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DESIGNING A SYNTHETIC PLANET

I

THE problem of designing a synthetic planet is not one we run into every day, and it immediately brings up the question of a suitable designer. There is one in the Old Testament, but the address is lacking.

The only planet we have had any experience with is Earth, and we are not likely to get another in the near future.

Earth, of course, is a natural planet, but for the past 7,000 years or so, various branches of our species have been busy modifying it. Not so much the early hunters and gatherers, for they left natural environments pretty much as they found them. But when they settled down and became farmers, they cleared fields, dug irrigation systems, built villages and then cities. Finally, when the machines came, the modifications became transformations.

For the layman, even the educated layman, it may seem presumptuous to apply the term "design" to so mind-boggling a project as a planet. Design tends to be viewed as a minor process of embellishment which, in a mass consumer society, has uses in relation to products and packaging which may enhance their sales appeal, and thus lubricate marketing programs. However, this is only the way it appears to our oddly distorted vision. Design is one of the most pervasive activities of the human race. It is no exaggeration to say that everything that cannot be *found* has to be *made*, and nothing can be made until there is a *design* for it. The use of "design" to mean surface decoration is only one facet of a universal process.

I think that we may fairly say that our synthetic planet is one largely created in the past century by a mass technological society, and that the only one we know anything about is Earth. Extending the description to the limit gets us to the image of a planet entirely designed and built and put into orbit by human beings or some other form of intelligent life, in the event that such intelligent life exists. Such a prospect is at present so far beyond our capabilities and knowledge that all we can do with such an image is file it as a current fantasy which might turn out sometime, somewhere, to be feasible. And wonder why anyone would bother.

I do not know when the idea of Earth as an increasingly synthetic environment suggested itself. My own recollections take me back to small, and comparatively recent events. During the last half of the 19th century there was a sudden explosion of building technology which greatly excited the Victorians. There was the Crystal Palace in London, conceived and executed by a landscape gardener, Joseph Paxton, using glass and prefabricated iron elements in a vast enclosure more like an immense greenhouse than any kind of traditional building. Today the synthetic environments are encroaching everywhere in the form of suburbs, highway networks, and vast industrial complexes. Sometimes a place name like Pittsburg, Gary or Ruhr Valley is enough to conjure up images of landscapes from which Nature has been almost totally expelled.

The giant world cities all fall into the "synthetic" category, and although, being old cities, they are greatly softened by the presence of old buildings, it must not be forgotten that even a charming old house of the 14th century is synthetic by our definition. But to get the full blast of transformed urban environment one has to look at other places, cities like Houston, Texas.

Houston was given its impetus by the oil industry and is already an urban wasteland of some 500 square miles. practically none of which

could be attributed to any God in full possession of His senses. a chain of asphalt gardens littered with parked cars like lizards sleeping in the humid heat, punctuated by clusters of 50-70-story "weeds" every five or ten miles. These fetid growths are strung out along cluttered highways already jammed with the rusty heaps of job-hungry refugees from the North, occasionally embellished by the stretch limousines of the new billionaires.

Still, we must not be too hard on ourselves. To create a synthetic planet with real amenities is way beyond our capabilities. Man is still a child of Nature, still dependent on it for his very survival, but these days it feels uncomfortably like life on a trapeze or a tightrope. Lean too far one way, and the waiting nukes swoosh out of their hardened nests, and, within a few hours or days, there goes the whole shooting match. Lean the other way, and there is the spectacle of our super technology, ready to do us in somewhat more slowly through pollution, deforestation, overpopulation, depletion of resources, melting of the polar ice cap, raising oceans perhaps 100 feet, and Heaven only knows what else. There are no safety nets under those daring young men on the flying trapeze.

The Universe is a game played with numbers so large that there is no possibility of comprehension, but becoming aware of this is creating pressures which force an accelerated learning process. Back in the mid-1500s, a roughly similar learning process was started quite innocently by Nicholas Copernicus when his theory of planetary motion was published, putting the Sun at the center rather than Earth. On the face of it, seen from a modern perspective, this shift in theory from the older one of Ptolemy was a sensible improvement, for among other things it made the constitution of a more accurate calendar possible. The consequences, over the next century, were staggering. With Earth demoted to the status of an orbiting little sphere among others, Heaven no longer had a permanent mailing address. The idea of the pearly gates whirling endlessly through space at a speed of many kilometers per second was unthinkable. When Galileo built his copy of a Dutch telescope, observed the moons of Jupiter, and announced loudly that Copernicus was right, the Church of Rome put him under house arrest. Earlier it had burned Giordano Bruno at the stake for the same reason.

What Copernicus and his followers really accomplished was an irreversible change of human consciousness and an end of the absolute power of the Church.

By the late 1600s, Isaac Newton had constructed a brilliant new clockwork universe, wound at suitable intervals by none other than the Almighty Himself, and the Western world, thanks to this accumulation of new insights into reality, was ready for the explosion in techniques we call the Industrial Revolution, and this marked the highspeed transformation of Earth into a synthetic planet, and the accumulation of wealth on a scale never dreamed of before.

All went well (if one happened to be on the receiving side of the transaction) for almost two centuries, when two unexpected events occurred in close proximity: one was the publication in 1905 of Einstein's first paper on relativity; the other was the appearance of the Cubist painters around 1907. The two events appeared to be entirely unrelated, except that they weren't.

Einstein's work was the beginning of another revolution in consciousness, for it changed—again irreversibly—mankind's now-established notions of the nature of space and time. Which is another way of saying, our perceptions of reality.

The work of the Cubists was a *pictoral* representation of reality as no one had ever seen it before: common objects like bottles, newspapers and furniture, now fragmented and reassembled in barely recognizable ways, with simultaneous view from different positions superimposed in the painting to further confuse the viewer.

I do not know if the Cubists had ever heard of Einstein's Theory, and it is irrelevant anyway, for the paintings are not illustrations of Relativity, but indications of a different way of perceiving reality by artists rather than scientists.

Since then the entire world has been gripped in a violent crisis of change of the most radical kind in which Relativity, Cubism and Quantum Theory are three conspicuous markers.

Other things were going on too. In 1962 Rachel Carson brought out her *Silent Spring*, a startling revelation of accelerating environmental damage, thoroughly documented and so well presented that it became an international bestseller. It was not by any means the first of such warnings, but it must certainly have been the most widely heard. Here again our forced learning program was accelerated by a growing awareness that nature and the ecological processes cannot be violated indefinitely without catastrophe.

With this awareness has come a new curiosity about who we are, where we are, and who else there might be to share it with. We inhabit a miniscule planetary system on a sparsely populated arm of the Milky Way, a spiral galaxy with 100 billion suns. Ours is a run-of-the-mill Type G sun with an age of 4-5 billion years. Our Sun is about 30,000 light years from the center of the galaxy, which has a diameter of 100,000 light years. There are thousands or millions of other galaxies. Earth's orbit around the Sun is very delicately balanced: let it shift by only a few degrees and we promptly fry or freeze.

Despite the publication of thousands of photographs of the varied beauties of our home planet, there are more and more citizens who would like to get off. Things are getting too hot for comfort, and there is no relief in sight. But, even with all our self-advertised technological miracles, there is no way of getting off. We cannot even find a nearby planet suitable for oxygen breathers who like a body temperature of 98.6°. Venus has a carbon dioxide atmosphere and a temperature of 800° F. On Mars we would have to import our oxygen in bottles and not even thermal underwear would keep us warm. There is no way to call up anyone who might want to talk to us.

To look for anyone else outside our system would take us closer to the center of the Galaxy, a one-way trip of perhaps 4-5,000 light years if we had a speed-of-light ship, which we do not, and some idea of where to go, which we do not, for planets do not show up at vast distances in telescopes: the stars are too bright.

If we were here in school, rather than a temporary assembly of strangers, the class assignment for today would not be what the students might think: not instructions to find something to do while waiting for Godot, but *to stop waiting*. The lesson is that it is time to install a phone system in all the lighthouses—for that is what we are, lighthouse keepers, four billion of us on earth, perched in self-imposed isolation on rocky tips of submerged mountains.

It looks very much as if we are stuck here for the duration, whatever that is, and if there is a better reason for designing a synthetic planet in the interval, I cannot imagine what it might be.

Since design still seems to be something of a mystery to the intelligent, educated adult, this may be worth a brief explanation

Design appears to progress as one moves from an early period to a later one, but what really goes on is the same process being adapted to more and more complex environments and tasks.

Evolution, in the case of the Universe, shows a change from an initial scattering of hydrogen atoms in space to an increase in the number of elements, to the formation of stars, planets, galaxies, comets, black holes and organic life, including people. The designer, whatever his professional specialty, will deal with a selection of such disparate elements, and to give some order to his thinking, he will always try to start with a

program, which is a list of freedoms and limitations.

In truth, the coexistence of freedom *and limitations* is at the core of all successful design activities, and this is not so easy, which is one of the reasons great designers are rare. Suppose we were already into our project of designing in order to assure an adequate amount of oxygen for the atmosphere. Which trees go where? How do we protect the young saplings from goats and people in need of firewood? How would one re-forest a desert, and what would it cost? Should we mechanize agriculture, and at what rate? The technological mind would answer without hesitation: "Mechanize by all means, and as rapidly as you can afford." The Chinese answer was "Absolutely not! It would displace hundreds of millions of peasants and dump them on the overcrowded cities."

We must somehow get on speaking terms with design and the design process. It isn't really that complicated. Design is a process that tries *to create things which work.* This distinguishes it from art, which has a different function. If you try to design a synthetic planet, of course you hope that the design will work. Otherwise, what is the point? Things have to work, because they are designed for people. They are designed for people because there is no one else.

There is no progress in design if we think of it as a basic process distinct from technology. A Volkswagen *Rabbit* is far more advanced in a technical sense than a suit of medieval armor, but it is not necessarily a better design. It would be normal for a designer with humane inclinations to look for a design program "for the people." It sounds great: who could object? But such a stipulation is doomed in advance. When one gets down to specifics, all hell would break loose. China clamps down on population growth, limiting each couple to one child. Argentina, looking at all those empty pampas, says "no!!" They are both right, no doubt, as long as one thinks locally. A synthetic planet has to hold together, to act as a consistent unity. How does a global population learn to think globally? For that matter, how does the European Economic Community learn to think like a community? It is having its problems even at this scale.

The only reason for even thinking about designing a synthetic planet is the hope of improving the human condition, which means *fostering* life as well as prohibiting killing. Here again, we can anticipate universal agreement until we come to the specifics. Fostering whose life? Whales? Coral snakes? Giant pandas? In some cases the poachers are enough to defeat good intentions, but most species are endangered because their habitats are being destroyed, notably the great forests of the Amazon and Southeast Asia. One would think that everyone would favor saving forests, since the oxygen they produce is intimately associated with the right to life, but localized interests find cutting them down very profitable.

It is probably safe to say that we really do not know which forms of life are expendable and which are not. For those with access to the comforts of religion, *there are no expendable life forms.* Noah's Ark, you will recall, was planned to hold two of *everything.* For primitive societies, all life was sacred, even the creatures they killed for food, but "sacred" is not a word used in polite society, now that we are "civilized." "Sacred," stripped of its ancient associations, covers anything which, if killed, cannot be brought back to life by human intervention. This is the fundamental difference between the farmer's old gray mare and his shiny new Toyota pickup.

The "right to life" movement, which gets a lot of press occasionally, also seems to assert the sacred nature of life, but in a peculiarly specialized way. It does not concern itself with children already born being seriously damaged by parents or others, nor with whales, pandas or American eagles, not even with adults whose lives are being eroded or even destroyed.

A useful metaphor for the designers might be the wise and experienced gardener, who in his or her way does some pretty impressive fostering of life in frequently restricted spaces. This gardener does all the right things in the right sequence, puts a lot of love into the goings-on and, in the fullness of time, may even come up with some prizewinning radishes or dahlias.

The problem of growing people, as both children and parents know, is infinitely more complicated and time-consuming, and human societies have developed a rich assortment of methods for helping their young grow to their full potential—or rather, to be more careful of what I am saying—to grow into what *that particular society considers their full potential*—which is not necessarily the same thing.

I am sure that all you will have noticed before this that the subject of designing a synthetic planet does not lend itself to linear, logical discussion, but keeps wandering in a maze, or perhaps a little world of boxes-within-boxes, or perhaps even the famous psychoanalytic onion which, no matter how many layers are peeled, still remains an onion.

There is a good reason for this, entirely apart from the deficiencies of the writer, which is that complex systems cannot be described as point-to-point affairs, but only as tangled networks in which everything is bound up with everything else. There are not, as a rule, clean beginnings and endings, but repeated forays out into the maze, full of false starts and much backing up. Or perhaps a better image is the trampoline, where each touch vibrates sympathetically throughout the entire surface.

The crucial problem for the designers of the synthetic planet will keep coming back to the question of how one goes about growing people, of expanding the already-existing human potential in those directions where it is meant to go. A related question, of course, is "meant to go where?"

In one sense, all these questions are unanswerable, and yet, how can one be sure?

For clues, I have come to believe, we will do better by far to go back rather than forward. To go forward will simply get us mired more deeply than we are already, and in a crisis of the present magnitude, which is absolutely unprecedented in its dimensions, there seems to be no place to go but back to the beginning

New York, N.Y. GEORGE NELSON

(*To be concluded*)

REVIEW
WATER IS LIFE

A RIVER NO MORE, the story of the fortunes and vicissitudes of the Colorado River and the seven states it waters, by Philip L. Fradkin, a reporter and editor, was first published by Knopf in 1981 and is now available in a new paperback edition from the University of Arizona Press at $10.95. Whatever the reader's initial interest in the subject of this great river—unique in some respects among the world's water courses—geologically and scenically spectacular, furious, stubborn, unpredictable, fascinating to nature lovers, awesome to all, and a life-line to desert dwellers of the Southwest, the history of its use and misuse, of which Mr. Fradkin writes, is immensely complicated. How, one asks oneself, can any reader except a well-instructed expert or two, form a clear idea of the appropriate conclusion to be drawn from this story? What, in other words, might be the *natural* relationship humans should seek to establish with such a river—humans, that is, in the numbers which now populate the vast western expanse of the United States?

Fradkin's preface tells what the reader may expect:

> It was my aim to sketch the background, give a sense of place and people, define the issues, set forth the problems and offer a few thoughts about the continued availability of Colorado River water and the viability of the West—all the time emphasizing the politics of natural resources. To me the river, in its present state, is primarily a product of the political process, whether conducted in Salt Lake City or Washington, D.C., rather than a natural phenomenon. The policies and laws that determine where water goes means life itself in this dry region—not only life but death, as the river has been depleted to serve the lands and people surrounding it. This oasis civilization will ultimately face that same process of withering when shortages occur in western water supplies in coming years.

So large questions arise right at the beginning—before the beginning. "Oasis civilization" seems like a useful expression. Is it wise, is it sensible, to try to turn an arid land into a teeming, lush, thickly populated area like the eastern coastal states? We certainly believed we could do this. Isn't our technological genius meant to serve such nearly miraculous accomplishments? For close to a century, making the desert "bloom like a rose" seemed to almost everyone a feat that would simply verify the Manifest Destiny of the American people. Bending nature to our purposes is natural fulfillment of our destiny. Or so we thought.

But today two questions have been raised—questions so far without answers. The first question is: How shall we reconcile our unlimited material goals with the fact that, as we are now beginning to realize, the planet and its resources are *finite*—that there is really a *limit* to growth? The other question is vaguer but equally important: What is the appropriate response to our discovery that technical know-how seems to have little or no bearing on the issue of what is right and good? It is becoming evident that we have almost no idea how to define the good.

A River No More will not supply answers to these questions. The author is far too modest for that. But he does provide us with an account of a lived-through drama which makes the questions unavoidable. Obviously, our engineering skills have given us delusions of grandeur. We have applied them so earnestly, so enthusiastically, so confidently that they have created a situation so fixed and committed in direction that we dare not stop doing what we are doing, yet more and more recognize that what we are doing will no longer work. The law of diminishing returns is applying to technology and the manipulation of nature in ways no one could have imagined—almost no one, that is. An Emerson might say—solving the problem for himself—"Ruthless self-interest does not work, cannot be made to work." But that is a comment not understood by the engineering mentality—or not understood until self-interest becomes so blinding that it turns technical know-

how into stupidity. This is the hard school of experience, and we seem willing to attend no other.

Preparatory to understanding this book would be two magazine articles. One is George Sibley's "The Desert Empire," which appeared in *Harper's* for October, 1977. Sibley is a writer who lives in Colorado, giving him intimacy with the problems of the river. His article was timely, being published toward the end of the second year of drought in the West, when the limit of the water available from the Colorado had become apparent. He covers briefly the material in Fradkin's book, which is a help in reading it. He also has provocative comment along the way. For example, after noting that when in 1921 the seven states claiming the river's water sat down together to divide it among them, they assumed the flow would be fifteen million acre-feet each year. But this figure proved too optimistic (based upon a wet cycle), and the actual flow had become thirteen million feet. (There are dry cycles, too.) Sibley remarked:

> But the truth is, we would eventually have come up against this problem, even if the river ran an average of 20 million acre-feet, due to the nature of our religion—which we of course denied as being a "religion" at all, and thereby never examined for flaws of faith. But our faith in technology, science, and rationalized economy has a profane and tragic flaw: we have assumed an infinity of supply, capable of. fulfilling an infinity of demand, if we can come up with the technology of production.

Sibley is a realist. He looks at the way people behave in order to determine their religion. Page Stegner, another sort of realist, in *Harper's* for March, 1981, after describing how the city of Los Angeles schemed to get the water of the Owens Valley, 200 miles to the north, said:

> To promote the growth of any community beyond its legitimate and predictable water resources is to risk one of two things: eventual slowdown or collapse and retrenchment to more realistic levels, or a continuing and often piratical encroachment on the water of other communities, at the expense of their prosperity and perhaps their life. . . . In the West, water is life.

But the other article that is really preparatory for reading Mr. Fradkin is Franz Schurmann's brief review and development of Karl Wittfogel's study of the "hydraulic society," the society in which water is life. (Summer 1981 *Cry California.*) Schurmann takes two examples from Wittfogel, China and Khwarazm. Of the latter, he says:

> Anyone who has lived in one of the great arid regions of the world, such as the Middle East, knows that its oases are really states of mind. They come and go. If a river changes its course, if an underground aquifer is depleted, the oasis vanishes One civilization that took steps to protect itself from the uncertainties of nature was Khwarazm in Central Asia some 1,000 years ago. It became a "hydraulic society" with a system of waterworks that was the marvel of the Islamic world, with a sophisticated bureaucracy to manage the system and with a brilliant civilization built upon it—brilliant until the Mongols [led by Jenghiz Khan] invaded in the 13th century and totally destroyed it.

The dikes and canals were not beyond repair but the managerial class was gone and the entire social system collapsed. Central management, Schurmann says, built the civilization but became its greatest weakness; without the managerial elite, killed by the Mongols, Khwarazm, which embraced Turkestan, Persia, and northern India vanished as a society. In contrast, China, also a hydraulic society dependent upon controlled irrigation with the waters of the Yellow River, survived through many disasters. The reason:

> During a good part of its 2,000 years of history, China's central government was weak, incompetent, beset with internal quarrels and interested in very little of local affairs beyond tax collection. It was not the watchful central government that kept the dikes intact but the watchful commitment of local communities. These stable and self-sufficient village and farm societies had everything to lose if dikes were not kept in repair, and they took the initiative that maintained the water-delivery system through many wars and natural disasters. The contrast between China and Khwarazm is clear: China had a great central government, but it also had a myriad of strong

> local communities. Khwarazm, in typical Central Asian or Mesopotamian fashion, did not.

"Which civilization," Schurmann asks, "does California most nearly resemble?" This is a good question to have in mind when reading Mr. Fradkin's history of our own hydraulic civilization in the interior and far West.

Fradkin, too, begins with history, recalling that another hydraulic empire, ancient Sumeria, flowered as a result of water control, and died after a thousand to fifteen hundred years when repeated use of too much water led to a salinity that stifled plant growth. With our heavy-handed methods and violent technology, we produced the same result in hardly half a century in the American West. The author shows that the Anasazi Indians of Chaco Canyon (northwestern New Mexico) and the Hohokam Indians who lived near what is now Phoenix understood the arts of irrigation, the latter constructing from 200 to 250 miles of canals along lines now followed by present-day ditches in the Phoenix area.

The first real study of the Colorado River and the lands which it waters was made by John Wesley Powell, "the one-armed Civil War major who is generally credited with being the first to float all the way through the turbulent waters of the Grand Canyon in 1869." Nine years later Powell made his *Report on the Lands of the Arid Region of the United States.* Summarizing his contentions, Fradkin says:

> Above all else, Powell preached the uniqueness of arid lands and their need for special institutions. He used common sense and proposed that instead of the rectangular grid survey useful to the east on flat, equally watered lands, the arid West should be divided into watersheds, such as the Colorado River basin. The West has paid dearly for not following that suggestion; witness the bitter intrastate water feuds. Powell knew that the West did not have an unlimited amount of land that could be irrigated or an inexhaustible supply of water, two false impressions spread widely by various boosters. He was read out of the Reclamation movement for declaring at the National Irrigation Congress in Los Angeles in 1893, "Gentlemen, it may be unpleasant for me to give you these facts. I hesitated a good deal but finally concluded to do so. I tell you, gentlemen, you are piling up a heritage of conflict and litigation of water rights, for there is not sufficient water to supply the land.

Mr. Fradkin's book, *A River No More*, provides 350 pages of confirmation of Powell's prediction, with equal attention to what was done to the River in the process, and to what end.

COMMENTARY
TODAY'S "MELTING POT"

IT should be said of this week's Review that the reason why not more is said of the content of Philip Fradkin's book on the Colorado is that the detail in this volume is overwhelming. So, our reviewer, not being a "specialist" in the subject, after reading it, made some suggestions for preparatory reading by those to whom the subject is unfamiliar. The book itself drives home the need for a fundamental change in attitude toward the land and the water that gives it life.

As a news items of more than passing interest, *Los Angeles* Magazine for last April reports in a lengthy article (by Laura Meyers) that the Los Angeles area is rapidly replacing New York as the primary "melting pot" of the Western world. Affected are the eleven cities of Los Angeles County, with a population approaching 7.9 million people. The writer says:

> The Latinization of Los Angeles County—expected to reach the 40 per cent level by the year 2000—isn't the entire story. L.A. has become a magnet for the rest of the world as well. It's estimated that some 130,000 Arab-Americans, 200,000 Iranians, 150,000 Armenians (including recent refugees from Soviet Armenia who have settled as a clan in the Hollywood area) and 90,000 Israelis now call Southern California, from Los Angeles to La Jolla, not just "home" but an economic and religious refuge. . . . the fastest growing groups in Los Angeles County are Asians, who hail from nearly 20 Pacific Rim countries. . . .

A matter of particular relevance to those who try to keep track of educational problems is reviewed

> In areas where it counts—schooling, crime, religion—Los Angeles is undergoing huge changes, influenced to a great degree by the county's growing non-Anglo population. . . . All the religious sects and denominations add up to 70 columns in the Yellow Pages. Schools, too, reflect ethnic changes. Especially, 67 languages are spoken in the Los Angeles city schools, though some experts place that number at over 100. For instance, nearly 40 per cent of Beverly Hills' kindergarten children are now entered in English-as-a-second-language classes, with the majority speaking Farsi, an Iranian tongue, as their primary language.

One naturally feels sympathy for teachers and school administrators confronted by such rapid changes in the school population. An investigative but sympathetic account of their problems would make an interesting story.

CHILDREN
. . . and Ourselves

THINGS TEACHERS CAN'T ARRANGE

FROM time to time we come across passages which seem valuable on education in books that are being considered for Review. They suggest things one is not likely to find in any of the current writing on education. For example, there is this in Erwin Chargaff's account of his youth in Vienna (he was born in 1905):

> While rummaging through my uncle's books one day in 1915 or 1916, I came across a recent issue of *Die Fackel* (The Torch), a periodical edited and at that time written entirely by Karl Kraus. An avid extracurricular reader even then (not yet 12 years old!), I tried to understand, though it was not easy. Besides, the text was full of white patches: the censor had done his work. For Karl Kraus, the greatest satirical and polemical writer of our times, was a fearless critic of the war and of the society that had given rise to it. He was the deepest influence on my formative years: his ethical teachings and his view of mankind, of language, of poetry, have never left my heart. He made me resentful of platitudes, he taught me to take care of words as if they were little children, to weigh the consequences of what I said as if I were testifying under oath. For my growing years he became a sort of portable Last Judgment. This apocalyptic writer—the title of this chapter ["A Fever of Reason"] comes from one of his descriptions of Austria—was truly my only teacher; and when, many years later, I dedicated a collection of essays to his memory, I acquitted myself of a small share of a grateful debt. Several people who noticed the dedication asked me whether it was to a former high-school teacher of mine. I said yes.
>
> The teachings of Karl Kraus derived mainly from his relation to the spoken and written word. This was, at any rate what influenced me most in my youth, for we take from others what is in us.

Is there anyone writing today whose books ought to be left lying around the house for a twelve- or fourteen-year-old to pick up out of curiosity? Yes, there is. What Chargaff says about Kraus might apply equally to Wendell Berry's most recent book, *Standing by Words* (North Point Press), a book no one would ever regret acquiring for the same purpose, or any other. But the best reason for having the book is its essential qualities and quiet philosophy. If parents like it, the young will be more likely to appreciate and learn from what it says.

The point, here, is the casual and unpredictable character of experiences which actually affect the formative years of youth. Such experiences cannot be planned, even with the best intentions. The planning itself, if noticed by the young person, is likely to spoil the experience. Such devices are sneaky, from a young person's point of view. As John Holt suggested recently, the best teaching comes from those who do as little "teaching" as possible. Trust in the spontaneous is the law of good educational life. There may be other laws for other departments of our being, but this one should never be violated—not if we care anything about the development of independent minds.

Yet having Chargaff's book around, too, would be a good idea. He is a writer who, we think, is able to pass along the spark that fired his own mind as a teen-ager. (On Kraus see the chapter about him by Janik and Toulmin in *Wittgenstein's Vienna*). His life story is by no means too difficult for an intelligent adolescent, and it had for us the qualities the writer attributes to Kraus. As for how Chargaff regarded his "real" education by writers like Kraus, Paul Goodman years ago wrote extensively on this sort of education, calling it "incidental" or "accidental." Without such influences, formal educational processes usually remain a matter of uninspired routine. (Chargaff's book is *Heraclitean Fire*, Rockefeller University Press, 1978.)

We turn now to a passage in another book—*Bioshelters, Ocean Arks, City Farming* (Sierra Club, 1984)—by Nancy and John Todd, who touch upon education, not for teachers but for parents, who are the only ones who might be able to offer at least some remedy for the situation they describe. They write:

> Children are usually educated at some distance from home. Some of the saddest designs in architecture are those of schools—impersonal, often windowless, sometimes almost prison-like buildings. The world of parents is separated from this daily fortress of the child, and the business person is separated from workers on the shop or factory floor. Few people ever come into contact with the people who grow or process their food. In a fragmented society we are all victims, intellectually and emotionally. Children do not learn to connect or to see patterns with meaning deeper than truncated parts of larger wholes. No amount of electronic information or television can alter this. In our work, we have distressingly frequently had the experience of asking children where their food comes from. After initially responding "the store!" they draw a complete blank . . . they cannot picture the fields, the acres, the farmers, the middlemen of agri-business. The statement that the soil is alive—made up of living matter—usually draws utter disbelief—to some people it seems like a product which can only be made rich by the addition of chemicals. For the disparate parts of society to become more reconnected, the model of nature needs to be studied. Buildings and architectural forms can be created in which living, manufacturing, food growing and processing, selling, banking, schooling, waste purification, energy production, religious activity, art guilds, governance and recreation are woven together on a neighborhood scale.

What can parents do, themselves, while waiting for such plans as the Todds offer to catch on? They can probably do more than they suppose. Simply as a means of making a more natural environment for the young, a man could work out a small leisure-time business he operates from his home, where its progress and problems would doubtless be of interest to young people growing up. Mothers who design and sew can be a practical inspiration to the young. And so forth. Individual ingenuity is called for, not a long list of suggestions, although even these may not be without value to get our imaginations going. And, incidentally, some of the most impressively useful businesses there are were begun on a small scale as moonlighting activities. Arthur Morgan, probably the world's leading flood control engineer of his time, developed his engineering practice as a sideline to his regular employment by municipalities and states.

One more paragraph from the book by the Todds:

> As a neighborhood becomes a center of integrated activity, there will be virtually unprecedented opportunities for young people. Adults as well will have an increasingly balanced talk-do ratio while learning new jobs, skills, and sensibilities. Educators might have to rethink what is meant by learning. In a community functioning in ecological balance and with its parts exposed to full view, the patterns and cycles, natural and human, are balanced and interconnected. The community itself is the school; because it is designed after the larger workings of nature using biological precepts of design, it is like a world in miniature. Living in such a place young people may take an integral part in all that is going on and want to participate in the peaceful transition of the planet from one based on the production of goods, to one dedicated to a fulfilling life-base for all its living creatures.

Is this a utopian view? Of course it is utopian, yet working utopian ideas are all we have for the redesign of our future, which, as we look about now, certainly needs it.

FRONTIERS

Our Civilization Kills

FOR the past year or two, the threat of acid rain has often been in the news, sometimes with hair-raising accounts of the imminent death of forests, degradation of soil, air and water pollution, the latter leading to the dying out of food fish. What then *is* acid rain, and how is its presence determined? How much is known about its various causes and multiple effects? Earlier this year the Worldwatch Institute (1776 Massachusetts Ave., N.W., Washington, D.C. 20036) issued an informative 54-page booklet ($2.00), *Air Pollution, Acid Rain, and the Future of Forests*, to provide what is known to answer these questions. The writer, Sandra Postel, says at the beginning:

> Over the past decade, scientists have amassed considerable evidence that air pollutants from the combustion of fossil fuels, both oil and coal, and the smelting of metallic ores are undermining sensitive forests and soils. Damage to trees from gaseous sulfur dioxide and ozone is well documented. Recently, acid deposition, more commonly called acid rain, has emerged as a growing threat to forests in sensitive regions. Acid deposition refers to sulfur and nitrogen oxides that are chemically transformed in the atmosphere and fall to earth as acids in rain, snow, or fog, or as dry acid-forming particles. Although acid deposition is now known to have killed fish and plants in hundreds of lakes in Scandinavia and eastern North America, its links to forest damage remain circumstantial. Yet studies of sick and dying trees in Europe and North America make the connection impossible to ignore.

There is a natural acidification which takes place in the soil at a result of decomposition of plant remains and organisms, but "Centuries of human use and abuse of forest ecosystems have added to this natural acidification."

> Air pollutants and acids generated by industrial activities are now entering forests at an unprecedented scale and rate, greatly adding to these stresses carried over from the past. Many forests in Europe and North America now receive as much as 30 times more acidity than they would if rain and snow were falling through a pristine atmosphere. Ozone levels in many rural areas of Europe and North America are now regularly in the range known to damage trees. Despite air quality improvements made during the seventies, the average concentration of sulfur dioxide in many areas is high enough to diminish tree growth.

In West Germany, where precise forestry records are kept, the damage done by acid rain has been worst, while throughout central Europe trees in an area equivalent to half the size of Austria show signs of injury. Forest covers about a third of the area of West Germany and a 1982 survey "estimated forest damage at 562,000 hectares (1 hectare=2.47 acres)—8 per cent of West Germany's forests." Another study a year later found damage on over 2.5 million hectares, "34 per cent of the nation's forests." Damage is also reported in France, Italy, East Germany, Netherlands, Romania, and Switzerland. Lakes are dying in Sweden, and *Pravda* has reported that "vast areas of forests are dying from air pollution near the automobile-manufacturing city of Togliatti," east of Moscow.

What about America?

> Although forest destruction of the magnitude occurring in central Europe is not visible in North America, trees are suffering from air pollutants there as well. In the United States, forest damage is most evident in the Appalachian mountain ranges of the east and in the Sierra Nevada of California. Field and laboratory studies have documented not only tree disease and death, but sustained declines in growth as well. From the Appalachians of Virginia and West Virginia, northward into the Green Mountains and White Mountains of New England, red spruce is undergoing a serious dieback, a progressive thinning from the outer crown inward. Damage is most severe in the high elevation forests of New York, Vermont, and New Hampshire, on peaks forested mainly with red spruce, balsam fir and white birch. Because of the high precipitation rates and the ability of conifers to intercept cloud moisture, these mountain forests generally receive 3-4 times more acid deposition than those at lower elevations. In addition, the soils of these forests have shown a marked increase in lead concentration over the past two decades, believed to come almost entirely from the atmosphere. .

Canada, where every tenth job is connected with forestry, is also a serious sufferer, with more than half of Canadian productive forests in the east, where acid rains have their worst effect. Only a one per cent reduction in Canadian tree productivity would result in "a significant reduction in total wood production." A Yale University authority has said that for Canada, "The danger is that by the time a 15 to 20 per cent loss in productivity has been documented degradation will be irreversible."

While the United States, West Germany, and the Netherlands have taken steps requiring the installation of "scrubbers" in the chimneys of polluting industries, only Japan has enforced measures that substantially reduce pollution and have noticeably helped the country's smog problem. The controls are costly but the expense is absorbed by former polluters.

An aggravating part of air pollution is that, in Europe, lack of controls in one country may lead to major pollution for a neighboring country, so that any long term solution will have to involve international agreement on controls, which is difficult to obtain. Meetings to agree on such measures have broken down because several nations were unwilling to cooperate, while the United States alone refused to sign a mild document in which the signatories agreed to "reduce emissions where feasible." The report says: "Although pressured at home and from neighboring Canada to take steps to combat acid rain damage, the Reagan administration maintains that action is unwarranted until the problem is better understood." Commenting, the writer says:

> The lure of short-term economic benefits too often precludes measures geared toward sustaining natural systems over the long term. Moreover, some nations are unwilling to act without irrefutable scientific "proof" of acid rain and air pollution's damaging effects—proof that requires decades of additional research. Only as pollution of the common air space claims more victims will more nations recognize the severity of the threat that lies before them and take action. Yet at some point, when the consequences become irreversible, this late-course correction strategy will fail.

The manifest lesson of all this is that the time has come to regard fulfillment of our responsibilities to the health of the earth with the same urgency that we apply to issues of free speech and political liberty.