1) The King of Pontus dabbled in medicine and defrauded Europeans with mithridate and theriac.

2) The Khedive of Egypt promoted the sale of Egyptian mummy as a medicine.

3) Mao Tse-tung ordered doctors at Peking Union Medical College to administer spinal anesthesia to patients (using cocaine analogs) before they were rolled into the operating room, where newsmen were told that the anesthetic was acupuncture.

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State-Specific Sciences

Tart's provocative article (16 June 1972, p. 1203) on altered states of consciousness proposes that different states of consciousness are related to different rule systems of mental functioning. A new approach (or new paradigm in a Kuhnian sense) is implied which suggests that we look for differences in the set of rules that the various states of consciousness offer. Perhaps the first priority would be to establish whether altered states of consciousness have the far-reaching effects that Tart suggests. Do they really alter the psyche in its most profound sense by changing the very foundation of its system of logic, or do they merely produce variations at some more superficial, say, sensory, level?

If we give Tart his point and assume that the change is profound, then several consequences follow, some of which may be problematical. For example, Tart assumes that communication between states of consciousness is possible. A scientist, he says, could pass judgment on a theory developed in one state of consciousness (SoC 1) while he occupied another (SoC 2). But could he? Imagine that a certain mathematician in SoC 2 discovers a proof of Fermat's last theorem. He now slips back into SoC 1. Suppose that, in strict Gödel fashion, Fermat's last theorem is undecidable in SoC 1. If the mathematician wants to relish the beauties of his proof he must slip back into SoC 2, since the proof is not possible, hence nonexistent, under the system governing SoC 1. Perhaps SoC 1 and SoC 2, since they belong to the same experimental milieu, merge into SoC 3. The difficulty here is that SoC 3 might possibly be governed by a system of logic based on contradictory premises. (One can imagine all sorts of neurotic behaviors issuing from the failure to keep two conflicting states of consciousness separated.)

All of this points to the following consequences. If altered states of consciousness produce fundamental changes in the sense used here, then (i) the states may merge, perhaps resulting in more subjective confusion than that produced by either state taken singly, or (ii) the states would remain noncommunicative, and one would have to pass from one state to another in order to savor the knowledge that the systems had to offer. Alter-states might offer predictability but not intuitive understanding—a situation acceptable to the pragmatist perhaps, but not to the esthete.

On the other hand, altered states of consciousness may have only a superficial effect, reaching, say, no further than the level of sensory or perceptual interpretation of physical stimuli. This is perhaps close to what mathematical logicians call metalanguage, or the use of one language (one system of symbols) to talk about another. Consider the following thought experiment: Identical twins with identical backgrounds of experience are subjected to two different states of consciousness. We arrange matters so that the sensory (perceptual?) experience in both states are the same. Will the inferences, the intuitive or subjective impressions of reality, be quite different to the two observers? An answer in the affirmative would give us reason to establish state-specific sciences. This would not be a trivial finding, for if we had access to even a finite number of different logics, then our intellectual powers would be increased by several orders of magnitude. On the other hand, if altered states of consciousness affected only sensory interpretations (metalanguages), then the various systems of subjective inferences would not be fundamentally altered, and different systems of science for different states of consciousness would be redundant.

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Scientific endeavor from its beginning has been committed to a rational explanation of human experiences and activities, and of events and phenomena in our environment. Scientists may thus be expected to explore and to seek rational explanations of all aspects of human consciousness, as Tart proposes.

Such rational explanations, both of ourselves and of our environments, tend to be in terms of physics and chemistry, since these scientific disciplines have optimum measurable precision. For biology, this was manifestoed in 1847, to include consciousness, by Carl Ludwig, Emile Dubois-Reymond, and Hermann von Helmholtz. The results, allowing for time, have been amazing. There seem to be no pressing reasons to turn to any other way of approaching altered states of consciousness scientifically, as proposed by Tart. His "state-specific sciences" imply an esoteric in-group of specialists with an unintelligible jargon who would tend to indulge themselves in emotionally oriented irrational speculation.

Guidelines for scientific effort are generally agreed upon by scientists. They seem to be adequate for the rational exploration and explanation of such altered states of consciousness as sleep, meditative trances, and drug-induced hallucinations. Tart's proposals, however sincere, add merely confusion, fallacious reasoning, and semimystical hope to the orderly, though slow, scientific process of reaching tentative explanations and understandings of how our complex brains function. Irrationality is incompatible with scientific endeavor, except as a phenomenon to be explored rationally.

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Lest fuzzy-headed chemical adventurers think Tart's article provides them with excuse for availing themselves of effortless entertainment, let me recite a little story in the style of a fable which carries nature's eternal message of "no free meals."

A wild pig deep in the jungle of Africa had it made. Being omnivorous in a land where nature is prodigal, he had a nearly endless assortment of fruits, nuts, roots, and even truffles with which to titillate his senses. A wonderful supply of incongruous input (*1*) available with only a small expenditure of effort. In season he received atmospheric messages from female pigs which further added to his state of delight. The other animals of the jungle bothered him very little, as he had sharp hooves and strong tusks. There was, nevertheless, the threat of lions, but his senses, attuned to the real world in which he lived, kept him informed of the lion situation and so

provided him with safety. Both his observations and his instincts had taught him to fear the lions and to seek shelter whenever his senses told him lions were in the vicinity.

One day in making his rounds he came upon a strange bush loaded with goofyberries. He sampled a few and found them not disagreeable. Soon the jungle began to change. Somehow it looked different. Yes, everything in it was getting smaller. One could walk through it with seven-league boots. He felt like a giant—almost a god. Suddenly his nose picked up a few warning molecules. Lion! But, under the influence of the goofyberries, the signal came through distorted. "The lion is my friend! He loves me and I love him. Why should I run and hide? Ah, I see him now. He looks so small and funny, like a pussycat. He's crouching down now to spring. He wants to play with me. Oh, this such great fun! Wheeee!" Scream! Silence! Blood and death.

It's still that kind of a world, with a thin veneer of civilization over the jungle. There are no free meals in the long run. Or free trips either. Statistically, if not individually, the weak and foolish perish in accordance with a set of rules now some 3 billion years old. That law of life is survival of the fittest. For an animal to deliberately handicap his senses and data processing equipment which evolution has given him to see the world as it is in exchange for some "effortless" entertainment has to be, consciously or not, suicidal. The probability is enormous that all altered states of consciousness are defective. The relation between drunken driving and highway carnage should be sufficient reminder.

Tart may have a valid interest in studying mental abnormalities, whether naturally occurring or induced by drugs. Otherwise, caveat lector.

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1. Borrowed from the paper by J. McV. Hunt, "Intrinsic motivation and its role in psychological development," in *Nebraska Symposium on Motivation* (Univ. of Nebraska Press, Lincoln, 1964 and 1965).

Tart's views on state-specific sciences in different states of consciousness should be applauded, as he recognizes and legitimatizes the differing realities of different people. In the wider world, however, this problem is analogous to some of the issues raised in anthropological linguistics by Sapir and Whorf (*1*) a couple of generations ago.

In modern parlance, the problem might be phrased as how to "get into" the minds and logics of the speakers of other languages: people who live in somewhat different states of consciousness as they live in different experiential worlds. By observing groups of people who share different states of consciousness from our own, one gains a sense that his own normal state of consciousness must be related to those around him, and not be in any sense a direct given of human nature; that is, what we call consciousness is in part a sociocultural statement.

I do not agree with Tart that we need state-specific sciences. The most productive approach to understanding different states of consciousness is to set up a wide comparative science which will try to translate different states, much as we are trying to understand the nature of the varying cultural states of consciousness that we call different cultural realities. To extend the comparative paradigm still further, it seems likely that this is not a very different problem from attempting to understand the different cognitive organizations of different species.

Scientific development is not, in my opinion, directly tied to ordinary states of consciousness. It moves to new paradigms by attending to counter intuitive thought; it changes through reconceptualization and new awareness. Once one has achieved or arrived at a new conceptualization, an "aha" experience, his experiential reality is no longer as it was previously. Scientific insight is much like an altered state of consciousness (ASC). A remarkable attribute of science is that its language seems to be sufficiently general to incorporate new modes of ideation and observation.

Perhaps the problem can be approached as a comparative one by looking at the array of different experiential realities, trying to discover the logic by which they work and to translate this into a metalanguage which is about consciousness.

In working with Mexican Tzotzil Indians some years ago, I discovered that they seemed to regard their true reality as occurring during what we call sleep. Their true soul, or *Nagual*, was then free to roam the world and see in the deepest, most visionary sense. The normal consciousness world of everyday waking life seemed to be mainly interpretive commentary of their dream states (from our point of view). The group seemed more likely to act in terms of peoples' reported visions than in terms of their normal consciousness states.

Part of Tzotzil logic is almost 180° out of phase with ours; but it does seem to be potentially understandable to us, and investigatable. We must be willing to accept the premises of its particular reality and learn to work in its observational terms. Perhaps it would, as Whorf claimed for the Hopi (*1*, p. 57), develop its own independent and interesting science. The important fact seems to be that there are ways in which we can use our experiential reality to understand theirs. I disagree with Tart's approach, which would appear to enhance the differences between different ASC's and legitimate the possibility of a potentially infinite set of disparate, unconnectable realities and sciences. It is more productive to search for common translatory devices with which to understand cross-cultural, cross-species, cross-state communication.

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Abraham Maslow once said that if the only tool you have is a hammer, you tend to treat everything as if it were a nail (*1*). More formally, psychological observations indicate that the overt logic or rationality of all of us often turns out to be rationalization in the service of nonconscious, implicit assumptions and needs. Some of these rationalizations have commanded the intellectual and emotional loyalty of millions of followers for hundreds of years. Believing that there is some form of complete rationality which frees us from the power of implicit assumptions is noble, but questionable, and diverts us from confronting the issue of what our implicit assumptions are and how they affect us. Understanding and confronting such assumptions may be quite difficult, for they are tied in with emotional reward and punishment systems conditioned in us during the process of socialization.

In spite of Leake's faith that chemistry and physics are the optimal explanatory systems, I am not impressed with our current scientific knowledge

of states of consciousness (SoC's), our rate of progress, or the hope of chemical and physical explanations of SoC's. Chemistry and physics provide some useful insights, and such conventional investigation should be continued. My proposal to develop state-specific sciences (SSS's) is not a call to abandon our useful hammer, but to develop additional tools for dealing with problems that don't act like nails.

Many of the comments of Cowan, Leake, Booth, and Sarles seem based on an implicit assumption which is very common in the scientific community. This is that our ordinary, normal, so-called rational SoC is the best one for surviving on this planet and understanding the universe, and that all altered SoC's are subnormal, irrational, or pathological to various degrees. This is a value judgment. One can find many examples of the products of a world supposedly run from a normal SoC that give reason to question this assumption, such as nuclear weapons or bacteriological warfare. It is also a common psychological ploy for each of us to support this assumption by defining our own ordinary SoC as normal and that of everyone whose behavior displeases us as abnormal or altered; this ploy, while ego-syntonic, is hardly scientific.

Cowan misrepresents me in saying a scientist ". . . could pass judgment on a theory developed in one state of consciousness (SoC 1) while he occupied another (SoC 2)," implying no need for SSS's. My original statement was that one could certainly comment on a theory developed in another SoC, but such comment said something about differences between SoC's, not about the validity of the SoC 1 theory from the point of view of SoC 1. If the proof of Fermat's last theorem (to use Cowan's example) is comprehensible to and agreed upon by all trained scientists who can enter SoC 1, even though they themselves cannot comprehend it while they are in SoC 2, that is not only a scientific advance, but an excellent illustration of the need for and potentialities of SSS's.

The hope expressed by Cowan and Sarles that there is some SoC in which all the observations and theorizing of other SoC's could be comprehended as special subsets is laudable: perhaps this is what the term enlightenment means. But this hope should not blind us to (i) the fact that we do not know of such a state now; (ii) the probability that our ordinary SoC is not such a state; and (iii) the need to develop SSS's now as an approach to social problems such as drug use, as well as for inherent scientific interest, rather than avoiding this issue by assuming that some extension of ordinary SoC science will eliminate the need to deal directly with altered SoC's. The speculation that altered SoC's may be ultimately reducible to simply alterations in sensory processing does not fit current knowledge about them and can also function as a rationalization to avoid looking at the need to develop SSS's.

I share Booth's concern about goofyberries. Many human beings act stupidly and suffer the consequences. Yet even a bird-brain like a pigeon can learn to discriminate seven different conditions and behave in an appropriate, rewarded fashion, so I have confidence that a large-brained creature like a scientist can learn to function in an SoC appropriate to the conditions he is in. Kekule used the altered SoC of dreaming to arrive at the inspiration for the structure of benzene (*2*), but he was intelligent enough not to go to sleep in a lion's den.

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Professional and Personal Equality

In her editorial "Misrepresented by 'Woman's Lib'" (10 Nov. 1972, p. 565), Susan Artandi attempts to speak for a large group of women who have hitherto been silent. Many of her points are true, but, as one of this large group, I wish that she had used the given forum to raise a point which is frequently ignored.

All women in the group of actively employed scientists do want equal pay and equal opportunity, as Artandi so clearly states. However, rather than understanding of their aspiration or sympathy to their cause, what these women would like is a just evaluation. This is particularly true for those who have spent a portion of their careers in part-time employment.

It seems self-evident that a woman who has been in academia for, as an example, 10 years on a half-time basis, should be expected to have been no more productive than a full-time male counterpart has for 5 years. Furthermore, she should be expected to be 5 years older. Evaluating groups, be they study sections or committees, considering grants, travel allowances, society memberships, or even promotions should be aware that a considerably lower productivity (that is, number of publications) should be expected from 10 years of half-time than from 5 years of full-time research. This is due primarily to the regulations of most institutions and granting agencies, which forbid part-time professionals from being "principal investigators." While in many cases this need not mean a lack of independence in research for the part-time investigator, it effectively prevents her from supporting postdoctoral fellows or graduate students. Thus, her productivity is limited to her own efforts—perhaps with some technical assistance—while her full-time counterpart would be expected, after 5 years, to have benefited from the input of several graduate students or postdoctoral fellows.

Thus, what women who have combined "careers and private lives," as Artandi states it, seek is not the additional special considerations, understanding, and sympathy, as she concludes. Rather, they seek consideration and evaluation of their abilities, contributions, and potential, as well as an equitable opportunity for consideration of grants, support, and position, on which, after all, the utilization of their ability to do academic research depends.

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While I am in agreement with much of what Susan Artandi has to say about Women's Lib, "questions like who should wash the dishes" are not side issues. Such questions reflect directly on the attitudes of men. The general quiet assumption that, of course, women will continue to do all household tasks results in those women having less time and energy for either their work or their recreation. There is really no call for a woman to do two jobs when a better alternative exists: both the woman and her partner can do one and one-half jobs each.

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