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Some Issues Concerning the Control of Human Behavior

A Symposium

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I [Skinner]

Science is steadily increasing our power to influence, change, mold—in a word, control—human behavior. It has extended our "understanding" (whatever that may be) so that we deal more successfully with people in nonscientific ways, but it has also identified conditions or variables which can be used to predict and control behavior in a new, and increasingly rigorous, technology. The broad disciplines of government and economics offer examples of this, but there is special cogency in those contributions of anthropology, sociology, and psychology which deal with individual behavior. Carl Rogers has listed some of the achievements to date in a recent paper (*1*). Those of his examples which show or imply the control of the single organism are primarily due, as we should expect, to psychology. It is the experimental study of behavior which carries us beyond awkward or inaccessible "principles," "factors," and so on, to variables which can be directly manipulated.

It is also, and for more or less the same reasons, the conception of human behavior emerging from an experimental analysis which most directly challenges traditional views. Psychologists themselves often do not seem to be aware of how far they have moved in this direction. But the change is not passing unnoticed by others. Until only recently it was customary to deny the possibility of a rigorous science of human behavior by arguing, either that a lawful science was impossible because man was a free agent, or that merely statistical predictions would always leave room for personal freedom. But those who used to take this line have become most vociferous in expressing their alarm at the way these obstacles are being surmounted.

Now, the control of human behavior has always been unpopular. Any undisguised effort to control usually arouses emotional reactions. We hesitate to admit, even to ourselves, that we are engaged in control, and we may refuse to control, even when this would be helpful, for fear of criticism. Those who have explicitly avowed an interest in control have been roughly treated by history. Machiavelli is the great prototype. As Macaulay said of him, "Out of his surname they coined an epithet for a knave and out of his Christian name a synonym for the devil." There were obvious reasons. The control that Machiavelli analyzed and recommended, like most political control, used techniques that were aversive to the controllee. The threats and punishments of the bully, like those of the government operating on the same plan, are not designed—whatever their success—to endear themselves to those who are controlled. Even when the techniques themselves are not aversive, control is usually exercised for the selfish purposes of the controller and, hence, has indirectly punishing effects upon others.

Man's natural inclination to revolt against selfish control has been exploited to good purpose in what we call the philosophy and literature of democracy. The doctrine of the rights of man has been effective in arousing individuals to concerted action against governmental and religious tyranny. The literature which has had this effect has greatly extended the number of terms in our language which express reactions to the control of men. But the ubiquity and ease of expression of this attitude spells trouble for any science which may give birth to a powerful technology of behavior. Intelligent men and women, dominated by the humanistic philosophy of the past two centuries, cannot view with equanimity what Andrew Hacker has called "the specter of predictable man" (*2*). Even the statistical or actuarial prediction of human events, such as the number of fatalities to be expected on a holiday weekend, strikes many people as uncanny and evil, while the prediction and control of individual behavior is regarded as little less than the work of the devil. I am not so much concerned here with the political or economic consequences for psychology, although research following certain channels may well suffer harmful effects. We ourselves, as intelligent men and women, and as exponents of Western thought, share these attitudes. They have already interfered with the free exercise of a scientific analysis, and their influence threatens to assume more serious proportions.

Three broad areas of human behavior supply good examples. The first of these —*personal control*—may be taken to include person-to-person relationships in the family, among friends, in social and work groups, and in counseling and psychotherapy. Other fields are *education* and *government*. A few examples from each will show how nonscientific preconceptions are affecting our current thinking about human behavior.

Personal Control

People living together in groups come to control one another with a technique which is not inappropriately called "ethical." When an individual behaves in a fashion acceptable to the group, he receives admiration, approval, affection, and many other reinforcements which increase the likelihood that he will continue to behave in that fashion. When his behavior is not acceptable, he is criticized, censured, blamed, or otherwise

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punished. In the first case the group calls him "good"; in the second, "bad." This practice is so thoroughly ingrained in our culture that we often fail to see that it is a technique of control. Yet we are almost always engaged in such control, even though the reinforcements and punishments are often subtle.

The practice of admiration is an important part of a culture, because behavior which is otherwise inclined to be weak can be set up and maintained with its help. The individual is especially likely to be praised, admired, or loved when he acts for the group in the face of great danger, for example, or sacrifices himself or his possessions, or submits to prolonged hardship, or suffers martyrdom. These actions are not admirable in any absolute sense, but they require admiration if they are to be strong. Similarly, we admire people who behave in original or exceptional ways, not because such behavior is itself admirable, but because we do not know how to encourage original or exceptional behavior in any other way. The group acclaims independent, unaided behavior in part because it is easier to reinforce than to help.

As long as this technique of control is misunderstood, we cannot judge correctly an environment in which there is less need for heroism, hardship, or independent action. We are likely to argue that such an environment is itself less admirable or produces less admirable people. In the old days, for example, young scholars often lived in undesirable quarters, ate unappetizing or inadequate food, performed unprofitable tasks for a living or to pay for necessary books and materials or publication. Older scholars and other members of the group offered compensating reinforcement in the form of approval and admiration for these sacrifices. When the modern graduate student receives a generous scholarship, enjoys good living conditions, and has his research and publication subsidized, the grounds for evaluation seem to be pulled from under us. Such a student no longer *needs* admiration to carry him over a series of obstacles (no matter how much he may need it for other reasons), and, in missing certain familiar objects of admiration, we are likely to conclude that such *conditions* are less admirable. Obstacles to scholarly work may serve as a useful measure of motivation—and we may go wrong unless some substitute is found—but we can scarcely defend a deliberate harassment of the student for this purpose. The productivity of any set of conditions can be evaluated only when we have freed ourselves of the attitudes which have been generated in us as members of an ethical group.

A similar difficulty arises from our use of punishment in the form of censure or blame. The concept of responsibility and the related concepts of foreknowledge and choice are used to justify techniques of control using punishment. Was So-and-So aware of the probable consequences of his action, and was the action deliberate? If so, we are justified in punishing him. But what does this mean? It appears to be a question concerning the efficacy of the contingent relations between behavior and punishing consequences. We punish behavior because it is objectionable to us or the group, but in a minor refinement of rather recent origin we have come to withhold punishment when it cannot be expected to have any effect. If the objectionable consequences of an act were accidental and not likely to occur again, there is no point in punishing. We say that the individual was not "aware of the consequences of his action" or that the consequences were not "intentional." If the action could not have been avoided—if the individual "had no choice"—punishment is also withheld, as it is if the individual is incapable of being changed by punishment because he is of "unsound mind." In all these cases—different as they are—the individual is held "not responsible" and goes unpunished.

Just as we say that it is "not fair" to punish a man for something he could not help doing, so we call it "unfair" when one is rewarded beyond his due or for something he could not help doing. In other words, we also object to wasting *reinforcers* where they are not needed or will do no good. We make the same point with the words *just* and *right*. Thus we have no right to punish the irresponsible, and a man has no right to reinforcers he does not earn or deserve. But concepts of choice, responsibility, justice, and so on, provide a most inadequate analysis of efficient reinforcing and punishing contingencies because they carry a heavy semantic cargo of a quite different sort, which obscures any attempt to clarify controlling practices or to improve techniques. In particular, they fail to prepare us for techniques based on other than aversive techniques of control. Most people would object to forcing prisoners to serve as subjects of dangerous medical experiments, but few object when they are induced to serve by the offer of return privileges—even when the reinforcing effect of these privileges has been created by forcible deprivation. In the traditional scheme the right to refuse guarantees the individual against coercion or an unfair bargain. But to what extent *can* a prisoner refuse under such circumstances?

We need not go so far afield to make the point. We can observe our own attitude toward personal freedom in the way we resent any interference with what we want to do. Suppose we want to buy a car of a particular sort. Then we may object, for example, if our wife urges us to buy a less expensive model and to put the difference into a new refrigerator. Or we may resent it if our neighbor questions our need for such a car or our ability to pay for it. We would certainly resent it if it were illegal to buy such a car (remember Prohibition); and if we find we cannot actually afford it, we may resent governmental control of the price through tariffs and taxes. We resent it if we discover that we cannot get the car because the manufacturer is holding the model in deliberately short supply in order to push a model we do not want. In all this we assert our democratic right to buy the car of our choice. We are well prepared to do so and to resent any restriction on our freedom.

But why do we not ask *why* it is the car of our choice and resent the forces which made it so? Perhaps our favorite toy as a child was a car, of a very different model, but nevertheless bearing the name of the car we now want. Perhaps our favorite TV program is sponsored by the manufacturer of that car. Perhaps we have seen pictures of many beautiful or prestigeful persons driving it—in pleasant or glamorous places. Perhaps the car has been designed with respect to our motivational patterns: the device on the hood is a phallic symbol; or the horsepower has been stepped up to please our competitive spirit in enabling us to pass other cars swiftly (or, as the advertisements say, "safely"). The concept of freedom that has emerged as part of the cultural practice of our group makes little or no provision for recognizing or dealing with these kinds of control. Concepts like "responsibility" and "rights" are scarcely applicable. We are prepared to deal with coercive measures, but we have no traditional recourse with respect to other measures which in the long run (and especially with the help of science) may be much more powerful and dangerous.

Education

The techniques of education were once frankly aversive. The teacher was usually older and stronger than his pupils and was able to "make them learn." This meant that they were not actually taught but were surrounded by a threatening world from which they could escape only by learning. Usually they were left to their own resources in discovering how to do so. Claude Coleman has published a grimly amusing reminder of these older practices (*3*). He tells of a schoolteacher who published a careful account of his services during 51 years of teaching, during which he administered: ". . . 911,527 blows with a cane; 124,010 with a rod; 20,989 with a ruler; 136,715 with the hand; 10,295 over the mouth; 7,905 boxes on the ear; [and] 1,115,800 slaps on the head. . . ."

Progressive education was a humanitarian effort to substitute positive reinforcement for such aversive measures, but in the search for useful human values in the classroom it has never fully replaced the variables it abandoned. Viewed as a branch of behavioral technology, education remains relatively inefficient. We supplement it, and rationalize it, by admiring the pupil who learns *for himself*; and we often attribute the learning process, or knowledge itself, to something *inside* the individual. We admire behavior which seems to have inner sources. Thus we admire one who *recites* a poem more than one who simply *reads* it. We admire one who *knows* the answer more than one who *knows where to look it up*. We admire the *writer* rather than the *reader*. We admire the arithmetician who can do a problem in his head rather than with a slide rule or calculating machine, or in "original" ways rather than by a strict application of rules. In general we feel that any aid or "crutch"—except those aids to which we are now thoroughly accustomed—reduces the credit due. In Plato's *Phaedus,* Thamus, the king, attacks the invention of the alphabet on similar grounds! He is afraid "it will produce forgetfulness in the minds of those who learn to use it, because they will not practice their memories. . . ." In other words, he holds it more admirable to remember than to use a memorandum. He also objects that pupils "will read many things without instruction. . . [and] will therefore seem to know many things when they are for the most part ignorant." In the same vein we are today sometimes contemptuous of book learning, but, as educators, we can scarcely afford to adopt this view without reservation.

By admiring the student for knowledge and blaming him for ignorance, we escape some of the responsibility of teaching him. We resist any analysis of the educational process which threatens the notion of inner wisdom or questions the contention that the fault of ignorance lies with the student. More powerful techniques which bring about the same changes in behavior by manipulating *external* variables are decried as brainwashing or thought control. We are quite unprepared to judge *effective* educational measures. As long as only a few pupils learn much of what is taught, we do not worry about uniformity or regimentation. We do not fear the feeble technique; but we should view with dismay a system under which every student learned everything listed in a syllabus—although such a condition is far from unthinkable. Similarly, we do not fear a system which is so defective that the student must *work* for an education; but we are loath to give credit for anything learned without effort—although this could well be taken as an ideal result—and we flatly refuse to give credit if the student already knows what a school teaches.

A world in which people are wise and good without trying, without "having to be," without "choosing to be," could conceivably be a far better world for everyone. In such a world we should not have to "give anyone credit"—we should not need to admire anyone—for being wise and good. From our present point of view we cannot believe that such a world would be admirable. We do not even permit ourselves to imagine what it would be like.

Government

Government has always been the special field of aversive control. The state is frequently defined in terms of the power to punish, and jurisprudence leans heavily upon the associated notion of personal responsibility. Yet it is becoming increasingly difficult to reconcile current practice and theory with these earlier views. In criminology, for example, there is a strong tendency to drop the notion of responsibility in favor of some such alternative as capacity or controllability. But no matter how strongly the facts, or even practical expedience, support such a change, it is difficult to make the change in a legal system designed on a different plan. When governments resort to other techniques (for example, positive reinforcement), the concept of responsibility is no longer relevant and the theory of government is no longer applicable.

The conflict is illustrated by two decisions of the Supreme Court in the 1930's which dealt with, and disagreed on, the definition of control or coercion (*4*, p. 233). The Agricultural Adjustment Act proposed that the Secretary of Agriculture make "rental or benefit payments" to those farmers who agreed to reduce production. The government agreed that the Act would be unconstitutional if the farmer had been *compelled* to reduce production but was not, since he was merely *invited* to do so. Justice Roberts (*4*) expressed the contrary majority view of the court that "The power to confer or withhold unlimited benefits is the power to coerce or destroy." This recognition of positive reinforcement was withdrawn a few years later in another case in which Justice Cardozo (*4*, p. 244) wrote "To hold that motive or temptation is equivalent to coercion is to plunge the law in endless difficulties." We may agree with him, without implying that the proposition is therefore wrong. Sooner or later the law must be prepared to deal with all possible techniques of governmental control.

The uneasiness with which we view government (in the broadest possible sense) when it does not use punishment is shown by the reception of my utopian novel, *Walden Two* (*4a*). This was essentially a proposal to apply a behavioral technology to the construction of a workable, effective, and productive pattern of government. It was greeted with wrathful violence. *Life* magazine called it "a travesty on the good life," and "a menace . . . a triumph of mortmain or the dead hand not envisaged since the days of Sparta . . . a slur upon a name, a corruption of an impulse." Joseph Wood Krutch devoted a substantial part of his book, *The Measure of Man* (*5*), to attacking my views and those of the protagonist, Frazier, in the same vein, and Morris Viteles has recently criticized the book is a similar manner in *Science* (*6*). Perhaps the reaction is best expressed in a quotation from *The Quest for Utopia* by Negley and Patrick (*7*):

"Halfway through this contemporary utopia, the reader may feel sure, as we did, that this is a beautifully ironic satire on what has been called 'behavioral engineering.' The longer one stays in this better world of the psychologist, however, the plainer it becomes that the inspiration is not satiric, but messianic. This is indeed the behaviorally engineered society, and while it was to be expected that sooner or later the principle of psychological conditioning would be made the basis of a serious construction of utopia—Brown anticipated it in *Limanora*—yet not even the effective satire of Huxley is adequate preparation for the shocking horror of the idea when positively presented. Of all the dictatorships espoused by utopists, this is the most profound, and incipient dictators might well find in this utopia a guidebook of political practice."

One would scarcely guess that the authors are talking about a world in which there is food, clothing, and shelter for all, where everyone chooses his own work and works on the average only 4 hours a day, where music and the arts flourish, where personal relationships develop under the most favorable circumstances, where education prepares every child for the social and intellectual life which lies before him, where—in short—people are truly happy, secure, productive, creative, and forward-looking. What is wrong with it? Only one thing: someone "planned it that way." If these critics had come upon a society in some remote corner of the world which boasted similar advantages, they would undoubtedly have hailed it as providing a pattern we all might well follow—provided that it was clearly the result of a natural process of cultural evolution. Any evidence that intelligence had been used in arriving at this version of the good life would, in their eyes, be a serious flaw. No matter if the planner of *Walden Two* diverts none of the proceeds of the community

to his own use, no matter if he has no current control or is, indeed, unknown to most of the other members of the community (he planned that, too), somewhere back of it all he occupies the position of prime mover. And this, to the child of the democratic tradition, spoils it all.

The dangers inherent in the control of human behavior are very real. The possibility of the misuse of scientific knowledge must always be faced. We cannot escape by denying the power of a science of behavior or arresting its development. It is no help to cling to familiar philosophies of human behavior simply because they are more reassuring. As I have pointed out elsewhere (*8*), the new techniques emerging from a science of behavior must be subject to the explicit countercontrol which has already been applied to earlier and cruder forms. Brute force and deception, for example, are now fairly generally suppressed by ethical practices and by explicit governmental and religious agencies. A similar countercontrol of scientific knowledge in the interests of the group is a feasible and promising possibility. Although we cannot say how devious the course of its evolution may be, a cultural pattern of control and countercontrol will presumably emerge which will be most widely supported because it is most widely reinforcing.

If we cannot foresee all the details of this (as we obviously cannot), it is important to remember that this is true of the critics of science as well. The dire consequences of new techniques of control, the hidden menace in original cultural designs—these need some proof. It is only another example of my present point that the need for proof is so often overlooked. Man has got himself into some pretty fixes, and it is easy to believe that he will do so again. But there is a more optimistic possibility. The slow growth of the methods of science, now for the first time being applied to human affairs, *may* mean a new and exciting phase of human life to which historical analogies will not apply and in which earlier political slogans will not be appropriate. If we are to use the knowledge that a science of behavior is now making available with any hope of success, we must look at human nature as it is brought into focus through the methods of science rather than as it has been presented to us in a series of historical accidents.

If the advent of a powerful science of behavior causes trouble, it will not be because science itself is inimical to human welfare but because older conceptions have not yielded easily or gracefully. We expect resistance to new techniques of control from those who have heavy investments in the old, but we have no reason to help them preserve a series of principles that are not ends in themselves but rather outmoded means to an end. What is needed is a new conception of human behavior which is compatible with the implications of a scientific analysis. All men control and are controlled. The question of government in the broadest possible sense is not how freedom is to be preserved but what kinds of control are to be used and to what ends. Control must be analyzed and considered in its proper proportions. No one, I am sure, wishes to develop new master-slave relationships or bend the will of the people to despotic rulers in new ways. These are patterns of control appropriate to a world without science. They may well be the first to go when the experimental analysis of behavior comes into its own in the design of cultural practices.

II [Rogers]

There are, I believe, a number of matters in connection with this important topic on which the authors of this article, and probably a large majority of psychologists, are in agreement. These matters then are not issues as far as we are concerned, and I should like to mention them briefly in order to put them to one side.

Points of Agreement

I am sure we agree that men—as individuals and as societies—have always endeavored to understand, predict, influence, and control human behavior—their own behavior and that of others.

I believe we agree that the behavioral sciences are making and will continue to make increasingly rapid progress in the understanding of behavior, and that as a consequence the capacity to predict and to control behavior is developing with equal rapidity.

I believe we agree that to deny these advances, or to claim that man's behavior cannot be a field of science, is unrealistic. Even though this is not an issue for us, we should recognize that many intelligent men still hold strongly to the view that the actions of men are free in some sense such that scientific knowledge of man's behavior is impossible. Thus Reinhold Niebuhr, the noted theologian, heaps scorn on the concept of psychology as a science of man's behavior and even says, "In any event, no scientific investigation of past behavior can become the basis of predictions of future behavior" (*9*). So, while this is not an issue for psychologists, we should at least notice in passing that it is an issue for many people.

I believe we are in agreement that the tremendous potential power of a science which permits the prediction and control of behavior may be misused, and that the possibility of such misuse constitutes a serious threat.

Consequently Skinner and I are in agreement that the whole question of the scientific control of human behavior is a matter with which psychologists and the general public should concern themselves. As Robert Oppenheimer told the American Psychological Association last year (*10*) the problems that psychologists will pose for society by their growing ability to control behavior will be much more grave than the problems posed by the ability of physicists to control the reactions of matter. I am not sure whether psychologists generally recognize this. My impression is that by and large they hold a laissez-faire attitude. Obviously Skinner and I do not hold this laissez-faire view, or we would not have written this article.

Points at Issue

With these several points of basic and important agreement, are there then any issues that remain on which there are differences? I believe there are. They can be stated very briefly: Who will be controlled? Who will exercise control? What type of control will be exercised? Most important of all, toward what end or what purpose, or in the pursuit of what value, will control be exercised?

It is on questions of this sort that there exist ambiguities, misunderstandings, and probably deep differences. These differences exist among psychologists, among members of the general public in this country, and among various world cultures. Without any hope of achieving a final resolution of these questions, we can, I believe, put these issues in clearer form.

Some Meanings

To avoid ambiguity and faulty communication, I would like to clarify the meanings of some of the terms we are using.

Behavioral science is a term that might be defined from several angles but in the context of this discussion it refers primarily to knowledge that the existence of certain describable conditions in the human being and/or in his environment is followed by certain describable consequences in his actions.

Prediction means the prior identification of behaviors which then occur. Because it is important in some things I wish to say later, I would point out that one may predict a highly specific behavior, such as an eye blink, or one may predict a class of behaviors. One might correctly predict "avoidant behavior," for example, without being able to spec-

ify whether the individual will run away or simply close his eyes.

The word *control* is a very slippery one, which can be used with any one of several meanings. I would like to specify three that seem most important for our present purposes. *Control* may mean: (i) The setting of conditions by *B* for *A*, *A* having no voice in the matter, such that certain predictable behaviors then occur in *A*. I refer to this as external control. (ii) The setting of conditions by *B* for *A*, *A* giving some degree of consent to these conditions, such that certain predictable behaviors then occur in *A*. I refer to this as the influence of *B* on *A*. (iii) The setting of conditions by *A* such that certain predictable behaviors then occur in himself. I refer to this as internal control. It will be noted that Skinner lumps together the first two meanings, external control and influence, under the concept of control. I find this confusing.

Usual Concept of Control of Human Behavior

With the underbrush thus cleared away (I hope), let us review very briefly the various elements that are involved in the usual concept of the control of human behavior as mediated by the behavorial sciences. I am drawing here on the previous writings of Skinner, on his present statements, on the writings of others who have considered in either friendly or antagonistic fashion the meanings that would be involved in such control. I have not excluded the science fiction writers, as reported recently by Vandenburg (*11*), since they often show an awareness of the issues involved, even though the methods described are as yet fictional. These then are the elements that seem common to these different concepts of the application of science to human behavior.

1) There must first be some sort of decision about goals. Usually desirable goals are assumed, but sometimes, as in George Orwell's book *1984*, the goal that is selected is an aggrandizement of individual power with which most of us would disagree. In a recent paper Skinner suggests that one possible set of goals to be assigned to the behavioral technology is this: "Let men be happy, informed, skillful, well-behaved and productive" (*12*). In the first draft of his part of this article, which he was kind enough to show me, he did not mention such definite goals as these, but desired "improved" educational practices, "wiser" use of knowledge in government, and the like. In the final version of his article he avoids even these value-laden terms, and his implicit goal is the very general one that scientific control of behavior is desirable, because it would perhaps bring "a far better world for everyone."

Thus the first step in thinking about the control of human behavior is the choice of goals, whether specific or general. It is necessary to come to terms in some way with the issue, "For what purpose?"

2) A second element is that, whether the end selected is highly specific or is a very general one such as wanting "a better world," we proceed by the methods of science to discover the means to these ends. We continue through further experimentation and investigation to discover more effective means. The method of science is self-correcting in thus arriving at increasingly effective ways of achieving the purpose we have in mind.

3) The third aspect of such control is that as the conditions or methods are discovered by which to reach the goal, some person or some group establishes these conditions and uses these methods, having in one way or another obtained the power to do so.

4) The fourth element is the exposure of individuals to the prescribed conditions, and this leads, with a high degree of probability, to behavior which is in line with the goals desired. Individuals are now happy, if that has been the goal, or well-behaved, or submissive, or whatever it has been decided to make them.

5) The fifth element is that if the process I have described is put in motion then there is a continuing social organization which will continue to produce the types of behavior that have been valued.

Some Flaws

Are there any flaws in this way of viewing the control of human behavior? I believe there are. In fact the only element in this description with which I find myself in agreement is the second. It seems to me quite incontrovertibly true that the scientific method is an excellent way to discover the means by which to achieve our goals. Beyond that, I feel many sharp differences, which I will try to spell out.

I believe that in Skinner's presentation here and in his previous writings, there is a serious underestimation of the problem of power. To hope that the power which is being made available by the behavioral sciences will be exercised by the scientists, or by a benevolent group, seems to me a hope little supported by either recent or distant history. It seems far more likely that behavioral scientists, holding their present attitudes, will be in the position of the German rocket scientists specializing in guided missiles. First they worked devotedly for Hitler to destroy the U.S.S.R. and the United States. Now, depending on who captured them, they work devotedly for the U.S.S.R. in the interest of destroying the United States, or devotedly for the United States in the interest of destroying the U.S.S.R. If behavioral scientists are concerned solely with advancing their science, it seems most probable that they will serve the purposes of whatever individual or group has the power.

But the major flaw I see in this review of what is involved in the scientific control of human behavior is the denial, misunderstanding, or gross underestimation of the place of ends, goals or values in their relationship to science. This error (as it seems to me) has so many implications that I would like to devote some space to it.

Ends and Values in Relation to Science

In sharp contradiction to some views that have been advanced, I would like to propose a two-pronged thesis: (i) In any scientific endeavor—whether "pure" or applied science—there is a prior subjective choice of the purpose or value which that scientific work is perceived as serving. (ii) This subjective value choice which brings the scientific endeavor into being must always lie outside of that endeavor and can never become a part of the science involved in that endeavor.

Let me illustrate the first point from Skinner himself. It is clear that in his earlier writing (*12*) it is recognized that a prior value choice is necessary, and it is specified as the goal that men are to become happy, well-behaved, productive, and so on. I am pleased that Skinner has retreated from the goals he then chose, because to me they seem to be stultifying values. I can only feel that he was choosing these goals for others, not for himself. I would hate to see Skinner become "well-behaved," as that term would be defined for him by behavioral scientists. His recent article in the *American Psychologist* (*13*) shows that he certainly does not want to be "productive" as that value is defined by most psychologists. And the most awful fate I can imagine for him would be to have him constantly "happy." It is the fact that he is very unhappy about many things which makes me prize him.

In the first draft of his part of this article, he also included such prior value choices, saying for example, "We must decide how we are to use the knowledge which a science of human behavior is now making available." Now he has dropped all mention of such choices, and if I understand him correctly, he believes that science can proceed without them. He has suggested this view in another recent paper, stating that "We must continue to experiment in cultural design . . . testing the consequences as we go. Eventually the practices which make for the greatest biological and psychological strength of the group will presumably survive" (*8*, p. 549).

I would point out, however, that to choose to experiment is a value choice. Even to move in the direction of perfectly random experimention is a value choice. To test the consequences of an experiment is possible only if we have first made a subjective choice of a criterion value. And implicit in his statement is a valuing of biological and psychological strength. So even when trying to avoid such choice, it seems inescapable that a prior subjective value choice is necessary for any scientific endeavor, or for any application of scientific knowledge.

I wish to make it clear that I am not saying that values cannot be included as a subject of science. It is not true that science deals only with certain classes of "facts" and that these classes do not include values. It is a bit more complex than that, as a simple illustration or two may make clear.

If I value knowledge of the "three R's" as a goal of education, the methods of science can give me increasingly accurate information on how this goal may be achieved. If I value problem-solving ability as a goal of education, the scientific method can give me the same kind of help.

Now, if I wish to determine whether problem-solving ability is "better" than knowledge of the three R's, then scientific method can also study those two values but *only*—and this is very important—in terms of some other value which I have subjectively chosen. I may value college success. Then I can determine whether problem-solving ability or knowledge of the three R's is most closely associated with that value. I may value personal integration or vocational success or responsible citizenship. I can determine whether problem-solving ability or knowledge of the three R's is "better" for achieving any one of these values. But the value or purpose that gives meaning to a particular scientific endeavor must always lie outside of that endeavor.

Although our concern in this symposium is largely with applied science, what I have been saying seems equally true of so-called "pure" science. In pure science the usual prior subjective value choice is the discovery of truth. But this is a subjective choice, and science can never say whether it is the best choice, save in the light of some other value. Geneticists in the U.S.S.R., for example, had to make a subjective choice of whether it was better to pursue truth or to discover facts which upheld a governmental dogma. Which choice is "better"? We could make a scientific investigation of those alternatives but only in the light of some other subjectively chosen value. If, for example, we value the survival of a culture, then we could begin to investigate with the methods of science the question of whether pursuit of truth or support of governmental dogma is most closely associated with cultural survival.

My point then is that any endeavor in science, pure or applied, is carried on in the pursuit of a purpose or value that is subjectively chosen by persons. It is important that this choice be made explicit, since the particular value which is being sought can never be tested or evaluated, confirmed or denied, by the scientific endeavor to which it gives birth. The initial purpose or value always and necessarily lies outside the scope of the scientific effort which it sets in motion.

Among other things this means that if we choose some particular goal or series of goals for human beings and then set out on a large scale to control human behavior to the end of achieving those goals, we are locked in the rigidity of our initial choice, because such a scientific endeavor can never transcend itself to select new goals. Only subjective human persons can do that. Thus if we chose as our goal the state of happiness for human beings (a goal deservedly ridiculed by Aldous Huxley in *Brave New World*), and if we involved all of society in a successful scientific program by which people became happy, we would be locked in a colossal rigidity in which no one would be free to question this goal, because our scientific operations could not transcend themselves to question their guiding purposes. And without laboring this point, I would remark that colossal rigidity, whether in dinosaurs or dictatorships, has a very poor record of evolutionary survival.

If, however, a part of our scheme is to set free some "planners" who do not have to be happy, who are not controlled, and who are therefore free to choose other values, this has several meanings. It means that the purpose we have chosen as our goal is not a sufficient and a satisfying one for human beings but must be supplemented. It also means that if it is necessary to set up an elite group which is free, then this shows all too clearly that the great majority are only the slaves—no matter by what high-sounding name we call them—of those who select the goals.

Perhaps, however, the thought is that a continuing scientific endeavor will evolve its own goals; that the initial findings will alter the directions, and subsequent findings will alter them still further, and that science somehow develops its own purpose. Although he does not clearly say so, this appears to be the pattern Skinner has in mind. It is surely a reasonable description, but it overlooks one element in this continuing development, which is that subjective personal choice enters in at every point at which the direction changes. The findings of a science, the results of an experiment, do not and never can tell us what next scientific purpose to pursue. Even in the purest of science, the scientist must decide what the findings mean and must subjectively choose what next step will be most profitable in the pursuit of his purpose. And if we are speaking of the application of scientific knowledge, then it is distressingly clear that the increasing scientific knowledge of the structure of the atom carries with it no necessary choice as to the purpose to which this knowledge will be put. This is a subjective personal choice which must be made by many individuals.

Thus I return to the proposition with which I began this section of my remarks —and which I now repeat in different words. Science has its meaning as the objective pursuit of a purpose which has been subjectively chosen by a person or persons. This purpose or value can never be investigated by the particular scientific experiment or investigation to which it has given birth and meaning. Consequently, any discussion of the control of human beings by the behavioral sciences must first and most deeply concern itself with the subjectively chosen purposes which such an application of science is intended to implement.

Is the Situation Hopeless?

The thoughtful reader may recognize that, although my remarks up to this point have introduced some modifications in the conception of the processes by which human behavior will be controlled, these remarks may have made such control seem, if anything, even more inevitable. We might sum it up this way: Behavioral science is clearly moving forward; the increasing power for control which it gives will be held by someone or some group; such an individual or group will surely choose the values or goals to be achieved; and most of us will then be increasingly controlled by means so subtle that we will not even be aware of them as controls. Thus, whether a council of wise psychologists (if this is not a contradiction in terms), or a Stalin, or a Big Brother has the power, and whether the goal is happiness, or productivity, or resolution of the Oedipus complex, or submission, or love of Big Brother, we will inevitably find ourselves moving toward the chosen goal and probably thinking that we ourselves desire it. Thus, if this line of reasoning is correct, it appears that some form of *Walden Two* or of *1984* (and at a deep philosophic level they seem indistinguishable) is coming. The fact that it would surely arrive piecemeal, rather than all at once, does not greatly change the fundamental

issues. In any event, as Skinner has indicated in his writings, we would then look back upon the concepts of human freedom, the capacity for choice, the responsibility for choice, and the worth of the human individual as historical curiosities which once existed by cultural accident as values in a prescientific civilization.

I believe that any person observant of trends must regard something like the foregoing sequence as a real possibility. It is not simply a fantasy. Something of that sort may even be the most likely future. But is it an inevitable future? I want to devote the remainder of my remarks to an alternative possibility.

Alternative Set of Values

Suppose we start with a set of ends, values, purposes, quite different from the type of goals we have been considering. Suppose we do this quite openly, setting them forth as a possible value choice to be accepted or rejected. Suppose we select a set of values that focuses on fluid elements of process rather than static attributes. We might then value: man as a process of becoming, as a process of achieving worth and dignity through the development of his potentialities; the individual human being as a self-actualizing process, moving on to more challenging and enriching experiences; the process by which the individual creatively adapts to an ever-new and changing world; the process by which knowledge transcends itself, as, for example, the theory of relativity transcended Newtonian physics, itself to be transcended in some future day by a new perception.

If we select values such as these we turn to our science and technology of behavior with a very different set of questions. We will want to know such things as these: Can science aid in the discovery of new modes of richly rewarding living? more meaningful and satisfying modes of interpersonal relationships? Can science inform us on how the human race can become a more intelligent participant in its own evolution—its physical, psychological and social evolution? Can science inform us on ways of releasing the creative capacity of individuals, which seem so necessary if we are to survive in this fantastically expanding atomic age? Oppenheimer has pointed out (*14*) that knowledge, which used to double in millenia or centuries, now doubles in a generation or a decade. It appears that we must discover the utmost in release of creativity if we are to be able to adapt effectively. In short, can science discover the methods by which man can most readily become a continually developing and self-transcending process, in his behavior, his thinking, his knowledge? Can science predict and release an essentially "unpredictable" freedom?

It is one of the virtues of science as a method that it is as able to advance and implement goals and purposes of this sort as it is to serve static values, such as states of being well-informed, happy, obedient. Indeed we have some evidence of this.

Small Example

I will perhaps be forgiven if I document some of the possibilities along this line by turning to psychotherapy, the field I know best.

Psychotherapy, as Meerloo (*15*) and others have pointed out, can be one of the most subtle tools for the control of *A* by *B*. The therapist can subtly mold individuals in imitation of himself. He can cause an individual to become a submissive and conforming being. When certain therapeutic principles are used in extreme fashion, we call it brainwashing, an instance of the disintegration of the personality and a reformulation of the person along lines desired by the controlling individual. So the principles of therapy can be used as an effective means of external control of human personality and behavior. Can psychotherapy be anything else?

Here I find the developments going on in client-centered psychotherapy (*16*) an exciting hint of what a behavioral science can do in achieving the kinds of values I have stated. Quite aside from being a somewhat new orientation in psychotherapy, this development has important implications regarding the relation of a behavioral science to the control of human behavior. Let me describe our experience as it relates to the issues of this discussion.

In client-centered therapy, we are deeply engaged in the prediction and influencing of behavior, or even the control of behavior. As therapists, we institute certain attitudinal conditions, and the client has relatively little voice in the establishment of these conditions. We predict that if these conditions are instituted, certain behavioral consequences will ensue in the client. Up to this point this is largely external control, no different from what Skinner has described, and no different from what I have discussed in the preceding sections of this article. But here any similarity ceases.

The conditions we have chosen to establish predict such behavioral consequences as these: that the client will become self-directing, less rigid, more open to the evidence of his senses, better organized and integrated, more similar to the ideal which he has chosen for himself. In other words, we have established by external control conditions which we predict will be followed by internal control by the individual, in pursuit of internally chosen goals. We have set the conditions which predict various classes of behaviors—self-directing behaviors, sensitivity to realities within and without, flexible adaptiveness—which are by their very nature unpredictable in their specifics. Our recent research (*17*) indicates that our predictions are to a significant degree corroborated, and our commitment to the scientific method causes us to believe that more effective means of achieving these goals may be realized.

Research exists in other fields—industry, education, group dynamics—which seems to support our own findings. I believe it may be conservatively stated that scientific progress has been made in identifying those conditions in an interpersonal relationship which, if they exist in *B*, are followed in *A* by greater maturity in behavior, less dependence on others, an increase in expressiveness as a person, an increase in variability, flexibility and effectiveness of adaptation, an increase in self-responsibility and self-direction. And, quite in contrast to the concern expressed by some, we do not find that the creatively adaptive behavior which results from such self-directed variability of expression is a "happy accident" which occurs in "chaos." Rather, the individual who is open to his experience, and self-directing, is harmonious not chaotic, ingenious rather than random, as he orders his responses imaginatively toward the achievement of his own purposes. His creative actions are no more a "happy accident" than was Einstein's development of the theory of relativity.

Thus we find ourselves in fundamental agreement with John Dewey's statement: "Science has made its way by releasing, not by suppressing, the elements of variation, of invention and innovation, of novel creation in individuals" (*18*). Progress in personal life and in group living is, we believe, made in the same way.

Possible Concept of the Control of Human Behavior

It is quite clear that the point of view I am expressing is in sharp contrast to the usual conception of the relationship of the behavioral sciences to the control of human behavior. In order to make this contrast even more blunt, I will state this possibility in paragraphs parallel to those used before.

1) It is possible for us to choose to value man as a self-actualizing process of becoming; to value creativity, and the process by which knowledge becomes self-transcending.

2) We can proceed, by the methods of science, to discover the conditions which necessarily precede these processes and, through continuing experimentation, to discover better means of achieving these purposes.

3) It is possible for individuals or groups to set these conditions, with a minimum of power or control. According to present knowledge, the only authority necessary is the authority to establish certain qualities of interpersonal relationship.

4) Exposed to these conditions, present knowledge suggests that individuals become more self-responsible, make progress in self-actualization, become more flexible, and become more creatively adaptive.

5) Thus such an initial choice would inaugurate the beginnings of a social system or subsystem in which values, knowledge, adaptive skills, and even the concept of science would be continually changing and self-transcending. The emphasis would be upon man as a process of becoming.

I believe it is clear that such a view as I have been describing does not lead to any definable utopia. It would be impossible to predict its final outcome. It involves a step-by-step development, based on a continuing subjective choice of purposes, which are implemented by the behavioral sciences. It is in the direction of the "open society," as that term has been defined by Popper (*19*), where individuals carry responsibility for personal decisions. It is at the opposite pole from his concept of the closed society, of which *Walden Two* would be an example.

I trust it is also evident that the whole emphasis is on process, not on end-states of being. I am suggesting that it is by choosing to value certain qualitative elements of the process of becoming that we can find a pathway toward the open society.

The Choice

It is my hope that we have helped to clarify the range of choice which will lie before us and our children in regard to the behavioral sciences. We can choose to use our growing knowledge to enslave people in ways never dreamed of before, depersonalizing them, controlling them by means so carefully selected that they will perhaps never be aware of their loss of personhood. We can choose to utilize our scientific knowledge to make men happy, well-behaved, and productive, as Skinner earlier suggested. Or we can insure that each person learns all the syllabus which we select and set before him, as Skinner now suggests. Or at the other end of the spectrum of choice we can choose to use the behavioral sciences in ways which will free, not control; which will bring about constructive variability, not conformity; which will develop creativity, not contentment; which will facilitate each person in his self-directed process of becoming; which will aid individuals, groups, and even the concept of science to become self-transcending in freshly adaptive ways of meeting life and its problems. The choice is up to us, and, the human race being what it is, we are likely to stumble about, making at times some nearly disastrous value choices and at other times highly constructive ones.

I am aware that to some, this setting forth of a choice is unrealistic, because a choice of values is regarded as not possible. Skinner has stated: "Man's vaunted creative powers . . . his capacity to choose and our right to hold him responsible for his choice—none of these is conspicuous in this new self-portrait (provided by science). Man, we once believed, was free to express himself in art, music, and literature, to inquire into nature, to seek salvation in his own way. He could initiate action and make spontaneous and capricious changes of course. . . . But science insists that action is initiated by forces impinging upon the individual, and that caprice is only another name for behavior for which we have not yet found a cause" (*12*, pp. 52–53).

I can understand this point of view, but I believe that it avoids looking at the great paradox of behavioral science. Behavior, when it is examined scientifically, is surely best understood as determined by prior causation. This is one great fact of science. But responsible personal choice, which is the most essential element in being a person, which is the core experience in psychotherapy, which exists prior to any scientific endeavor, is an equally prominent fact in our lives. To deny the experience of responsible choice is, to me, as restricted a view as to deny the possibility of a behavioral science. That these two important elements of our experience appear to be in contradiction has perhaps the same significance as the contradiction between the wave theory and the corpuscular theory of light, both of which can be shown to be true, even though incompatible. We cannot profitably deny our subjective life, any more than we can deny the objective description of that life.

In conclusion then, it is my contention that science cannot come into being without a personal choice of the values we wish to achieve. And these values we choose to implement will forever lie outside of the science which implements them; the goals we select, the purposes we wish to follow, must always be outside of the science which achieves them. To me this has the encouraging meaning that the human person, with his capacity of subjective choice, can and will always exist, separate from and prior to any of his scientific undertakings. Unless as individuals and groups we choose to relinquish our capacity of subjective choice, we will always remain persons, not simply pawns of a self-created science.

III [Skinner]

I cannot quite agree that the practice of science *requires* a prior decision about goals or a prior choice of values. The metallurgist can study the properties of steel and the engineer can design a bridge without raising the question of whether a bridge is to be built. But such questions are certainly frequently raised and tentatively answered. Rogers wants to call the answers "subjective choices of values." To me, such an expression suggests that we have had to abandon more rigorous scientific practices in order to talk about our own behavior. In the experimental analysis of other organisms I would use other terms, and I shall try to do so here. Any list of values is a list of reinforcers—conditioned or otherwise. We are so constituted that under certain circumstances food, water, sexual contact, and so on, will make any behavior which produces them more likely to occur again. Other things may acquire this power. We do not need to say that an organism chooses to eat rather than to starve. If you answer that it is a very different thing when a man chooses to starve, I am only too happy to agree. If it were not so, we should have cleared up the question of choice long ago. An organism can be reinforced by—can be made to "choose"—almost any given state of affairs.

Rogers is concerned with choices that involve multiple and usually conflicting consequences. I have dealt with some of these elsewhere (*20*) in an analysis of self-control. Shall I eat these delicious strawberries today if I will then suffer an annoying rash tomorrow? The decision I am to make used to be assigned to the province of ethics. But we are now studying similar combinations of positive and negative consequences, as well as collateral conditions which affect the result, in the laboratory. Even a pigeon can be taught some measure of self-control! And this work helps us to understand the operation of certain formulas—among them value judgments—which folk-wisdom, religion, and psychotherapy have advanced in the interests of self-discipline. The observable effect of any statement of value is to alter the relative effectiveness of reinforcers. We may no longer enjoy the strawberries for thinking about the

rash. If rashes are made sufficiently shameful, illegal, sinful, maladjusted, or unwise, we may glow with satisfaction as we push the strawberries aside in a grandiose avoidance response which would bring a smile to the lips of Murray Sidman.

People behave in ways which, as we say, conform to ethical, governmental, or religious patterns because they are reinforced for doing so. The resulting behavior may have far-reaching consequences for the survival of the pattern to which it conforms. And whether we like it or not, survival is the ultimate criterion. This is where, it seems to me, science can help—not in choosing a goal, but in enabling us to predict the survival value of cultural practices. Man has too long tried to get the kind of world he wants by glorifying some brand of immediate reinforcement. As science points up more and more of the remoter consequences, he may begin to work to strengthen behavior, not in a slavish devotion to a chosen value, but with respect to the ultimate survival of mankind. Do not ask me why I want mankind to survive. I can tell you why only in the sense in which the physiologist can tell you why I want to breathe. Once the relation between a given step and the survival of my group has been pointed out, I will take that step. And it is the business of science to point out just such relations.

The values I have occasionally recommended (and Rogers has not led me to recant) are transitional. Other things being equal, I am betting on the group whose practices make for healthy, happy, secure, productive, and creative people. And I insist that the values recommended by Rogers are transitional, too, for I can ask him the same kind of question. Man as a process of becoming—*what*? Self-actualization—for what? Inner control is no more a goal than external.

What Rogers seems to me to be proposing, both here and elsewhere (*1*), is this: Let us use our increasing power of control to create individuals who will not need and perhaps will no longer respond to control. Let us solve the problem of our power by renouncing it. At first blush this seems as implausible as a benevolent despot. Yet power has occasionally been foresworn. A nation has burned its Reichstag, rich men have given away their wealth, beautiful women have become ugly hermits in the desert, and psychotherapists have become nondirective. When this happens, I look to other possible reinforcements for a plausible explanation. A people relinquish democratic power when a tyrant promises them the earth. Rich men give away wealth to escape the accusing finger of their fellowmen. A woman destroys her beauty in the hope of salvation. And a psychotherapist relinquishes control because he can thus help his client more effectively.

The solution that Rogers is suggesting is thus understandable. But is he correctly interpreting the result? What evidence is there that a client ever becomes truly *self*-directing? What evidence is there that he ever makes a truly *inner* choice of ideal or goal? Even though the therapist does not do the choosing, even though he encourages "self-actualization"—he is not out of control as long as he holds himself ready to step in when occasion demands—when, for example, the client chooses the goal of becoming a more accomplished liar or murdering his boss. But supposing the therapist does withdraw completely or is no longer necessary—what about all the other forces acting upon the client? Is the self-chosen goal independent of his early ethical and religious training? of the folk-wisdom of his group? of the opinions and attitudes of others who are important to him? Surely not. The therapeutic situation is only a small part of the world of the client. From the therapist's point of view it may appear to be possible to relinquish control. But the control passes, not to a "self," but to forces in other parts of the client's world. The solution of the therapist's problem of power cannot be *our* solution, for we must consider *all* the forces acting upon the individual.

The child who must be prodded and nagged is something less than a fully developed human being. We want to see him hurrying to his appointment, not because each step is taken in response to verbal reminders from his mother, but because certain temporal contingencies, in which dawdling has been punished and hurrying reinforced, have worked a change in his behavior. Call this a state of better organization, a greater sensitivity to reality, or what you will. The plain fact is that the child passes from a temporary verbal control exercised by his parents to control by certain inexorable features of the environment. I should suppose that something of the same sort happens in successful psychotherapy. Rogers seems to me to be saying this: Let us put an end, as quickly as possible, to any pattern of master-and-slave, to any direct obedience to command, to the submissive following of suggestions. Let the individual be free to adjust himself to more rewarding features of the world about him. In the end, let his teachers and counselors "wither away," like the Marxist state. I not only agree with this as a useful ideal, I have constructed a fanciful world to demonstrate its advantages. It saddens me to hear Rogers say that "at a deep philosophic level" *Walden Two* and George Orwell's *1984* "seem indistinguishable." They could scarcely be more unlike—at any level. The book *1984* is a picture of immediate aversive control for vicious selfish purposes. The founder of *Walden Two,* on the other hand, has built a community in which neither he nor any other person exerts any *current* control. His achievement lay in his original *plan,* and when he boasts of this ("It is enough to satisfy the thirstiest tyrant") we do not fear him but only pity him for his weakness.

Another critic of *Walden Two,* Andrew Hacker (*21*), has discussed this point in considering the bearing of mass conditioning upon the liberal notion of autonomous man. In drawing certain parallels between the Grand Inquisition passage in Dostoevsky's *Brothers Karamazov,* Huxley's *Brave New World,* and *Walden Two,* he attempts to set up a distinction to be drawn in any society between conditioners and conditioned. He assumes that "the conditioner can be said to be autonomous in the traditional liberal sense." But then he notes: "Of course the conditioner has been conditioned. But he has not been conditioned by the conscious manipulation of another *person.*" But how does this affect the resulting behavior? Can we not soon forget the origins of the "artificial" diamond which is identical with the real thing? Whether it is an "accidental" cultural pattern, such as is said to have produced the founder of *Walden Two,* or the engineered environment which is about to produce his successors, we are dealing with sets of conditions generating human behavior which will ultimately be measured by their contribution to the strength of the group. We look to the future, not the past, for the test of "goodness" or acceptability.

If we are worthy of our democratic heritage we shall, of course, be ready to resist any tyrannical use of science for immediate or selfish purposes. But if we value the achievements and goals of democracy we must not refuse to apply science to the design and construction of cultural patterns, even though we may then find ourselves in some sense in the position of controllers. Fear of control, generalized beyond any warrant, has led to a misinterpretation of valid practices and the blind rejection of intelligent planning for a better way of life. In terms which I trust Rogers will approve, in conquering this fear we shall become more mature and better organized and shall, thus, more fully actualize ourselves as human beings.

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EEG, Consciousness, and Sleep

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Since the discovery of brain waves, considerable effort has been made to link this physiological activity to psychological correlates. After more than a quarter of a century of research, this hope has been only partially realized. Although clinicians and neurologists have found the EEG useful as a diagnostic tool, its contribution to the psychologist working with normal individuals has been slight (*1*).

The state of wakefulness and sleep of a normal individual, however, has been related successfully to changes in the EEG (*2*). A number of investigators have found that varying depths of sleep, as measured by the length or intensity of tones required to awaken the subject, are related to increases in amplitude and decreases in frequencies of delta-type (*3*) electroencephalographic patterns. When subjects were awake, alpha rhythms (*4*) could generally be detected (*5, 6*).

This article relates specific EEG patterns along the continuum between waking and deep sleep with more complex behaviors associated with degrees of consciousness and unconsciousness. It would be foolish to belabor a precise definition of consciousness. Two measures that are believed to be highly correlated with the "degree of consciousness" in normal and motivated individuals are (i) the ability to recognize and report the occurrence of particular stimuli to which they have been instructed to attend and (ii) the ability to remember and later recall these stimuli.

Consciousness refers to stages of the waking state during which degrees of awareness of external stimuli occur and to the transition state during which internal stimuli—that is, dreams—occur and are recalled. Unconsciousness refers to the state in which various stages of sleep occur. This article emphasizes the investigation of the waking end of the continuum.

Materials and Methods

Twenty-one normal, adult male subjects were selected on the basis of IQ (average or above) and a monopolar, occipital EEG showing a continuous alpha rhythm when they were awake and resting with their eyes closed (*7*).

Subjects were pretested to see whether they knew the answers to 96 factual questions on history, sports, science, and the like. They then retired to soundproof, air-conditioned booths for a normal 8-hour night's sleep. The same questions along with the correct answers were played one at a time at 5-minute intervals during the night. Continuously throughout this entire period, monopolar electroencephalographic recordings were made from each subject's right occiput and vertex. A pen marker showed the exact sections of electroencephalographic record during which the questions and the answers occurred.

Subjects were asked to call out their names immediately if they heard the answer to any question. After the 8-hour training period, all subjects were awakened and given the questions again and were tested to determine which of the answers not known previously could now be recalled.

Alpha as an Index of Consciousness

The positive relation between alpha and consciousness has been noted by a number of investigators (*5, 6*). In the present experiment, the period between awakefulness and sleep was extended sufficiently to provide a means of studying the relationship between the quantity and quality of alpha and variations in consciousness, as measured by responding and recalling.

Figure 1 shows sample EEG patterns from the right occiput along with their corresponding measures of consciousness. The letters assigned to the sleep levels correspond quite closely to those used by other investigators (*6*). Figure 1 illustrates that as the quality and quantity of alpha increases, so does the probability that a stimulus will be reported heard when it occurs and correctly recalled later.

Within level O, a slight reduction in the amplitude of the continuous waking alpha before going to sleep and after awakening from sleep was related to a similar decrease in the probability that an appropriate response would be made. As the percentage of alpha continues to decrease in quantity and amplitude in levels A+ and A, there is a corresponding decrease in the probability of responding or recalling. As the individual becomes very drowsy and level A– patterns are observed, the cyclical activity still remains, although it is approximately 2 cycles per second slower than the subject's normal waking alpha rhythm. These waves fall within the alpha frequencies, and recall still has a relatively low probability of occurrence, as does an immediate response.

For the sake of completeness, the obvious should be emphasized. Lack of alpha does not guarantee lack of consciousness. Alpha may disappear during

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