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SCIENCE AND CONSCIOUSNESS

THE role, place, and part of science in human life seems the essential content of *The Nature of Scientific Discovery*, a large volume issued last year by the Smithsonian Institution Press ($15.00), edited by Owen Gingerich, professor of astronomy and the history of science at Harvard University. The book contains papers by eminent scientists presented at a symposium honoring Nicolaus Copernicus on the 500th anniversary of his birth in 1473. Among the contributors are the late Werner Heisenberg, noted theoretical physicist, and John Wheeler, cosmologist and professor of physics at Princeton University. It is appropriate to mention these two in particular for the reason that what they say has attracted wide attention among other scientists as marking a new spirit in scientific inquiry, and possibly a new start in scientific practice. The British radio astronomer, Bernard Lovell, who reviewed the book in *Science* (March 19), said that the essays by Heisenberg and Wheeler "raise the entire problem of knowledge and of the relation of man to the universe in an acute sense." The reviewer's concluding questions and observations are a measure of the importance of *The Nature of Scientific Discovery:*

> Are physics and astronomy returning us to a belief in the partnership of the mind of man in the foundation of the universe? It is a question asked and debated in this volume.
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> Where lies the foundation of ethics? Is ethics created by man for the sake of survival, or is there a fundamental ethic in our existence in the universe? . . . One ends this volume with these questions uppermost and with a feeling of entreaty and hope that man will survive so that the genius of a future Copernicus can penetrate the heart of darkness.

If these are the brooding considerations excited by present expressions of leading scientists, should we any longer regard science as the work of certain highly skilled specialists who pursue only one sort of inquiry? May it not be equally appropriate to declare that, in the present epoch, at least some scientists represent, not merely a limited if highly intelligent division of our culture, but the actual thrust of general human intelligence to discover the meaning as well as the working of things? Quite evidently, there are some scientists who think of themselves and their work in this light.

There are arguments both for and against this view. The objections are well known. It might be said, for example, that the mechanistic method and objectivistic definition of knowledge, on which science relies, are over-all background causes of the disorder of the modern world. It could be argued that neither science nor its offspring technology has any balance principle of self-limitation, that both are value-free, providing their know-how and power indifferently to those able to pay for it, regardless of misuse. That, moreover, there are other ways of knowing which the vast influence of the modern scientific preoccupation with "public truth" has caused to be ignored, with disastrous effects on the quality of life.

In reply, however, it could be argued that these objections, focusing on science as an established institutional entity, overlook the fact that what we term science is, in its origins, an expression of essential intelligence possessed in some measure by all human beings. Labeling a man a scientist does not convert him into a special breed. Science is ultimately the will-to-know, and since humans are also self-conscious—aware of what they are about—evidence of imperfect knowing excites the determination to know exactly. The scientific method has been the result. Neither the virtues nor the limitations of this method make a reason for ignoring the fact that all humans—scientists and others—are in some

degree animated by the will to know. Yet it is certainly the case that the extraordinary elaboration of scientific specialties—far beyond the interest and comprehension of most people—has had the effect of making science or scientists seem something apart, a cultural "thing in itself." In short, the technique of science is at once impressive in result, isolating in effect, and in the eyes of articulate critics, dehumanizing in its general influence.

But all this may be no more than an exaggerated expression of a common human tendency and capacity, so specific in its present character that it seems to us practically unique. The most effective corrective of this impression is the study of history—the history of science, of culture, and of the evolution of ideas over the period of the emergence of the scientific movement. The book, *The Nature of Scientific Discovery,* is in some measure a work devoted to history of this sort.

How shall we regard the rise from medieval ignorance of the modern scientific movement? This great historic and historical awakening has both definable and indefinable factors in it. The hunger to know in the terms called "scientific" is partially explained by the disgust and boredom of intelligent men with pointless and fruitless theological explanation. But why, the historians ask, didn't the same sort of awakening take place among the Chinese, a highly cultivated and sophisticated people? This question has some answers, but they hardly seem satisfactory. What was the intellectual matrix of the awakening in Europe? We could say that the educated men of Copernicus' time (1473-1543), and of Galileo's (1564-1642) a century later, felt that they had two sources of knowledge—the Book of Revelation and the Book of Nature. The Book of Revelation was held to be utterly reliable, having a divine origin, but was seriously incomplete and puzzlingly obscure. The Book of Nature, on the other hand, promised endless disclosures, but had hardly been opened. The attitude of the first scientists—the Natural Philosophers—was that they would study the Book of Nature in order to obtain a better understanding of the Book of Revelation: make plain what it meant in relation to practical matters. Then, with discovery of the findings of ancient Greek science that came with the Renaissance, new-old ways of studying the Book of Nature became exciting possibilities for the European pioneers. In his dedication to the Pope of *De Revolutionibus,* Copernicus revealed his annoyance with "philosophers" who discoursed at length about the world but said nothing of how it worked; and how, by reading Cicero, he had found that "Nicetas thought that the earth moved." From Plutarch he learned that there were "others of the same opinion"—the Pythagoreans. This, he said, was sufficient reason for him to think seriously about the mobility of the earth. And since others had been free to work on the problem of astral phenomena, he concluded: "I thought that I too would be readily permitted to test, on the assumption that the earth has some movement, whether a more convincing explanation, less shaky than those of my predecessors, could be found for the revolutions of the celestial spheres."

Philip Handler, president of the National Academy of Sciences, has this to say concerning the achievement recorded in *De Revolutionibus:*

> Copernicus was not the first to consider that the sun rather than the earth might be the center of our system, nor indeed did his work in astronomy, at the time, significantly affect either the larger society in which he dwelled or the considerable European intellectual community of the time. But it was his work which, in due course, came to be recognized as the incontrovertible set of arguments with respect to the relations among the planets and the sun. The methods that he used, patient observation and mathematical analysis of the relevant data at his disposal, are those which have been characteristic of science for the succeeding five centuries. . . .
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> It would be erroneous to allege that modern science began with Copernicus. Were there any such "starting date," it should probably mark Bacon's description of the scientific process or Galileo's experiments. But in the subsequent five centuries, the

only event comparable to the Copernican Revolution, in respect of its impact on the collective mind of man, was the revelation of biological evolution through the life work of Charles Darwin.

Another perspective on the achievement of Copernicus was given by Ruth Nanda Anshen during one of the discussion periods of the symposium:

> The *scientific* importance of Copernicus is being elaborated with great skill and wisdom. . . . Yet the extraordinary *philosophical importance* of Copernican astronomy was that it removed the earth from the center of the universe and placed it among the planets. It undermined the very foundations of the traditional cosmic world-order with its hierarchical structure. . . . For the immediate effect of the Copernican Revolution was to spread skepticism and confusion. Its philosophy cast doubt over everything: God, nature, man, the universe itself, in a certain sense.
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> This conception of the history and destiny of mankind, deriving from the Christian story in religion and a mutilated classical tradition, dominated the social and political thinking of Europe for a millennium. I believe that the names of Columbus and Copernicus may be taken as symbolic of the time and space frame of reference, a notable expansion effected by geographical exploration and discovery, on the one hand, and the growth of scientific and historical knowledge, on the other. . . .
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> The Church—and men—of the Copernican age could never recover from the shock that Copernicus had created by opening the cosmos from a closed to an expanding universe. And it was Copernicus who inspired Galileo to declare that "Scripture may teach man how to go to heaven but not how the heavens go."

Mrs. Anshen now turns to an aspect of scientific inquiry that too often has only lip service:

> It is often argued that finality is foreign to the spirit of science merely because the inductive method supposedly the scientific method of ultimate authority, precludes any generalization of having more than probable validity. While this is in part true, it does not express the most important aspect of the situation. The relinquishing of finality on the part of science is not merely a matter of method. For particular generalizations, those, for example, that have to do with the planets or the circulation of the blood, claims may be made that are tantamount to indubitable certainty. Such is the competence and seduction of the inductive method. The foe of finality is the spirit of science as such, irrespective of the method it may employ and regardless of the established verity of some of its conclusions. For nothing in science is ever so conclusive as to fail to entice the scientific spirit to further exploration, of which the result is always a crop of fresh problems and a harvest of unexplored insights.
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> . . . science ought to embrace not only purpose, or theology; it ought also to show that life processes transcend physics and chemistry, statistics and equations, . . . to point to the error in Newton's celestial mechanics, in which he stated that man does not influence the objects of his observation. On the contrary, he is constantly influencing such objects since he brings his perception to them and indeed the most creative and seminal minds do act in just this way. They become metaphysical.
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> Nature operates out of necessity; there is no alternative in nature, no will, no freedom, no choice as there is for man. Man must have convictions and values to live for and this also those scientists who are at the same time philosophers recognize and accept. For they then realize that duty and devotion to our task, be it a task of acting or of understanding, will become weaker and rarer unless guidance is sought in metaphysics that transcends our historical and scientific views or in a religion that transcends and yet pervades the work we are carrying on in the light of day.

In saying this Mrs. Anshen restores to science the dignity that it had in its very beginnings. She speaks of the human spirit which accepts responsibility for understanding the world and for seeking knowledge of all the diverse things in the world. Actually, there are passages in this book which show that this conception of the meaning of science has never been lost, although it seems to appear only in the work of the most distinguished investigators. It is also the case that the real scientists have a deep and abiding faith, though they may speak of it seldom. In one of the discussion periods Heisenberg referred to the "extreme skepticism" which was characteristic in the eighteenth century, remarking, "I am sure that science is not necessarily connected with that kind

of skepticism." He pointed out that Kepler and Galileo made no clear distinction between what are spoken of as the natural and the supernatural—"they simply felt it was the same thing." As for present-day science, he said:

> I would say the distinction now is only that we claim that we restrict our science to the natural things, that we leave the supernatural to the priests or to somebody else. Science is not forced to make this distinction between the supernatural and the natural. Therefore, I would hope that science would find out that what it actually does is to discover things that also go well together with the other side of the world, which has been called the supernatural, but which is also the natural.

This declaration by Heisenberg may be taken to represent the new spirit in science. No longer do the leaders ask only, "How does the world work?"—or, as Galileo put it, "How do the heavens go?" Equally important, today, are the questions, "How do *we* work?" and "What is the relation between how we work and the working of the world?" For example, John Wheeler says:

> The brain is small. The universe is large. In what way if any, is it, the observed, affected by man, the observer? Is the universe deprived of all meaningful existence in the absence of mind? Is it governed in its structure by the requirement that it give birth to life and consciousness? Or is man merely an unimportant speck of dust in a remote corner of space? In brief, are life and mind irrelevant to the structure of the universe—or are they central to it? Lack of conclusive evidence on so cosmic an issue suggests that something is still to be learned about how the universe came into being.

That scientists from the time of Copernicus to Einstein have always made ideal presuppositions concerning the nature of things—sought help, one might say, from "metaphysics," as Ruth Anshen suggests—is the leading idea in Gerald Holton's contribution to the symposium. In his paper, "Mainsprings of Scientific Discovery," he shows that Kepler would not have been successful in his discoveries unless he had trusted to "frankly metaphysical presuppositions when his physical ones gave out." Every case of major scientific advance, Prof. Holton says, has involved "such unverifiable, unfalsifiable, and yet not arbitrary conceptions or hypotheses, a class to which I have referred as thematic presuppositions." He recalls that Einstein "first announces his basic two postulates of relativity, almost brusquely declaring them to be hunches that he wishes to elevate to the status of postulates—without even bothering to connect them plausibly with the experimental material." Holton also quotes Einstein's 1930 essay, "Religion and Science":

> . . . there is a third stage of religious experience which belongs to all of them, even though it is rarely found in pure form. I shall call it cosmic religious feeling. It is very difficult to elucidate this feeling to anyone who is entirely without it, especially as there is no anthropomorphic conception of God corresponding to it [nor any dogma or church]. . . . I maintain that the cosmic religious feeling is the strongest and noblest motive for scientific research. . . What a deep conviction of the rationality of the universe and what a yearning to understand, were it but a feeble reflection of the mind revealed in this world, Kepler and Newton must have had. . . .

Gerald Holton believes that in the thought of creative scientists "a quiet underground current exists along the lines described by Einstein," and that a drying up of this current would signal the decline of science.

During the discussion of his paper, "The Universe as Home for Man," John Wheeler spoke of the confusions which result from attempting to form clear ideas of the meaning of "time" in relation to quantum mechanics. He also said:

> We have to deal in new and unfamiliar terms when we concern ourselves with the "beginning of time" and "the end of time." Does that mean that "mind" reaches backward into the beginnings of things and forward to the end of it all, and through this route decides the structure of the universe? The universe gives birth to mind; but mind gives meaning to the universe. In this coupling of mind and universe do we have what our electrical engineering friends would call a self-excited circuit?

Prof. Wheeler next speaks briefly of the need to incorporate in the scientific theory of knowledge the idea of *self-reference*, as the only means of meeting the consequences of Gödel's

theorem. These consequences are described at some length by J. Bronowski in "The Logic of the Mind" (*American Scholar*, Spring, 1966), in which he said:

> Neither science nor literature ever gives a complete account of nature or life. In both of them, the progress from the present account to the next account is made by the exploration of the ambiguities of language that we use at this moment. In science, these ambiguities are resolved for the time being, and a system without ambiguities is built up provisionally, until it is shown to fall short. That is why the results of science at any given moment can be presented on an axiomatic and deductive machine, although nature as a whole can never be so presented because no such machine can be complete.

When the system "falls short," new axioms must be added, Bronowski says, by an act of "self-reference." The self, in other words, necessarily participates in all supposedly objective accounts of the universe around us. The implications of this discovery, Prof. Wheeler thinks, may dominate the reflections of those who concern themselves with the idea of knowledge for the next three thousand years! As he puts it: "Among all instances of self-reference is there any with more implications for our place in the scheme of things than this: 'The universe gives birth to consciousness; and consciousness gives meaning to the universe'?"

Prof. Wheeler began his paper by asking whether "the discoveries from Copernicus to today" are "only the prelude to greater discoveries?" The quantum principle, he observes in conclusion, requires us to say, "No physics without an observer." It follows that the central problem for science, today and tomorrow, lies in the question: "Consciousness can analyze the world around; but when will consciousness understand consciousness?"

REVIEW
"WHAT DOES SOCIETY VALUE?"

THE NEW AMERICAN IDEOLOGY (Knopf, 1976, $12.50) is an engrossing and largely successful attempt by George Cabot Lodge, professor of business administration in the Harvard Business School, to increase general awareness of what lies behind the economic and moral confusions of present American society. It is basically a critical examination of the assumptions which have guided economic enterprise in the United States during the past 200 years, and a showing that these assumptions are now leading toward almost irremediable disaster. The author also proposes alternative principles more in keeping with the needs and emerging spirit of the times.

This is a public-spirited work, a book that every literate American should become familiar with. By ideology Mr. Lodge means the system of practices and institutions founded on the fundamental beliefs of an age—beliefs concerning the nature of things, the meaning of human life, and what is good to do and to have. He traces contemporary institutions to their origins in philosophic ideas, making his book a careful study of changing human attitudes. He combines the history of these attitudes with unmistakable evidence of the bankruptcy or inadequacy of prevailing opinion in American business and government today, then draws attention to what seem spontaneous changes in progress, suggesting reasons for these changes. Mr. Lodge hopes to persuade his readers—especially those who are leaders in business—that clear understanding of both the practical and moral validity of this new spirit will open the way to deliberate, step-by-step advance in the right direction.

His main target is the dogma laid down in the seventeenth century by John Locke, that private property is the bastion of human freedom and the root of virtually all practical human good. There was, he suggests, some truth in Locke's claim for a while—until, say, the industrialization of our economy and the dominating role of corporate industry and finance—but this belief, held as an article of unquestioned faith, is now the barrier to recognition of far more important and universal truths concerning the welfare of human beings.

A much simpler example of this sort of problem, taken from the past, will show how Mr. Lodge attacks his subject. In this illustration he begins with quotation from Plato:

> Plato commented explicitly on the necessity for economic activity—trade in particular—being held tightly in the strong embrace of community need and the social goof. Retail trade, he found, was a corrupting occupation, to be tolerated only because of its usefulness in assigning exact values to commodities and redistributing them. It must be closely watched and regulated according to the judgment of the aristocracy, for the good of the whole community.
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> The ideas of Plato and Aristotle served to justify and legitimize important institutions of the ancient world. In the economic sphere they worked tolerably well as long as the society remained essentially agricultural. But when Athens had become a great commercial center and its wealthy landlords were producing wine and oil for profit, the Athenians ridiculed the farmer and his ways, the traditional ideology eroded and disintegration set in.
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> Similarly, in the latter days of Rome, cartels of grain merchants reaped huge profits by manipulating the food supplies of the great cities of the empire. It became increasingly difficult for the political authorities to control such practices. Augustus, Claudius, Julian, and other emperors experimented with various forms of price regulation, but they had neither the understanding nor the power to control the merchants' manipulation of the market. Desperately, through various ad hoc interventions, they sought to cope with each crisis as it came along, but the economic system had effectively impelled itself beyond their reach.

Something similar is happening today, on a larger and more disruptive scale. Meanwhile, the world of thought is changing, the moral attitudes of human beings are maturing, and the goals of the young are increasingly nonacquisitive, although the business community, a lagging institution,

responds to these disturbing transformations mainly with verbal devices. While it is rapidly becoming evident that "the old ideas of individualism, property, and competition" can no longer have a dominating role, our leaders, Mr. Lodge says, "persist in trying to legitimize the new in the language of the old." He calls this "ideological schizophrenia," which seems accurate enough.

The fact is that the competitive system and the adversary approach no longer serve the needs of the community. The old principles of individual acquisition, property rights, and competition with government as umpire, have under the stimulus of scientific specialization reached a degree of abnormal development which creates one problem after another, and solutions conceived in the same terms are not solutions at all, but multipliers of disorder. Competition has become an ineffectual check on monopoly, due to the economic power of vast corporations, and it is of no value at all in serving the needs of clean air, pure water, and auto safety. Property, which in large measure amounts to holding stock certificates, is no longer a castle of security since fractionated ownership is only nominal. The typical stockholder gains no power from his tiny interest in "property." Government, meanwhile, finding it necessary to intervene and attempt to regulate the conduct of industry, can do so only by violating traditional Lockean principles, the result being a sudden proliferation of agencies whose narrow concerns and duplications of effort have become incredibly expensive to the taxpayer. The United States, Mr. Lodge remarks, "for all its Lockean protestations, has one of the world's largest governments." Federal spending, for example, has grown from 5 per cent of the gross national product in 1930 to 26 per cent in 1973.

The American people, according to this writer, are now going through the ordeal of redefining their ends:

> Where once the attainment of human fulfillment appeared to be an individualistic process, it is now increasingly dependent upon community design. Where once we focused on the atom and the monad, we now focus on the relativity of these things within the entities of which they are parts. Where once we thought of Economic Man, we are now beginning to think in terms of global society. Our attention is shifting from the parts, now that we have passed the crest of the Lockean blip, and is turning instead toward the whole.
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> If we are to shift our vision successfully, obviously we must know as exactly as possible what we are doing. We cannot possibly plan such an immense undertaking, involving literally everything in the world, unless we know what is possible; then, the best alternative among the possibilities; and then how to accomplish our goals. At present we have only glimmerings; we cannot say we know these things, in any detailed or profound way.

Mr. Lodge gives attention to the ideas of Karl Polanyi, quoting his critique of the "Market Philosophy" in *The Great Transformation.* Polanyi showed that the expansion of purely economic ideas to an entire philosophy of life has been a degrading preoccupation for Americans, and a distraction from intelligent and worthwhile objectives. An emancipation from such economic dogmas, helped by the historical studies of writers like Polanyi and Lodge, should release the imagination of many people and open the way to independent thinking which the present so sorely needs.

There is a common-sense element in Mr. Lodge's book which deserves attention. Toward the end he says:

> In considering the ideological transition from the idea of competition to satisfy consumer desire to that of community need, it is important to identify as precisely as we can those areas and circumstances in which the old idea of competition and the "free market" can continue to render useful service. The process we are discussing is, after all, a transition. Although it has been going on for a long time, it will continue for much longer before it can be called complete. I am not engaged in utopianism—indeed, one of the purposes of this analysis is to avoid utopianism and the dangers and disappointments it breeds. The task is to discern as best we can the utility in the old so that we can retain its most effective and just aspects, recognizing that we would

> be stupid to reduce efficiency without a gain in justice.

Important to remember, while measuring the effects on our lives of Newtonian mechanism and Lockean individualism, is that in their own time Newton and Locke were largely animated by devotion to what seemed to them impartial truth. Understanding the integrity behind their conceptions should be a help in tempering our own righteousness as reformers in the present. What we decide to think and do will not be the final word. There is, in short, a crucial difference between the admirable motive of devotion to freedom and justice and the particular rationalizations of these ideals during one brief epoch of history. A large part of Mr. Lodge's book is devoted to showing that seventeenth-, eighteenth-, and nineteenth-century ideas and social goals, when made into rigid formulas, become intellectual prisons and programs for producing the opposite of what they intended.

A difficulty that some readers may feel from reading Mr. Lodge's book might be put in the form of a question: Is it possible that the way we live and think, and what we all do every day, simply to survive and provide for our families, is actually *wrong?* The answer must be ambiguous. Supporting our families and working for a living can hardly be wrong, but there may indeed be better ways for humans to live and work—ways which can be adopted only gradually by some, quite soon, perhaps, by others, once we begin to think about such matters. As Mr. Lodge says:

> We are continually forced to return to certain vital questions. What does society value? What is the collection of ideas on the basis of which these agents and agencies determine the criteria for control of the uses of property? What is the binding mystique? What the ingredients of the consensus, the purpose of community?

Enabling people to think without prejudice about these questions is a purpose of this book.

COMMENTARY
CHANGES IN PROGRESS

THIS issue amounts to a report on the varied phenomena of worldwide change. Enduring changes take place when the pressures of unavoidable necessity combine with vision, generating a tide of inclinations which move people to act in a new direction. The difficulties of change seem produced mainly by the differences in the times when people begin to recognize that change is inevitable and desirable.

The lead article shows that eminent scientists are revising the way in which they define the external world of nature and its forces. The natural world was once explained as a panoramic exhibition of the workings of a great world-machine, but now this same world is viewed as in part an expression of consciousness. Thinking about the world, humans give objects—what we see in the world—their character. A scientist, John Wheeler, wonders whether man's ethical sense is somehow rooted in the universe itself.

Review is concerned with changing attitudes toward economic activity. Mr. Lodge deals with both the necessities of the future and the noticeable alterations in how people feel about matters such as property-owning and buying and selling.

The "Children" article illustrates the pain and struggle resulting from differences in rates of change. Many businessmen, especially the successful ones, regard proposed changes in their methods, motives, and objectives as a species of madness—totally irresponsible. How can what has worked so well for so long be wrong? The young, however, who have not yet entered into involving relationships with the world, may see the moral contradictions of the times in a clearer light. What they see is neither inviting nor encouraging in respect to their future. Feelings of betrayal are hard to avoid.

The growing of food is so fundamental, it is natural that in this area the new attitudes should be most visible and most acceptable. Many people now believe that a variety of the ills of the times could be corrected or simply washed away by an agriculture in harmony with nature. Meanwhile a renewal of moral strength and inspiration seems to flow naturally from the philosophical underpinnings of agricultural reform.

CHILDREN
. . . and Ourselves
"NO RENT NEXT TIME"

THERE are situations in human life which can be discussed in theory—that is, in terms of generally acceptable ideas of right and wrong—but cannot be settled in practice to anyone's satisfaction. These situations are the unresolved dilemmas of the age, and they sometimes become so acute, so ugly in their consequences, that they reach down and affect the young. This happens because the dilemmas are out of control. The adult population has proved itself irresponsible and incompetent, so that the dilemmas flood into the schools. No one—or everyone—seems responsible, but adults are more responsible than the young because in theory adults have the initiative in change or reform. Yet no remedies are available. Such situations call for heroes, but no real heroes are available, either, in these mediocre times. What then? Better than no heroes are inadequate or unprepared heroes. When there are no real heroes the rest of us have to make do.

Making do according to one's lights is a personal act. It cannot be imitated, although it may be recognized and perhaps admired. Conceivably, we are unable to apply heroic solutions because the time is not ripe for either reasoned settlement or really high achievement. We have a lot to learn, a lot to understand, before we can climb to the plateau of a better civilization. All that seems possible now is to take a step or two in the right direction—what may be the right direction. Even a courageous step in a wrong direction may be useful, since we learn mostly by making mistakes. Thus the right/wrong axis of analysis is essential to human beings, although we also need the light of other perspectives, if only to reduce the rancor that usually accompanies righteous argument.

Ron Jones, a highschool teacher in San Francisco, has been making-do for a number of years. He does it so well that we feel obliged to read practically everything he writes about his work. One report is called *No Substitute for Madness,* a collection of true stories about his teaching experiences in Palo Alto, California, where, for various reasons, there are a great many bright youngsters.

A story called "The Last Meeting" tells about a gathering of seventy students who are planning "an attack on the Oakland Induction Center." Jones was student adviser:

> I hated being in this position. Enjoyed life too much to put it up for grabs. What a box. The Vietnam war was vile. I often cried and shook with anger, just thinking about it. It had to be stopped. But me, why me? Where is the rest of the faculty? Not one of them even knows of this meeting. And if they did, they would stay away. Where are the parents of these kids? How come children have to bear the moral weight of this nation . . . throw themselves at the war machine? How many children must be sacrificed before it stops? It's so easy to walk away. I don't even like these kids. They are brash and demanding. Arrogant and proud. . . . I hate and admire these kids in the same breath. We have been through so much. I've learned from them things that can't be talked about or read in a book. . . .

Ron Jones was teaching history and coaching basketball at this high school. As the youngest member of the faculty, he was picked to be sponsor of a club of students who wanted to talk about—do something about—the Vietnam war. It was called the Junior Statesmen club and it didn't last. A local businessman attempted to sober its proceedings by pointing out that young people in school are not supposed to be ready for political decision and action. They should study the questions bothering them in their classes in school. Proper preparation comes first. He thought the matter was settled, but then a student came to the front of the room and said:

> " . . . the politics you ask us to study in the classroom. It doesn't exist. Here is a copy of my civics book." Doug placed the large green book on the table in front of Mr. Oliver, then turning and facing the audience said, "There is no mention of the Ku Klux Klan or racism, or labor struggles, or the Vietnam war. Not one word about honesty or integrity, or even justice." Mr. Oliver looked uncomfortable. "How can we study politics if its forces and issues are missing from our books and classrooms?" The assembly was still. . . . Sue joined in the questioning. "When do we become citizens?" she asked. "How do we learn to ask the right questions, take responsibility for our own actions?

> When does this happen? Must we wait until we are in the military or working for you at Hewlett/Packard?"

The gavel banged and the outraged chairman declared that a political club organized to support Communist efforts would not be allowed in a high school! A student shouted, "The word Communist is also missing from our textbooks!"

So the club was disbanded, dissolved, prohibited. The students immediately formed a new club called United Student Movement and began to buck the school. Against the principal's wishes, Jones accepted the invitation to be faculty adviser. The role proved embarrassing:

> Everyday vital questions were being asked concerning which I as a teacher didn't have an answer or even a procedure to supply an answer. . . . The history and civics I was teaching was obsolete if not dangerous in its avoidance of real issues and events. I didn't have a single tool or educational experience related to issues in land ownership, housing, pollution, hiring policies, police practice, health, food, let alone the manifestations of these conditions into racial and violent morals. I was ashamed and alarmed at my Ignorance. . . .
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> Of course the real question is what to do. Do you throw yourself physically in the path of this waste machine, hoping to stall its progress or make it repent? Or practice civil disobedience? Refusing to pay its taxes and supporting its causes by accepting its recrimination of jail? Or do you close within yourself—trying to be a better individual and thereby hoping to infect the rest of society with your humanitarian qualities? Or pick up the gun and assault the system with its own madness? Or build a commune in some remote place, hopefully outside the path of the slug called progress? Or is there nothing to do but accept judgment in a last orgy . . . watch the butterflies die, the seeds drop on still ground. What do you do?

In school the students were getting into trouble. They painted protest words on their faces, and in wintertime planted flowers in the ground in front of the school that in the spring would come up in the pattern of a peace symbol. The administration dug them up. Other actions led to student arrests.

When the student invasion of the Oakland Induction Center was decided on, Jones felt it necessary to resign as advisor. The action would be with more than words:

> And so I argued, "You will no longer be acting within the law or even a civil disobedient manner. You have chosen to work outside the law. The act of revolution that you contemplate is an extremely personal decision. If you decide to act tomorrow, you do so on your own." . . .
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> The next morning a Cubberly High School history teacher took part in a demonstration at the Oakland Induction Center. I was that teacher. I couldn't escape my future.

An event reported in the middle of this tale adds much to the flavor of the story. When the school would not let its auditorium be used for showing a film on the Vietnam war, Sue located a parking garage that seemed suitable. That night the students were all there, shivering with cold, watching the picture, when an outraged shout came from a small Chinese man in pajamas who had rushed into the building. By coincidence a police car was nearby and the officers, hearing the disturbance, arrested the little man! But then it developed that he owned the building and didn't know about the movie performance. Sue hadn't included him in the arrangement.

> With the end of the film Sue stepped in front of the crowd and explained about the arrest of the landlord. The political jargon of "Right on" and "Down with the landlord" greeted her announcement. Sue stood there shaking her head until the clamor quieted. Then she spoke: "We can take this building, but it's people we must win." The landlord is not our enemy. She then asked for contributions to pay the rent.

A few days later the Chinese gentleman appeared on campus, asking for Mr. Jones. He was *delighted!* A lovely young lady had come to pay some rent. They talked about China for hours. Then he said, "Please use the garage if you need it. . . . No rent next time. Just clean up, OK?"

Copies of *No Substitute for Madness* are available from Zephyros, 1201 Stanyan Street, San Francisco, Calif. 94117. (We don't know the price, but it's probably not much.)

FRONTIERS

"Fertility without Fertilizers"

FROM France (with U.S. reproduction and distribution by Rodale Press) comes a recent issue of the IFOAM *Newsletter*—organ of the International Federation of Organic Agriculture Movements—bringing twenty-eight reports on progress around the world. The vigorous activities described add up to the struggle of a brave young David with the doped-up Goliath of chemical farming. Founded four years ago by five associations, IFOAM now has fifty members in seventeen nations, uniting various developments in the direction of agricultural alternatives. This association of organic associations has a general secretariat staffed by volunteers and supported by funds supplied by members and subscribers to the *Newsletter.* Subscription (four issues) for Americans is $12.00 a year. Address Anton L.S. Pinschof, IFOAM Secretariat, c/o Nature et Progres, 3 Chemin de la Bergerie, 91700 Ste. Geneviève-des-Bois, France.

First among the progress reports is a brief statement on the comparison of sixteen organic farms in the American Corn Belt with sixteen "chemical" operations (reviewed in MANAS for May 19), by William Lockeretz, who headed the study (not Barry Commoner, as MANAS earlier reported). The comparison showed that the organic farmers did about as well financially as their chemical counterparts, but used only a third as much energy. Commenting, Mr. Lockeretz said:

> Quite apart from the specific results we have obtained so far, the very existence of the farms of the type we have been studying may come as a great surprise to many of you. Simply stated, these farms are doing what common wisdom says cannot be done: they are surviving in the intensely competitive environment of Corn Belt agriculture without using modern agricultural chemicals, which have been widely characterized as an absolutely essential feature of the high productivity realized by present-day agriculture. . . . If there is to be a successful adjustment to recent energy problems, it will come from a more realistic recognition of the indispensable role that non-renewable natural resources have come to play in so many aspects of our present food production systems. From such a recognition, I am optimistic enough to presume, there will emerge a persistent determination to develop a more self-sufficient agricultural system that uses the cyclical self-renewing processes of nature to provide more of the materials that agriculture must itself consume to produce food. To make nitrogen available to crops, you can use natural gas and an ammonia plant, or you can use the sun and a clover plant. The short-term economic considerations that have determined so many features of our agricultural system are no substitute for long-term stability and dependability in our food supply.

News note from Maine: "A petition to request the University of Maine to research into organic agriculture has been dropped for the present, not because of opposing pressure, but because the University has been so flexible and receptive to our needs."

A correspondent in Quebec relates that an organic farming movement began in the Ste. Hyacinthe region in 1974 and a year ago had 250 active members and 700 sympathizers:

> Of these, over 200 are farmers and smallholders whose production is their livelihood. A network of food cooperatives is expanding rapidly, and an increasing number of agronomy and agriculture students participate in MAB activities (Mouvement pour L'Agriculture Biologique). About 200 persons took part in our 1975 nutrition courses. The *Journal du MAB* has a print run of 1,000 copies. Ever more numerous groups in all regions of Quebec are organizing projects and gathering the necessary expertise. An "Eco-Agriculture Center" has been set up at MacDonald College (McGill University) directed by Prof. Stuart Hill, which offers advice to farmers wanting to undertake conversion of their farms.

The reviewer of a recent French publication by Grenoble University, *L'Agriculture Biologique en France*, while noting that only one per cent of French farmers use biological (organic) methods, observes that organic agriculture exerts an influence out of all proportion to its numerical strength. The ecological and environmental

implications of organic farming generate needed publicity. The review concludes:

> More profoundly, furthermore, this influence is inherently related to the contradictions provoked by contemporary capitalism's concentrated industrialization, in the field of natural resources as in that of social relations.
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> In regard to this, the motivations of organic farmers are significant. The rejection of dangerous practices and the desire to deliver produce of better quality link up with the refusal of permanent indebtedness, plus the feeling that the present course of industrial agriculture is globally untenable, and all together arrive at a fundamental critique of the dominant technological pattern. . . . Organic agriculture is at once a source and a product of this critique.

A Bolivian describes the efforts of an agronomist supported by the German mission, Miseris, to teach composting techniques to the Andes peasants of Tunari. Experiments showed less need for water, since compost instead of chemicals increased the soil's retention of water. Organic methods applied to a parish garden resulted in enormous cobs of corn. In another region composting brought "a tenfold rise in maize yields from soils which had apparently lost all fertility through erosion and complete disappearance of humus."

Announcement is made of a completely rewritten and enlarged edition of the classic, *Fertility without Fertilizers*, by L. D. Hills. The reviewer says: "New knowledge of plant nutrition and the latest work of the Henry Doubleday Research Association (England) have made this the most up-to-date practical book on the soil fertility side of organic farming and gardening."

> The chapter "Organic and Inorganic" draws the line clearly between compost and chemical where it is drawn by the crops themselves. The final chapter, "Fertility for the Future," demolishes the argument that without artificial fertilizers we shall never feed a hungry world. [Probably available in the U.S. from Rodale Press, Emmaus, Pa.]