speculate that it is difficult to arrive at this realization, since the development of science is a quite recent phenomenon in human history.

Rule four, *observable consequences of theories*. Any theory the scientist develops must have observable consequences, it must make predictions that, in principle at least, can be verified by observation. If such a verification does not occur, the theory must be considered invalid, regardless of how elegant, logical, or otherwise appealing it is.

Let us consider the application of those four rules in detail.

### *Good Observatton*

It is generally accepted that we do not seem to be capable of observing more than a small part of the vast universe at any one time. Further, our paradigmatic commitments, our SoC, makes us likely to observe certain parts of it and to ignore or observe with error certain other parts of it. There IS an initial (philosophical) commitment as to *what is there to observe*. The insistence that only that which is physical is real, that mental processes and the like are epiphenomena, "subjective," "ephemeral," "unreliable," or "unscientific," has kept scientists from adequately observing ASCs.

*limitations  
of equating  
physicality  
with reality*

Admittedly, observations of internal processes are probably much more difficult to carry out than those of physical processes, due to their inherently greater complexity. Nevertheless, the essence of science is that we observe what there is to observe) *whether it is difficult or not*. Thus we must consider a physicalistic approach, as currently known, only partially useful in the investigation of ASes. While it is a possibility that all phenomena currently labeled "internal" or "mental" may be reducible to physical factors, this is unproven and should not keep us from observing the phenomena of interest. I prefer to work from the proposition that *experiences* are all that we have in direct experience. To delete internal experiences from our scientific realm because of difficulties in observing them is to unnecessarily blind ourselves.

*difficultiesin  
observing  
internal  
processes*

Given that the experiences in other SoCs may now be seen as legitimate data, worthy of detailed scientific Observation, we will want to augment our observations. This may be comparable to shifting one's physical position with respect to an object in order to view it from many angles. Or, it may involve a systematic sampling of observations of the phenomenon of interest, under a variety of conditions. The high variability often encountered in observing internal phenomena has mistakenly led many people, prematurely, to the

*high variability  
and difficulty  
of systematic  
observation*

position that there is no stability, rather than to the development of systematic sampling procedures for more adequate observation.

*usefulness of  
alternative  
mode of  
observation*

Another way of augmenting observations is to shift one's *mode* of observation, a shift that may take place internally. Often, for example, when we are stuck on solving some particular problem, we recognize the value of taking a vacation, of looking at it from a different point of view, of somehow changing our own internal mood so that we now observe the same data but with a different internal organization, which may allow us to see important aspects of the data of which we were not formerly aware. Often a change in the observer's SoC constitutes such a freshening of viewpoint.

*re-examining  
ones own  
selectivity  
process*

Still another way can result from realizing that our perceptions of phenomena, whether they be external or internal, are highly selective. We perceive through a complex set of "filters," rather than by having direct contact. Thus we may attempt to augment our observations by attempting to examine our own internal biases and predispositions, to understand the nature of our own selectivity, and to thus be able to compensate for it to a greater or lesser degree.

Note that our current knowledge of most of the phenomena of ASCs has been obtained from untrained people, almost none of whom have shared the scientists' commitment to constantly reexamine one's observations in greater and greater detail. That these observations are crude and unreliable in comparison with those of physical science does not mean that internal phenomena are inherently unobservable or unstable: we are comparing first observations with those that have undergone centuries of refinement.

#### *Public Observation*

A second major rule of scientific procedure is that observations must be *public*, that the conditions for making the observations must be specified in sufficient detail that any trained observer may replicate the conditions and then make the same observations. Another way of saying this is that one must describe the *experienced* conditions that led up to one's report of certain *experiences* in sufficient detail that others may set up the *experience* of similar conditions and consequently have *experiences* which seem essentially identical. To the extent that someone else sets up similar condi-

tions and does *not* have the same experiences, one has either described conditions and observations incorrectly and/or one was not aware of certain essential aspects of the conditions, and so did not specify them.

Another way of stating this requirement is that scientists look for *consensual* validation. Rather than trusting exclusively to one's own observations, one feels much more secure if other people can repeat the observations, Le., if others report similar experiences under similar conditions.

*consensual  
validation*

The physicalistic, nonessential accretion to this rule of consensual validation is that, physical data being the only "*real*" data, internal phenomena must be reduced to physiological or behavioral data or ignored entirely. In point of fact, I believe most physical observations are much more readily replicable by any trained observer because they are inherently simpler phenomena than internal ones. In principle, however, consensual validation of internal phenomena by a trained observer is quite possible.

*inherently  
simpler nature.  
of physical data*

*Trained Observers.* The emphasis on *public* observations in science has had a further misleading quality insofar as it implies that *any* intelligent man can replicate a scientist's observations. This might have been true early in the history of science, but nowadays we cannot emphasize too much that only the *trained* observer can replicate observations. I, for example, cannot go into a modern physicist's laboratory and confirm his observations. I do not have the training, and his instrument readings would make no sense to me. Indeed, his talk of what he has found in his experiments would probably seem "mystical" to me, just as many descriptions of internal states sound "mystical" to those with a background in the physical sciences.

Given the high complexity of ASC phenomena, the need for replication by a trained observer is exceptionally important. When it generally takes four to ten years of intensive training to produce a scientist in any of our conventional sciences, we should not be surprised that there has been very little replication of observations with respect to ASC phenomena, because our current knowledge consists almost entirely of reports of untrained people. Further, we are at the very beginnings of a science of ASCs, and so cannot specify very well what might constitute adequate training. Considerable trial and error must be carried out along these lines. We should also recognize that very few people may be capable

*current shortage  
of trained  
observers  
in ASCs*

*role of personal characteristics*

of profiting from their training and able to systematically verify each other's observations. Some people do not have the necessary innate characteristics to become physicists, and some probably do not have the innate characteristics to become, say, scientific investigators of meditative states.

Public observation, public verification then, always refers to a limited, *specially trained* public. It is basic agreement among these specially trained people that builds up the data base for the development of a science. That laymen cannot replicate the observations is of little scientific relevance.

*conditions relevant to state specific communication*

*State-Specific Communication.* Another problem concerns one observer communicating his observations adequately to a second observer, so the latter may try to replicate. This takes us to the possible phenomenon (Tart, in preparation) of *state-specific communication*. Given that an ASC is an overall qualitative and quantitative shift in the complex functioning of consciousness, perhaps involving new "logics," new perceptions, and a paradigm shift, it is quite reasonable to hypothesize that the *form* of communication may take on a different style. For two observers who are both experienced and fluent in communicating in a given SoC, communication of observations made in that, state may sometimes be quite adequate, or may be enhanced or deteriorated in specific ways at other times. To an outside observer in a different SoC, *all* the communication, verbal and nonverbal, occurring between these two observers may seem "deteriorated." Indeed, practically all research on communication in ASCs has reported a "deterioration" of communication abilities. The design of these studies, however, has not taken into account the fact that the pattern of communication may have changed.

If I am listening to two people speak in English, and they suddenly both begin to speak in Polish, I, as an outside observer, will note a gross deterioration in communication. Similarly a biologist and a physicist may have great difficulty understanding each other because they are used to thinking in quite different paradigms.

Thus we must recognize that consensual validation may be further restricted by the apparent fact that only observers in the same SoC are able to communicate adequately with each other, and they may not be able to communicate adequately to someone in a different SoC, e.g., normal consciousness. In addition to the training factor, a state-specific science may seem incomprehensible and esoteric to the layman because basic data cannot be communicated to him unless he

trains himself (which may take much time) to develop that SoC and to function well within it.<sup>5</sup>

*The Detached Observer.* One of the traditional stereotypes of science, the "detached, uninvolved observer," no longer has a place in dealing with internal phenomena of SoCs. The observer must be recognized as part of the observations. That is, we must recognize that his perceptions are selective, that he may affect the phenomena he is studying, and we must try to understand the characteristics of each individual observer in order to parcel them out, either on theoretical grounds, or by comparing the observations of observers with different personal characteristics in order to average out their effect.

*observer  
as part of  
observations*

A recognition of the unreality of the "detached observer" in the psychological sciences is becoming more and more widespread, under the topics of experimenter bias (Rosenthal, 1966) and demand characteristics (Orne, 1962). A similar recognition long ago occurred in some areas of physics when it was realized that the observed was altered by the process of observation at subatomic levels. When dealing with ASCs where the scientist is himself the observer, the experiencer of the altered state, this factor is of paramount importance and must be worked with.

#### *Theoretical Consistency*

An important step in the knowledge-acquisition process, which is also the third basic rule of science, is to think about, to theorize with respect to the observations. The requirement to theorize logically and consistently with the data is not as simple as it sounds, however. Recall that *any* logic consists of a basic set of *assumptions* and a set of rules for manipulating information, based on these assumptions. Change the assumptions, or change the rules, and entirely different outcomes from the same data may occur. In geometry, for example, one may assume, with Euclid, that parallel lines always remain the same distance apart no matter how far extended, or one may assume that they gradually meet at infinity, or that they gradually diverge as one goes to infinity. Three different geometries result from this change of assumptions. A paradigm too is a logic: it has certain assumptions, things not to be questioned, and rules for

*consequences  
of/changing  
assumptions*

<sup>6</sup> To further complicate matters, a state-specific scientist may find his own work rather mysterious or incomprehensible when he is not in that SoC because of the phenomenon of *state-specific memory*: thus he may not be able to adequately recall the phenomena he is investigating or his experimental design when out of that SoC.

working within these assumptions. By changing the paradigm, changing the SoC, the nature of a "logical" chain of reasoning, of theory building, may change radically. Thus someone in SoC #2 might come to very different conclusions about the nature of the same events observed by someone else in SoC #1. The person in SoC #1, however, cannot make any pronouncements about the *validity* of the theorizing of the person in SoC #2. One may reject another person's assumptions, *and* thus disagree, but this cannot be settled by scientific means.

*theorizing and  
state specific  
logic*

On the other hand, one may accept the other person's assumptions but argue that he has incorrectly followed his own rules. Thus, scientists in the same SoC may check each other's theorizing to see if the agreed-upon rules have been consistently followed. We have, then, the possibility of a *state-specific logic* underlying theorizing in various SoCs.

Modulating this process of one scientist checking another's theorizing is the previously mentioned factor of state-specific communication. Until two scientists are reasonably convinced that they can communicate adequately (Tart, in preparation), it is difficult or impossible for them to check each other's reasoning.

Clearly then, an outsider, one not in a given SoC, may not be able to decide whether logical processes in a given SoC have deteriorated (in the sense of errors being frequent) or whether they are correct but follow a different logic.

*checks on  
validity of  
intuition*

Thus in the third stage of the knowledge-acquisition process, the scientist may attempt a number of cognitive strategies to make sense out of the data. He may attempt to apply to the problem principles appropriate to that SoC; he may try a random application of principles if he has no particular guidelines; or he may find cognitive processes occurring that are outside of his awareness, viz., the kind of processes we call intuition. Insofar as he can describe his reasoning processes and communicate them to another in the same state, their validity can be checked and we are following good scientific procedure. Further, even if some of the theorizing is nonconscious or "intuitive," if different scientists starting from the same data and all employing "intuition" nevertheless arrive at the same outcome, in spite of being unable to describe how they arrived at this outcome, this constitutes a check on the validity of the intuition.

In terms of the knowledge-acquisition process, we now ar-

rive at what often is a terminal stage, the experience of a new understanding of what was initially puzzling. If no new understanding is arrived at, or the new understanding feels only partially correct, the preceding steps may be recycled until a certain kind of experience, a feeling of understanding, occurs.

#### *Observable Consequences of Theory*

While ordinary knowledge-acquisition processes stop at this point, an essential requirement of science is that the new understanding be accepted only after the predictions of observable consequences, inherent in the theory, are verified by observation. No matter how elegant, formal, mathematical, or aesthetically pleasing the new understanding, it *must* be subject to testing in terms of observable consequences. Now, while we ordinarily think of "empirical" validation, of validation in terms of testable consequences that produce *physical* effects, this is not necessarily required. Again, we note that any effect interpreted as physical is ultimately an experience in the observer's mind. Essentially, all that is required to validate a theory is that it predict that "When such and such experiences (observation conditions) have occurred, another (predicted) kind of experience will follow, under specified experiential conditions." Thus a perfectly scientific theory may be based on data that have no physical existence but that give rise to a theory, a concept, that another observer can experience. Insofar as this observable consequence is indeed experienced, the theory is tentatively valid until further expansion of the inquiry process calls for a more adequate formulation.

*physical effects  
not necessarily  
required for  
validation*

*State-Specific Congruence.* Note that this process of experiential validation requires that one experience (observed data) be *congruent* with another experience (the cognitive, theoretical structure). The criteria for congruence (does this experience really prove the theory?) may also vary from one SoC to another, depending on the kind of overall cognitive changes that have taken place in a particular SoC. Too, we must remember the problem of state-specific communication complicating the problem of whether two observers, both in a given SoC, agree that a theory has indeed been confirmed in terms of its predicted consequences.

#### STATE-SPECIFIC SCIENCES

In the human practice of the basic rules of science, the basic picture we see is this: centered around interest in some

*conditionsof  
scientific  
observation*

particular range of subject matter, a small number of highly selected, talented, and rigorously trained people spend considerable time carrying out detailed observations on the subject matter of interest. They may or may not have special places (laboratories) or instruments or methods to assist them in making finer observations. They speak to one another in a special language, which often makes little sense to the layman, but which they feel precisely and succinctly conveys the important facts of their field. Using this language, they confirm and extend each other's knowledge of certain data basic to the field. They theorize about their basic data and construct elaborate systems, which often make little or no sense to the layman. They validate these theoretical systems by recourse to further observation. Sometimes the effects observable to a layman seem to be obviously important effects, but often they do not seem to be important, and/or it is not at all clear how or why they validate a rather mysterious set of theories. This group of trained people all have a long-term commitment to the constant refinement of observation and extension of theory.

This general description is equally applicable to a variety of sciences, or areas that could become sciences, whether we called such areas biology, physics, chemistry, psychology, understanding of mystical states, drug-induced enhancement of pleasure, etc. *Externals* would look very different, but the basic scientific method running through all is the same.

*definitionof  
statespecific  
science*

The above discussion now makes it possible to define a *state-specific science*: a group of highly skilled, dedicated, and trained practitioners are able to achieve a certain SoC, and agree with one another that they have attained a common state. Given that SoC, they may then investigate further problem areas of interest, whether they be totally "internal" phenomena of that given state, or the interaction of that state with "external," physical reality or people in other SoCs,

*an example  
of a state  
specificscience*

We have one example of such a state-specific science—"ordinary-consciousness science"—that has succeeded very well, namely Western science. *Almost* any branch of ordinary science would have looked chaotic and error-ridden if one looked only at its beginnings, but in their present state of evolution most of them have reached a high degree of sophistication and success,"

<sup>6</sup>This is not quite a "pure" state-specific science, as many important breakthroughs in this state-specific science, this "normal-state-of-consciousness science," have resulted from intrusions of insights gained in other SoCs. What we

Within our western scientific tradition, we have not yet developed state-specific sciences for states other than our normal, waking state,"

#### *Level-Specific Sciences*

Within a state-specific science, it is possible that we might have *level-specific sciences*. That is, many SoCs exhibit clear gradations along some dimension, this dimension often being referred to as *depth, level, profundity, intensity*, etc. Common threads run through all these levels; for this reason we consider them levels of a single SoC rather than separate SoCs (Tart, 1972). Nevertheless, the kinds of alterations in perceptual and cognitive processes at a more intense level of a given SoC, as compared to a less intense level of the same SoC, might give rise to rather different level-specific sciences. We shall leave this problem to the future, for now,"

*gradations  
within  
specific states*

#### *Selective Nature of State-Specific Sciences*

In principle, the investigator who does not develop skill in functioning in a particular SoC cannot hope to be a good investigator of it. He simply cannot have direct access to a variety of data, and/or cannot directly validate the reasoning involved in theorizing himself, even though he may be able to deal with peripheral aspects of the science or investigate its manifestations from the view of another SoC, as discussed in the next section.

*special need for  
self-knowledge  
in ASC  
experimenter*

Again we should emphasize that because the experimenter is no longer separate from the experiment, the characteristics of the experimenter-observer, as they affect his observations and theorizing, are very important to know. One of the most important aspects of training for a state-specific scientist may be prolonged psychological training in learning to recognize his own biases and sources of distortion. Because intent, wish, or desire can create vivid experiences in some SoCs, it is much more important for the investigator-observer of ASCs to be very aware of such desires and

often call "creative" scientific breakthroughs have, in many cases, occurred in states of reverie, dreaming, meditative-like states, etc.

7A very big assumption is being made here of the uniformity of normal consciousness across people. This is probably a very poor assumption, but at the present, ~~crude~~ state of our knowledge, it provides a useful discrimination.

8Some experimental data and some traditions of various mystical schools suggest that at very profound levels of some ASCs, experiences become very similar, whereas they were quite dissimilar at lower levels. This suggests that some of the overall *relationships* between levels of SoCs may follow similar laws, despite difference, in particular contexts and overall *organizations* of the states. This is an interesting problem for investigation.

biases in himself, than, say, an investigator in the physical sciences, where the ordinary range of feelings about the outcome of an experiment may not produce gross errors in the reading of meters.

#### *Experimenter-Observer-Subject*

*some alternative  
functions  
ofASC  
experimenter*

The fact that the experimenter must be able to function skillfully in the relevant SoC does not necessarily mean that he is always the "subject." While often he is subject, observer, and experimenter simultaneously, it is quite possible for him to collect data from experimental manipulations of other subjects in that SoC, and either be in that SoC himself at the time of data collection and/or be in that SoC himself for data reduction and theory building. The problems discussed under the heading of state-specific communication apply very much to the collection of data from subjects in ASCs.

#### *Illustrating a State-Specific Science*

It would be valuable to give some concrete examples of data and theories of state-specific sciences. This cannot be done, because we have not yet developed such sciences. Further, any such examples might well fail to illustrate the need for developing state-specific sciences, for if they were readily comprehensible to the reader (who is, presumably, in an ordinary SoC), they would not illustrate how a state-specific science could handle certain kinds of data in a way that cannot be done in an ordinary SoC.

*recommended  
accountsof the  
teachingsof  
don Juan*

For the reader who would like to get some feel for the difficulties in comprehending data and theories from an ASC, however, I cannot recommend too strongly the excellent accounts by an anthropologist, Carlos Castaneda, of his attempts to comprehend the ASC effects and beliefs of a Yaqui Indian sorcerer, don Juan (Castafieda, 1968, 1971). I do not know whether don Juan's system comprised a developed state-specific science (with a constant commitment to refinement) or only a state-specific belief system and technology, but Castaneda's accounts of his attempts to comprehend the system from his ordinary SoC and Western scientific training are unsurpassed in illustrating the problems of understanding an SoC from the "outside."

#### *State-Specific Art*

While we do not have any developed, state-specific sciences, other than normal-consciousness science, to use as an illustra-

tion of the actual workings of a state-specific science, we do have a contemporary example of a somewhat similar field, a *state-specific art*. This art is the style of music known as *acid rock* or, more generally today, simply as rock.

*example  
of state  
specific art*

Acid rock evolved from the musical style known as rock and roll when LSD and marijuana use became relatively common among many young musicians. While called acid rock for this reason, much of the art, probably the major part, is played by and intended for people who are in the ASC of marijuana intoxication.

The art is state-specific in that it uses a number of the common experiential qualities of marijuana intoxication (Tart, 1971a) (also found with LSD) to communicate certain things and produce certain effects that cannot be done very well in ordinary consciousness. While some of the special effects transfer between SaCs, i.e., acid rock is appreciated to some extent by listeners in ordinary consciousness, to most people acid rock sounds chaotic and loud, and they can't understand the words of the songs. Common effects of marijuana intoxication are hearing new, subtle qualities to sounds and being able to understand the words of songs better. as well as space becoming structured in terms of auditory qualities rather than visual qualities at high levels of intoxication. Thus acid rock shows state-specific communication, for much of it can be understood only by people in that Soc.

This example differs from a state-specific science in being aimed at producing esthetic effects rather than consensually validated knowledge.

### *Sciences and Religion*

On the surface, many aspects of organized religion appear to resemble state-specific sciences. Techniques exist to allow the believer to enter an ASC and then have religious experiences in that ASC which are the "proof" of his religious belief. People who have had such experiences usually describe them as ineffable in important ways, i.e., as not fully comprehensible in an ordinary SoC. The conversions so common at intense revivalistic meetings are the most common example of religious experiences occurring in various types of ASCs induced by an intensely emotional, religious atmosphere.

In examining the esoteric training systems of some religions,

there seems to be even more resemblance between such mystical ways and state-specific sciences, for here we often have the picture of devoted specialists, complex techniques, and repeated experiencing of the ASes in order to further religious knowledge.

Are the proposed state-specific sciences simply religion in a new guise?

*ASCs and  
belief systems*

They are not. The use of ASCs in religion *may* involve the kind of commitment to the search for truth that is needed for developing a state-specific science, but in practically all the religions we know of, what we have is a state-specific *technology* operated in the service of an a priori belief system. That is, the experiencers of ASCs in most religious contexts have already been thoroughly indoctrinated in a particular belief system before experiencing any ASCs. This belief system may then mold the content of ASCs to create specific experiences that reinforce or "validate" the belief system, which "prove the faith." For example, in the revival, a person with a Christian belief system is subjected to incredibly intense emotional pressure until, in many cases, the normal SOC temporarily breaks down, an ASC occurs (we do not know enough to be more specific about this ASC at present), and the pressure that produced the ASC now structures it so that Christian beliefs take on the appearance of direct experience, "revelations."

The crucial distinction, then, between a religion using ASCs and a state-specific science, is the commitment of the scientist to constantly reexamine his own belief system, to "question the obvious" in spite of its intellectual and/or emotional appeal to him. Investigators will certainly encounter an immense variety of phenomena labeled religious experience or mystical revelation in the development of state-specific sciences, but they will have to remain committed to examining these phenomena more carefully, sharing their observations and techniques with colleagues, and subjecting the beliefs (hypotheses, theories) that result from such experiences to the required testing of predictions. In practice, knowing what we do about the immense emotional power of mystical experiences, this will be a difficult task, but it is one that must be undertaken by disciplined investigators if we are to understand various SoCs.

#### INTERRATIONSHIPS AMONG STATE-SPECIFIC SCIENCES

Any state-specific science, or branches of science within a state-specific science, may be considered as consisting of two

parts, namely observations and theories. The observations are what can be relatively *directly* perceived, the theories are the *inferences* drawn about the observations. Some theories are well supported by tests with further observations, others are tentative, awaiting development of ways to adequately test them.

In comparing several state-specific sciences, we might find that what was observational data for one was a theoretical inference for another. In this way different state-specific sciences might provide *complementary* views of the same phenomena, as well as discrete views of phenomena specific to each SoC.

It would be premature to talk about observations in one state-specific science *validating or invalidating* observations in a second state-specific science; I prefer the more conservative position of saying that two or more different sciences, where they overlap, provide quite different points of view with respect to certain kinds of theories and data, thus complementing each other. In a more general sense, the extension of scientific method to state-specific sciences, proposed in this paper, neither validates nor invalidates our ordinary scientific activities, a science specific to a normal SoC. What we do now in normal science deserves as much extension and continuation as it can get, but the possibility of developing certain state-specific sciences means that certain kinds of phenomena may be handled more adequately within these potential new sciences.

*complimentary  
relationship of  
ordinary to state  
specific science*

### *Cross-Fertilization*

As mentioned previously, the possibility of cross-fertilization among different state-specific sciences is very real. Many instances of creative breakthroughs in normal SoC science have occurred when the scientist temporarily went into an where a quite different view of the problem was taken and different kinds of reasoning, conscious or nonconscious, led to outcomes testable within ordinary SoC science.

*breakthrough  
factor in  
normal SoC  
science*

A current example of cross-fertilization beginning to take place between a traditional scientific approach and what might be a state-specific science is the finding that in Zen meditation (a highly developed discipline in Japan) there are physiological correlates of meditative experiences, e.g., decreased frequency of alpha-rhythm (Kasamatsu & Hirai, 1966), which can also be reproduced via instrumentally aided feedback-learning techniques (Kamiya, 1969). This

*example  
of cross  
fertilization*

method has the possibility of casting light on processes peculiar to each discipline.

It is difficult at present to predict what various ASCs could lead to in terms of state-specific sciences, because our knowledge of the phenomenology and potentialities of these states is generally too crude and incomplete. Given the immense importance that some practitioners of these ASCs attach to them, and the drastic changes resulting in their life style, one could safely predict that state-specific sciences will handle *certain* kinds of important phenomena very well, although we cannot specify in detail what these will be at present.

### *"Higher" States of Consciousness*

While the term "higher" is frequently used by practitioners of some ASCs, it is seldom defined clearly. It generally carries the connotation that the SoC being reported on is in some way(s) superior to or more profound than ordinary consciousness. Particular phenomena that often lead to this kind of claim include feelings of insights into oneself, insights into others, intuitive understandings of the nature of the universe, or comprehension of an individual's place in the overall scheme of things.

*definition of  
"higher" state  
of consciousness*

Let us define one SoC as *unequivocally* higher than another SoC if *all* functions available in the lower SoC are not only available in the higher SoC, but either (1) some or all of these functions work more efficiently and/or (2) some new functions, of positive value, are present that were not present in the lower SoC. Looked at this way, and based on our *current* scientific knowledge of ASCs, we do not know of any unequivocally higher state. The various *SaCs* we know of seem to have both strengths and weaknesses, improvements and decrements, so that one SoC may be "higher" than another with respect to *some specific function*, but "lower" for another specific function. For example, a state of marijuana intoxication might yield more creative insights in thinking about the meaning of life than ordinary consciousness, but might be inferior to ordinary consciousness in its effects on complex psycho-motor tasks.

### *Individual Differences*

One of the most widespread and misleading assumptions that hinders the development of state-specific sciences and con-

fuses their interrelationships is the assumption that, because two people are "normal," i.e., not certified insane, their ordinary SaCs are essentially the same. We know, however, that there are enormous differences between the SaCs of normal people. Because societies train people to behave and communicate along socially approved lines, these differences are covered up, written off as "quirks, idiosyncracies, personality differences," etc.

*false  
assumptions  
regarding  
"normality"*

For example, some people think in images, others in words. Some can voluntarily anesthetize parts of their body, most cannot. Some recall past events by imaging the scene and "looking at" the relevant details, others use complex verbal associative paths with no images.

*examples*

This means that person A may be able to observe certain kinds of experiential data (have certain experiences) that person B cannot experience *in his ordinary SoC* no matter how hard B tries. Several consequences may result. Person B may think that A is "nutty," too imaginative, or a liar, or he may feel inferior to A. Person A may also feel "odd" if he takes B as a standard of "normality."

In some cases, however, B may be able to enter an ASC and there experience similar sorts of things that A has reported to him. A realm of knowledge that is "ordinary" for A is then state-specific knowledge for B. Similarly, some of the experiences of B in his ASC may not be available to direct observation by A in *his* ordinary state.

As a practical example, consider the phenomenon of synesthesia, the most common form of which is seeing colors in one's mind when stimulated by sounds. Some individuals possess this ability in their ordinary SoC, most do not. Yet many individuals who have never experienced this in their normal SoC may do so when in the ASC produced by marijuana intoxication (Tart, 1971a).

Thus we may conceive of bits of knowledge that are ASC-specific for one individual, part of ordinary consciousness for another. What is an ASC-specific science for the one may be (partially) ordinary knowledge for another. Rather than quarrel over the usefulness of the concept of states of consciousness (as happens in current scientific literature), effort would be better devoted to understanding how the various individuals differ.

*preferred  
approach to  
individual  
differences*

Another important source of individual differences, little un-

*transferability  
phenomena*

derstood at present, is the degree to which an individual may first make an observation (have an experience) in one SoC and then be able to reexperience it in another SoC. That is, many bits of information that were state-specific for initial observation can be "learned" in some fashion and transferred (fully or partially) to another SoC. Differences among individuals, the number of combinations of SoCs, and types of experience, will probably be enormous.

#### PROBLEMS, PITFALLS, AND PERSONAL PERILS

Judging by the practical experience of Western man with ASCs, it is clear that, on a practical level, the development of state-specific sciences will be beset by a number of difficulties. These difficulties are of two kinds: first, general methodological problems that arise from the nature of some ASCs; and second, personal perils and dangers to the potential investigator. We shall discuss these separately.

#### *State-Related Problems*

*problem of  
"obvious"  
perception  
of truth*

The first important problem in the development of state-specific sciences is a phenomenon that may be described as the "obvious" perception of truth. In many ASCs, one's experience is that one is *obviously*, lucidly, experiencing truth *directly*, with no questions about it. An immediate result of this may be an extinction of the scientific desire for further questioning, further investigating, investigation of the "obvious." Indeed, one way of looking at science is that it is a realization that the investigation of what does not seem to need investigation often leads to important advances in knowledge. Further, this experience of "obvious" truth, while not necessarily preventing the individual investigator from further examining his data, may not arouse his desire for consensual validation. Since one of the greatest strengths of science is its insistence on consensual validation of basic data, this can be a serious drawback. Investigators attempting to develop state-specific sciences must learn to distrust the obvious.

*problem of  
enhanced  
visualizing and  
imaginative  
abilities*

Another major problem in developing state-specific sciences is that, in some ASCs, one's visualizing and imaginative abilities are immensely enhanced, so that whatever one imagines seems perfectly "real." Thus one can *imagine* observations (based on nonconscious personal desires) and experience them as direct *data*. If one can essentially conjure

up anything one wishes, and see it as basic data, how can we ever get at truth?

One way of looking at this problem is to consider any such vivid imaginings as *potential effects*: they *are* data, in the sense that what can be vividly imagined in a given SoC is important to know. It may *not* be the case that *anything* can be imagined with equal facility, and the relationships between what can be imagined may show a lawful pattern.

More generally, the way to approach this problem is to realize that it is not unique to ASCs. One can have all sorts of illusions and misperceptions in ordinary consciousness. Indeed, before the rise of modern physical science, all sorts of things were imagined about the nature of the physical world that could not be directly refuted. The approach that eliminated these illusions in the physical sciences is the same approach that will eliminate them in state-specific sciences dealing with nonphysical data, namely, to attempt to subject all observations to consensual validation and/or to work out their theoretical consequences and then test the predictions of these theories. Insofar as experiences are purely arbitrary imaginings, they will not show consistent patternings and interobserver replications, and so in the long run will be distinguishable from those phenomena that do show lawfulness.

The complicating effects of this enhanced vividness of imagination in some ASCs should also be compensated for with respect to two other important problems, namely the problem of experimenter bias, now increasingly recognized in ordinary psychology, and the fact that one person's illusions in a given ASC can be communicated to another person in the same ASC, leading to a kind of false consensual validation. Again, the only long-run solution to this is the requirement of the experiential verification of predictions based on the concepts arising from various experiences.

A third major problem in the development of state-specific sciences is the fact that they probably cannot be developed for all ASCs: some ASCs may involve genuine deterioration of observational and reasoning abilities, or a deterioration of volition, such that one cannot adequately develop a state-specific science even if one desires to. SoCs that seem likely candidates for the development of state-specific sciences will be discussed in the next section. Note, however, that this should be finally decided upon as a result of sustained attempts, not by *a priori* decisions based on reasoning in our

*problemsOf  
experimenter  
biasand  
communication  
of illusion*

*possibility of  
deteriorationOf  
observational  
and reasoning  
abilitiesor  
of volition*

ordinary SoC, in which we may not be able to adequately assess the potentials of another SoC.

*problem of ineffability*

A fourth major problem is that of *ineffability*. Some experiences are ineffable in the sense that: (1) a person may experience them, but be totally unable to express or conceptualize them adequately to *himself*; and/or (2) while the person may be able to conceptualize an experience to himself, it is ineffable in the sense that he simply cannot adequately communicate it to anyone else. Thus certain phenomena of the first type may simply be inaccessible to scientific investigation. Phenomena of the second type may be accessible to scientific investigation only insofar as we are willing to recognize that a science, in the sense of following the basic rules, may exist only for a single person. That is, one person may be as scientific as possible in attempting to understand his personal experiences. Insofar as such a solitary science would *lack* all the advantages gained by consensual validation, however, we could not expect it to have the full power of scientific investigation.

Note that many phenomena now considered "ineffable" may not be so in reality. This may be simply a matter of our general lack of experience with ASCs and the lack of an adequate language for communicating about ASC phenomena. The only well-developed languages we know of are state-specific for a normal SoC. No phenomena should be considered ineffable in principle, but only after lang attempts at adequately investigating and communicating.

*problem of uniqueness*

A fifth problem in developing state-specific sciences may be that some "internal" phenomena are so unique to an individual that there simply is nothing that can generally be learned about them. Such a phenomenon may be useful for a "solitary science," but not useful for a general state-specific science. Nevertheless, a vastly neglected approach in the psychological sciences has been the study of lawfulness within an individual. That is, an individual may have totally unique experiences, but there may be very lawful patterns within his experiences that are accessible to study. The lawfulness of the *patterns* may indeed be generalizable across individuals, even though the individuals' experiences are totally unique.

*possible intractable complexity*

Finally, we should recognize the possibility that various phenomena of ASCs may simply be too complex for human beings to understand. There may simply be too much input, affected by too many variables, for us to grasp adequately.

Thus we would see various phenomena as so unstable and unreliable that we couldn't make sense out of them. Note that in the history of science, however, many phenomena that appeared too complex at first were eventually comprehensible, so we simply have to try here also and see what happens.

### *Personal Perils*

The kinds of personal perils faced by an investigator attempting to develop a state-specific science are of two sorts, those that we might call "bad trip" perils, and those that we might call "good trip" perils.

The possibilities of a bad trip, an extremely unpleasant, emotional reaction in an ASC, with possible long-term adverse consequences on a person's personal adjustment, generally stem from the fact that training and upbringing in American society have not prepared most people to undergo radical alterations in their own SoC. Here we deal with various needs for stability, fear of the unknown, personal rigidity (so that change to a different state seems threatening), and various kinds of personal and social taboos. For example, my own observation is that during the short period of sexual orgasm there is a marked change in my SoC, with many state-specific phenomena, including state-specific memory, and other intriguing effects. I am reluctant, however, to commit this observation to paper because of social taboos, and I doubt very much that I could receive grant support to begin investigating orgasm consciousness, much less develop a major project for developing a state-specific science of this SoC. General tradition in our society considers ASCs as signs of craziness, and so usually induces great fear in people when they begin to experience them.

*"bad trip" perils*

Another aspect of the bad-trip peril is that, in many ASCs, defenses against unacceptable personal impulses are altered, and become partially or wholly ineffective, so the person is flooded with traumatic material that he cannot handle. All of these things result in a generalized fear and avoidance of ASCs, and make it difficult or impossible for some individuals to function in them in a way consistent with the development of a state-specific science. Maslow (1966) has discussed these as *pathologies of cognition*, which seriously interfere with the scientific enterprise in general as well as with ordinary life. In principle, adequate selection and training could reduce these hazards for at least some people, but

these hazards may be too probable for some investigators and so preclude them from investigating ASCs.<sup>9</sup>

*"good trip"  
perils*

The second major category of personal perils may be considered as arising from *too good* a trip, i.e., having such rewarding experiences in ASCs that they again interfere with the scientific activity of the potential investigator. The perception of "obvious truth" and its weakening of the need for further investigation or consensual validation, and the ability to imagine or create vivid experiences, have already been mentioned above. Similarly, *attachment* to good feelings, ecstasy, and the like, and refusing to consider alternative explanations, can seriously stifle the progress of investigation.

*necessity for  
adequate  
training*

These personal perils again emphasize the necessity for developing adequate training for scientists who wish to develop state-specific sciences. It is hard at present to envision the form that this training will take, except to note two very likely considerations. First, it is clear that much of the conventional scientific training given in the ordinary sciences is of a sort that is contrary to what would be needed to develop a state-specific science. Much conventional training produces rigidity and avoidance of personal involvement with subject matter, rather than open-mindedness and flexibility. Second, much of the training will have to be devoted to self-understanding in order to minimize the (unconscious) effects of personal biases.

Note also that considerable experience with and adaptation to a particular SoC will be necessary for a state-specific scientist. One of the great shortcomings of our present experimental knowledge of ASCs is that almost all of it has been gathered from naive subjects; subjects with practically no experience of that ASC. Thus almost all their reactions in the laboratory have been *coping* reactions, attempts to adapt to a strange and possibly frightening situation. Being completely involved in coping does not make for good observation of characteristics other than one's own coping reactions.

<sup>9</sup>In general, people who develop a personal interest in ASCs or "higher" SoCs tend to think that once they become interested in "spiritual" matters of this sort it is very difficult for them to err, that they have transcended ordinary human concerns and problems. In point of fact, it is clear that all the various kinds of neuroses and pathologies that occur in the context of everyday life can also occur around the subject matter of spiritual development or higher understanding, and are that much worse for being unrecognized. A major contribution will be made by someone who develops an adequate psychopathology of the spiritual path, in order to make people more aware of the very real distortions of belief in thinking and similar dangers that can occur.

Many of us know of unfortunate examples of scientists who were successful in conventional sciences before becoming personally involved with ASCs, and who subsequently became very poor scientists or experienced personal psychological crises. It would be premature, however, to conclude from this that such unfortunate outcomes cannot be avoided with proper training and discipline. In the early history of the physical sciences we had many fanatics who were poorly balanced people and nonobjective about their investigations. While the perils may be greater in developing sciences for some ASCs, not all experiencers of various ASCs develop pathology from them. Indeed, many seem to become considerably more mature. Only actual attempts to develop state-specific sciences will be able to tell us what SoCs or what kinds of people are unsuitable for such developments, and what SoCs yield fruitful results."

*lessons from  
history*

#### PROSPECTS

I believe the strongest argument for the urgent necessity of developing state-specific sciences, as well as an indication of what the potential benefits of such sciences may be, can come from a look at both our current societal situation and human history. One of the most important factors in human history is what we might call the *spiritual* or *mystical* factor, as it is expressed (often in watered-down form) in the religions that attract the masses of people. Spiritual and mystical experiences, insofar as we understand them, are a primary phenomena of various ASes. Because of experiences in ASes, untold numbers of both the noblest acts and the most horrible atrocities have been committed. Yet in all the time that Western science has existed, no real attempt has been made to understand these ASe phenomena in scientific terms.

It was the hope of many that religions were simply a form of superstition, and that superstition would be left behind in our "enlightened, rational" age. Not only has this hope failed historically, but our own understanding of the nature of reasoning now makes it clear that it can never be fulfilled. Reason is a tool, and a tool that is wielded in the services of assumptions, beliefs, and needs, which themselves are not subject to reason. The irrational, or, better yet, the arational

*reasons a  
"tool"*

<sup>10</sup>The ASCs resulting from some of the very dangerous drugs (heroin or alcohol, for example) may be of scientific interest, but the personal risk may be too high to warrant developing a state-specific science for such ASCs. The personal and social issues involved in evaluating such risks are beyond the scope of this paper.

will not disappear from the human situation. Our immense success in the development of the physical sciences has not been particularly helpful in formulating better philosophies of *life*, or increasing our real knowledge of *ourselves*. The science we have developed to date is not a very human science. It tells us *how* to do things, but gives us little scientific insight into the question of *what* to do, *what not* to do, or *why* to do things.

*pre-situation*

Much of the current crisis in our culture today can be traced to a breakdown in the functioning of our old religious systems, and the inadequacy of a "scientific" view of life to replace them with something more functional. Not only the technologically trained youth of today, but many mature scientists are increasingly turning to meditation, oriental religions, humanistic psychology, and personal use of psychedelic drugs, because the phenomena encountered in the ASCs frequently associated with these activities are more satisfying, more relevant in formulating a philosophy of life and deciding upon appropriate ways of living, than "pure reason." My own impression is that very large numbers of scientists are now personally exploring ASCs, but few have begun to connect this personal exploration with their scientific activities.

*a basic question*

A basic question then is whether we shall continue to let ASCs exert their profound power over human life as scattered, chaotic *bits* of knowledge, subject to great misunderstanding, or whether we shall attempt to expand our conception of science and develop state-specific sciences that could vastly improve our ability to function in, understand, and learn from such ASCs.

*favorable prospects*

It is difficult to be more specific in indicating what the prospects, the gains would be from an adequate development of state-specific sciences. Our knowledge is still too scattered, chaotic, and *indirect* knowledge of what can be understood of ASCs in normal consciousness. Yet I think it is very likely that we might be able to develop state-specific sciences for such SoCs as autohypnosis, meditative states, lucid dreaming, marijuana intoxication, LSD intoxication, self-remembering, reverie, and biofeedback-induced states. In all of these states, *volition* seems to be retained, so that the observer can indeed carry out experiments on himself and/or others. Other *SoCs*, in which the volition to experiment during the state may disappear, but in which some experimentation can be carried out by setting up special conditions previous to entering the state, might be alcohol intoxication,

ordinary dreaming, hypnogogic and hypnopompic states, and high dreams (Tart, 1969). For many other ASCs, it is not clear whether they would be suitable for developing state-specific sciences or whether deterioration is too high. Only actual attempts will tell.

I am not opposed to religions and mystical groups, although I have personal preferences pro and con about specific ones. Yet I suspect that the vast majority of these mystical and religious groups have actually developed a compelling belief system rather than a state-specific science. Will scientific method be extended to the development of state-specific sciences, perhaps making possible a better *human* situation than that provided by many cults and sects? I hope so.

*hopes for  
the extension  
of scientific  
method*

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mental functioning," Similarly, Ludwig (1966) defines an altered state of consciousness as

any mental state induced by various physiological, psychological, or pharmacological maneuvers or agents, which can be recognized subjectively by the individual himself (or by an objective observer of the individual) as representing a sufficient deviation in the subjective experience or psychological functioning from certain general norms for that individual during alert, waking consciousness.

There is the question of whether or not these quite varied states can be reduced to a common denominator. Freud (1900) attempted to do so in his discussion of attention cathexis in Chapter VII of *The Interpretation of Dreams*, and his ideas were later systematized, refined in some areas and expanded in others, by Rapaport (1951), who attempted to provide a metapsychology sufficiently comprehensive to handle all these complex and diverse phenomena.

#### DE-AUTOMATIZATION

*attention and de-  
automatization*

The prolonged focusing of attention, whether in meditation or hypnosis, often leads to an altered state of consciousness. In the case of meditation, this altered state is documented not only by subjective reports but by numerous psychophysiological correlates as well (e.g., Kasamatsu and Hirai, 1969, Anand et al., 1961, Kamiya, 1969, Wallace, 1970). The process whereby sustained attention leads to an altered state has been called de-automatization. The concept of de-automatization is derived from Hartmann's (1958) discussion of the automatization of motor behavior. According to automatization occurs when with increasing prac-

Thus, de-automatization is the undoing of automatization by reinvesting automatized actions, thoughts, or precepts with attention. The techniques of both meditation and hypnotic induction seem to constitute just such a manipulation of attention as is required to produce de-automatization. The occurrence of cognitive or perceptual de-automatization presumably results in a change in the state of consciousness through a shift in the level of perceptual and cognitive organization.

*meditation,  
hypnotic  
induction,  
and de-  
automatization*

#### ATTENTION AND MEDITATION

The techniques of meditation offer an ideal laboratory for studying attention and de-automatization. There are a number of techniques for meditating (see Maupin, 1969) but the essence of all of them is that the meditator works to gain control over his attentional processes. Gaining mastery over one's attention is difficult work for there seems to be a natural tendency for attention to constantly shift from one point of focus to another. DeRopp (1968, p. 71) says, "Only by work, by a steady, unremitting effort can he learn to stop the wheel of the imagination, to halt that flood of inner conversations, arguments, mere chatter, with which the roof brain, by its useless overactivity, floods the awareness from dawn to dusk." In the *Bhagavad-Gita*, Prince Arjuna says to Krishna. "The mind is restless, turbulent, powerful and obstinate . . . I deem it as difficult to control as the wind." Another Yogic text (Satprem, 1964, p. 35) compares the mind to a grinding machine:

*control over  
attentional  
processes  
meditation*

For the mind does not seek to know truly, though it seems to-it seeks to grind. Its need of knowledge is primarily a need of something to grind. And if perchance the machine were to come to a stop because the knowledge was found, it would quickly rise in revolt and find something new to grind, to have the pleasure of grinding and grinding. This is its function,

Thus, we seem obsessively compelled to have thoughts during all our waking hours, even when not engaged in the problem solving for which thought presumably evolved. So it is that in meditation one attempts the difficult task of gaining control over this apparently wasteful dissipation of attention by fixing attention either on one thing or on nothing. Deikman (1963) did preliminary research on meditation in which he had a small number of subjects fix their attention on a vase for periods over 12 sessions while distracting stimuli were played on tape. Even within this small

*research based  
on meditation  
techniques*

number of meditative sessions, his subjects reported a wide range of striking alterations in perception and thought, which Deikman explained in terms of sensory translation, reality transfer, and perceptual expansion, all of which he believed to be a consequence of a de-automatization of the psychological structures that organize, limit, select, and interpret perceptual stimuli.

Maupin (1965) attempted to study ego functions that he felt would be relevant in meditation. In his study, male college volunteers were instructed in an exercise related to Zen Buddhist meditation procedures and their subjective response to the exercise was rated high, moderate, or low based on their verbal reports taken after daily sessions over a three-week period. He hypothesized that successful response to the exercise would correlate with measures related to attention, tolerance for unrealistic experience, and capacity for regression in the service of the ego. While capacity for regression and tolerance of unrealistic experience significantly predicted response to meditation, the attention measures he used did not. This rather surprising failure he attempted to explain *post hoc* by suggesting that "Once issues related to comfort in the face of strange inner experience are resolved, attention functions necessary to the experience probably become available." However, it is possible that Maupin dismissed the role of attention too easily. A somewhat more likely possibility is that the particular measures of attention he used (digit span, continuous additions, and size estimation) did not correlate because they were confounded with factors other than attention and did not tap into the most relevant aspects of the attention construct *vis a vis* meditation. Later, two alternative measures of attention will be proposed which, at least on the face of it, appear to be more directly relevant to the meditation task and less confounded. Maupin did find that experimental meditators experienced many of the alterations of consciousness classically reported in mystic literature. These striking subjective changes were a consequence, presumably, of instructions to the subjects to focus their attention on their own breathing.

#### A NOVEL TECHNIQUE FOR STUDYING ATTENTION DURING MEDITATION

The technique is incredibly simple, but a detailed description of the procedure follows, in the event that others wish to use it.

Forty-seven male undergraduates at the University of Michigan, 18-23 years, participated as paid volunteers in a study on meditation, hypnosis, and attention. In the course of this study each subject was asked to report an intrusion each time his attention wandered during two meditation exercises. One of the meditations selected involved attending to an external stimulus (candle-gazing), the other to an internal stimulus (breathing). The subject was seated in a small anechoic chamber and the experimenter read aloud the following instructions:

*description of  
procedure in  
Van Nuy's  
experiment*

The purpose of this session is to study your attention style. Some people are able to focus their attention readily on one thing while others tend to scan over a number of things. Of course, we all do both of these, focusing and scanning, to some degree *but* generally a preferred mode develops. In this next task, I am going to ask you to focus your attention on one thing and I am going to rely on your report of the extent to which you were or were not able to keep your attention focused.

Let me show you what I mean by having you practice focusing your attention on this doorstep here (the doorstep just happened to be a convenient fixation point that was at eye-level across from the seated S). In a moment, I am going to ask you to sit back comfortably in your chair and fix your attention on this doorstep. By focusing your attention on the doorstep, I do not mean analyzing its different parts, or thinking a series of thoughts about it, or associating ideas to it, but rather trying to see the doorstep *as it* exists in itself, without any connection to other things. Try to exclude all other thoughts or feelings or sounds or body sensations. Do not let them distract you but keep them out so that you can focus all your attention, all your awareness on the doorstep itself. Try to let the perception of the doorstep fill your entire mind. Is this much clear? OK, I'd like you to try it for a minute or two right now . . .

Fine. How did it go? At some point, you may have noticed yourself thinking about something rather than just focusing on the doorstep. Most people find it fairly difficult to keep their mind empty of thoughts and it is expected that you will experience the intrusion of random thought. I'd like you to signal each time such an intrusion occurs by pressing this button (E shows S the button which was mounted in a small 2½" X 11/2" X 2" chassis box so that the S could hold it comfortably in one hand on his lap. The button electrically activated a counter outside the experimental chamber.) Some extremely fleeting thought or perception may cross your mind and not be counted as an intrusion so long as you do not get

caught up in a stream of thought about it. An intrusion is counted whenever you find that you have gotten caught up in some thought or other and, by force of will, have to bring yourself back to the task of just focusing on the doorstop. It is as if you have momentarily forgotten the task or had a slight lapse of consciousness and then suddenly remembered what you were supposed to be doing. It is very important that you report the intrusions as honestly as you can without getting caught up in trying to look good to me. I assure you that I am only interested in studying your attention style as it is and I have no basis for making judgments of good or bad. So just do your best to report an intrusion whenever you notice that you are not concentrating on the doorstop as fully as you might and you have to bring your attention back to the task. Let's try another practice session now, this time for 3 minutes. This time I will be closing the door and observing you from the adjoining chamber. I will tell you through the intercom when to begin. Remember, each time you experience an intrusion, press the button ... (E left chamber, closing doors) ... Ready? Begin ... (E allowed 3-min. If no intrusion occurred by then, the period was extended to the first intrusion.) Fine. (E rejoined S in the chamber.) How did that go? (E answered questions and clarified by essentially repeating the above.)

You seem to understand what I want you to report, so let's try an actual 15-minute session now. (E then lit a large candle which was sitting in the middle of the table. The same candle was used throughout the experiment and did not change appreciably in size. It was about 8" high and 3" in diameter.) This time I am going to ask you to focus your attention on the flame of this candle. Remember that by focusing I do not mean analyzing the different parts of the flame, or thinking a series of thoughts about the flame, or associating ideas to the flame, but rather trying to see the flame as it exists in itself, without any connection to other things. Each time an intrusion occurs, press the button. I will let you know when the 15-minute period is over. Before we begin, take a moment to get as comfortable and relaxed as possible. I will let you know through the intercom when to begin. (E left chamber, closing doors.) Ready? Begin ... (E was able to observe S from behind through the observation window. E recorded the number of times S pushed the button during each minute of the 15-minute period.)

Fine. You can stop now. Perhaps you would like to step outside the chamber a moment to stretch before we begin the next task. (E then had S return to his seat in the chamber alone and closed the doors.)

(Over the intercom.) Now let's try another 15-minute session. In a moment, I am going to ask you to close your eyes

and focus your attention on your breathing. I don't want you to try to change your breathing or try to analyze it. I just want you to watch yourself breathing, as it were-to focus on the in-and-out movement of your belly. In other words, you are to try to keep your mind clear of all thoughts except for the perception of your breathing. Remember to report an intrusion whenever you find you have gotten caught up in a stream of thought. Right now let your breathing become relaxed and natural, Let it set its own pace and depth if you can. Close your eyes and I will tell you when to begin. I will also tell you when the 15-minute session is over. Ready? Begin ...

Once again, *E* recorded the number of times *S* pressed the button during each minute of this second 15-minute period. The *E* then rejoined *S* in the experimental chamber and conducted a brief interview to gather information on the *S*'s subjective experience of the meditation exercises.

#### DISCUSSION

This study employed the novel technique of having the subject report each intrusion during meditation. Fortunately, and despite its introspectionist flavor, this reporting of inner experience turned out to be an effective measure that could be significantly related to behavior (i.e., hypnotizability). Intrusions during meditation correlated with hypnotizability  $-.42$  (Van Nuys, 1971b). Thus, the technique seems naturally suited to the study of meditation, which at least in its initial stages consists of an attempt to control and limit thought intrusions. Deikman (1966) has hypothesized that eventually an intrapsychic barrier is developed that keeps such intrusions out of consciousness. Presumably, as a subject progresses in meditation he would report fewer and fewer intrusions. Also, the number of intrusions reported should correspond to the different stages of meditation as judged by changes in the quality of experiencing (Maupin, 1965). Although it was possible in this study to compare the number of intrusions reported with the subjective reports gathered in the interview after the meditation session, no clear relationship between the two could be discerned. However, one meditation session is certainly not enough for much differentiation to occur. The counting of intrusions during meditation would likely be a far more powerful tool if the measure were based on a number of sessions over a longer period of time. Informal pilot testing, however, had suggested that a single session might be sufficiently reliable for the purpose of this study. The intrusion measure would be further enhanced if BEG studies were to show changes in brain rhythms corresponding to the occurrence of intrusions.

*discussion of  
technique of  
subject report  
of "intrusions"  
during  
meditation*

*experimental possibilities of intrusion technique*

Future research is planned using this technique at Sonoma State College, which provides a rich supply of mediators of varying experience and from many traditions. It should be possible, for example, to compare the rate of intrusion decline between a group of Transcendental meditators and a group of Zen breath-counters. Having subjects report intrusions has somewhat of the quality of negative reinforcement. It might be interesting to play around with having a periodic stimulus (tone, bell, voice) go off that in essence says, "Bring your attention back now." Those who find that they don't have to bring their attention back, having remained focused, would press the button. In this way, button pressing might well take on the quality of positive reinforcement. Instrumentation might be further simplified by supplying meditators with simple mechanical digital counters which can be held in the hand. Positive reinforcement of concentration might well have therapeutic value since it is possible to conceive of obsessions, phobias, schizophrenias, hysterias, and so on as disorders of attention. The possibilities seem limitless. I hope others will want to explore them.

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