

Special Article: *Psychology in the Year 2000* by B. F. Skinner

EDITORS' INTRODUCTION

The following is a hitherto unpublished address by B. F. Skinner given on May 10, 1968 to the Department of Psychology in commemoration of the Centennial of Wayne State University. The topic was "Psychology in the Year 2000." Another invited address on the same topic was given to the department at that time by Gardner Murphy. We are indebted to Eliot Hearst at the University of Arizona who discovered the manuscript among some old reprints. He sent it to the former editor of the *Journal of the Experimental Analysis of Behavior (JEAB)*, K. A. Lattal, for possible publication. We are also indebted to Alice Young, Associate Dean of the College of Sciences at Wayne State, who researched the speech to determine if it had been published locally and/or if we needed any official permission to reprint it. Apparently, there were no reasons not to go ahead and print it in *JEAB* in recognition of the B. F. Skinner Centennial this year. The speech is printed exactly as written (other than for standard journal copyediting requirements), but we have added just a few footnotes to clarify certain references for the modern reader.

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PSYCHOLOGY IN THE YEAR 2000

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It's tempting to approach this topic in the spirit of science fiction. What new discoveries will revolutionize the field of psychology? We could find some suitable themes in current speculation. Will new drugs be discovered that will increase intelligence, control our emotions, heighten awareness, or cure psychoses? Will geneticists solve these problems through direct manipulation of the germ plasm, or will electrophysiologists do it by brain stimulation? Is it possible that a drug may be discovered which will have the same effect as sleep, so that we can stay awake all our lives and thus add at least a third to our effective life span? Will a chemical basis of memory be unveiled so that the education of the future will be a matter of inoculation or ingestion?¹ Will a knowledge of French or mathematics then be purchasable at your corner drugstore or grocery store?

Interesting as all that may be, we must not forget that 2000 A.D. is only 32 years away. It lies as near us in the future as 1936 in the

past, and many of us remember that very well indeed. It is quite possible that the final third of the 20th century will see greater progress in psychology than the middle third, because science is always accelerating, but it's unlikely that progress will be of an entirely different order of magnitude. It is more likely that certain current trends will continue and that our best guess about the year 2000 will come from a rather conservative extrapolation of what is going on now.

One of these trends seems to me to be particularly important. Examples are to be found in both basic and applied psychology but the case in applied psychology seems somewhat clearer, and I'll begin with that. Science and technology have always been closely interwoven. Practical problems usually come first and their solutions are then taken over by a basic science; the craftsman's rule of thumb is the beginning of a scientific law, as Ernst Mach pointed out long ago. But there are contributions in the other direction, as the methods and results of scientific research come to be applied to practical affairs. Much of the technology derived from a basic science may have no earlier rule of thumb counterpart. In the long run, the distinction between basic and applied science is probably not worth maintaining. Techniques of mental measurement were first invented to solve practical problems in education—how to classify students in the school system of France.² They then came to be used in a basic analysis of traits, abilities, and so forth. Introspective psychology, however, emerged from philosophical considerations of a "pure" nature, and it gave rise to instruments and techniques involved in the analysis of the environment that, combined with other techniques and instruments designed to study movement, formed the basis for the design of efficient man-machine interfaces. Studies in learning, training, and teaching have probably always been a mixture of basic and applied research.

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¹ This question was posed in reference to a strange set of studies initiated by J. V. McConnell. These studies purported to show that a history of Pavlovian conditioning in planarians could be transferred to naive planarians through ingestion of their more knowledgeable companions. (See, e.g., McConnell, J. V. [1962]. Memory transfer through cannibalism in planarians. *Journal of Neuropsychiatry*, 3, 542–548; McConnell, J. V. [1968]. The modern search for the "engram." In W. C. Corning & M. Balaban [Eds.], *The mind: Biological approaches to its functions* [pp. 49–68]. New York: Interscience. See also, Ungar, G. [Ed.]. [1970]. *Molecular mechanisms in memory and learning*. New York: Plenum Press.) At the time of Skinner's speech, these kinds of studies were hotly debated and widely publicized; but, unfortunately, they often could not be replicated by other researchers (e.g., Byrne, W. L., et al. [1966, August 5]. Memory transfer. *Science*, 153, 658–659.) (For details and history of the memory transfer research, see, e.g., Corning, W. C., & Riccio, D. [1970]. The planarian controversy. In W. L. Byrne [Ed.], *Molecular approaches to learning and memory* [pp. 107–149]. New York: Academic Press; Rose, S. [1992]. *The making of memory: From molecules to mind*. New York: Anchor Books; Travis, G. D. L. [1981]. Replicating replication? Aspects of the social construction of learning in planarian worms. *Social Studies of Science*, 11, 11–32.)

² Binet, A., & Simon, T. (1905). Méthodes nouvelles pour le diagnostic du niveau intellectuel des anormaux. *L'Année Psychologique*, 11, 191–244.

There is one feature of “pure” psychology, however, that has left a deep mark. Psychology is unique among the sciences in the sense that no other science has ever had to move against such a weight of folklore, superstition, and error. Under these circumstances, psychologists have naturally put a premium on the factual and objective. They have struggled assiduously to escape from the limitations of personal experience. What does a man actually hear or see? Control the stimulating environment, and you will find out. What does he actually do or say? Record his behavior as precisely as possible, and you will have the answer. What is he inclined to do or say? Sample his opinions and beliefs, and you will find out. What is he really like? Quantify his behavior with inventories and questionnaires and tests, and you will know. Guarantee the significance of your answers, of course, by covering many cases and draw your conclusions only with the help of accepted logical and statistical methods.

All the social sciences have taken this first basic step. They have triumphed over all earlier treatments of their subject matter by emphasizing objectivity. The social scientist has been called the man with a notebook—observing, sampling, recording what he sees, in order to advance beyond casual observation and memory. Even historians have entered upon a phase of this kind, searching for materials that can be analyzed statistically rather than relying on the personal reminiscences of eyewitnesses.

Now objectivity is no doubt valuable. It is a great step forward to discover the facts rather than to trust to personal impressions. But in playing the role of fact finder, the applied psychologist often finds himself in a subordinate position. He tends to stop short of decision making. He reports his results and leaves their use to others. Clinical psychologists often find themselves in this position with respect to psychiatrists. They examine the patient, gather statistics about him, and the psychiatrist carries on from that point. The school psychologist often simply reports to the teacher or the administrator, who takes action on the basis of his reports. It’s the statesman or politician who uses the results of opinion polls, and boards of directors who plan the future of companies in the light of market analyses. It is true that a psychologist

sometimes moves into a decision-making spot, but it is generally felt that he is then no longer acting as a psychologist, at least in a scientific sense.

This state of affairs reveals something very fundamental about the current history of psychology. The psychologist is credited—justly—with special skills in establishing facts about human behavior, but others are supposed to have a different kind of wisdom that they use in doing something about these facts. This, of course, could be true. It may very well be that psychologists are aware of the limitations of their science and of their shortcomings in decision making and are wise to leave decisions to others. But a concentration on facts in this sense, to the exclusion of what is done about them, to the exclusion of making any use of them in the prediction or the control of human behavior, is also characteristic of a basic scientific approach to behavior. It isn’t simply a question of a realistic sense of competence or modesty; if it is a necessity, we have somehow or other successfully made it into a virtue. Let me analyze two or three basic fields of research as examples.

Ethology is the study of what animals do. It is great fun to get a grant that will permit you to go off and observe animals in the wild and keep records of their behavior. It’s interesting to read books that tell you how birds build nests, how seals form harems and hierarchies, and so on. The facts comprise a record of the behavior of organisms. As to *why* animals behave in this way, the ethologist makes something of a virtue of claiming not to know. The behavior is due to innate environment—that mystery of mysteries—and that is all you can say about it. Ethologists take a good deal of satisfaction when learning theorists admit they cannot explain the ethologists’ facts. But why should they? The behavior comes with the organism, along with the capacity to change behavior. The explanation lies in the evolutionary history of the species; the variables are phylogenetic and one really can’t complain because the ethologist has not teased them all out. They are remote in time and inaccessible. But we should not therefore endow them with glamour and prestige. We are in the midst of another wave of instinct

theory. *The Naked Ape*³ is said to have sold 500,000 copies. Robert Ardrey's two books, *The Territorial Imperative*⁴ and *African Genesis*⁵ have sold very widely. All this goes back, of course, to Lorenz, and particularly to his book on aggression. It is interesting to note that people and animals behave aggressively, but there is no particular reason to suppose that this must all be traced to genetic variables which mark us inevitably as aggressors. Yet, those who write books of that sort seem to be anxious to rule out the possibility that aggressive behavior can be traced to any other source. There is a stubborn refusal to accept the possibility, for example, that some aggression might actually be of environmental origin.

The same is true in the field of developmental psychology, where again you are essentially concerned with genetic variables. If a child begins to behave in a given way at a given age, and if that fact is independent of culture, then it is something we must accept. But those who study the emergence of concepts, as, for example, in the work of Piaget and others, are likely to underplay environmental variables and to take a certain satisfaction in ruling them out, so that the mere emergence of behavior at a certain age can have greater significance. Here again, I believe, some variables are out of reach, but the point I am making is that psychologists who specialize in developmental theories are disinclined to admit the possibility of environmental variables and take a certain satisfaction when environmental explanations prove unworkable.⁶

The same thing is found in other social sciences. The fields of sociology and anthropology today are divided among those who take a structuralist position and those who take a functional. The structuralist position, represented at the moment by Claude Lévi-

Strauss,⁷ is concerned with what people do, simply as behavior. This is, in a sense, a return to the days of anthropological inquiry. You go off on a sailing ship and turn up in some out-of-the-way place and write an account of what people there do. Kinship systems, the way they make fire, the ways they hunt, and so forth—these are simply behavior, without any references to causes. People were once said to follow customs because it was customary to follow them. And in a sense that position is maintained very stubbornly today by the structuralist school.

The alternative view, which becomes explicit with Malinowski,⁸ is that people follow customs because of what they get out of doing so. There are important consequences. These are environmental, and once identified, they account for what people do.

You see a special example today in linguistics. The current pattern in structural linguistics is simply to emphasize what people do—they speak, make certain noises, and these can be analyzed phonemically, phonetically, and phonologically in the greatest detail. Grammatical structure can also be analyzed. You look at the topography of the speaker and satisfy yourself with a physical account of what is going on. No real causal approach is attempted. This is, in part, a reaction against old-fashioned psychologizing. (That is true, I think, in all the fields I have mentioned.) To argue that an animal does something because it finds satisfaction in doing this, or because it intends to get something out of this; to argue that people follow customs because of what they feel or because of their attitudes toward each other; to argue that a kinship system gives us an insight into the savage mind—these are mentalistic explanations which were wisely rejected. In political science a comparable school called behavioralism (a very confusing term) is at best a kind of methodological behaviorism, the proponents of which simply record what people do and make no effort to tell why they do it.

It is not, therefore, simply a matter of whether or not psychologists have the oppor-

³ Morris, D. (1967). *The naked ape*. New York: McGraw Hill.

⁴ Ardrey, R. (1966). *The territorial imperative*. New York: Atheneum.

⁵ Ardrey, R. (1961). *African genesis*. New York: Macmillan.

⁶ For a recent discussion of the nativist-empiricist issue in developmental psychology, see Newcombe, N. S. (2002). The nativist-empiricist controversy in the context of recent research on spatial and quantitative development. *Psychological Science*, 5, 395-401.

⁷ See, for example, Lévi-Strauss, C. (1967). *Structural anthropology*. (C. Jacobson & B. G. Schoepf, Trans.). Garden City, NY: Anchor Books.

⁸ See, for example, Malinowski, B. (1944). *A scientific theory of culture and other essays by Bronislaw Malinowski*. Chapel Hill: University of North Carolina Press.

tunity or the power to assert themselves or whether they recognize the limits of their science. Rather, it is an uncertainty as to how behavior is, indeed, to be explained. The generative grammarians appeal to innate mental processes, thus returning, as one linguist has pointed out, to the Middle Ages. The structural anthropologist goes back to the savage mind. This is not satisfactory—hence a deliberate, exclusive commitment to descriptive facts. A change in all this, I think, is coming about, and it seems to me to be the kind of thing that, when extrapolated, gives us an insight as to what will be happening in the year 2000.

In my own field of interest, the experimental analysis of behavior, subhuman and human, there is an emphasis not only upon topography of behavior—on what the organism is doing—but on the relation between behavior and environmental variables. The analysis remained in the laboratory for a long time, but it has now come out into the world at large. Several areas show what seems to me to be a new kind of applied psychology. The distinction is between the older emphasis on what people do and the newer emphasis on predicting and controlling their behavior.

Take education for example. For the first 50 years or so, educational psychology was primarily a matter of measurement. Mental tests dominated the field. Teaching was generally left to common sense. The experience of a teacher in the classroom was guided by a few rules of thumb discovered by successful teachers and communicated to students. In the older techniques, teachers fell back on ways of controlling behavior borrowed from daily life. These were primarily aversive. The student studied because he feared the consequences of not studying. Unfortunately, although we've given up the more violent kinds of aversive consequences, that is still the pattern. A great deal of the unrest among students today can be traced to a slow recognition that somehow or other they are not actually being *taught*. They are simply held responsible for learning. We tell them what to learn and test them, but we do not actually teach.

There is another possibility. Programmed instruction is an example. A good program (and don't take the first program you find as a sample) is simply a reorganization of what

is to be learned in such a way that the student is maximally reinforced for learning it in positive ways rather than as a means of escape from undesirable consequences. Programmed instruction is going to be much more widely used than many educators realize. It represents the application of psychological principles that go beyond merely analyzing what happens, or what students are doing, to an exploration of why they do it. Possibly more exciting at the moment in education is the application of the same principles to classroom management. We hear a great deal these days about the problem of discipline. If you mean by discipline that teachers should have weapons which are somewhat more lethal than those that the students carry, then we are back in the old pattern; but if you mean by discipline arranging contingencies in the classroom under which the students willingly come to school, willingly sit down, keep quiet when they are not supposed to talk, study and learn, then that is within reach.

Psychotherapy is another example. The psychologist has, in the past, played the role of a psychometrician. (What goes on in clinical psychology, in counseling, is a different matter. I am talking now about the psychiatric case.) The psychiatrist is not making use of a basic science. Psychiatry, in spite of Freud and others, is still largely a matter of good personal contact between patient and therapist, and so on. And institutionalized psychotics don't even get the benefit of much of that. The situation is, as everyone recognizes, undesirable. And something is beginning to be done in redesigning the conditions under which psychotics live. This is another example of moving from the mere recording of what psychotics do, to an analysis of causes that permit us to do something about it. An example that shows how easy it is to misunderstand what is happening is an experiment by Houghton and Ayllon,⁹ working with a ward of some 30 schizophrenic women. When they approached the situation, it was taking three attendants 30 minutes to shepherd these patients into the dining room at mealtime. A good deal of pushing, nudging,

⁹ Ayllon, T., & Haughton, E. (1962). Control of behavior of schizophrenic patients by food. *Journal of the Experimental Analysis of Behavior*, 5, 343-352.

cajoling—and they finally got them in. The situation was then changed. At mealtime a bell sounded, and anyone who got into the dining room within 30 minutes ate; the others did not. Not very many got there the first meal, but a great many did the second, and almost all the third. (I think there was one holdout who went 6 days, but she was overweight anyway.) Eventually they were all getting into the dining room in 30 minutes. Then the time was cut down to 25, 20, 15, 10, and finally to 5 minutes. At the end of the experiment, when the bell rang, all the patients in the ward filed into the dining room and sat down within 5 minutes. It seems like such a simple thing. It doesn't seem as if you'd need a science of behavior to suggest the change. But the fact is that that kind of condition is very common. Patients in a psychiatric ward tend to be bored. Our own problem of leisure is nothing compared with that of the psychotic. One of the interesting things one can do is to annoy the attendants, but the attendants can usually control that by responding as little as possible. When the attendants are charged with the responsibility of getting patients into the dining room, however, they are vulnerable. They can't ignore the patients. The dinner bell actually gives the patients extraordinary power. They can really annoy the attendants by going away from the dining room or by refusing to move. At every mealtime, the patients could get 30 minutes of fun by holding out against the attendants. The situation changed immediately when the attendants were not required to get the patients into the dining room, for they could then continue to ignore efforts to annoy them. Moreover, a slightly increased deprivation made institutional food reinforcing, and it reinforced going into the dining room.

Here, then, we have an example of looking at a situation, discovering that the "contingencies of reinforcement" are wrong, and changing them. But there are other problems in the management of psychotics as they tend to be insensitive to the contingencies under which they live. Special contingencies are needed. A former student of mine, Ogden Lindsley, speaks of a prosthetic environment. Eyeglasses are prosthetic devices for those with poor vision and hearing aids for those with poor hearing. A prosthetic environment is simply one in which a person who is for

some reason simply not sensitive to contingencies of reinforcement can adjust because the contingencies have been clarified. Tokens or points can be used to make reinforcement conspicuously contingent upon behavior. A good deal is now being done in state hospitals and elsewhere in working out reinforcement systems. This is simply an example of a psychological principle being extended to the design of special environments.

Economics is another field in which all this is relevant but in which, at the moment, not much is being done. Productive labor is, of course, a very important problem in any culture. We have our incentive conditions, the Russians have theirs, and we tend to compare cultures largely in terms of economic systems, as when we talk about a capitalistic culture. I speak now very much aware of my amateur status, but there are principles of reinforcement in wage systems, and the issues run quite parallel with problems in the laboratory. Money is a conditioned reinforcement; it only works when it has been made so. In a primitive culture, you may not be able to use it. You can't use deferred payment without a great deal of conditioning to make it effective. An engineer who used local labor in an odd corner of the world had to put a paymaster at the end of a ramp to pay each worker each time he dumped a wheelbarrow full of earth. It was not possible simply to pay at the end of the day. It's said that the Sherpa guides who went up Mount Everest in the first ascent had to be paid every night. Three guides began by carrying all the local coins that eventually came down carried in separate portions by all!¹⁰

The ordinary weekly wage is a very inadequate example of positive reinforcement. No sensible organism works on Monday morning for a payment on Friday afternoon. The system works only when there is a supervisor or boss who can threaten discharge. The em-

¹⁰ Although an intriguing example, we have not been able to verify the veracity of or source for this comment. For a discussion of the motivation for why the Sherpas climb, see Ortner, S. B. (1999). *Life and death on Mt. Everest: Sherpas and Himalayan mountaineering*. Princeton, NJ: Princeton University Press. Ortner notes (p. 203) that "in spite of what the sahibs thought, [Sherpas] climbed largely for reasons of money," but also points out (p. 66) that "To say that most Sherpas climbed (and still climb) primarily for money is the beginning, not the end, of understanding why they climb."

ployee works during the week not for the pay envelope, but to avoid losing the standard of living that the pay envelope guarantees. Various morale problems follow. More effective wage systems have often been misused, simply because they are effective, and they are now generally opposed by those interested in labor. I am told that industrial managers don't even discuss incentive wages anymore, but piecework or piece-rate pay engenders not only a very high level of work but a kind of activity that the worker reports as enjoyable. The schedule used in gambling devices, the so-called variable ratio schedule, is a particularly good one from that point of view. If you have ever seen a room full of people playing bingo, you've seen what it can do. Here are people sitting quietly, looking at two or three cards in front of them, listening keenly to numbers and letters as they are called out, arranging small counters very precisely, and speaking up instantly when a pattern is completed. What would industry not give to have workers who would work with that kind of concentration? And what would workers not give to have as much fun?

Governments use almost completely aversive techniques. At one time it was possible to define the state simply as the power to punish. Now, of course, our governments manipulate vast quantities of positive reinforcers, and yet they have failed to achieve very much as a result. Governments ordinarily don't even bother to define the behavior they hope to strengthen or weaken as they administer rewards or punishments. In Vietnam, for example, we haven't made it clear what we would like to have our friends or enemies do, although we send in 2 or 3 billion dollars worth of positive and negative reinforcers every month.

Another area is daily life. There is no one figure, comparable with that of a teacher, therapist, employer, or governor, who cares about what happens in daily life, even though daily life uses techniques appropriate to all these areas. We educate each other, we induce each other to work, we give each other therapy, and so on. Nevertheless, the field is in the hands of the amateur at the moment. We feel, somehow or other, that we are not ready to move in and do anything more positive about it. Yet, what goes on in daily life is capable of analysis and design and change.

An interesting example was an experiment at the National Training School for Boys in Washington, in which the daily life of certain young delinquents was completely redesigned.¹¹ These young men—all minors—were murderers, rapists, and the like. The environmental conditions were changed so that a boy could, if he liked, go “on relief.” That is to say, he was guaranteed a nutritious but not very palatable diet; he had a pad in the dormitory at night; he could sit around on a bench all day. If that was what he wanted, he got it. But he could improve his lot enormously by earning points. He could rent a private room; he could use billiard tables; he could watch television; he could have a private television set; he could buy time off and take a day out on the town. He earned points in part through simple janitorial services or by working in the kitchen, but mainly he earned them by learning something. Teaching machines and programmed instruction were available, as well as other learning materials with tests. A bright boy could quickly become a capitalist. I visited this experiment and saw the private room of one of the bright boys, with a typewriter and a television set—all of which he had earned simply by learning things. An important result is that the boys discovered they could learn something. Most of them had become delinquent in part because their school system had persuaded them that they were stupid. The only way to be successful seemed to be delinquent. Many of them had to start very far back, possibly in grade or high school reading, writing, and mathematics, but the chances were greatly increased that when they left the institution they would be better able to fall into a legal way of life and stay out of trouble.

My novel *Walden II* was an effort to suggest the design of a community with a normal cross section of the population. These experiments on specific communities are bringing us a little closer to that state of affairs all the time. There is a good deal of interest on the part of various groups in starting something like *Walden II*, and it may even be done even-

¹¹ Cohen, H. L., & Fillipczak, J. (1971). *A new learning environment*. San Francisco: Jossey-Bass. (We thank Mike Zeiler for bringing this reference to our attention.) Of curious historical interest, Charles Manson, at the age of 17, was incarcerated at the National School for Boys in 1951, but was transferred after he raped another inmate.

tually with government support. People who are interested in urban design, architecture, and city planning are realizing the importance of the psychological principles involved and the need to design the space in which people live so that contingencies of reinforcement will bring out the best in individuals and give them a satisfactory way of life.

I'm not saying that the science of behavior has been a complete innovator in this sense. There have been very wise people from time to time who have shown a prescientific wisdom that has often been effective. My point is that as psychology moves toward an account of behavior as a dependent variable and seeks the independent variables of which it is a function, it will take over the realm of decision making in the design of cultures that

has been left in the past to intuition and guesswork. This doesn't mean that psychologists are going to run the world anymore than physicists run the world when physical knowledge is involved, but psychology will supply the techniques that those who are in the position of educators, governors, therapists, and so forth will need to achieve their respective goals. That kind of thing is going to develop very rapidly during the last third of the 20th century. By the year 2000 we will have to leave fewer of our problems to personal experience, to historical analogy, or to the kind folk wisdom that at the present time go into their solution. Possibly this is science fiction but it may nevertheless come true—a scientific analysis of human behavior is generating a technology that may have extraordinary consequences.