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AN OPENING DOOR

THE words we use gain their meanings from the general assumptions we have adopted from the prevailing beliefs of our time. When those beliefs change a process of the revision of meanings takes place, which may last a century or more. Fortunately, we have an excellent book that is concerned with such changes, by a remarkably perceptive historian, Carl Becker. While the book, *The Heavenly City of the Eighteenth-Century Philosophers*, is regarded as "old"—it was published by Yale University Press in 1932—its content is still as fresh as though most of it were written last year, and this currency is likely to continue indefinitely. He begins in his first chapter ("Climates of Opinion") by comparing passages from Aquinas and Dante with equivalent statements—equivalent in the sense of declaring current assumptions in definitive terms—from James Jeans and Bertrand Russell. The extract from Aquinas is from *Summa Theologica*, that from Dante from *De Monarchia*, and both are magnificently sound and logical, given their assumptions. But so also, on the same basis, are the characterizing declarations of Jeans and Russell. But we are not persuaded by the great men of the Middle Ages, and as to Jeans, and especially Russell, we are beginning to wonder. Writing in 1932, Becker says:

> Edit and interpret the conclusions of modern science as tenderly as we like, it is still quite impossible for us to regard man as the child of God for whom the earth was created as a temporary habitation. Rather must we regard him as little more than a chance deposit on the surface of the world, carelessly thrown up between two ice ages by the same forces that rust iron and ripen corn, a sentient organism endowed by some happy or unhappy accident with intelligence indeed, but with an intelligence that is conditioned by the very forces that it seeks to understand and to control. The ultimate cause of this cosmic process of which man is a part, whether God or electricity or a "stress in the ether," we know not. Whatever it may be, if indeed it be anything more than a necessary postulate of thought, it appears in its effects as neither benevolent nor malevolent, as neither kind or unkind, but merely as indifferent to us. What is man that the electron should be mindful of him! Man is but a foundling in the cosmos, abandoned by the forces that created him. Unparented, unassisted and undirected by omniscient or benevolent authority, he must fend for himself, and with the aid of his own limited intelligence find his way about in an indifferent universe.
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> Such is the world pattern that determines the character and direction of modern thinking. The pattern has been a long time in the weaving. It has taken eight centuries to replace the conception of existence as divinely composed and purposeful drama by the conception of existence as a blindly running flux of disintegrating energy. . . .
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> The fact is that we have no first premise. Since Whirl is king, we must start with the whirl, the mess of things as presented in experience. We start with the irreducible brute fact, and we must take it as we find it, since it is no longer permitted to coax or cajole it, hoping to fit it into some other category of thought on the assumption that the pattern of the world is a logical one. Accepting the fact as given, we observe it, experiment with it, verify it, classify it, measure it if possible, and reason about it as little as may be. The questions we ask are "What?" and "How?" What are the facts and how are they related? If sometimes, in a moment of absent-mindedness or idle diversion, we ask the question "Why?" the answer escapes us. Our supreme object is to measure and master the world rather than to understand it. . . . "Science," said Lloyd Morgan, "deals exclusively with changes of configuration, and traces the accelerations which are observed to occur, leaving to metaphysics to deal with the underlying agency, if it exist."

Today, a little more than fifty years after Becker wrote this apt summary of a world outlook, we have begun to be appalled by the fruits of our focus on the "what" and the "how." The answers we have made to these questions have laid the world to waste, producing at the same time a surfeit that we are no longer able to enjoy. Meanwhile, the "we" that we speak of here

have become fewer and fewer, and the ever more numerous others are given no reason to look for or expect enjoyment, but hope only, if possible, to survive. A world of this sort leads the educated and the thoughtful of mankind, as well as the hungering poor, to return to that neglected question: Why?

It is fair to say, then, that we now live at the beginning of an epoch of renewed philosophizing. We want to know what meaning life may have, and the answers to the what and how tell us nothing about meaning.

What is meaning? It is the only reason we have for living, for going on as rational intelligences. True, we have instincts that drive us, appetites that demand satisfaction, desires that whip us to various kinds of action, but in reflective moments we feel—or know—that we are more than these provocative energies. Is there, indeed, we ask ourselves, an "underlying agency"? Is there a principle seeking fulfillment behind the façade of every day life?

The answers we once had to this question, whether from religion or philosophy, have either been shredded or hopelessly attenuated by the scientific intellect. Reacting to the pretenses and frauds of institutional religion, to the thin abstractions of philosophical speculation, the scientific mind challenged the age with its declaration that matter—what we can touch, measure, weigh, and feel—is all. When we have learned the what and the how of matter, we shall know how to order our lives and will need nothing else.

But this is not true and we are discovering why. To order our lives we need a sense of meaning, and science does not supply us with this. It speaks only about "things," not about us, and we can hardly experience meaning except in terms of ourselves. What, then, are we? We have bodies and use them, but we are not, or are more than, our bodies, since we are able to use our bodies wisely or unwisely. Today, in the sciences, a growing number of investigators are looking at human life with such questions in mind. They are cautious, circumspect, careful to preserve the spirit—the critical spirit—of scientific inquiry, but they are *looking.* And their work is followed with intense interest by an increasing number of intelligent people who have been wondering along the same lines.

One such investigator is Rupert Sheldrake, a biologist who, at a recent conference on Consciousness and Survival, began by speaking about memory. Memory is a part of the mind, therefore of ourselves, since without memory we could hardly speak about ourselves or be aware that we exist. Where, Sheldrake asks, is memory stored? The conventional answer—really a chorus—would be, in the brain. So his opening section is entirely devoted to showing that memory is by no means dependent upon the brain. There is a great deal of evidence, based on experiment, indicating that memory is elsewhere preserved. This is not guesswork or theory but neurological fact, and it is fact bearing on the question of human identity. After a review of this evidence, Sheldrake comments:

> I say all this simply to make it clear that the question of memory storage is an extremely open one. There's nothing in the existing evidence that compels us to believe that memories are stored inside the brain. The reason for people believing this so strongly is simply because it's an assumption, and not because there's such overwhelming evidence that it's impossible to think of any other way of memory being stored. Of course, the other reason why everyone believes it, or so many people believe it, is that alternative theories of memory storage are indeed difficult to think of. Because if it is not in the brain, or indeed not in the body at all, then where is it? I mean, it seems as if it had to be in the brain. It just seems as if that's the only possible theory of memory storage.

There are, however, other possible theories, and Sheldrake has proposed one in his book, *A New Science of Life.* He says in his talk:

> This hypothesis starts, not from the problem of memory, but from one of the other central unsolved problems of biology, the problem of form. How is it that embryos form simple fertilized eggs into complex

> structures such as ourselves? As form comes into being in animals and plants, more complex structures come from less complex structures. This is a grave problem, not for developing organisms, which just do it, but for biologists trying to understand how they do it.

These efforts, he says, all center on DNA, "the genetic chemical present in the genes and chromosomes." DNA is regarded as having the code for the development of the form of the organism, but as Sheldrake shows, this explanation breaks down because DNA is absolutely chemically uniform. The same chemical produces radically different results and DNA is therefore not an explanation of differentiation.

> Well, we might say, it's because of the DNA, that something influences it so that different proteins are made in different places. But again, we have the problem that just making the right chemicals doesn't automatically give the form. This building could be demolished, I hope it isn't, but it could be and it could be analyzed for its chemical constituents, and you could make a very impressive list of analyses of the building, but it wouldn't tell you what the form of the building was. It's possible to build houses of different forms out of the same building materials. The form is not explained by the materials, they are necessary for building the building but it's not explained by the materials. . . . No one has an explanation of the coming into being of form. What biologists do have is a strong faith, many of them, that an explanation will be obtained at some unspecified time in the future by pursuing existing lines of research for much longer. Well, that's fine. I mean it's not a scientific theory, it's an act of faith. . . . So the whole thing is very open and it's rather like the position in relation to the mind and the brain, trying to explain the mind in terms of the brain, which hasn't been done.

Sheldrake suggests that form arises out of the influence of a morpho-genetic field—a theory for which there is considerable evidence, some of which he gives. This view, he says, has been widely adopted, especially in embryological textbooks.

> The only question is, What is the nature of the fields? And there we find a lot of disagreement. Some biologists think that the fields are essentially the reflections of the total mathematical patents of structures, and this is really a kind of Platonic or Pythagorean theory of the fields, and is quite influential. Others think that they don't exist and that they are just a way of talking about patents of complex spacio-temporal physico chemical intersections, not yet fully understood.

In its development Sheldrake's theory has bearings on a wide range of questions and problems, which may be considered by reading his book. Here we give attention to an implication of his work that seems to open the door to metaphysical inquiry. He says:

> Now if our memories are not stored inside our brains this also, of course, has a great bearing on the question of survival. . . . if our memories are stored inside our brains, since our brains decay at death, that's the end of us, at least as far as any recognizable characteristics are concerned. If they're not stored inside the brain, then there's the possibility that memories could survive the death of the body. . . . perhaps there's some part of the personality that is not material, that interacts with the brain through morphic fields; we then have some non-material, field-like, central part of self which could survive going some way beyond the theory.

Yet he adds at the end:

> . . . I think that in a few years' time, I think we should begin to see whether this approach is more valuable, more in accord with the evidence than the conventional mechanistic approach, which as I've already pointed out, has very little evidence in its support in this area.

The closing sentence of this talk by Rupert Sheldrake has the importance of showing that at least among the pioneering thinkers in science, the direction of inquiry is changing, or has already changed. He says that "at present from the present scientific point of view, I think it's fair to say that these questions are completely open."

Well, writing as a scientist, Sheldrake makes it evident that he, as scientist, has embraced no claim as to the "underlying agency." Yet while calling open the questions affecting our ideas about the underlying agency, he does not speak of the attitudes which are likely to be assumed by

those who are not "scientists." This point was well made by Ortega in *History as a System*, a book in which he begins by saying:

> Scientific truth is characterized by its exactness and the certainty of its predictions. But these admirable qualities are contrived by science at the cost of remaining on a plane of secondary problems, leaving intact the ultimate and decisive questions. . . . Yet science is but a small part of the human mind and organism. Where it stops, man does not stop. If the physicist detains, at the point where his method ends, the hand with which he delineates the facts, the human being behind each physicist prolongs the line thus begun and carries it to its termination, as an eye beholding an arch in ruins will of itself complete the missing airy curve. . . .
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> For living means dealing with the world, turning to it, acting in it, being occupied with it. That is why man is practically unable, for psychological reasons, to do without all-round knowledge of the world, without an integral idea of the universe. Crude or refined, with our consent or without it, such a trans-scientific picture of the world will settle in the mind of each of us, ruling our lives more effectively than scientific truth. . . . How can we live turning a deaf ear to the last dramatic questions? Where does the world come from, and whither is it going? Which is the supreme power of the cosmos, what the essential meaning of life? We cannot breathe confined to a realm of secondary and intermediate themes. . . . We are given no escape from last questions.

This does not mean that we stop thinking as we declare ourselves in behalf of tentative answers to the "last questions," but simply that we feel that the decision of whether the answers we find are true or not does not really lie with science—a science which, we now feel, was constructed as a polemic against any form of transcendental reality.

The work of another researcher—or rather, today, a growing group of researchers—drives this point of Ortega's home. We speak of those who are studying what has been called "the near-death experience." Another speaker, Kenneth Ring, at the Consciousness and Survival Symposium (of the Institute of Noetic Sciences) dealt with this subject as a scientist, yet with a distinctly friendly attitude toward those who have been through this experience. Those who have had the experience and were thrilled by it, no longer have any fear of death. They become witnesses to an intensity of conviction about what is for them the life after death, so much so that psychologists and others who have been collecting their reports, and the general public, the psychologists say, are both aroused and fascinated by what seems the import of the reports.

The reports reveal that for many of such individuals, the experiences are quite similar. Dr. Ring generalizes the near-death occurrence:

> Experiencers commonly say that they are aware of a tremendous feeling of peace and well-being; that they feel separate from and outside of their body, which they often claim to see lying below them. There is a sense of moving through a dark space sometimes described as "like a tunnel" toward a radiantly beautiful, brilliant white or golden light that seems to exude an overwhelming feeling of pure love.

A man who had been working on his truck, lying beneath it when the supports gave way, noticed that his heart was slowing, and then stopped before help arrived. Then all pain left him and he entered the tunnel, seeing the brilliant, blue-white light at the end. He spoke of the wonderful feeling of this light, "almost like a person," but not a person, although a being of some kind, and "a mass of energy." He added: "Then the light communicates to you and for the first time in your life is a feeling of true, pure love . . . the feeling that you get from this brilliant white light."

Those who have had this experience—on the operating table, or during childbirth, or after a nearly fatal accident—all describe it in similar terms, and most of them speak of the intense sense of identity they felt, apart from the body, from which they were somehow separated. Dr. Ring comments: "Of course it is this riveting sense of personal identity, coupled with the conviction that one has died, which is common in these experiences, that provides most near-deathers with an unshakable assurance that they will, and all of us will, survive physical death."

Another quality of the experience was the loss of a sense of time. This recalled for Ring a passage in Richard Maurice Bucke's *Cosmic Consciousness,* decribing his own mystical experience: "I became conscious in myself of eternal life. It was not a conviction that I would *have* eternal life, but the consciousness that I possessed eternal life *then."*

This is the mood of present-day research, quite serious and disciplined in its way, growing out of what seem the obvious inadequacies of the scientific frame of explanation. It will of course open the way to numerous extravagances while changing our feeling of how we look at the world and the possibilities inherent in human beings. What might be a good insurance policy against the return of the age of superstition would be the development, by each one for himself, of a metaphysical scheme of meaning in which the principles of science, but not its past assumptions, are applied.

REVIEW
WHAT WE ARE LEARNING OF THE SEA

SCORES of books come out each year warning readers of the human abuse of the earth and its inhabitants, and if we read surveys like *State of the World* we learn that, with a few exceptions, there is little improvement over the years, but rather that, in crucial areas, conditions produced by human beings are growing worse and worse. The warnings grow righteous and shrill, but with little effect.

Yet there are ways of writing about our planet which seem capable of accomplishing some good. We are thinking of the books of Rachel Carson, having recently been dipping into *The Sea Around Us*, which was first published in 1951. It soon becomes evident that she loves what she writes about with such grace and skill. If her love of the natural world could infect the rest of us, there would be no need for warnings. Why do some people feel love for the world? The question is probably impossible to answer, yet we know first of all that those who experience it do so in a way that others do not. We might add that those with this experience are sometimes able to set their feelings (and their knowledge, which is of equal importance) down in books in a way that inspires at least some of their readers to increase their experience of what they read about. Rachel Carson is one of the few of whom this can be said. The love of the sea that she communicates generates respect—the respect that she hoped to inspire. So she is one of the few successful writers of our time. And reading her is to find reason for going back to her books again and again.

Speaking of what the observer may see in the ocean, day and night, simply by looking at it from a boat, she says:

> With these surface waters, through a series of delicately adjusted, interlocking relationships, the life of all parts of the sea is linked. What happens to a diatom in the upper sunlight strata of the sea may well determine what happens to a cod lying on the ledge of some rocky canyon a hundred fathoms below, or to a bed of multicolored, gorgeously plumed seaworms carpeting an underlying shoal, or to a prawn creeping over the soft oozes of the sea floor in the blackness of mile-deep water.
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> The activities of the microscopic vegetables of the sea, of which the diatoms are most important, make the mineral wealth of the water available to the animals. Feeding directly on the diatoms and other groups of minute unicellular algae are the marine protozoa, many crustaceans, the young of crabs, barnacles, sea worms, and fishes. Hordes of the small carnivores, the first link in the chain of flesh eaters, move among the peaceful grazers. There are fierce little dragons half an inch long, the sharp-jawed arrow-worms. There are gooseberrylike comb jellies, armed with grasping tentacles, and there are the shrimplike euphausiids that strain food from the water with their bristly appendages. Since they drift where the currents carry them, with no power or will to oppose that of the sea, this strange community of creatures and the marine plants that sustain them are called "plankton," a word derived from the Greek meaning "wandering."
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> From the plankton the food chains lead on, to the schools of plankton-feeding fishes like the herring, menhaden, and mackerel; to the fish-eating fishes like the bluefish and tuna and sharks; to the pelagic squids that prey upon fishes; to the great whales who, according to their species but not according to their size, may live on fishes, or shrimps, or on some of the smallest plankton creatures.
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> Unmarked and trackless though it may seem to us, the surface of the ocean is divided into definite zones, and the pattern of the surface water controls the distribution of its life. Fishes and plankton, whales and squids, birds and sea turtles, all are linked by unbreakable ties to certain kinds of water—to warm water or cold water, to clear or turbid water, to water rich in phosphates or in silicates. For the animals higher in the food chains the ties are less direct; they are bound to water where their food is plentiful, and the food animals are there because the water conditions are right.

In short, the waters of the earth are filled with life, and with intelligence which guides all life. Even at great depths in the ocean, we now know from the discovery by research vessels, using dredges, that living things are to be found "where

only recently it was supposed life would be too scanty to permit such sampling." Rachel Carson says:

> These findings of the dynamic nature of the sea are not academic; they are not merely dramatic details of a story that has interest but no application. They have a direct and immediate bearing on what has become a major problem of our time.
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> Although man's record as a steward of the natural resources of the earth has been a discouraging one, there has long been a certain comfort in the belief that the sea, at least, was inviolate, beyond man's ability to change and despoil. But this belief, unfortunately, has proved to be naive. In unlocking the secrets of the atom, modern man has found himself confronted with a frightening problem—what to do with the most dangerous materials that have ever existed in all the earth's history, the by-products of atomic fission. The stark problem that faces him is whether he can dispose of these lethal substances without rendering the earth uninhabitable.
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> No account of the sea today is complete unless it takes note of this ominous problem.

There is great variety in *The Sea Around Us.* The lonely islands that are found in vast stretches of sea—where do they come from? How are they formed? The author says:

> Islands have always fascinated the human mind. Perhaps it is the instinctive response of man, the land animal, welcoming a brief intrusion of earth in the vast, overwhelming expanse of sea. Here in a great ocean basin, a thousand miles from the nearest continent, with miles of water under our vessel, we come upon an island. Our imaginations can follow its slopes down through darkening waters to where it rests on the sea floor. We wonder why and how it arose here in the midst of the ocean.

She gives an example:

> Millions of years ago, a volcano built a mountain on the floor of the Atlantic. In eruption after eruption, it pushed up a great pile of volcanic rock, until it had accumulated a mass a hundred miles across at its base, reaching upward toward the surface of the sea. Finally, its cone emerged as an island with an area of about 200 square miles. Thousands of years passed, and thousands of thousands. Eventually the waves of the Atlantic cut down the cone and reduced it to a shoal—all of it, that is, but a small fragment which remained above water. This fragment we know as Bermuda.

Even today islands are appearing and disappearing. The greatest explosion in our own time was the disintegration of the island of Krakatoa in Sunda Strait, between Java and Sumatra, in 1883. On August 27 a series of eruptions began which lasted two days, carrying away half the island. Cold ocean water added to the molten lava of the eruptions created an inferno of white-hot lava, smoke and steam and eventually the island which had stood 1400 feet above the sea was reduced to a cavity a thousand feet below sea level. All that was left of the island was an edge of a former crater. The eruption produced a hundred-foot wave which wiped out villages along the Strait, killing people by tens of thousands. All the world suddenly became aware of the disaster at Krakatoa, even the sound of the explosion being heard nearly 3000 miles away. The dust clouds thrown up by the explosion were carried around the world in the stratosphere and affected the appearance of sunsets almost everywhere. In 1929, Rachel Carson says, "a new volcanic island arose in this place—Anak Krakatoa, Child of Krakatoa."

Volcanic activity may have other consequences:

> The sea waves that have fixed themselves most firmly in the human imagination are the so-called "tidal waves." The term is popularly applied to two very different kinds of waves, neither of which has any relation to the tide. One is a seismic sea wave produced by undersea earthquakes; the other is an exceptionally vast wind or storm wave—an immense mass of water driven by winds of hurricane force far above the normal high-water line.
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> Most of the seismic sea waves, now called "tsunamis," are born in the deepest trenches of the ocean floor. The Japanese, Aleutian, and Atacama trenches have each produced waves that claimed many human lives. Such a trench is, by its very nature, a breeder of earthquakes, being a place of disturbed and uneasy equilibrium, of buckling and warping downward of the sea floor to form the deepest pits of all the earth's surface.

The waves are continually reshaping the continents.

> The high clay cliff of Cape Cod, rising at Eastham and running north until it is lost in the sand dunes near Peaked Hill, is wearing back so fast that half of the ten acres which the Government acquired as a site for the Highland Light has disappeared, and the cliffs are said to be receding about three feet a year. Cape Cod is not old in geologic terms, being the product of glaciers of the most recent Ice Age, but apparently the waves have cut away, since its formation, a strip of land some two miles wide.

The first chart of the Gulf Stream—reproduced in the book—was prepared in 1769 under the direction of Benjamin Franklin. The life of the sea is thus interwoven with history, and our ever-growing knowledge of its mysteries was most recently recorded for the general reader by Elisabeth Mann Borgese in *The Future of the Oceans* (Harvest House) which was published last year.

COMMENTARY
THE LOGIC OF EVOLUTION

THE main point of this week's lead article is that we are conducted by current events in scientific research to a place where we must ask ourselves the question: Have we the right, the capacity, and reason to expect the world we live in to make sense in human terms?

The scientistically inclined will reply that we have no such right, that to look for meaning in the world of nature is anthropomorphizing weakness of mind. Yet one might counter this claim by asking: Are we not part of Nature? Why should we suppose that the natural human longing for meaning is "unnatural"? It is, after all, the driving force in human life. It seems obvious enough that Nature itself is an expression of driving forces, of which the reproduction of the species is an example. The splendor of certain animals—the stallion's inchoate announcement of its determination to freely gallop on the plains, the heroic quality we perceive in some dogs, the lofty flight of birds, and the wisdom manifest in their incredible migrations—these qualities excite not only our admiration but our wonder and awe.

Humans, however, have another range of wonder-seeking fulfillment, most evident to us in the arts—in the achievements of a Phidias, a Beethoven, a Blake, a Shakespeare, and also in the sciences, as in a Newton or an Einstein. Most precious to us, and most inspiring, are the works of the mind, which are sublime fulfillments. What do they represent? They grow out of the pursuit of meaning. In his *Farther Reaches of Human Nature,* A.H. Maslow wrote:

> If we want to answer the question how tall can the human species grow, then obviously it is well to pick out the ones who are already tallest and study them. If we want to know how fast a human being can run, then it is no use to average out the speed of a "good sample" of the population; it is far better to collect Olympic gold medal winners and see how well they can do. If we want to know the possibilities of 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.
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> On the whole I think it is fair to say that human history is a record of the ways in which human nature has been sold short. The highest possibilities of human nature have practically always been underrated. Even when "good specimens, the saints and sages and great leaders of history have been available for study, the temptation too often has been to consider them not human but supernaturally endowed.

The scientistic war on any claim to "supernatural endowment" has succeeded too well, leading to almost total neglect of the wonderful examples we have of high *human* development. Yet a simple, common-sense application of the idea of evolution should be enough to persuade us that extraordinary individuals may well be examples of the future possibility of human evolution.

"How," asked Ortega, "can we live turning a deaf ear to the last dramatic questions?" It is time, no doubt, for us to recover this point of view. Human aspiration and wonder are a natural part of our lives, and the question of life apart from a physical body should no longer be neglected. A single lifetime is obviously insufficient for realizing our dreams and our hopes. Why should there not be, then, farther reaches of life and consciousness than we have at present realized? The logic of evolution surely points in this direction.

CHILDREN
. . . and Ourselves
MONTESSOR SCHOOLS IN MILWAUKEE

WE have from a reader some pages from the WinterSpring *1987 Journal* of the North American Teachers Association, dealing with the Montessori schools in the city of Milwaukee. The writer is Tim Duax. It is evident that these schools came into being as a result of genuine enthusiasm growing out of positive experience of the Montessori method, yet the account does not provide much to show why people felt that way about it. So we went to a back issue of MANAS for a quotation from Madame Montessori's book, *From Childhood to Adolescence.* She speaks first of the need to *interest* the child:

> To speak to him is not enough for this; it is necessary to interest him. What he learns must be interesting, must be fascinating. We must give him grandeur. To begin with, let us present him with the world. . . .

That, as John Holt has said, is the business of the teacher. We need to bring the world to the child so that he can begin to experience it. Madame Montessori continues:

> When details are presented as being parts of a whole they become interesting. The interest increases in proportion to the gain in knowledge. In addition, the knowledge presented now must not be purely censorial any more. Now the child must have constant recourse to his imagination. . . .
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> The child's imagination is vague, imprecise without limits. But from the moment he finds himself in contact with the external world he *requires precision.* This requirement is such that the adult would be unable to impose it. When a child's interest is aroused on the basis of reality the desire to know more on the subject is born at the same time. At such a moment exact definitions may be presented.
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> The mind bases itself on the imagination, which brings things to a higher level, that of abstraction. But the imagination has need of support. . . . A study outline here presents itself: *to bring the whole by means of the presentation of detail.* . . . And each detail holds the child's interest by reason of its strict relation to others. We may compare it with a tapestry: each detail is a piece of embroidery; the whole constitutes a magnificent cloth.

Moved by Maria Montessori's insight and practice, Hildegard Solzbacher started the first Montessori school in Milwaukee twenty-five years ago. She also began a training institute for Montessori teachers. She was able to generate interest in this work by giving an adult education lecture series at Marquette University, which as many as three hundred people attended. As Tim Duax says in his account of this effort:

> Over time, there developed numerous private schools including several which fostered integrated education by using sliding scale tuition based on socioeconomic factors and in obtaining grants to operate schools for those in need. . . . So the commitment to quality Montessori education and the functional model schools were firmly established when the Milwaukee Public School system began its search for programs upon which to build a quality integrated school system.

Tim Duax is a director in the MacDowell Montessori program. Today, he says, the program is providing "the best that public education can offer to all the children of Milwaukee." It functions as a magnet school, attracting children from various neighborhoods to its program, which is fully integrated. Ironically, the building occupied by the MacDowell School was built twenty years ago to house only black children. The Montessori schools have helped the people of Milwaukee to triumph over segregation and to integrate their schools. Duax says: "MacDowell is today joined by a second public Montessori program—Greenfield Montessori School—and the Milwaukee Public Schools now supports, like other urban education systems, a growing Montessori movement, a movement which is spreading across public schools and supported by conscientious Montessorians in many parts of the USA." He goes on:

> Just as the method of integrating schools used in Milwaukee became known nationwide in educational literature as the "Milwaukee Plan," so did its Montessori program become nationally known. Milwaukee is prominent, along with several other

cities which have fostered the growth of public Montessori schools. It is among those which have had a seminal influence in shaping the direction of Montessori education in the public domain.

Over the last several years, school administrators of other cities came to Milwaukee to see the "Plan" and to see the Montessori schools. Last year, Milwaukee hosted the International Conference of Magnet Schools in recognition of its system of using mag-schools which attract children from all over the city to integrated schools. These administrators were impressed by the obvious quality they saw, and impressed that the Milwaukee Montessori program, with approximately 1,000 children enrolled, has over 600 applicants for the coming fall.

Denver is one such city which came to Milwaukee and is now embarking on the long journey of growing its own Montessori program. Denver has the help of two capable Montessorians, both of whom trace their public Montessori training to productive years in the Milwaukee Public School Montessori Program.

The Twin Cities, Minneapolis-St. Paul, are also pursuing the idea of Montessori magnet-schools. The assistant superintendent who administered the installation of magnet schools here has become the superintendent of the St. Paul school system. He is overseeing the voluntary integration of those schools and the new magnet program he is intent on opening is, of course, Montessori.

Another writer, Phyllis J. Williams, principal of a Cincinnati Montessori School, tells about the spread of the Montessori approach. She says:

Montessori Magnet schools are increasing in significant numbers across the nation. There are at least fifty public school districts sponsoring Montessori Magnet schools. In May 1986, a Magnet School conference was held in Milwaukee, Wisconsin. All school districts represented were meeting to exchange ideas and recommendations for school desegregation through magnet schools. Magnet, or alternative schools, allow parents to enroll their children in educational programs that are consistent with their expectations and the child's learning style. The various programs provided through magnet schools include schools for creative and performing arts, bilingual schools, Paideia, Individually Guided Education (IGE), Academy of Physical Education, programs for the academically talented students, etc. While attending the Magnet School Conference in Milwaukee, Wisconsin, one had the opportunity to tour the various magnet school programs in the Milwaukee Public School District. The demand for expansion exceeds the supply of available personnel. Montessori Magnet Schools were reported as being most popular in most public districts. The Magnet School concept perpetuates the ideal need for decentralizing large urban school districts and for desegregating student population.

Montessori in the public schools again allows more children to experience an "education for life" in a pluralistic setting. Maria Montessori wisely recognized our only solution to peace in the world is through our children. Peace through education in an environment that allows for mixed human experiences, facilitates the process. Magnet Montessori schools may be destined to help direct peace through education. For those parents who fear conflict or confusion that the outside world often thrusts upon their children, Montessori Magnet schools seem to provide a secure entry into a broader and more complex life away from home.

For a conclusion we go to another of Maria Montessori's books, *The Secret of Childhood,* in which she says:

It is the child who builds up the man, the child alone. The adult cannot take his place in this work; the exclusion of the adult from the child's "world" and "work" is still more evident from the work of producing the social order superimposed on nature in which the adult reigns. The child's work belongs to another order and has a wholly different force from the work of the adult. Indeed one might say that the one is opposed to the other. The child's work is done unconsciously, in abandonment to a mysterious spiritual energy, actively engaged in creation.

FRONTIERS

Wisdom about Plants and Soil

THE Spring *Land Stewardship Newsletter* presents an article by Wes Jackson of the Land Institute in Kansas, a portion of a forthcoming book, in which he discusses biotechnology and gives reasons for more caution in embracing these experimental methods. Jackson is a geneticist who relies on the wisdom of nature and has become skeptical of agricultural practices which assume that we know how to improve on nature or replace natural processes. The value of this article lies in an attitude that needs to be more widely adopted in order that a truly sustainable agriculture can come into being.

He begins with an answer to the question: What is biotechnology?

> There are *some* new things in the biotechnology grab bag—our ability to remove genes from one organism to another remotely related creature. . . . Biotechnology involves genetic manipulation. Though it heavily involves the field of biochemistry, it is still genetics, itself a young discipline. Perhaps because the field of genetics is still young—only as old as this century—we have yet to develop a mature perspective and a calmer verbiage about the promises and pitfalls. Let us look at some history. In the 1930s genetic mapping of chromosomes became possible. It became useful, too, for to know what genes were linked together on the same chromosome and how far apart they were had practical applications in the corn plant, for example. Mapping helped breeders calculate such things as how many plants they would have to grow out and the acreage involved in order to recover certain desirable recombinations. After the techniques for genetic mapping were elucidated, there were enthusiastic claims that we would eventually map all genes in humans, corn plants, fruit flies, mice, and the like. What happened, of course, is that we got the easy five or ten per cent mapped and then more or less gave up, deciding it wasn't worth it.

He examines other enthusiasms which came to nothing, such as the hope of developing giant plants and animals by reason of what is called polyploidy, and the discovery that radiation could induce mutation. Here, too, the enthusiasm was premature.

> What do we have today? Very little to show. I can't think of a single radiation-induced mutation in any of our crops though I am sure there are some. The reality is that breeders soon realized they had the same problem with radiation-induced mutants that they had with wide hybrids—how to handle all the genetic variation coming at them. The radiation-induced variety as a goal for agronomists has been essentially sidelined.

In view of this undramatic record, why is industry interested in biotechnology? Jackson says:

> We all know the answer. Because they will make money and will create an even greater dependency on them. The problem is, corporate America, in general, is interested in the simple but large effect. This motivation is endorsed, I suspect, because we are a silver or a magic bullet nation. We want that magic bullet to solve complex problems in one shot. . . . Now we are faced with the new field of biotechnology where heroic notions of the industrial age are fueled with the desire to make money regardless of what farmers on the landscape need. How do we combat it? I suppose in much the same way that we organized for civil rights or against the Viet Nam war or nuclear power.

Jackson makes a comment that calls for more than ordinary reflection:

> There are lots of cutting edges in science with the possibility for people to make contributions every bit as profound as the cutting edges in biotechnology. The fundamental question is not, "What can we do?" but rather, "What kind of a world do we want and what will nature require of us?" I expect that biotechnology will have a role, but it should follow and not lead.

Jackson's point about gene splicing is that it may have unpredictable results that might not appear until a heavy investment has been made in its promise. Of the splicers he says:

> They may be successful with the easy ones first—remember the five per cent success story for chromosome mapping. But more importantly, there is the problem of optimizing a gene against a genetic background that is alien. Even if that were simple,

there is the problem of reoptimizing that gene at the population level.

All genes interact and one doesn't just throw them into a recipient plant container to swish around at will. There are episodal genes to be reckoned with—genes that are turned on that may cause a hormone to be released at a specific time generating major effects on development. . . .

The green revolution in wheat and rice should have taught us the seriousness of breeding high-yield varieties often thousands of miles from where they eventually displaced the heterogeneous local varieties and mixture. They were well adapted to high input agriculture, but genetic variability in those landscapes went into steep decline. Some of the capital going into biotechnology would be better spent on genetic conservation in order to compensate for the decline in native variability, but it won't make a biotechnology firm rich.

Jackson stresses a fundamental consideration:

It is still important to ask how organisms carrying new or altered genes will relate to the ecological interrelationships of organisms when introduced into the environment. Based on what we know about large mutations, I suspect that it won't be the big change that will come to haunt us so much as the small cumulative changes after we are deep into the new era.

The early agricultural revolutionists surely did not *intend* to give us the problem of soil loss, yet more carbon is in the atmosphere due to agriculture than from the industrial revolution. No one intended this. Those who gave us electricity from coal-fired plants did not intend to give us acid rain either. *Hubris* is a human condition that is not so much the consequence of a strutting sort of pride, as the pride that causes us to introduce into the world human designs that threaten to disrupt patterns we did not make but are nevertheless dependent upon.

For observant agriculturalists, soil is already as much a non-renewable resource as fossil fuels. How, Jackson asks, "can we use our soils in such a manner that we can stretch them out until sensible agricultural ecosystems are moved into the landscape?"