

ON WAYS OF THINKING

THE time we live in is bad and likely to get worse, for a number of practical reasons that are elaborately catalogued from week to week in magazine articles and books. Will just "thinking" about this do any good? Has poor thinking played a part in producing the mess we are in?

There is a lot of careful, critical thinking about current problems in the good magazines, these days. Take for example the long article by James Fallow on the military defense of America in the October *Atlantic*. Whether or not you believe armament has any importance, a great many people are convinced that the welfare of the nation depends on it, but after you read this article it seems plain that only technical experts are qualified to make judgments about the various missiles that we have so many of, and that even the experts by no means agree. Also clear is the large amount of guesswork in all such calculations. So many intangibles are involved that a very good thinker about these matters would probably know too much to be able to convert very many people to his views. Unilateral disarmament, hardly a popular way to cut the Gordian knot, may be the only sane course, but the kind of thinking that really supports disarmament gets published only in a few pacifist journals.

Mr. Fallow attacks the question of military preparedness at another level. The Army, he points out, is in trouble—"drugs, desertion, poor discipline, bad morale." He recalls that Robert McNamara, a distinguished businessman, as Secretary of Defense (1961-68) made it his mission to run the Army on "sound managerial principles," and after a few hundred words of analysis the *Atlantic* writer says:

Management "rationality," so noble in intention and benign in apparent effect, is, in the minds of many people, the greatest enemy of real defense.

What we need, they say is a different calculus, based not on computer readouts but on the realities of the battlefield, so different from any other form of human behavior.

This contention—that the military needs more leaders and thinkers, and fewer "rational" managers—is the heart of *Crisis in Command*, a penetrating book by Richard Gabriel and Paul Savage about the Army's failures in Vietnam. I found the same contention bubbling up more and more often as I left the respectable mainstream of defense analysis and moved toward the fringe.

The main trouble with the Army, this writer suggests, comes "from something that cannot be measured by statistics: the sense that the Army is no longer made of, or led by, men who can fight." Developing this judgment, he quotes a "thinker":

"You should think of the military as a Burkean, not a Lockean world," says James Woolsey. "An organic whole, in which people are bound to each other by ties of obligation and loyalty, rather than fee-for-service, limited contract, limited obligation." In *Crisis in Command*, Richard Gabriel and Paul Savage explain how managerial Army has meant the end of that organic whole and the creation of a system whose incentives, performance, and internal values resemble those of the Civil Service. Within such a system, it is not reasonable to sacrifice or to risk death for abstract goals: it makes sense only to minimize risk in pursuit of promotion. In the German army during World War II, generals suffered a far higher casualty rate than enlisted men. One third of the 650 German generals were killed in action. In ten years of combat in Vietnam, only three American generals were killed, two of them (according to Gabriel and Savage) in helicopter crashes unrelated to combat. In the modern American Army, there are few bonds of mutual sacrifice and commitment, little perception among the soldiers that their leaders will share the risks they ask the troops to take. All that remains is the silent, individual pursuit of career ends.

It is this change of spirit, numerous people suggest, that lies behind many of the mundane ills of the military—escalating pensions, ennui in the officer corps, the difficulty of holding on to the talented

enlisted men who make the services run. When the Army is run like Sears or the Agriculture department, it will be judged in the same way—on the basis of hours, pay, fringe benefits. But no one expects Sears to be ready to fight a war.

This seems like good thinking, but can anything come of it? Seen in the perspective of larger considerations—such as the fact that no nation can win a big, modern war—one might say that Mr. Fallows gives excellent reasons for unilateral disarmament and a corresponding shrinkage in the army. But this is thinking not likely to be widely adopted. Moreover, in our time thinking and becoming a military man seem a contradiction in terms.

Another (October) *Atlantic* article is on the application of sales promotional techniques to the enrollment problems of small colleges. Experts in this field have done well in showing some of the colleges how to attract more students. The writer, Edward B. Fiske, after reporting on the successes, warns of what may happen as a result:

An obvious danger is sacrificing quality in the all-out effort to maintain enrollments and adjust programs to meet a perceived academic need—or at least a market. John Sawhill, the president of New York University, wonders whether colleges will ever flunk students in whose recruitment they have invested so much time, effort, and money. "You have to remember that the end result of education is a degree or a certificate, and that awarding this is a selective process," he commented. "You do have to evaluate students. If you engage in too big a selling effort to get them in, it makes it difficult to evaluate them when you're ready to give the degree."

In effect, Mr. Fiske wonders if colleges are also becoming operations like Sears:

There is also the danger that the new marketing fad could backfire and lead to greater governmental regulation. If colleges begin to act like businesses, they will be treated as businesses," observed Arthur Levine, who recently shepherded an eighty-six-page report for the Carnegie Council on Policy Studies in Higher Education which criticized, among other things, "inflated and misleading advertising" among colleges and universities today. "If they act as hucksters, they will be treated as hucksters. . . . Neither businesses, nor hucksters, can successfully

wear the mantle of academic freedom or autonomy from social control."

The best in this article come at the end:

The fact is that, in a time when there will be a quarter fewer eighteen-year-olds, some colleges *should* fold. . . . What some colleges need is not another piece of market research but another look at the third chapter of Ecclesiastes. "To everything there is a season, and a time to every purpose under heaven. A time to be born, and a time to die; a time to plant, and a time to pluck up that which is planted."

We have one more sample of the kind of thinking now being done, also from the October *Atlantic*. A review of Christopher Jencks's *Who Gets Ahead?* begins:

Christopher Jencks is a Harvard-based social scientist with a well-deserved reputation for saying sensible and intelligent things about anything that interests him. He upset a great many critics with his last book, *Inequality*, in which he contended that more schooling, by itself, would not greatly change the distribution of wealth among individuals, and that the requirements of economic justice could be achieved only through direct control of some aspects of the economic apparatus. In one breath he both wounded liberal ideologues and outraged the free market wing of the conservative right.

Who Gets Ahead? is less adventurous, and thus less inflammatory. Its aim is to narrow the focus, and thus heighten the likelihood of statistical accuracy, in several areas of presumed controversy. How much does family matter, in predicting job success? What about race, education, attitude, academic ability? What is success, anyway?

Whatever it is, none of these factors will guarantee success, according to Jencks's research, and the reviewer ends by saying that Jencks and his collaborators "have found an expensive way to tell us what we already know, but would rather not admit."

Here, again, it is difficult to see what, if anything, might result from this thinking about "success," although the reviewer's question, What is it, anyway? should lead to needed inquiry of another sort. Surely it is more than coincidence that the troubles described by the three *Atlantic*

writers are directly attributable to obsession by "business goals." Is it too much to say that our civilization has mistaken business for life, and the goal of business—making a sale, getting ahead—for life's meaning?

Critical sharpshooting, however, so well performed by the *Atlantic* writers, doesn't press issues as far-reaching as this. Such questions come only from observations at a higher level—the kind made by Robert Solomon in a recent article (July 1) in the *Los Angeles Times*. A teacher of philosophy. Mr. Solomon had been reading Hegel's *The Phenomenology of the Spirit*, a book written by the German thinker in 1806, when Napoleon's artillery could be heard at the university in Jena where Hegel taught. It was a dark time for Germans, but Hegel was filled with vision, intent upon "the perfectibility of humanity." He saw that time as the beginning of a new age for the Western world. Knowing pretty well what would happen, Solomon talked to his philosophy class (at the University of Texas) about Hegel, and then—

. . . I asked my students to characterize their own times. The word that they used most often was "apathy." "Dull," "dead" and "crisis" were front-runners.

I was struck by the dramatic contrast to the vibrant, hopeful, almost joy-of-living ideas we had just been reading about—all written by a middle-aged philosopher who had just lost his job, at a time when a very palpable crisis was booming just over the horizon. One articulate graduate student, facing the prospect of his own unemployment within a year or so, suggested that either mankind would annihilate itself (something not even Napoleon could threaten) or we would have to look forward to lives of increasing bureaucracy, dull jobs, government interference, a lower standard of living and what he described as "being packed in ever smaller little boxes."

Now comes a thinker's question:

What did Hegel have that we do not, that allowed him to face even the wholesale destruction of his society—as well as his own career—with an attitude that can only be called inspired, if qualified, cheerfulness?

What he had was philosophy, a tradition of thinking that leads to ideas. Ideas give our lives perspective. They define our place in the universe, our relation to other people—what is and isn't important, fair and worth believing, what gives life meaning and what leaves it flat and meaningless. In our concern for bread-and-butter issues, we've denied ourselves the joys of thinking—the inspiration, as well as the "consolations," of philosophy.

Philosophy as now taught, Mr. Solomon says, is a private affair carried on by learned academics, not anything people generally can understand or would want to. And the intellectual fare for the reading public is not much better:

The current wisdom tends to feed rather than correct our thoughtless pessimism. Tom Wolfe's diagnosis of the "me" decade and Christopher Lasch's gloomy pathology of "the new narcissism," for example, replace self-neglect with self-contempt, accusing us as a nation of turning inward and just enjoying ourselves—blaming the victims, in other words.

The students are victims, along with the rest of us:

It takes but a glance at my students to see that these are not the happy hedonists of the Pepsi commercials. They are neither flushed from their latest orgy nor beaming with self-enlightenment. They are, in a certain sense, empty. They have no ideas, no passions, no dreams—not even the so-called "American dream" (which is, in fact, an Enlightenment dream carried over from the 18th century, the same vision that kept Hegel so enthused in the midst of a cataclysm). And when the vacuum of vision is explosively filled with a cult philosophy, or when the idea-less idealists of the '60s were replaced by the Mickey Marxists of the radical Left, why should anyone be surprised? . . .

I'm worried about the lack of vision, and the banal and subjective slogans that are replacing the development of real ideas. We in "the liberal arts" can't promise our students decent jobs, or the end of inflation, or intelligence in TV programming. But we can, and must, inspire some new ideas. They require no down payment; they neither rust nor break nor lose their value before they're paid for. Their value is both simple and profound: Ideas give life meaning. And a meaningful life is a sturdy shelter against any century's calamity.

We don't need any big expensive "study." It is plain enough that the slogans of the hucksters have taken up all the mental space that would normally be occupied by ideas, whether new or old. But what about "the masses"? Did the masses *ever* entertain what Mr. Solomon means by "ideas"? The answer to this must be that until about a hundred years ago, what we now call the masses were peasants who worked the land, and while peasant culture may have its limitations, the relations of farmers with the natural environment provided a psychic balance that is no longer available to most people, wherever they live.

Another question may be raised. Is it "fair" to compare today's undergraduates with a genius like Hegel, one of the greatest thinkers of the early nineteenth century? Why not? Mr. Solomon used Hegel for contrast, to show how a fine and awakened mind was occupied, despite the grim events going on around him, and when we are considering ideals to emulate, why not choose the best examples we can find? As Maslow said in *Farther Reaches of Human Nature*:

If I ask the question, "Of what are human beings capable?" I put the question to [a] small and selected superior group rather than to the whole of the population. . . . 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 for spiritual growth, value growth, or moral development in human beings, then I maintain that we can learn most by studying our most moral, ethical, or saintly people.

In antiquity and in even the fairly recent past, an atmosphere favorable, or not antagonistic, to this study—and the study of what such people said—was created by family and community life. While no one knows how to spread around great and enlivening ideas—except by repeating them, which often seems not to work—we at least know how they are shut out, ignored, and made to disappear. In the fourth part of *Four Arguments for the Elimination of Television* (William Morrow, 1977), Jerry Mander explains the effect

of this coarse means of visual communication, emphasizing what the producers tend to select, in programming, by reason of the limitations of the technology, and what, for this and other reasons, is left out. First, in a general comment, the author says:

The act of sitting in front of television is itself a replacement of other modes of experience and the awareness these would bring. In this way, television is an acceleration of a condition that began with our artificial environments. We are already separated from most experiences with an unmediated planet. We have given up our personal sensory informational systems. The artificial forms around us already limit our experience and awareness. . . . With television, however, the artificial information-field is brought inside our darkened rooms, inside our stilled minds, and shot by cathode guns through our unmoving eyes into our brains, and recorded. We have no participatory role in gathering data. . . . If we don't experience a wider information field, we lose knowledge of that field's existence. We become the hermit in the cave who knows only what TV offers.

While you could say that all forms of designed and technically communicated forms of experience have more or less this effect, it seems obvious that television is the extreme case, and Jerry Mander dramatizes what happens in a way that drives his point home. And as he says, TV watchers look at the screen for an average of four hours a day. As for the reformers who want to make TV producers show positive good behavior, such as caring and warmth instead of so much hostility and violence, Jerry Mander says that TV is a technologically stacked deck:

Unfortunately these reformers are doomed to fail in their efforts because the medium is far better suited technically to expressing hate, fear, jealousy, winning, wanting and violence. These emotions suffer very little information loss when pushed through the coarse imagery of television. . . . The popularity of such programming is not so much a sign that public tastes are vulgar, as they are assumed to be in many quarters ("People want that kind of programming"), as it is a sign that these programs are the ones which manage to communicate something, at least, through television.

This analysis goes on for pages, all of it worth reading, but the writer's meaning is clear. Television performs a kind of selection which tends to impoverish whatever is offered. There are some rare exceptions, due to great individual skill, but the fact remains that the medium itself makes communication of any delicacy very difficult. Mander says:

Human beings who view these attempts are led to believe that these fuzzy little pellets of information about our rich, subtle, complex and varied world constitute something close to reality. What they really do is make the world as fuzzy, coarse, and turned-off as the medium itself.

Two things become evident. First is an obvious conclusion: TV is bad in its effect on people, and possibly in itself, no matter how it is used. We can't use it properly because of the many obstacles, both technical and commercial, to doing so, so why not abandon it?

Equally evident is the general fact that all our impressions have the form of abstractions from experience—resulting in ideas and feelings isolated by our faculties and by the gadgets we use to extend perception. Then these abstractions are themselves generalized in terms of intellectual abstractions developed by habits of thinking. This double removal from the immediacies of experience cannot be called "bad," since it seems inevitable as we are presently constituted, but it makes our encounter with the world wholly self-defined and partly self-created. Clear thinking takes its own remoteness from life into account.

REVIEW

CHINESE ATTAINMENTS

JOSEPH NEEDHAM'S *Science and Civilisation in China*, which when complete will have seven volumes issued by the Cambridge University Press, may now be begun in a shortened text for the general reader. The first volume (comprising the first two volumes of the larger series) is now available. The abridgement is by Colin A. Ronan. Since this volume of *The Shorter Science and Civilisation in China* is largely introductory, giving background and history, the content tends to be philosophical, showing how the ancient Chinese thought about ultimate questions, and the effect this had on their practice of science.

One importance of this work may be seen from the writer's discussion of the difficulty in deciding whether an invention—in either East or West—was an independent development or the result of transmission from one part of the world to another:

To take an extreme example, the German astronomer Joseph von Fraunhofer invented in 1842 a special clock to drive a telescope so that it could follow the stars continuously in spite of the rotation of the Earth, and thus make observing more convenient. He did not know that even though they had no telescopes, the Chinese had done this eight centuries earlier with their own astronomical instruments. Was this development a re-invention? Again, there are other apparently independent discoveries that one feels convinced were really due to transmission even though we have no absolute proof. Suspension-bridges with wrought-iron chains are a case in point: first constructed in China in the sixth century A.D., they soon had successors in that part of the world, especially Tibet and other Himalayan countries, but they did not appear in Europe until the eighteenth century. Was this a case of independent invention or delayed diffusion? Here as in so many other cases, dates of transmission are hard if not impossible to find, and we cannot be sure, though we do know that some of the European engineers knew of the Chinese bridges before any were built in Europe itself. Nevertheless it is clear that a host of technical devices—the wheelbarrow, the piston-bellows, the cross-bow; the technique of deep borehole drilling,

the art and mystery of cast iron—were all known in China before, and often long before, they were known in the West. On the other hand, the Chinese also had to wait a very long time for some basic inventions to penetrate from the West, e.g. the screw and the crankshaft, to name only two; and there were some Chinese inventions which were known to the West but not adopted: paper money, the use of coal, and the adoption of water-tight compartments in ship-building for example.

For the present-day reader the most interesting aspect of this study may be the anticipation by the Chinese of the modern "organic" way of thinking now becoming popular in the sciences. In the introduction, Mr. Ronan says:

To those of us brought up in a culture which has the classical world as its foundation, the Chinese achievement may well seem nothing less than astonishing. Certainly there was no rise of modern science in sixteenth-century China as occurred in Europe from this time onwards, while it is also true that the Chinese suffered from a weakness in the oretical ideas and a lack of deductive geometry—the very essence of precision in Greek science. Yet in spite of all this we see in ancient China a society more amenable to the application of science than was the case in Greece, in Rome, or even in mediaeval Europe. What is more, in China there developed an organic philosophy of nature that closely resembles that which modern science has been obliged to adopt after three centuries of scientific materialism.

The three great religious philosophies of China—Taoism, Confucianism, and Buddhism—each have a chapter to show how these forms of thinking either contributed to or became a barrier to what Dr. Needham regards as scientific progress. Confucius, for one, while he believed in education and intellectual democracy, stood in the way:

. . . Confucianism was not scientific in outlook: the universe had a moral order and the proper study of mankind was man, not a scientific analysis of Nature. Certainly Confucius taught a rationalist system that was opposed to any superstitious or even supernatural forms of religion, but it was an outlook that concentrated interest on social questions to the exclusion of all non-human phenomena. The rational

element that could have encouraged the growth of a scientific outlook was not allowed to do so.

One may imagine that the writing of a book of this sort started out with the assumption that the climactic development of Western civilization is to be found in its scientific achievement, and that other civilizations are best measured by what they accomplished in the same direction. However, the study, as it goes along, reveals a profound respect for the subtle insights of the Chinese, so that the author might finally have become persuaded that Western science ought to be measured and evaluated by philosophy, instead of itself being made the canon of excellence. The Confucianists, while they may have caused weakness in physical theory, were certainly perceptive in relation to psychological science. The Confucian, Tai Chih, wrote in 1235, comparing two outlooks:

People talk about human nature—some say it is good, others that it is bad. Generally they prefer Meng Tzu's view and reject Hsun Tzu's. After studying both books I realised that Meng Tzu is talking about the heaven-nature and what he calls the goodness of human nature referred to its (innate) uprightness and greatness. He wished to encourage it. This is what the *Ta Hsueh* (Great Learning) calls (developing) sincerity.

But Hsun Tzu is talking about the matter-nature, and what he called the badness of human nature referred to its (innate) wrongness and roughness. He wished to repair and control it. That is what the *Chung Yang* (Doctrine of the Mean) calls "forceful checking". . . .

Thus Meng Tzu's teaching is to strengthen what is already pure, so that defilement tends to disappear of itself. While Hsun Tzu's teaching is to remove defilement actively. Both are equally helpful to later students.

A rough parallel in modern times, showing correspondence to the two Chinese authorities here quoted, might be Freud and Jung, as Western psychologists who saw the nature of man differently. But it is the recognition of the dual nature of man, which grew out of the moral approach to human behavior of the Chinese, that is of particular interest. Needham calls this "a

more scientific approach," although, a generation or two ago it might not have been so honored by Western psychologists, who were then still much involved in mechanistic theory.

The concluding chapter provides a comparison of the Chinese conception of law with that of the West. The Chinese were disinclined to rely heavily on positive manmade law, preferring the administration by the wise of what might be termed "natural law."

In the West law has always been revered as something more or less sacrosanct, imposing itself on everyone, great or small, defining and regulating the conditions of all forms of social activity. But as one passes to the East this picture changes, and in China law and jurisprudence took an inferior place to the powerful body of spiritual and moral values which she created and which were diffused among neighboring cultures. China recognised natural law and exalted the rules of morality, Chinese positive law was above all administrative.

The Chinese name for natural law was *li*—"a *jus naturale* which the sage kings and the people had always accepted." As the author says:

The full force of the meaning behind *li* was profound, and could not be divorced from the customs, usages and ceremonies which epitomised it. The significance of these was deep, lying not merely in the fact that they had arisen because they agreed with the instinctive feeling of rightness experienced by the Chinese, but also in the conviction that they accorded with the "will of Heaven," with the structure of the whole universe. Hence the basic disquiet aroused in the Chinese mind by crimes, or even by disputes, since these were felt to be disturbances in the Order of Nature.

The Chinese distaste for definitive law and fixed punishments grew out of the feeling that if man-made statutes became the criterion of morality, then the uncoercive intimations of the moral law would begin to be ignored. If the people ceased to have faith in the order of Nature and its bearing on human conduct, disorder and a mechanical view of righteousness would ensue. During the time of the Thang period, from the seventh to the tenth centuries, a phrase was used in the legal code: "he who leaves *li* will fall into

hsing"—*li* being the order instilled by nature, and *hsing* the laws made by man—"in other words if one does not follow the behaviour felt to be ethically right, one will find oneself caught in the net of criminal law."

Will the modern world, one wonders, ever return to the ancient view:

If, as in ancient China, all crime and disputes were looked on not primarily as ruptures of a purely human legal code, but rather as ominous disturbances in man's connections with Nature, this would presuppose so subtle a complex of causal connections that any positive law would seem unsatisfactory. Indeed, the Thang code of the seventh century A.D. specifically suggests that it is dangerous and ominous to "leave *li* and engage in legally fixed punishments."

The practical choice, quite apparently, is between the flexible intelligence of just and sagacious judges, and the rigid provisions of a code administered by bureaucrats; or, on the other hand, between the paternalism of individuals of indifferent understanding and the impersonal rules of law. Such are some of the old questions renewed by a reading of this book.

COMMENTARY
THERE OUGHT NOT TO BE A LAW

BACK in 1943—in the middle of the war—Rose Wilder Lane (daughter of Laura Ingalls Wilder, who wrote the *Little House on the Prairie* series) published *The Discovery of Freedom*, a book which celebrated two ideas. First was the idea that the rights of Americans are *natural* rights, not generously permitted by the ruling authority, but *retained* by the people. This is the exact reverse of the English Bill of Rights, which lists the freedoms allowed to the British by the sovereign state. The second idea was that in the United States, we have a government of law and not of men.

Yet Mrs. Lane gave full credit to the quality of the government by *good* men, using for illustration the social order which resulted from Mohammed's religious and cultural reform. She makes it plain that human freedom in the early centuries of Islam had practically nothing to do with charters of civil rights or constitutionally guaranteed securities, and draws an interesting comparison. Under Islam—

The only safeguards of property seem to have been possession of the property, individual honesty, and public opinion.

Well, cabins were never locked on the American frontier where there was no law. The real protection of life and property, always and everywhere, is the general recognition of the brotherhood of man. How much of the time is any American within sight of a policeman? Our lives and property are protected by the way nearly everyone feels about another person's life and property.

This seems identical with what the ancient Chinese called *li* (see Review), warning that "he who leaves *li* will fall into *hsing*"—legally fixed punishments. The Muslims, apparently, had the same idea:

The Saracens evidently got along very well for nearly a thousand years with no law. They modified, in many ways, the pure anarchy of freedom. From the past they kept tribal customs. They increased the natural authority of parents over children, and the

natural influence of the wise, able, successful men and women. . . . All these are methods of using free energy flexibly, in mutual action. They are ways of controlling combined human energies without restricting human freedom.

The trouble with laws is, if you make one, you always have to make another.

CHILDREN ... and Ourselves PRE-MATH

[The *Parent's Bulletin* of the School in Rose Valley (Moynan, Pa.) recently reprinted an article by Becky Cramer on getting small children used to the experiences and relationships that, later on, will be of value in learning arithmetic. The article first appeared in the *Newsletter* of the Ruth Washburn Cooperative Nursery School, Colorado Springs, Colorado, which the writer's children attended. Here it is slightly condensed.]

A COUPLE of months ago I sat in on a Ruth Washburn staff meeting—as a "mother-consultant" you might say—to toss around some ideas about "pre-mathematics" for nursery schoolers. Don't panic. Not math, *pre-math*. It's really what Ruth Washburn is doing already in much of its program, and we were aiming at bringing some of the goals of the program into sharper focus. Vicki Vandeloop (Director of the R.W. school) thought it might be helpful if I wrote down some of the ideas we touched on, for other parents to think over, because they represent one way, maybe not the most common one, of looking at our children's preschool years.

Personally, I'm decidedly opposed to pushing our children prematurely into school skills. There seems to be no gain in it. If they are ready early, they teach themselves. I've been trying, though, off and on for some time, to sort out for my own satisfaction the *good* preschool experiences (i.e., right for the 2, 3, or 4 year old's developmental stages and appealing to his normal interests) that also add up over the years to a solid preparation for math for a first-grader. If we can identify them, we can take stock now and then of ourselves.

First, what is this first-grade math our kids will be doing some day? (You parents who teach, be patient with me!) Mathematics, just generally speaking, is a way of describing, in useful shorthand, the sensory world of materials, space, time, sound, light. Even at its most abstract, its

terms have their basis in observable facts. In elementary math, our children will be learning the *symbols* that represent relationships between real things, showing that they are part of a mutual group, or a sequence, or a set of correspondences. $3 + \bullet = 7$ makes a good example. It's complex for a small child. The numbers here represent quantities, groups of 3 and 7; the = sign means that one side corresponds exactly to the other when the blank is filled in. The + sign means you haven't yet got enough in the group on the left to make a true equation. It's enough work to learn to understand the symbols and translate them into ideas, and a challenge for a child—but when the ideas behind the symbols are themselves beyond the child's grasp, math is discouraging, a baffling frustration.

I think the use of symbols is best left for first grade, though we can prepare the child to be receptive. I want to skip over that and dwell on three things we ought to provide for our children long before it is time to symbolize anything. One is something we call at our house "getting the nerve endings in touch," or sometimes just "messing with stuff." It means getting a thorough physical experience of the world, learning the properties of materials, the ways objects can be grouped or lined up, the quantities you can tell at a glance, the feel of different spaces around us, the time and effort required to cover a distance or paint a picture. It includes direct experience of multitudes of things within one group, of different categories for grouping the same objects, of sets of things corresponding so you can call them equal, of rows of things, of sequences of events, of shape correspondence. In normal play, you will even find the child discovers that one item can stand for several, or for a different item altogether. All this is pretty hard to teach if it hasn't first been *felt* through objects handled, arranged and rearranged, materials used, manipulated, and talked about.

Second, and just as important, is the child's developing confidence in his or her own

effectiveness. A child who learns that his or her own physical actions will get predictable, dependable results will bring that confidence to the management of materials in the abstract. Third, and perhaps most important for the making of a real mathematician in the long run, is the development of the ability to remember, mentally rearrange, and reproduce remembered patterns, and more than that, to learn to love patterns, inventing them, remembering them, and completing them. Getting the right number in the box in $3 + \bullet = 7$ is a genuine pleasure for someone who loves balance and the fulfillment of design.

In more practical forms (taken in a different order):

(1) The concrete play of everyday. Try for a few days, if you never have, to see your small child as totally ignorant of the feel of the world, out to collect information and test the effects of his/her presence in the world of things and space. Shut out what you observe of his or her social life, just for the time being. Think about the relationship she or he is building with the physical world. Try to follow what she or he is learning by physical involvement. Does the child, perhaps, get things all out at once and dump them on the floor? Granted that there are limits to a parent's patience, try to realize at such moments that quantity is something your child wants to know about, and huge, unsorted quantity is a different experience from orderly, limited quantity. Get down and help push the mess into piles, so he or she can grasp the order that is potential within the mess, and share with the child the physical sense of "getting in touch." Sets of things that cry out for sorting as the child plays are the best for preparing for math equations. When you overhear your kids saying, "You have to let me use two of your soldiers so we'll have the same on both sides," you can rejoice that, though they may be naive about the reality of warfare, they will breeze through arithmetic!

(2) As for a love of patterns, and an ability to imagine them, remember them, and reproduce them—think how many opportunities we give children! Paint, clay, building blocks, mosaic tiles, sand and mud, all let a child develop first a delight in creating patterns, and later on a pleasure in recollection and recreating, and eventually in planning and executing imaginatively. Songs and nursery rhymes do the same in the world of sound. Dancing and group circle games are social, but also are fun because the child likes participating in the physical arrangement of bodies, dance-like. Watch how children often sit in a row spontaneously, or line up boots at the door. Pattern-pleasure.

(3) I've saved effectiveness for last. All of us are somewhat aware of how effective our child feels in the social world of family, school, and neighbors. Shyness, unresponsiveness, boisterousness, peskiness can be seen as signs telling us how much a child feels he has to do to make his presence noticed. It takes a little closer observation to reveal your child forming a parallel attitude toward things, but he is doing just that. He is on the way toward becoming the adult who can, for example, fix anything, or the one infuriated or defeated by hammers and wrenches, or sums and bank balances.

It's actually more fun to raise a child if you consider his need to check out the effects of his own physical presence. Why does he throw things out of the crib, or smear the cereal all around? He soon learns that there are social consequences, but initially it's like Mount Everest: because it's there, and he's there, and the relationship has to be explored. It gives him evidence that he exists and can make things happen in a physical world. He will write on himself with his markers, instead of on the paper. The reason is the same. He lugs great chairs around the house, hammers nails in things, puts stuff in boxes and dumps them out for no purpose, tries out the typewriter, to see his own actions changing the state of things. Just as he needs to learn how loud to talk in the social

world to get a reaction, he also has to test the amount of effort he must exercise before his activity makes a difference in the physical world.

So often we parents intervene, and the child gets a social reaction before he has discovered the physical consequences he is curious to know. We have to remind ourselves that we want him to grow up feeling sure that he can manage the physical reality of his life. Ironically, our butting in on the side of propriety, neatness, protection of property, may leave the child feeling that the physical world governs his actions, and not the other way around.

We can, also ironically, actually put out a lot of effort arranging things for him in such a way as to make him feel more competent, independent, and self-sufficient. An adult-sized world can seem very unmanageable to a child. It helps if we put his toys, and things like toothbrush and clothes, even his special dishes, where he can get them when he wants them, and be sure of finding what he needs. Our effort expended in sorting and filing his toys, mending broken ones, throwing out incomplete games, allows him to feel in control when he goes to play, confident that the world is what he expects it to be and will respond predictably.

Incidentally, I've found that one great unsettling factor in our lives is the need to drive our children everywhere. How can they feel the world responds to them in predictable ways while being chauffeured to all the important places in their lives, unable when small even to see out along the way? I try to at least point out landmarks, draw picture maps of the route, even discuss the operation of the car, to demystify the very physical task of getting us to where we are going. Walking is so much better, seeing clearly what you pass, sensing the energy needed to cover the distance, remembering the route afterward and happily anticipating it when you do it again—and joyfully finding that all those things you passed are there again, right where you thought they would be!

These nursery school years provide an opportunity to learn through the sense that won't come again. Social life looms larger, life gets busy, reading, writing, and arithmetic call the child to the abstract. Sports and music become the child's physical involvements, and very valuable ones, but "messing with stuff" fades away. Make the most of it now!

FRONTIERS

The Conservation of Energy

IT seems evident that most of the public confusion concerning energy resources arises from prevalent illusions based on misinformation. In a talk given last May before some Congressional staff people, Vince Taylor, a policy analyst who works with the Union of Concerned Scientists, began by drawing attention to a hardly noticed fact: That increased efficiency in the use of energy by industry, since 1973, has contributed twice the energy made available by oil from the Alaska Pipeline during last year. The implication is clear. Individual companies which require large amounts of energy for the production of goods are making better use of their energy supply. This is something they can do on their own.

Vince Taylor's paper, "The Easy Energy Plan," a condensed and up-dated version of an earlier work, *Energy: The Easy Path* (produced last January), is a persuasive argument for conservation. It proposes a number of steps that can now be taken. Taylor says:

The reason why our energy problems appear so intractable to most people, even to supposed experts, is that attention has been focused entirely upon the possibilities of expanding energy supply. "Conservation" has been written off in official circles as a fantasy of "back-to-the-woods" romantics, and efforts have been turned to finding ways to keep up with the ever-expanding requirements for energy. Alaskan oil, offshore drilling, the Elk Hills Naval Petroleum Reserve, western coal mines, nuclear power, synthetic fuels, oil shale, geothermal power, solar power—all have been pursued, promoted, advanced as solutions to our energy problems. But, the more closely that people have looked at these supposed solutions, the clearer it has become that they can provide no immediate answer. In spite of all efforts, U.S. production of energy in 1978, including the contributions of nuclear power and Alaskan oil, was lower than in 1973. Little wonder that those wedded to supply expansion as the only energy solution have turned to calling upon the public for sacrifice.

Meanwhile, however, without trumpets, banners, or fanfare, and apparently completely

unbeknownst to those in charge of energy policy, the United States has already begun to move down the easy path: improvements in energy productivity have met nearly two thirds of the growth in demand for energy services since 1973. In almost all sectors of the economy, strong trends toward improved energy productivity are established or will soon begin. These trends are primarily the result of the very great past increases in energy prices and the legislation establishing minimum mileage for new cars.

Increases in energy productivity, Taylor makes clear, "are completely equivalent to expansions in energy supply: if they did not occur, primary energy supplies would need to be increased by the amounts of these contributions in order for the projected levels of energy services to be provided." The substantial importance of better productivity is evident from the record:

While the level of industrial production rose by 12 per cent between 1973 and 1978, consumption of primary energy (which includes consumption and losses incurred in oil and gas processing and electrical generation and distribution) actually declined. The increases in energy productivity in the industrial sector have been large and show no signs of diminishing. They apparently represent the rational, cost-minimizing response of firms to the large past increases in energy prices. Because the industrial sector buys energy resources almost directly from producers, with little intervening distribution costs, it has experienced by far the greatest percentage rises in energy costs of all the economic sectors.

As industry continues to replace equipment and alter process technology, energy productivity will continue to increase. On present trends, the contribution of post-1973 productivity improvements will grow to 12.4 quads per year—equivalent to 6 million barrels of oil per day—a far greater contribution to expansion of energy services than will be made by all sources of supply combined.

(A quad is a large energy unit equal to 10^{15} British Thermal Units (BTU's). Two quads are approximately equal to 1 million barrels of oil per day. Total U.S. primary energy consumption was 78 quads in 1978.)

This study gains in impact and clarity by being altogether devoted to the importance of conservation. There is inestimable value, the

author points out, in having sufficient energy to meet current needs while future renewable resources are being chosen and developed without desperate hurry and anxiety. Mr. Taylor emphasizes the important distinction between the uses of oil and the fuels used to generate electricity:

Since almost all new generating capacity will be either nuclear or coal-powered, the future rate of growth of electricity will affect requirements for coal and nuclear energy, not for oil. And since nuclear energy is used almost exclusively for electrical generation, the total of the contribution of these two energy sources is almost entirely determined by the size of the electricity sector. A decrease in or even a moratorium on orders for nuclear reactors will not lead to an increase in oil consumption but to an increase in the demand for coal. All this is well understood by electric utilities and manufacturers of nuclear reactors, but they are seldom forthright about it in public, often equating every nuclear reactor with a savings of so many millions of barrels of oil.

As evidence continues to accumulate, the accident at Three Mile Island appears more and more to reflect serious generic problems with the design and operation of nuclear reactors rather than a unique situation. If further investigation confirms this to be the case, it is important that the nation not feel compelled by necessity to continue indefinitely to operate existing reactors. The electricity measures of the Easy Path Plan provide a means of gradually reducing dependence on nuclear power without disrupting electrical supplies, requiring major revisions of utility construction plans, or necessitating expansions in coal production above presently anticipated levels.

As a guide to policy, Vince Taylor says: "Ninety percent or more of the solution to our energy problems will come from improvements in energy productivity; ten per cent or less from supply expansion." Yet the U.S. budget for 1980 allocates almost a billion dollars to research and development on breeder reactors and magnetic fusion systems, which cannot add a single BTU to our resources during this century, while doing nothing to improve the efficiency of gasoline and diesel engines, which consumed 87 percent of all the oil produced by the United States last year. A

better understanding of conservation might reverse this policy.