VOLUME XXVI, NO. 4
JANUARY 24, 1973

SCIENCE AND ITS CRITICS

WHAT does it mean to be "anti-scientific"? Or, to give the question the relativist frame it should have: What is meant by this epithet as commonly used? The term does not apply merely to sloppy or careless thinking, which is an offense of another sort. Defenders of the scientific outlook see no serious threat to the discipline they cherish in such weaknesses, since they are easily identified and disposed of. It is the man who reasons with some cogence in criticism of a generally accepted scientific conception or assumption who is condemned as anti-scientific—and this, sometimes, in a manner in which independent thinkers were branded as "heretics" in the days of triumphantly monolithic religious orthodoxy.

But isn't there a great difference between science and religion? Well, yes and no. Insofar as science does indeed rest upon verified public truth—yes; but science is more than this, since it also includes frontiers of inquiry into matters not yet understood. And when it comes to the question of approaches and methods in relation to the as-yet-unknown or undetermined, there may sometimes be very little difference between orthodox religion and orthodox science.

This conclusion seems to have support from an article, "Prematurity and Uniqueness in Scientific Discovery," by a molecular geneticist, Gunther S. Stent, in the *Scientific American* for December, 1972. Primarily, Mr. Stent sets out to define "prematurity," which means to show how and why a discovery may attract no attention among other scientists until years after the actual finding has been reported. The answer he finds is this: "A discovery is premature if its implications cannot be connected by a series of simple logical steps to canonical, or generally accepted, knowledge." A large part of this article is devoted to giving illustrations of discoveries recognition of which was delayed until those "simple logical steps" had become available. For example, Friedrich Miescher determined the presence of deoxyribonucleic acid in the cell nucleus in 1869, and Oswald Avery identified it as "the active principle in bacterial transformation and hence as genetic material" in 1944, but not until other work by Erwin Chargaff at Columbia and Alfred Hershey and Martha Chase at Cold Springs Harbor (Carnegie Laboratory) was complete did the importance of DNA become evident, inspiring Watson and Crick to inquire into its structure. Similarly, Mendel's discovery of the gene in 1865 had to wait thirty-five years before its recognition or "rediscovery," for the reason the "concept of discrete hereditary units could not be connected with canonical knowledge of anatomy and physiology in the middle of the 19th century," and also because "the statistical methodology by means of which Mendel interpreted the results of his pea-breeding experiments was entirely foreign to the way of thinking of contemporary biologists." Therefore, Mendel's discovery was "premature."

Mr. Stent's idea of a presently "premature" discovery is the extrasensory perception of central interest to parapsychologists. He regards the demonstrations of *psi* or psychic energy independent of known physical agencies as not fitting into present-day canons of scientific knowledge. Discussing this question at some length, he describes a "heated argument" between two now well-known molecular biologists, back in 1948. R. E. Roberts of the Carnegie Institution in Washington had become interested in ESP and said to Salvador Luria of Indiana University that "it had not been given fair consideration by the scientific community." As Mr. Stent tells it:

> Luria declared that not only was he not interested in Roberts' proposed experiments but also in his opinion it was unworthy of anyone claiming to

be a scientist even to discuss such rubbish. How could an intelligent fellow such as Roberts entertain the possibility of phenomena totally irreconcilable with the most elementary physical laws? Moreover, a phenomenon that is manifest only to specially endowed subjects as claimed by "parapsychologists" to be the case of ESP, is outside the proper realm of science, which must deal with phenomena accessible to every observer. Roberts replied that far from him being unscientific, it was Luria whose bigoted attitude toward the unknown was unworthy of a true scientist. The fact that not everyone has ESP only means that it is an elusive phenomenon, similar to musical genius. And just because a phenomenon cannot be reconciled with what we now know, we need not shut our eyes to it. On the contrary it is the duty of the scientist to try to devise experiments designed to probe its truth or falsity.

Both the participants in this debate seemed right in their way to Stent. Later, in a book by C. West Churchman, he found what seemed a key to resolving the difficulty:

Churchman stated that there are three different possible scientific approaches to ESP. The first of these is that the truth or falsity of ESP, like the truth or falsity of the existence of God or of the immortality of the soul, is totally independent of either the methods or the findings of empirical science. Thus the problem of ESP is defined out of existence. I imagine that this was more or less Luria's position.

Churchman's second approach is to reformulate the ESP phenomenon in terms of currently acceptable scientific notions, such as unconscious perception or conscious fraud. Hence, rather than defining ESP out of existence, it is trivialized. The second approach probably would have been acceptable to Luria too, but not to Roberts.

The third approach is to take the proposition of ESP literally and to attempt to examine in all seriousness the evidence for its validity. That was more or less Roberts' position. As Churchman points out, however, this approach is not likely to lead to satisfactory results. Parapsychologists can maintain with some justice that the existence of ESP has already been proved to the hilt, since no other set of hypotheses in psychology has received the degree of critical scrutiny that has been given to the ESP experiments. Moreover, many other phenomena have been accepted on much less statistical evidence than what is offered for ESP. The reason Churchman advances for the futility of a strictly evidential approach to ESP is that in the absence of a hypothesis of how ESP could work it is not possible to decide whether any set of relevant observations can be accounted for only by ESP to the exclusion of alternative explanations.

After reading Churchman's review I realized that Roberts would have been ill-advised to proceed with his ESP experiments, not because, as Luria had claimed, they would not be "science" but because any positive evidence he might have found in favor of ESP would have been, and would still be, premature. That is, until it is possible to connect ESP with canonical knowledge of, say, electromagnetic radiation and neurophysiology no demonstration of its occurrence could be appreciated.

Since this is an article by a scientist, written for scientists and the scientifically-minded, and in behalf of the general discipline of scientific inquiry, it may be taken as a fair statement of enlightened scientific opinion. The objective, obviously, is the maintenance of *order* in scientific progress or proceedings, without excessive repression or innovation. If innovation comes "too soon"—well, it will have to wait until canonical scientific knowledge grows up or expands to make it acceptable. Yet it is evident that a margin of radical differences of opinion among scientists is inevitable—and plainly necessary—on the forefront of inquiry. Meanwhile, Luria and Roberts were in effect charging each other with being "anti-scientific"! Mr. Stent seems to think that the canon must rule—for what might be called a higher utilitarian reason. If the new discovery is accepted too soon, other scientists can't "do anything" with it. They might of course undertake to modify the canon, but this can hardly succeed save from the confrontation of an extraordinarily dramatic and powerfully persuasive discovery which has the effect of being irresistible. And this would amount to what we term a "revolution" in science.

In *Personal Knowledge*, Michael Polanyi adopts much the same position, although with an important qualification, saying:

When I speak of science I acknowledge both its tradition and its organized authority, and I deny that

> anyone who wholly rejects these can be said to be a scientist, or have any proper understanding and appreciation of science. Consequently, nothing that I—who accept the traditions and authority of science—may say about science can mean anything to such a person, and this holds also in reverse. Yet I do not enter this commitment unconditionally, as shown by the fact that I refuse to follow both the traditions and authority of science in its pursuit of the objectivist ideal in psychology and sociology. I accept the existing scientific opinion as a *competent* authority, but not as a *supreme* authority, for identifying the subject matter called "science."
>
> This distinction is . . . indispensable to any survey of the historic progress of science. For to limit the term science to propositions which we regard as valid, and the premisses of science to what we consider to be its true premisses, is to mutilate our subject matter. A reasonable conception of science must include conflicting views within science and admit of changes in the fundamental beliefs and values of scientists. To acknowledge a person as a scientist—and even as a very great scientist—is merely to acknowledge him as competent in science, which admits the possibility that he was, or is, in many ways mistaken.

Earlier in this volume, under the heading of "Scientific Controversy," Polanyi has pointed out that scientific disagreements do not lie altogether within the realm of science. There is a sense in which you cannot know whether some proposal is "scientific" or not unless you give it sympathetic attention, and even become involved in its assumptions before they have been verified. To illustrate Polanyi speaks of Freud's psychoanalysis, Eddington's *a priori* system of physics, Rhine's ESP, and Lysenko's environmental genetics. Each of these discoverers, innovators, or "theoreticians," has what can be called his own canon and his own conceptual vocabulary, which, Polanyi suggests, "is correspondingly segregated from any knowledge or alleged knowledge rooted in different conceptions of experience." One must be willing to enter this system in order to evaluate it, and "no one can learn a new language unless he first trusts that it means something." He continues:

> A hostile audience may in fact deliberately refuse to entertain novel conceptions such as those of Freud, Eddington, Rhine or Lysenko, precisely because its members fear that once they have accepted this framework they will be led to conclusions which they—rightly or wrongly—abhor. Proponents of a new system can convince their audience only by first winning their intellectual sympathy for a doctrine they have not yet grasped. Those who listen sympathetically will discover for themselves what they would otherwise never have understood. Such an acceptance is a heuristic process, a self-modifying act, and to this extent a conversion. It produces disciples forming a school, the members of which are separated for the time being by a logical gap from those outside it. They think differently, speak a different language, live in a different world, and at least one of the two schools is excluded to this extent for the time being (whether rightly or wrongly) from the community of science.
>
> We can now see, also, the great difficulty that may arise in the attempt to persuade others to accept a new idea in science. We have seen that to the extent to which it forms a new way of reasoning, we cannot convince others of it by formal argument, for so long as we argue within their framework, we can never induce them to abandon it. Demonstration must be supplemented, therefore, by forces of persuasion which can induce a conversion. The refusal to enter on the opponent's way of reasoning must be justified by making it appear altogether unreasonable.
>
> Such comprehensive rejection cannot fail to discredit the opponent. He will be made to appear as thoroughly deluded, which in the heat of battle will easily come to imply that he was a fool, a crank or a fraud. And once we are out to establish such charges we shall readily go on to expose our opponent as a "metaphysician," a "Jesuit," a "Jew," or a "Bolshevik," as the case may be—or, speaking from the other side of the Iron Curtain—as an "objectivist," an "idealist" and a "cosmopolitan." In a clash of intellectual passions each side must inevitably attack the opponent's person.
>
> Even in retrospect such conflicts can often be appreciated only in these terms. They do not appear as scientific arguments, but as conflicts between rival scientific visions, or else between scientific values and extraneous interests interfering illegitimately with the due process of scientific inquiry.

For illustrations of controversies of this sort, Polanyi describes the historic struggle between the

Copernican and the Ptolemaic theories; the long argument about Bode's law, concerned with the relative distances of the planets, in which the young Hegel went down to defeat; the attack on van's Hoff by Kolbe for the former's "vitalistic" tendencies; and the long fight about the nature of alcoholic fermentation among nineteenth-century chemists. Polanyi's point is to stress the importance of the initial conception of meaning, the driving interest and concern that brings creativity and originality to the sciences, and to show that the borderland of discovery must be subject to controversy and flux or science will grow sterile and merely repeat the past. Accounts of the nature of science which emphasize only the process of "verification" overlook the fertility of minds devoted to discovery, the unorthodoxy of many original inspirations, and the value of uninhibited wondering which reaches beyond the canons of the time.

Persistent intuitions of rationality in nature, philosophies whose transcendental implications are never mentioned, mystical hunches, and notions of elegance and beauty may all play a part in the beginnings of scientific discovery, and the potency of presently unacceptable theories as determinants of where investigators look for evidence, along with these other factors, tend to be hidden in the purified—"bowdlerized," Polanyi says—versions of what happens in the development of scientific knowledge, since the convention that science recognizes only "empirical" methods and accepts only "objective" knowledge must be preserved.

The great merit of Polanyi's work is its restoration of science to membership in the humanities. For, as he shows, the true practice of science is essentially a humanist undertaking. It does not dispense with the moral qualities of human beings, but rather relies upon them. The idea of "empiricism" is at best no more than a somewhat narrow and dogmatic reading of the spirit of impartiality and integrity in the study of nature, since we all go to nature with preconceptions of some sort. "Natural science," as Polanyi says, "deals with facts largely borrowed from common experience," so that "The methods by which we establish facts in everyday life are therefore logically anterior to the special premisses of science, and should be included in a full statement of these premisses." The validity of the scientific canon depends upon trust:

> Any attempt to define the body of science more closely comes up against the fact that the knowledge comprised by science is not known to any single person. Indeed, nobody knows more than a tiny fragment of science well enough to judge its validity and value at first hand. For the rest he has to rely on views accepted at second hand on the authority of a community of people accredited as scientists. But this accrediting depends in its turn on a complex organization. For each member of the community can judge at first hand only a small number of his fellow members, and yet eventually each is accredited by all. What happens is that each recognizes as scientists a number of others by whom he is recognized as such in return, and these relations form chains which transmit these mutual recognitions at second hand through the whole community. This is how each member becomes directly or indirectly accredited by all. The system extends into the past. Its members recognize the same set of persons as their masters and derive from this allegiance a common tradition, of which each carries on a particular strand.

These are the scientists. What then is science?

> The discoveries of science have been achieved by the passionately sustained efforts of succeeding generations of great men, who overwhelmed the whole of modern humanity by the power of their convictions. Thus has our scientific outlook been moulded, of which . . . logical rules give a highly attenuated summary. If we ask why we accept this summary, the answer lies in the body of knowledge of which they are the summary. We must reply by recalling the way each of us has come to accept that knowledge and the reasons for which we continue to do so. Science will appear then as a vast system of beliefs, deeply rooted in our history and cultivated today by a specially organized part of our society. We shall see that science is not established by the acceptance of a formula, but is part of our mental life, shared out for cultivation among many thousands of

> specialized scientists throughout the world and shared receptively, at second hand, by many millions. And we shall realize that any sincere account of the reasons for which we too share in this mental life must necessarily be given as part of this life.
>
> Science is a system of beliefs to which we are committed. Such a system cannot be accounted for either from experience as seen within a different system, or by reason without any experience. Yet this does not signify that we are free to take it or leave it, but simply reflects the fact that it *is* a system of beliefs to which we are committed and which therefore cannot be represented in non-committal terms. In leading up to this position, the logical analysis of science decisively reveals its own limitations and points beyond itself in the direction of a fiduciary formulation of science, to which I propose to move on at a later stage of this inquiry.

This is an account of science to which all ought to be able to subscribe and respect.

But what about the question of canonical scientific knowledge, and the claim that ESP research is scientifically irrelevant since nothing in the present scientific canon indicates hospitality to the assumptions and implications that ESP involves?

The issue, here, is quite simple. If scientists, when discussing these matters, would refrain from sounding as though they had charge of all the dependable knowledge that exists, then no one of intelligence could find any reason for sounding "anti-scientific." It is the presumption allowed by scientists to become extremely widespread, that the methodological limitations of one sort of scientific inquiry must apply to *all* serious inquiry, all fruitful investigation, that requires determined opposition and even aggressive criticism. Such opposition and criticism cannot be called " anti-scientific."

The *ex cathedra* role of the spokesmen for science continually offends by implying that the rules of canonical knowledge, which bind the members of the scientific community (until some daring and extraordinarily talented individual succeeds in changing them), must command a similar allegiance from all the rest of us. The fact is that science develops in its own particular directions, guided by its own unfolding abstractions and conceptions of ends, and these abstractions and ends are not the processes and meaning of human life. They may enter into and affect human life, but they have a different origin, process, and purpose, and will continue to be different until the day that science, religion, and philosophy are one.

REVIEW
SELF-CREATED MAN

RICHARD WRIGHT, of black, white, and Choctaw Indian ancestry, was born in Natchez, Mississippi, to a sharecropper father and a schoolteacher mother in 1908. In 1914 the boll weevil drove the Wrights, along with many others, aff the land and they moved to Memphis. There Richard's father, Nathan, found work as a night porter, but he could not adjust to city life and before long left the family. Richard's mother, Ella Wright, found work as a cook for white people, but the pay was hardly enough to keep her family alive.

> Sometimes Ella took Richard to work with her and stood him in a corner of the kitchen while she cooked. That did not work out very well because he was too hungry and Ella had been told that she was not to feed her child anything but leftover scraps from dinner plates. Richard could not understand why some people could eat and he could not. And Ella could not bear to watch his suffering.

The life-story of this American writer of distinction is told by Constance Webb in *Richard Wright*, a sympathetic biography published in 1969 (Putnam). It is a tale of uncompromising integrity from beginning to end—made worth reading about by the power of Wright's disciplined imagination. No literate American should allow himself to remain ignorant of the circumstances of Wright's life, and what he distilled from his experiences. His work is doubtless subject to criticism and he had his share of blind spots, which Constance Webb neither stresses nor hides. But the stature of Wright as a man and an artist rises heroically above these limitations. If a dozen men of similar talent could do as much, the impact of the achievement would be felt throughout the land.

The attraction which made us want to read Constance Webb's biography was memory of *Black Boy*, an account of his boyhood which Wright wrote after the success of *Native Son.* In 1949 we said of this book:

> *Black Boy*, by Richard Wright, makes you forget, in a way, that the boy is black—although in another way you remember it all the more. For the quality of his writing, Richard Wright's skin-color is of no more importance than the color of his shoes. A lot of the time, the reader would like to have been, himself, the kind of boy Richard Wright was—to have his courage and his self-respect.

Needless to say, from boyhood Wright was consumed with a passion to write—to be a writer. His childhood was filled with horrors—with things no man could ever forget—but he managed to resist the distortions such experiences produce in more ordinary men. Wright wrote about race, but he was never a racist, and he wrote about all things human. He was not invulnerable; he had intense and persisting pain; the importance of reading this book is to see how he *used* this pain; he was not its creature.

The family had to move about to keep from going hungry. Ella suffered a stroke and could not work any more, and they lived with various relatives. When Richard was twelve, he and his mother were staying with his grandmother in Jackson, Miss., and the boy had not yet had a full year of formal schooling. His youngest aunt, who taught in the local Seventh-Day Adventists school, arranged for Richard to attend there. The children were a docile lot, but he was made of different stuff. Constance Webb says:

> Richard had nothing in common with his classmates: he had come from a milieu of alcoholism and saloons, railroad yards, street gangs, an orphan home, he had shifted from town to town and house to house, had known the murder by white people of an uncle and the murder of a white woman by another uncle. Before the first day of school had ended Richard had shocked half the students with his cursing and four-letter words.

But Richard was bright and moved quickly from grade to grade. He read everything in sight, which at that time was mostly pulp fiction.

He never acquired the "survival" manners of a "good" Negro. He couldn't behave that way. Without thinking he would look people in the eye when he spoke. He couldn't help it. His next

school was a public school for Negroes in Jackson—elementary, there were no Negro high schools. But he did so well in the eighth grade that a friendly teacher taught him a number of high-school subjects, including Latin and algebra. He was chosen to be class valedictorian at the graduation ceremony. One morning the assistant principal, Prof. Cobbins, called Richard to his office:

> "Well, Richard Wright, here's your speech," Cobbins told him, handing a paper across his desk.
>
> "But Professor, I've written my speech already," Richard said.
>
> Cobbins laughed indulgently.
>
> "Listen, boy, you're going to speak to both *white* and colored people that night. What can you alone think of saying to them? You have no experience. . . ."
>
> It was not the first time that Richard had disagreed with Professor Cobbins. It had been raining one day, a steady unremitting torrent, and Cobbins had remarked to the class that it was the work of God. Richard's hand shot up and without waiting to be recognized he asked: "What does God have to do with making it rain?" He then went into a long explanation of the chemical changes, moisture, hot and cold air, wind currents, to prove that God did not make it rain every time the farmers needed it.
>
> Cobbins' suggestion that Richard give a speech he had not written made him furious. But he tried to keep his voice low and quiet when he answered:
>
> "I know that I'm not educated, Professor. . . . but the people are coming to hear the students, and I won't make a speech that you've written."
>
> No matter how much the assistant principal argued, Richard clung to his notions of honesty. More and more, stubborn refusal was becoming a way to preserve his own integrity. Finally, Cobbins made an inverted threat: he had been considering Richard for a position in the school system, he said, but he wondered whether he would fit in.

He used other arguments. The white superintendent would attend and it was important to make a good impression on him. If Richard did not do the right thing, the school might not let him graduate.

Days went by, but Richard stood firm, and finally the school permitted him to graduate and to make his own speech.

At seventeen, Richard moved to Memphis, found a job and saved to send for his mother, who still could not work although she was somewhat recovered. There he began to read better things, buying second-hand copies of *Harper's,* the *Atlantic,* and *American Mercury* for a few cents. He discovered H. L. Mencken and realized that writing was a way of "fighting." Southern newspapers had been attacking Mencken and Richard figured that there must be something to him. He borrowed a library card and began reading Sinclair Lewis and Dreiser. Then there were Anatole France, Conrad, Sherwood Anderson, Dostoevski, Tolstoy, Twain, Eliot, Mann, Dumas, and Poe, whom he read about and began to explore.

The next move was to Chicago, where he and his mother would live with Aunt Maggie. At nineteen, Wright left the South with no regrets:

> The white South said it knew "niggers," and I was what the South called a "nigger." Well, the white South had never known me—never known what I thought, what I felt. The white South said I had a "place" in life. Well, I had never felt my "place"; or, rather, my deepest instincts had always made me reject the "place" to which the white South had assigned me. It had never occurred to me that I was in any way an inferior being. And no word that I had ever heard fall from the lips of southern white men had ever made me really doubt the worth of my own humanity. . . . Not only had the southern whites not known me, but, more important still, as I had lived in the South I had not had the chance to learn who I was. The pressure of southern living kept me from being the kind of person I might have been. I had been what my surroundings demanded, what my family—conforming to the dictates of the whites above them—had exacted of me, and what the whites had said I must be. Never being fully able to be myself, I had slowly learned that the South could recognize but a part of a man, could accept but a fragment of his personality, and all the rest—the best and deepest things of heart and mind—were tossed away in blind ignorance and hate.

Richard's first story had been published when he was sixteen, in 1924, in the *Southern Register*, a Negro tabloid issued in Jackson. In Chicago, he began to work hard on his writing, experimenting with various forms, reading omniverously in sociology and other areas. He had a passion to know, to understand, in order to describe. He tried stream-of-consciousness writing in dialect, and other modes. He had a job in the post office and hoped for protected steady employment. Then, in 1929, the stock market crash came and Richard was soon out of work.

Now began the ordeal of his life as a grown man. The realities of economics, which he had suffered but ignored, were brought home to him. He saw in others the same want, poverty, and hunger he felt. The pain was there, but for Wright it was also a means of studying the human condition. He went eight months without a job—then got a little employment here and there. Finally, through a friendly welfare caseworker, Richard met a University of Chicago professor who gave him a reading program. Then the professor's wife found him a job in a hospital, and after that he became publicity agent for the Federal Negro Theatre—a New Deal project. Richard now mixed with people of similar interests and his real career began to take shape. He met socialists and communists, joined the John Reed Club and became its secretary. This was followed by membership in the Communist Party and his early activity as a radical writer. He kept his integrity throughout this period, and when this seemed no longer possible he broke with the Party (in 1942). He told the story of his communist interlude in *The God That Failed. Native Son* was published in 1940. Bigger Thomas, Constance Webb says, was "a kind of anti-hero through which to express the result of centuries of oppression and the type of violent action by which freedom would come." She remarks that this book foreshadowed "Richard's ultimate break with the Communist Party."

Native Son brought Wright overnight fame. It was chosen by Book of the Month and its sales earned Wright "more money than he had ever thought about in his life." *Black Boy* enjoyed a success almost as spectacular. Published in 1945, its prepublication sale was 30,000, and within three months the total exceeded 400,000.

Now Wright was one of the most influential writers in America, perhaps in the world. The full story of his life, as related by Constance Webb, shows that he deserved to be.

COMMENTARY
TIME TO CHANGE THE CANON?

MORE than thirty year ago (in the *American Scholar* for the Winter of 1938-39), Joseph Jastrow summed up the attitude toward ESP of many scientists, in particular the psychologists of that time, by quoting a colleague:

> ESP is so contrary to the general scientific world-picture, that to accept the former would compel the abandonment of the latter. I am unwilling to give up the body of scientific knowledge so painfully acquired in the Western world during the last 300 years, on the basis of a few anecdotes and a few badly reported experiments.

This was a more extreme way of putting scientific objections to ESP experiments than the reasons given by Mr. Churchman (see p. 2), and adopted by Mr. Stent in his *Scientific American* article. The latter is willing to consider the possibility that evidence favorable to ESP would result from Roberts' investigation especially since "no other set of hypotheses in psychology has received the degree of critical scrutiny that has been given to ESP experiments"—but regards the question as not worth attention *now* because of inadequate theory and the inability "to connect ESP with canonical knowledge" in science.

But the fact is that present canonical scientific knowledge "by hypothesis" *shuts out* the postulates required by the defenders of ESP! As Albert Einstein once pointed out: "Whether you can observe a thing or not depends upon the theory you use. It is the theory which decides what can be observed."

So, while Mr. Stent is probably right in concluding that the phenomena of ESP are "irrelevant" to present science, the real issue is whether or not the time has come to call into question the validity of the existing scientific canon or the appropriateness of applying it to such happenings as thought transference and clairvoyance of various sorts. In 1940, the *New York Times* said editorially:

> THE TIMES is neither for nor against Professor Rhine. But it does believe that, the mathematicians having approved Professor Rhine's statistical conclusions, it is time for the psychologists to explain them.

This seems entirely reasonable. It is not made unreasonable because the canon of scientific knowledge has no place for such facts. Defenders of the canon should recall Thomas Huxley's prayer: "God give me strength to face a fact though it slay me."

CHILDREN
. . . and Ourselves
TOWARD A NEW ECONOMICS

HAVING official word from Harper & Row that this spring a collection of essays by E. F. Schumacher will become available in book form, we are happy to relay this news to our readers, since we have long contended that Schumacher might well be the source for a new kind of education in economics.

Meanwhile, our economist-of-the-week is Henry David Thoreau, who would, we think, find much to approve in Mr. Schumacher's writings, even though his two paragraphs on the subject we came across recently (in Krutch's Bantam collection of Thoreau) might seem but a playful introduction to what Mr. Schumacher has to say.

On the division of labor:

> To such an excess have our civilization and the division of labor come that A. a professional huckleberry picker, has hired B.'s field, and we will suppose is now gathering the crop, perhaps with the aid of a patented machine. C., a professed cook, is superintending the cooking of a pudding made of some of the berries, while Professor D., for whom the pudding is intended, sits in his library writing a book, a work on the Vaccinieae, of course. And now the result of this downward course will be seen in the book, which should be the ultimate fruit of the huckleberry field, and account for the existence of the two professors who come between D. and A. It will be worthless. There will be none of the spirit of the huckleberry in it. The reading of it will be a weariness to the flesh. To use a homely illustration, it is to save at the spire and waste at the bung. I believe in a different kind of division of labor, and that Professor D. should divide himself between the library and the huckleberry field.

Next is a treatise on the mining of gold:

> The recent rush to California and the attitude of the world, even of its philosophers and prophets, in relation to it appears to me to reflect the greatest disgrace on mankind. That so many are ready to get their living by the lottery of gold-digging without contributing any value to society, and that the great majority who stay at home justify them in this both by precept and example! It matches the infatuation of the Hindoos who have cast themselves under the car of Juggernaut. I know of no more startling development of the morality of trade and all the modes of getting a living than the rush to California affords. Of what significance the philosophy, or religion of a world that will rush to the lottery of California gold-digging on the receipt of the first news, to live by luck, to get the means of commanding the labor of others less lucky, *i.e.*, of slaveholding, without contributing any value to society? And that is called enterprise, and the devil is only a little more enterprising! The philosophy and poetry and religion of such a mankind are not worth the dust of a puffball. The hog that *roots* his own living, and so makes manure, would be ashamed of such company. If I could command the wealth of all the worlds by lifting my finger, I would not pay such a price for it. It makes God to be a moneyed gentleman who scatters a handful of pennies in order to see mankind scramble for them.

Well, Thoreau obviously has a perfect understanding of the science of economics and needs instruction from no one. Mr. Schumacher writes for less perfect souls, but his goal amounts to the practice of the same common sense founded on moral intelligence that Thoreau declares. In Schumacher's view, production and consumption are not ends in themselves, but are means sub-seeing other, distinctively human ends. His economics is concerned with neither the accumulation of wealth nor the achievement of more production but is "the systematic study of how to attain given ends with the minimum means." He is interested only in an economics which supports the human values which are ends in themselves. Encountered in Schumacher are statements like the following:

> What is the meaning of democracy, freedom, human dignity, standard of living, self-realization, fulfillment? Is it a matter of goods, or of people? Of course it is a matter of people. But people can be themselves only in small, comprehensible groups. Therefore we must learn to think in terms of an articulated structure that can cope with a multiplicity of small-scale units. If economic thinking cannot grasp this it is useless. If it cannot get beyond its vast abstractions, the national income, the rate of growth, capital/output analysis, labor mobility, capital

> accumulation—if it cannot get beyond all this and make contact with the human realities of poverty, frustration, alienation, despair, breakdown, crime, escapism, stress, congestion, ugliness and spiritual death, then let us scrap economics and start afresh.

Schumacher's restoration of humanist principles to economics keeps his work from being dull. He knows the complexities of modern theory but is able to do without them. Anything he says could be used with high school students. It should be. The same, of course, applies to Thoreau.

* * *

Thoreau did not survive the Civil War, since he sickened seriously in 1861 and died the year following, on May 6. The South fired on Fort Sumter April 14, 1861. Thoreau was anti-militarist, although he might have supported the Northern cause as he did John Brown. At any rate, he was saved the horror of that terrible conflict by death.

Curiously, the man who was most responsible for the victory of the North—of the Union forces—was also in his way an anti-militarist! Knowing little about Grant except for an anecdote or two, we turned eagerly to Howard N. Meyer's *Let Us Have Peace—the Life of Ulysses S. Grant* (Collier Books, 1966), and enjoyed every bit of this book written for young people. If the publicity hadn't said it was for "young people," we wouldn't have known, since it seems a fine book for anyone to read.

How could Grant possibly have been an anti-militarist? Well, first of all, he had no interest in being in the army and went to West Point only because his father had gone to great lengths to get him the appointment, this seeming to him the only way for a poor man to arrange an education for his son. The boy tried not to go, but agreed when he felt the intensity of his father's determination.

As a child Grant was self-reliant. He had a way with horses and managed to evade working in his father's tannery by caring for the work horses and hauling the wood used in the tanning process. It seems almost unbelievable that by nine or ten he was getting extra work as a "free lance teamster," and in his early teens made long-distance hauls of both passengers and freight. People who knew him would reassure potential customers who wondered about an under-sized boy taking this responsibility. Another quality he had:

> His attitude toward hunting was unusual for a boy on the Midwest frontier. When the outdoor shooting season rolled around, all went out who owned a gun or could borrow one. Ulysses never would. "Half the time they don't kill when they shoot," he would say. "They only wound the animal. Then the poor creature crawls away and starves to death. I can't bear it." He would never use firearms for amusement or kill for the mere sake of killing. So deep was this prejudice that he would not eat meat if the blood hadn't been cooked out and the flesh practically burned to a crisp, and he could never touch fowl and game.

After completing the four years at West Point he tried to get a job teaching mathematics at the Academy, and planned to get out of the army as soon as he had served his enlistment. But then came the Mexican war—a war, Grant realized with some disgust, that had been provoked by the United States—and while he strongly disapproved he served well and rose in the ranks to captain. This stint of service in the Southwest accomplished some good for Grant, however. He strengthened his physique and regained his health, which had been failing.

He left the service in 1845 and planned on a civilian career. As he told Bismarck many years later: "I never went into the Army without regret and never retired without pleasure." He now had a wife and child and went to work for his brother, acting as traveling salesman for the tannery. Then, when Fort Sumter was attacked, he told his brother that he thought he ought to go back into the service.

Grant's behavior, throughout the war, seemed founded on principle. He believed in the Union, he freed the one slave that had been given to him,

and he disapproved of slavery strongly. After it was over he said:

> There was no time during the rebellion when I did not think, and often say, that the South was more to be benefited by its defeat than the North. They were burdened by an institution abhorrent to all civilized people not brought up under it, and one which degraded labor, kept it in ignorance, and wore out its governing class. The labor of the country was not skilled, nor allowed to become so. The whites could not toil without becoming degraded and those who did were contemptuously called "poor white trash." The system of labor would soon have exhausted the soil and left the people poor.

After the war Grant did what he could to protect the dead Lincoln's reconstruction plans from Andrew Johnson's undermining policies, and while he may not have been a great President, he was an honorable, conscientious man who deserves the place in our history that this book gives him. And if a country believes it must have soldiers, it will be fortunate indeed to have men like Grant. He was an indefatigable commander and a generous and considerate conqueror. Forty-eight hours before he died he wrote the last page of his memoirs, ending with the words, "Let Us Have Peace."

FRONTIERS

A Look at "Science"

READERS interested in informing themselves more thoroughly about the role of science in our society would do well to dip into the pages of the weekly *Science* from time to time. The issue of Dec. 1, 1972, is a good one to look at. The first page of text begins with a letter from John T. Edsall, a biologist at Harvard, who comments on the hazards of depending upon nuclear energy to solve the energy problems of the future, and votes against it. He agrees with another scientist, Hannes Alfvén, that fission energy "would place an unendurable burden on the safety and health of future generations." In view of the impending energy shortage, Mr. Edsall recommends that we "stick to fossil fuel" and slow down the rate of growth of electric power, emphasizing economy in the use of power, and establish rates for power which *increase* as use increases. He would discourage the manufacture of products which require large amounts of electrical energy (such as aluminum cans) if alternatives can be found, and intensify research for pollution-free sources of energy, such as solar radiation. The resistance to such a program, he feels, would make troubles that are "trivial by comparison with the immense hazards of a large-scale system of nuclear fission plants."

Another writer, urging nuclear fission, believes that only "an essentially inexhaustible energy source" will enable mankind to avoid the catastrophe predicted by the Club of Rome in *The Limits to Growth.* However, it is of particular interest to note that the advocates of ever-increasing consumption seldom deign to discuss the idea of a no-growth, less materially luxurious way of life for that comparatively small proportion of the population that has achieved the affluence an expanding economy is supposed to serve. Instead, proposals for plain living and high thinking are brushed aside as unthinkable nonsense or heresy.

An article by William Metz under the heading of "Research News" discusses at length a single aspect of the complications which are likely to result if the present rate of increase in energy-consumption continues. Considering various designs of power lines for the transmission of electrical energy, this writer says:

> If the U.S. power consumption multiplies six times by the year 2000, as often predicted, is it tolerable to install five more lines for every one that exists now, or to replace each line with a gargantuan counterpart? More than 7 million acres (2.8 hectares) of land are now set aside for overhead transmission and if the projected demand is met with more high-voltage towers, the needed acreage will probably double. Particularly in scenic areas, how much visual pollution is acceptable? In the large cities where most electricity is consumed, there is simply not enough available land, in many cases, for any enlargement of the power corridors. Power lines with greatly increased capacities, particularly lines that can be installed underground, appear to be needed.

"Put them underground" seems a happy solution, but the cost of this kind of transmission will be paid by the consumer:

> Overhead transmission lines typically require 12 acres per mile. If the cost of the land reaches $70,000 per acre, as it might in densely populated areas, the expense of land alone for an overhead line might be as great as the cost of a 345-kv underground cable ($840,000 per mile). . . . If land costs are not considered, however, an underground cable costs 6 to 20 times more than an overhead cable with the same power-carrying capacity. . . . Underground cables now represent more than 10 per cent of the capital investment in transmission facilities in the United States, although they make up only 1 per cent of the network.

So, as the article concludes, "for the next decade or two, it appears that the rising costs of electrical power transmission will add to the ever-increasing price of raw energy."

It is pleasant and encouraging to find in this issue of *Science* a thoughtful and friendly interview with Theodore Roszak, author of *The Making of a Counter Culture* (1969) and *Where the Wasteland Ends* (1972). The writer, Nicholas

Wade, asked Roszak leading questions about his point of view and gave a balanced report to his scientific readers. Following is some of the interchange:

> Even assuming that reductionism and depersonalization of experience are definitive aspects of scientific activity, why should these values become translated from science to society at large? Roszak: "The way in which people conceive nature is bound to carry over. If science is the most reliable approach we have, who can doubt it is the most reliable way of addressing everything else around us? I think it follows as a matter of course that, once you have established that nature is best addressed in an objective way, then it begins to bleed over into literature. What I am saying in my book is that maybe we should not address nature in that way."
>
> Nevertheless, scientific modes of thought do not seem to be that firmly entrenched, even in the most industrialized societies. Is science really as dominant a cultural force as Roszak contends? He replies that most people are "scientifically illiterate, just as most people in the middle ages didn't understand the Latin of the mass." But when it comes to statements about the nature of things, most people will defer to science. "They are up against the reality principle of their society. They are running the risk of being written off as irrational if they dispute the authority of the scientist. People cannot dispute scientific authority gracefully—they have nothing to fall back on."

That indeed is the problem, and for us all. There is no culturally approved alternative to "fall back on," and the people who declare independence of the scientific outlook—not in terms of its practical usefulness, but as a theory of knowledge—are those who have in some way or other found another "reality principle" to rely upon. It may be well-considered, stable, and philosophically open-minded, or it may be a collection of impulsive, emotional attitudes that are likely to change when the first crisis comes along.

It follows that to become—or to be set—free of the conventional view of "reality" can be a vastly disturbing and even frightening experience. The more people it affects, the more turbulent and unsettled grow the times, unless those who free themselves by deliberate effort are strong-minded and wise enough to provide principles and examples of order and personal control that are impressive to others, giving, in this way a new, voluntarist cohesion to society.