

THE PSYCHOLOGICAL VIRTUES

THE lives of human beings seem to be careers pursued under the rules of two systems—the system of the world around us and the system of one's individual life. There are obvious relations and interdependencies between these two systems, but we don't understand them well. Both, we feel, ought to operate on the same basic principles, yet much of the time their requirements seem to be in gross contradiction. Our spontaneous reaction is that this conflict is simply *wrong* and needs to be straightened out. So, having problem-solving capacities, we set out to reconcile the two systems. We do this by studying both the world and ourselves, and if we are formal about it we call the one activity science, the other religion. Science is systematic inquiry into how the world system works. It investigates the complex schemes of external reality for the purpose of adjusting to its necessities and in order to use its forces and resources more effectively. Religion is at root the inquiry into *meaning*. No matter how much we know about the world and how it works, if we lack a sense of meaning, of purpose, our knowledge about the world seems pointless and we remain indifferent to the promise it affords.

Years ago Simone de Beauvoir called attention to this state of mind by describing an ailing young woman who was urged by her friends to concentrate on "getting well." All the rest, they said, "is of no importance." She replied: "But nothing is important, so why should I get well?" At the end of a course of experience which led him to the same conclusion, Macbeth exclaimed that life is but a tale "Told by an idiot, full of sound and fury, signifying nothing."

This feeling of total defeat is not inevitable. There are those who, arriving at the stage of exhaustion of meaning, are able to reach into themselves for the capacity to make a new

beginning. In one of his papers Carl Rogers relates:

I think of . . . a young woman graduate student who was deeply disturbed and on the borderline of a psychotic break. Yet after a number of interviews in which she talked very critically about all of the people who had failed to give her what she needed, she finally concluded: "Well, with that sort of foundation, well, it's really up to *me*. I mean it seems to be really apparent to me that I can't depend on someone else to give me an education." And then she added very softly: "I'll really have to get it myself." She goes on to explore this experience of important and responsible choice. She finds it a frightening experience and yet one which gives her a feeling of strength. A force seems to surge up in her which is big and strong, and yet she feels very much alone and sort of cut off from support. She adds: "I am going to beam to do more things that I know how to do." And she did.

What, in such cases, has become of the importance of knowledge of the external world? It is still there, of course, but it has receded to a weak level of everyday common sense. What brings about a change in such situations? Quite evidently, the reconciliation of one's personal existence and meaning with the conditions of life in the world is dependent upon reanimating the inner system of things. One of the first moves is described in the kindergarten lesson of the little Red Hen: "I will have to do it myself." This principle of action is entirely absent—absent by definition—from the scientific system of things, which is doubtless a basic reason why so many thoughtful persons these days give the impression of being "antiscientific." The scientific conception of reality, they say, is irrelevant to the central questions of human life and preoccupation with scientific knowledge takes our attention away from questions and issues no human being can afford to neglect.

Well, this has been generally true for centuries. Little by little, it is now becoming less true, although the balance of scientific interest and attention has hardly swung into clear focus on the issues of meaning, as yet. Involved is the question of what "science" means. Are psychologists scientists? Some of them think so, but the specialists in physics and chemistry often doubt it. Science deals with objective matters, and psychology is (or ought to be) concerned with human beings as subjects. Only another sort of science, then, can cope with the inner feelings of people, improve their attempts to chart a course for their lives that will satisfy basic longings and bring some measure of fulfillment. Dr. Rogers, you could say, is endeavoring to practice this kind of science—a science admittedly in the kindergarten stage. Defending this idea of an infant science which includes "subjective experiences in the world of reality," A. H. Maslow pointed out (in *The Psychology of Science*):

Knowledge has an embryology, too; it cannot confine itself to its final and adult forms alone. Knowledge of low reliability is also part of knowledge. At this point, however my main intention is to include subjective experience in this all-inclusive realm of being and then to pursue some of the radical consequences of this inclusion.

One "radical consequence" of admitting that subjective experience is susceptible to understanding and ordering is that the fundamental psychological virtues must be admitted to be substantially real. The girl Dr. Rogers talked to finally recognized that her case was hopeless unless she practiced self-reliance. She proclaimed this—quietly to Dr. Rogers—as a principle of her life. As a result she began to change, find meaning, work harder, do more of what she knew how to do. Well, all the virtues have multiple disguises and imitations. Some are real and some merely pretentious. Self-deception and fraud are part of the circumstances of the inner life. We all know this. But the polarities of a good life and a bad life are clear enough, not subject to dispute. The gray area in between is

where we work, do the best we can, and if the Pollyannas distort things sentimentally, while the cynics make everything look dark, we *still* try to do the best we can, and be honest with ourselves, now and then. It is as Socrates said—if one is not at peace with oneself, nothing else counts for much. What happens as a result of noticing these complications is that we are compelled to admit that psychological science and moral science may often be in such close embrace that they become indistinguishable.

It is necessary to take into account the fact that the way people think about these questions and issues is deeply affected by the tendencies and opinions of the times. In other words, while general views may be rejected by extraordinary individuals, as the history of ideas shows, people for the most part take their opinions ready-made from the people around them. They seldom change unless things stop working well. For a long time, now—say, since Galileo—our leading thinkers (perhaps not our *best* thinkers) have been insisting that the most important thing to do to improve our lives is to study the external world. For a lot of energetic people, this has meant to *conquer* it. Science is power and technology is conquest. The metaphor is dramatic and no doubt has truth in it. In some sense mastery is conquest. But conquest may become a blind and ruthless habit. Many people are now pointing this out and demanding another sort of relationship with the external world. Words like collaboration, harmony, interdependence, and expressions such as the brotherhood of life are gaining currency. You could say that the language of *human meanings* is being applied to the world outside, or to how we ought to relate to it. A great change in human attitudes is going on.

Physical scientists such as Werner Heisenberg and John Wheeler and psychologists like Carl Rogers and A. H. Maslow represent this great change, but they are not making it *for* us. We are also doing it for ourselves, even though we are doing it together, affecting others and being

affected by them. In any change of importance in the inner system of things, the principle of self-reliance must be in operation, even though it sometimes works modestly and imperceptibly through all the delicate interrelations of human beings. There was a fundamental independence in the decision of the girl Dr. Rogers talked to. She gave *him* something in that talk—the substance of what might have been one of the most valuable papers he ever wrote.

In relation to the present change of allegiances concerning what is real, or what deserves our most careful attention, a great and deep question lies behind the wonderings of a great many people. Can there be—they ask themselves—is there, actually, a set of principles by which the inner universe operates?

If you want to build a house you get a book which gives the application of engineering principles to building. The best houses are usually constructed this way. Well, is there similar knowledge about how to build a life? *Of course* there is, will come a chorus of response, but then endless argument begins. People—even philosophers, most of all, perhaps, philosophers—do not agree. Since the days of Job people have been uncertain about whether this knowledge really exists, how you get it, whether it proves out in practice. Arjuna, on the battlefield with his friend Krishna, had the same problem. He was no Macbeth, but he seemed to feel as Macbeth did. What's the use! he said to Krishna, and Krishna's reply, which may be the most persuasive account in all literature of the idea that knowledge does exist, and is obtainable, has still left a great many people uncertain. Somehow, we can't really be *told* about such things.

So the question remains. Is it possible to acquire knowledge of how to live a life that is in harmony with the world and other people, or is it simply a matter of guesswork and luck? This is like asking: Is the world a meaningless and senseless place, so far as I am concerned? It often seems that way. But what if the way the world

looks depends mostly on the quality of our relations with it? During the long stage of our "conquest" of nature, it made a great deal of sense to regard it as a vast resource, a sort of smorgasbord. It was there—no matter how it got there—and we were enjoying it. The techniques of extracting its treasures and managing its energies have been very exciting to learn.

But a time comes when the joys of exploitive action pall. We may get inside signals of this, or the action itself may grow less and less effective. Or there may be explicit warnings. "The scientists," Robert Oppenheimer said, after the detonation of the first atomic bomb, "have known sin." Rachel Carson's *Silent Spring* was another warning. Now we are getting warnings from all sides.

It is easy enough, of course, to say that our course is clear: We mustn't abandon science because it has been so misused, but begin to redirect it. This seems obvious, but the question is *how*? How shall we know whether what we decide to do is only a "more sophisticated" form of more of the same? One thing seems certain: We need to know a lot more about the differences between objective (scientific) and subjective (another sort of scientific) knowledge. We need to know this difference for ourselves, not by instruction from experts. And *this* may be precisely the difference between the two kinds of science. Having seen it, we then must anticipate that once we set out to acquire subjective knowledge, a great flow of plausible self-deceptions becomes a distinct possibility, perhaps an inevitability. One value of reading about the discipline of the oldtime scientific method is that it makes such possibilities clear. Recognizing these hazards as part of the human condition—as some of the raw materials of self-understanding—and not a reason for abandoning attempts at subjective knowledge, may be the next step.

While we have to do these things for ourselves, other people can certainly help. Sometimes they set splendid examples and are

able to tell how they learned what they learned, even if reading what they say does not of itself supply knowledge. The kind of knowledge we are describing seems incommunicable in any one-to-one fashion, although it can be talked "about." A. H. Maslow has written a great deal along these lines.

Discussing the difference between schoolbook science—learning how things work objectively—and the inner science he was trying to establish and develop, he called the "facts and definitions" of science "associative learning." Then he said:

Associative learning is certainly useful: for learning things that are of no consequence, or for learning techniques that are interchangeable. And many of the things we must learn are like that. If one needs to memorize the vocabulary of another language, he would learn it by sheer rote memory. Whereas if one wants to learn automatic habits in driving, like responding to a red signal light or something of the sort, then conditioning is of consequence. It is important and useful, especially in a technological society.

We must admit that matters of "associative learning," as here described, by no means encompass the majestic heights of scientific knowledge; this criticism does not meet the claims of C. P. Snow's "Two Cultures" essay, which elaborated on all the practical good scientific knowledge has done the human race—supplying more food, better medicine, labor-saving machinery, sanitation, etc. But the issue Dr. Maslow is considering comes down to asking, quite simply, as Tolstoy asked, and as Camus asked: How does scientific knowledge of this sort illuminate the meaning of my life? The answer is that it doesn't, can't, and wasn't expected to, except by those ignorant of its nature. As Maslow says:

In terms of becoming a better person, of self-development, of self-fulfillment, or "becoming fully human," the greatest learning experiences are very different. In my life, such experiences have been far more important than listening, memorizing, and organizing data for formal courses.

More important for me have been such experiences as having a child. Our first baby changed me as a psychologist. It made the behaviorism I had been so enthusiastic about look so foolish that I could not stomach it any more. It was impossible. Having a second baby, and learning how profoundly different people are even before birth, made it impossible for me to think in terms of the kind of learning psychology in which one can teach anybody anything. I could no longer think in terms of the John B. Watson theory, "Give me two babies and I will make one into this and one into the other." It is as if he never had any children. We know only too well that a parent cannot make his children into anything. Children make themselves into something. The best we can do, and frequently the most effect we can have, is to serve as something to react against if the child presses too hard.

Another profound learning experience that I value far more highly than any particular course or any degree was my personal psychoanalysis: discovering my own identity, my own self. Yet another basic experience—far more important—was getting married; this was certainly more important and instructive than my Ph.D.

All this is bound to be confusing. Is he saying, Don't go to school to get an education: Get married! Do his remarks mean that everybody would learn from psychoanalysis what he learned? He is saying no such thing. People as well as children make themselves into something. The wisdom of Dr. Maslow is between the lines because it has to be. He continues (we are quoting from material printed in the *Humanist* for September/October 1970, in honor of Dr. Maslow soon after his untimely death):

Thus if one thinks in terms of developing the kinds of wisdom, understanding, and life skills that he would want, he must think of what I call *intrinsic* education, *intrinsic* learning; that is, first, learning to be a human being in general, and second, learning to be *this* particular human being. Once you start thinking in terms of being a good human being, and then ask about your high school courses—"How did trigonometry help me to become a better human being?"—an echo answers, "By gosh, they didn't work!" In a certain sense, trigonometry was for me a waste of time. My early music education was also unsuccessful because it taught a child who had a profound feeling for music and a great love for the

piano *not* to learn it. My piano teacher taught me in effect that music is something to stay away from. And I had to relearn music as an adult.

I am talking about ends: This is a revolutionary repudiation of 19th-century science and contemporary professional philosophy, which is essentially a technology and not a philosophy of ends. I reject thereby, as theories of human nature positivism, behaviorism, and objectivism. I reject thereby the whole model of science, and all its works derived from the historical accident that science began with the study of nonpersonal, nonhuman things that in fact had no ends. The development of physics astronomy, mechanics, and chemistry was impossible until they had become value-free, value-neutral, so that pure descriptiveness was possible. The great mistake that we are now learning about is that this model, developed from the study of objects and of things has been illegitimately used for the study of human beings. It is a terrible technique. It has not worked.

This is a good place to stop quoting Dr. Maslow because it brings us to about where we are now, as a somewhat enlightened if deeply-in-trouble civilization. We are looking for another model because the physicalistic, nonhuman model has not worked. We are searching in earnest for a way to approach the system of human life—to develop some knowledge of it that works. Unsure, even, that such a system exists—on the ground that we seem to get into trouble all the time, no matter what we do—we nonetheless are looking for the principles of psychological or moral life, since our need is great and there seems little else to do. We feel, moreover, that such knowledge *ought* to exist.

But one more thing seems appropriate to quote from Dr. Maslow. He was looking for another kind of model—how consciously we hardly know—when he met certain individuals who were so fine, so great, that his lifework was there before him. Why are they like that? He had to try to know. The idea of self-actualization and the climactic significance of the peak experience came out of these studies. Years later he justified them by saying: "If we want to know the possibilities for spiritual growth, value growth, or

moral development in human beings, then I maintain that we can learn most by studying our most moral, ethical, or saintly people." (*Farther Reaches of Human Nature*.) How he studied these people, and what he learned, is told in his books, of which the best one to read first is probably *Toward a Psychology of Being*.

When you come down to it, Dr. Maslow's ideas are simplicity itself, except for the fact that, as a scientist and a psychologist, he expresses them partly in the complex language of the time—the language which resulted from centuries of trying to describe human beings in objective terms. He had to use this language to be taken seriously. But too much loyalty to this language would eliminate all directness and simplicity. Maslow's lucid prose shows that he understood this well.

REVIEW

HAZARDS OF DEFINITION

THE Fall 1976 issue of *Dædalus* has contributions on two themes—the meaning of "adulthood" in America, and changing American institutions in the present. Both turn out to be subjects difficult to get at, and therefore worth investigating.

There are various ways of demonstrating that our lives are to us very largely mysteries, and attempts to define adulthood soon make this evident. Even the idea of being an adult seems to be historically of recent origin. Winthrop Jordan shows that the present meaning of adulthood as capable of responsibility—as having maturity—really dates from the transformation of Calvinist religion, in which God is the only responsible party, into a liberal religious view that "emphasized the individual's ability to gain salvation by means of his own efforts, often aided by revivalist preaching." From this view of the individual, it is only a short step to the non-theological injunction of the male parent to his young to "grow up," to "shape up," or take the consequences of remaining a ninny.

The word adult comes from the same Latin root as adolescent—a verb meaning "to grow up," the adolescent being in the process, the adult one who has completed it, more or less. A mosaic of meanings can be put together from the various ways in which adults are identified. Before the law, adulthood means being able to tell right from wrong and being responsible for one's actions. For the average person, an adult is someone who is able and willing to do his appointed work in the world. Robert Coles puts it well:

To be "grown up" is to be responsible, hard-working dedicated, and, not least, self-sacrificing without demonstrations of self-pity. To be "grown up" is also to be busy, to have found a mission in life, a purpose: the bills to be paid, the children to be brought up, and so on.

Interestingly, the country as a whole seemed to need to reach some sort of maturity in its own

eyes before the American people were ready to separate from England. At the time of the Revolution, Prof. Jordan points out—

George III was the "father" of his people and they properly owed him "filial" obedience and respect until he transformed that natural relationship by becoming a "tyrant." While George III was the "father," Great Britain was the "parent" or the "mother" country of the Colonies. It was precisely these natural relationships that Thomas Paine so successfully assailed in *Common Sense* when he denounced the king as "the royal brute of Great Britain" (i.e., standing in an *unnatural* relationship to the colonists) and declared that Europe, not England, was the "parent" of America.

To clinch the matter for his readers, Paine remarked: "To know whether it be the interest of the continent to be independent, we need only ask this easy, simple question: Is it the interest of a man to be a boy all his life?"

In curious contrast to such capacities and dignities is the spurious image of adulthood or maturity which results from considering the appeal and content of present-day television programs. Roger Rosenblatt concludes an examination of this material:

There is . . . a state of mind that falls short of savagery, which stimulates a dream state, where all freedoms associated with savagery flourish without histrionics. We have no name for this state, for it did not exist before television and still does not exist outside it. But, whatever its name it is a state of freedom—apolitical, though it admits politics, asocial, though it depends on social life—a celebration of pure irresponsibility.

In many ways, television is the medium of irresponsibility, which is why the idea of adulthood within television is a contradiction in terms. The medium itself allows freedoms that no other medium will; it doesn't hold us like the theater or movies; we can place it where we choose, we can eat, do push-ups, answer the door. We are free to spin the channels, free to take or leave it. In turn, it shows us freedoms never won before—tapes and repeats that play havoc with time and sequential actions, with order and the idea of order. . . .

"Grow up!" as an imperative means "behave and control yourself": understand your limitations and be

reasonable and civil accordingly. One does not grow up on television. It is not in television's commercial interests to have one do so, because a free-floating mind is more apt to buy large quantities of La Choy Chinese food. . . .

I seriously doubt that watching panicky or wise adults on television will make children grow one way or the other, or that seeing adults forfeit sense and manners will cause children to do likewise. But what of these fierce freedoms: the message continually sent, dot by dot, that a person needs no one but himself in this world and no other person needs him? What is the message of the box? Every night in America the doors lock, the screens grow bright, and man sits down to see how free he can be. Nothing will disturb him, if he can help it. He is a grown-up, after all, and has earned his independence.

Well, we have our biological, legal, commercial, and common-sense ideas of adulthood, but we are still in the dark as to what being a grown-up human being really means. Some of the brightest members of society confuse us on the subject. Discussing the writer and adulthood, Wallace Stegner says:

Indeed, the Romantics from Blake and Wordsworth to D. H. Lawrence have insisted that the writer ought to be a child or a primitive, and that acceptance of social obligations and duties, far from being a sign of maturity, is the saddest sort of surrender. Egocentrism, bohemianism, rebelliousness, lack of self-control and of that "developing strength" that Erik Erikson suspects is central to maturity—these are qualities we expect to find in writers and often do. . . . Yet we should not, I think, dismiss artists from any consideration of adulthood. They are not quite gifted but irresponsible children; they are mixtures and approximations like other concepts—like adults, for instance. And from the time of the invention of the alphabet, writers have helped to shape our ideas of adulthood. On occasion writers have themselves achieved status as saints and sages. Moreover, writers are not static: they grow and change, and perhaps they grow toward greater wisdom and responsibility; perhaps there are stages in their lives that correspond to the stages of childhood, adolescence, adulthood, and senility in the life of Everyman. Perhaps, furthermore, the very qualities that self-protective societies find dangerous are proofs of a higher adulthood, beyond and above the prescriptive and limited adulthood that limited societies feel comfortable with. Writers would like to

think so. "What is Chaos?," asks Stanislaw Lec. "It is the Order destroyed during Creation."

Whom shall we allow to make the definitions of maturity, of adulthood, and how insistent on conformity ought we to be? Obviously *some* conformity is necessary in any society; but where ought it to stop? The writer or artist, in a high conception of him, Mr. Stegner suggests, is "the priest of human possibility, not of any limited system, and his fate is sometimes to be a sacrifice to his openness." Socrates is an example: He was an "artist" done in by "adults."

So there is this maturity beyond maturity, and only a little consideration of how problematic yet how precious it may be makes clear that definitions of maturity cannot be fixed; we can be firm only in relation to somewhat trivial goals. Meanwhile the dream of the higher maturity of sages and saints is an element of the cultural horizon that has to be preserved, and diffused in the atmosphere again and again, or we will go on having societies in which Socrateses are poisoned, Lincolns and Gandhis shot, and the Thoreaus laughed at and ignored.

To do orderly thinking about such matters hardly seems possible today. How shall we protect extraordinary individuals against the dull averages of mediocrity, exempt them from the rules for living which mediocrity finds comfortable, and therefore enacts in law? And how, in turn, shall we protect the great mass of serious, hardworking men and women from the hair-brained notions of brilliant schemers who are quite ready to demand by statute that everyone be like them?

The matter is filled with difficulty because every reserve of freedom, when left without definition, seems sooner or later to be turned into an area for voracious exploitation. And when we guarantee in our Constitution the room required by the independence and daring of a Socrates, after a while we find such spaces taken up by a Billy Graham, a Maharaj-ji, or a Rev. Moon!

In the second section of *Dædalus*, on changing American institutions, Nathan Glazer goes to the heart of our "minority" problems by pointing out that from revolutionary days until the present, "we have never been sure whether we ought to add to 'liberty' and 'equality' a 'fraternity' that encompasses all the people." In consequence, excluded peoples form defensive (at times aggressive) fraternities of their own. The result:

"Fraternity" has two faces: There is the small fraternity of the group, the manufacture of distinctive customs, attitudes, and values which, when exercised in the larger society, makes it the most unlikely thing in the world that each group will show the same profile of education, employment, wealth, and political influence. Many such groups exist in the United States, though inevitably over time and through the influence of the larger society their distinctiveness is reduced.

The comment is obvious: Valuing and learning from the distinctiveness of groups enriches the larger society—a benefit of the fraternity which also, at the same time, prevents the defense of distinctiveness from becoming angrily partisan. Curiously, brotherhood is an attitude which takes the sting out of manifest inequalities, so long as they exist; it gives us time to erase the injustice growing out of differences, while leaving the differences themselves as part of the diverse wonder of life. These qualities of Fraternity, moreover, are all that keeps the perquisites of membership in the larger society from being a fraud.

COMMENTARY
ADVOCATES OF COMMON SENSE

HAPPILY, the strongest advocates of alternate energy systems are not only accomplished scientists but also effective communicators. Explaining the importance of matching energy products with the level of energy required, Amory Lovins (see *Frontiers*) points out that we are now using electricity for needs that could be served by low-grade sources. At the point of consumption, only 8 per cent of our total energy use actually *requires* electricity (industrial motors, lighting, electronics, telecommunication, industrial applications such as arc-welding and metallurgy, home appliances and railways), but we are using electricity for many low-grade purposes such as low-temperature heating. The result is that electrical energy (taking 29 per cent of our fossil fuels for its generation) is applied to 13 per cent of our energy needs. The laws of physics, Mr. Lovins says, decree that two out of three units of fuel dissipate in wasted heat to produce one unit of electricity. The point:

This electricity can do more difficult kinds of work than can the original fuel, but unless this extra quality and versatility are used to advantage, the costly process of upgrading the fuel—and losing two thirds of it—is all for naught.

Plainly we are using premium fuels and electricity for many tasks for which their high energy quality is superfluous, wasteful and expensive. . . . Where we want only to create temperature differences of tens of degrees, we should meet the need with sources whose potential is tens or hundreds of degrees, not with a flame temperature of thousands or a nuclear temperature of millions—like cutting butter with a chain saw.

This recalls Barry Commoner's comparison of a nuclear power plant for boiling water with using a cannon to kill a fly on the wall, when a flyswatter would do the job. Solar energy absorbers, he said, are far better suited to boiling water. (*New York Times Magazine*, Nov. 7.)

The idea of using alcohol instead of gasoline for motor vehicle fuel is far from fanciful.

According to a mid-November newscast over a Los Angeles radio station, Brazil is seriously considering the use of its enormous sugar cane crop for the production of alcohol for this purpose. The disadvantage that gasoline is between one and a half to two times more efficient than alcohol for running motor vehicles is offset by the fact that alcohol is a clean fuel that would produce virtually no pollution of the atmosphere.

CHILDREN

. . . and Ourselves

SOME ECOLOGICAL SUCCESSES

AS one of the three scientists who were honored with the 1975 Tyler Ecological Award, René Dubos gave a lecture, "Symbiosis Between the Earth and Humankind," at Pepperdine University (California) last April. We have heard a great deal on the misuse of the earth by man, but not nearly enough about the successful collaborations, some of which have lasted for thousands of years. The educational possibilities of the material in this paper by Dr. Dubos (published in *Science*, Aug. 6) are numerous. As a record of some outstanding examples of mutually beneficial relationships between man and nature, it provides leads to material for use in both elementary and high school classes. For older students, Dr. Dubos' discussion of desirable changes in these relationships is suggestive of various careers for young people to choose from in both ecological science and appropriate technology.

The closing paragraphs of his paper convey the spirit and attitude of this distinguished biologist:

Just as the surface of the earth has been transformed into artificial environments, so have these in turn influenced the evolution of human societies. The reciprocal interplay between humankind and the earth can result in a true symbiosis—the word symbiosis being used here in its strong biological sense to mean a relationship of mutualism so intimate that the two components of the system undergo modifications beneficial to both. The reciprocal transformations resulting from the interplay between a given human group and a given geographical area determine the characteristics of the people and of the region, thus creating new social and environmental values.

Symbiotic relationships mean creative partnerships. The earth is to be seen neither as an ecosystem to be preserved unchanged nor as a quarry to be exploited for selfish and short-range economic reasons but as a garden to be cultivated for the development of its own potentialities of the human adventure. The goal of this relationship is not the

maintenance of the status quo, but the emergence of new phenomena and new values. Millennia of experience show that by entering into a symbiotic relationship with nature humankind can invent and generate futures not predictable from the determinist order of things, and thus can engage in a continuous process of creation.

Early in this paper Dr. Dubos describes the achievements of the English in land cultivation and landscape design:

It is not a native landscape, only one which has become familiar because it has been progressively shaped from the primeval forest by centuries of human intervention. Roadsides and riverbanks are trimmed and grass-verged, trees no longer obscure the views but appear to be within the horizon, foregrounds contrast properly with middle distances and backgrounds. Much of the English landscape is indeed so humanized that it might be regarded as a park or a vast ornamental farm.

For another example of wholly successful intervention by man into natural systems, Dr. Dubos recalls the country of the Ile de France, north of Paris, where he grew up:

This is a part of the earth that has been occupied and profoundly transformed by human beings since the later Stone Age. Before it was inhabited, the region was covered with forests and marshes, and it would return to this state of wilderness if it were not for the human presence. Now that it has become humanized, however, it consists of a complex network of prosperous farm lands, tamed forests and rivers, parks, gardens, villages, towns, and cities. It has long been heavily populated and has continuously supported various forms of civilizations. While it has repeatedly experienced destructive wars and social disturbances, it has remained ecologically diversified and economically productive. From the human point of view, it is more satisfying visually and more rewarding emotionally—for me and most people—than it would be in the state of wilderness. It provides a typical example of symbiosis between humankind and the earth.

It is not generally realized how much the fine arts may affect the landscapes created by men. Pieter Mondrian and Paul Klee, for example, had extensive influence on recent environmental planning, and this far-reaching result of the work of distinguished painters was really nothing new.

Dr. Dubos says that the great English parks created in the eighteenth century grew out of the inspiration of the imaginary landscapes of the French painters, Claude Lorrain, Nicholas Poussin, and Salvatore Rosa. Of the designers who made these parks Dr. Dubos says:

They obviously did not believe that "nature knows best," but instead tried to improve on it by rearranging its elements. They eliminated vegetation from certain areas and planted trees in others; they drained marshes and channeled the water into artificial streams and lakes; they organized the scenery to create both intimate atmospheres and distant perspectives. In other words, they invented a new kind of English landscape based on local ecological conditions but derived from the images provided by painters.

The English parks are now the envy of the world. However, as can be seen from the 18th-century illustrations, they were then far less attractive than they are now. The planted trees were puny, the banks of the artificial streams were bare and raw, the masses of vegetation were often trivial, and, in any case, were poorly balanced. The marvelous harmony of scenic and ecologic values that are now so greatly admired did not exist in the 18th century except in the minds of the landscape architects who created the parks. The sceneries composed from the raw materials of the earth acquired their visual majesty and came to fruition only after having matured with time. Their present magnificence symbolizes that human interventions into nature can be creative and indeed can improve on nature, provided that they are based on ecological understanding of natural systems and of their potentialities for evolution as they are transformed into humanized landscapes.

Some areas of the world have remained both fertile and beautiful throughout ages of human management. The rice paddies of tropical Asia continue to be fruitful, and even in regions of sparse soil there have been adaptations which do not wear out the land, as in the case of a large olive grove in Greece, near Delphi, which has been under continuous cultivation for thousands of years.

Looking to the future, Dr. Dubos gives attention to questions such as what the Arabs are going to do with their deserts after they run out of

oil, perhaps in thirty or forty years. The vast irrigation projects sometimes suggested may not be ecologically sound, and a better plan, he suggests, might be "to create in the desert self-contained cities so designed as to be able to grow their own food, perhaps in greenhouses located on the roofs of buildings." Proposals of this sort point to the relevance of the work of groups like the New Alchemists in Massachusetts and the inventive urban gardeners who are developing roof and basement crops in Washington, D.C.

Human care, human invention, and intelligent innovation are requirements of the future, and at least a dozen new fields of study and enterprise seem implicit in Dr. Dubos' paper:

Conservation practices are as essential for the maintenance of humanized nature as they are for the protection of the wilderness.

The stewardship of the earth, however, goes beyond good conservation practices. It involves the creation of new ecosystems in which human interventions have caused some changes in the characteristics of the land and in the distribution of living things, to take advantage of the potentialities of nature that would remain unexpressed in the state of the wilderness.

FRONTIERS

Required Reading on Energy

COMMENTING on the ongoing debate about energy and possible energy sources for the future, Philip H. Abelson, editor of *Science*, said in the Oct. 15 issue:

Part of the difficulty in gearing up to meet future energy needs is that few people seem to grasp the magnitude of the problem. The domestic oil and gas that we are now enjoying were discovered and developed relatively inexpensively and they have been produced with only localized environmental impact. Unless our people are prepared to pay a much higher price for energy in monetary terms and to some extent in environmental factors, they must be prepared to face a drastic change in their standards of living.

Those who campaign for strong negative positions toward various energy sources rarely seem to consider the total problem. They seldom devote comparable positive effort to conservation or to the development of alternative energy sources. The net result of their activity is almost totally negative.

The situation is exemplified by a recent incident related to me by a friend. He was approached at his home by a young man seeking signatures to a petition aimed at nuclear power plants. My friend queried the petitioner about the use of other fuels. Both agreed as to the necessity of reducing imports of oil. The young man, when questioned about coal, denounced pollution arising from burning it. My friend then asked, "If we stop nuclear power, where will we get our electricity?" The reply was, "Oh, they'll take care of that." Thereupon the young man took his petition elsewhere.

Fortunately, there are those among the opponents of nuclear energy who "consider the total problem" very carefully, and whose voices, in order to be effective, need to be widely heard. There is a clear answer to the question, "If we stop nuclear power, where will we get our electricity?" in the article, "Energy Strategy: The Road Not Taken?" by Amory Lovins, which appeared in *Foreign Affairs* for October, and was reprinted in the Mid-November *Not Man Apart* (published at \$10 a year by Friends of the Earth, 529 Commercial, San Francisco, Calif. 94111; single copies 50 cents).

Two paths, representing radically different energy policies for the United States, are described by Mr. Lovins. One, the path we are now on, he calls the "hard path." It involves rapid expansion of the use of coal (stripmined, mainly, and converted into electricity and fluid fuels), further development of domestic petroleum sources, long-term reliance on nuclear power (fission and fusion breeders), and some use of solar electricity. According to existing projections (to the year 2000 and 2025), America's "1976-85 energy program turns out to cost over \$1 trillion (in 1976 dollars) in initial investment, of which about 70 to 80 per cent would be for new rather than replacement plants." Three fourths of this sum would go to pay for electrification. If we figure the cost of converting fossil fuels into electricity, Mr. Lovins says, "the capital cost per delivered kilowatt of electrical energy emerges as roughly 100 times that of the traditional direct fuel technologies on which our society has been built."

Not even the national treasury, Mr. Lovins points out, can afford a long-term electrification program at such costs. And even if nuclear power could ease this burden, we would then be saddled with the garrison-state security measures that threats of sabotage would make necessary. This is no idle anticipation, but what the Stanford Research Institute has dubbed "friendly fascism," involving "a managed society which rules by a faceless and widely dispersed complex of warfare-welfare-industrial-communications-police bureaucracies with a technocratic ideology." What alternative have we?

Mr. Lovins' "soft path" has two basic features—first, extensive conservation, then development of alternative energy sources which involve decentralization and local production. The conservation seems simple enough. It begins with immediate application of existing technologies to consume less heat and energy. After listing some of these possibilities—which are numerous—he says:

Theoretical analysis suggests that in the long term, technical fixes alone in the United States could probably improve energy efficiency by a factor of at least three or four. A recent review of specific practical measures cogently argues that with only those technical fixes that could be implemented by about the turn of the century, we could nearly double the efficiency with which we use energy. If that is correct, we could have steadily increasing economic activity with approximately constant primary energy use for the next few decades, thus stretching our present energy supplies rather than having to add massively to them. One careful comparison shows that *after* correcting for differences of climate, hydroelectric capacity, etc., Americans would still use about a third less energy than they do now if they were as efficient as the Swedes (who see much room for improvement in their own efficiency). U.S. per capita energy intensity, too, is about twice that of West Germany in space heating, four times in transport. Much of the difference is attributable to technical fixes.

The soft technologies, with solar heating heading the list, are cheaper than electricity and far more inflation-proof. Mr. Lovins describes them at length, remarking that conversion of organic wastes to methanol and other fluid fuels could probably "run an efficient transport sector." The beer and wine industry now produces from organic materials alcohol approaching about five per cent of the gross gallonage of gasoline, so that if these plants were multiplied by ten or fourteen, and if transport vehicles were three times more efficient than they are now, organic conversion would meet our fuel needs.

We have been attempting to give the highlights of Mr. Lovins' fifteen thousand words, which need to be read in full for their impact to be felt. We conclude with a paragraph on the overall advantages of the "soft path":

Just as improvements in end-use efficiency can be used at home (via innovative financing and neighborhood self-help schemes) to lessen first the disproportionate burden of energy waste on the poor, so can soft technologies and reduced pressure on oil markets especially benefit the poor abroad. Soft technologies are ideally suited for rural villagers and urban poor alike, directly helping the more than two billion people who have no electric outlet or anything

to plug into it but who need ways to heat, cook, light and pump. Soft technologies do not carry with them inappropriate cultural patterns or values, they capitalize on poor countries' most abundant resources (including such protein-poor plants as cassava, eminently suited to making fuel alcohols), helping to redress the severe energy imbalance between temperate and tropical regions, they can often be made locally from local materials and do not require a technical elite to maintain them; they conform to modern concepts of agriculturally based eco-development from the bottom up, particularly in the rural villages.