Future shock is a time phenomenon, a product of the greatly accelerated rate of change in society. It arises from the superimposition of a new culture on an old one. It is culture shock in one’s own society. But its impact is far worse. For most Peace Corps men, in fact most travellers, have the comforting knowledge that the culture they left behind will be there to return to. The victim of future shock does not.

Take an individual out of his own culture and set him down suddenly in an environment sharply different from his own, with a different set of cues to react to—different conceptions of time, space, work, love, religion, sex, and everything else—then cut him off from any hope of retreat to a more familiar social landscape, and the dislocation he suffers is doubly severe. Moreover, if this new culture is itself in constant turmoil, and if—worse yet—its values are incessantly changing, the sense of disorientation will be still further intensified. Given few clues as to what kind of behavior is rational under the radically new circumstances, the victim may well become a hazard to himself and others.

Now imagine not merely an individual but an entire society, an entire generation—including its weakest, least intelligent, and most irrational members—suddenly transported into this new world. The result is mass disorientation, future shock on a grand scale.

This is the prospect that man now faces. Change is avalanching upon our heads and most people are grotesquely unprepared to cope with it.

This acceleration is frequently dramatized by a thumbnail account of the progress in transportation. It has been pointed out, for example, that in 6000 B.C. the fastest transportation available to man over long distances was the camel caravan, averaging eight miles per hour. It was not until about 1600 B.C. when the chariot was invented that the maximum speed was raised to roughly twenty miles per hour.

So impressive was this invention, so difficult was it to exceed this speed limit, that nearly 3,500 years later, when the first mail coach began operating in England in 1784, it averaged a mere ten mph. The first steam locomotive, introduced in 1825, could muster a top speed of only thirteen mph, and the great sailing ships of the time laboured along at less than half that speed. It was probably not until the 1880’s that man, with the help of a more advanced steam locomotive, managed to reach a speed of one hundred mph. It took the human race millions of years to attain that record.

It took only fifty-eight years, however, to quadruple the limit, so that by 1938 airborne man was cracking the 400-mph line. It took a mere twenty-year flick of time to double the limit again. And by the 1960’s rocket planes approached speeds of 4000 mph, and men in space capsules were circling the earth at 18,000 mph. Plotted on a graph, the line representing progress in the past generation would leap vertically off the page.

Whether we examine distances travelled, altitudes reached, minerals mined, or explosive power harnessed, the same accelerative trend is obvious. The pattern, here and in a thousand other statistical series, is absolutely clear and unmistakable. Millennia or centuries go by, and then, in our own times, a sudden bursting of the limits, a fantastic spurt
The reason for this is that technology feeds on itself. Technology makes more technology possible, as we can see if we look for a moment at the process of innovation. Technological innovation consists of three stages, linked together into a self-reinforcing cycle. First, there is the creative, feasible idea. Second, its practical application. Third, its diffusion through society. The process is completed, the loop closed, when the diffusion of technology embodying the new idea, in turn, helps generate new creative ideas. Today there is evidence that the time between each of the steps in this cycle has been shortened.

Thus it is not merely true, as frequently noted, that 90 percent of all the scientists who ever lived are now alive, and that new scientific discoveries are being made every day. These new ideas are put to work much more quickly than ever before. The time between original concept and practical use has been radically reduced. This is a striking difference between ourselves and our ancestors. Appollonius of Perga discovered conic sections, but it was 2000 years before they were applied to engineering problems. It was literally centuries between the time Paracelsus discovered that ether could be used as an anaesthetic and the time it began to be used for that purpose.

Even in more recent times the same pattern of delay was present. In 1836 a machine was invented that mowed, threshed, tied straw into sheaves and poured grain into sacks. This machine was itself based on technology at least twenty years old at the time. Yet it was not until a century later, in the 1930's, that such a combine was actually marketed. The first English patent for a typewriter was issued in 1714. But a century and a half elapsed before typewriters became commercially available. A full century passed between the time Nicholas Appert discovered how to can food and the time canning became important in the food industry. Today such delays between idea and application are almost unthinkable. It is not that we are more eager or less lazy than our ancestors, but we have, with the passage of time, invented all sorts of social devices to hasten the process. Thus we find that the time between the first and second stages of the innovative cycle—between idea and application—has been cut radically. Frank Lynn, for example, in studying twenty major innovations, such as frozen food, antibiotics, integrated circuits and synthetic leather, found that since the beginning of this century more than sixty percent has been slashed from the average time needed for a major scientific discovery to be translated into a useful technological form. Today a vast and growing research and development industry is consciously working to reduce the lag still further. But if it takes less time to bring a new idea to the marketplace, it also takes less time for it to sweep through the society. Thus the interval between the second and third stages of the cycle—between application and diffusion—has likewise been sliced, and the pace of diffusion is rising with astonishing speed. This is borne out by the history of several familiar household appliances. Robert B. Young at the Stanford Research
Institute has studied the span of time between the first commercial appearance of a new electrical appliance and the time the industry manufacturing it reaches peak production of the item. Young found that for a group of appliances introduced in the United States before 1920—including the vacuum cleaner, the electric range, and the refrigerator—the average span between introduction and peak production was thirty-four years. But for a group that appeared in the 1939-1959 period—including the electric frying pan, television, and washer-dryer combination—the span was only eight years. The lag had shrunk by more than 76 percent. "The post-war group," Young declared, "demonstrated vividly the rapidly accelerating nature of the modern cycle."

KNOWLEDGE AS FUEL
The rate at which man has been storing up useful knowledge about himself and the universe has been spiraling upward for 10,000 years. The rate took a sharp upward leap with the invention of writing, but even so it remained painfully slow over centuries of time. The next great leap forward in knowledge—acquisition did not occur until the invention of movable type in the fifteenth century by Gutenberg and others. Prior to 1500, by the most optimistic estimates, Europe was producing books at a rate of 1000 titles per year. This means, give or take a bit, that it would take a full century to produce a library of 100,000 titles. By 1950, four and a half centuries later, the rate had accelerated so sharply that Europe was producing 120,000 titles a year. What once took a century now took only ten months. By 1960, a single decade later, the rate had made another significant jump, so that a century's work could be completed in seven and a half months. And, by the mid-sixties, the output of books on a world scale, Europe included, approached the prodigious figure of 1000 titles per day.

One can hardly argue that every book is a net gain for the advancement of knowledge. Nevertheless, we find that the accelerative curve in book publication does, in fact, crudely parallel the rate at which man discovered new knowledge.

The quietism and search for new ways to "opt out" or "cop out" that characterizes certain (though not all) hippies may be less motivated by their loudly expressed aversion for the values of a technological civilization than by an unconscious effort to escape from a pace of life that many find intolerable. It is no coincidence that they describe society as a "rat-race"—a term that refers quite specifically to pacing. Older people are even more likely to react strongly against any further acceleration of change. There is a solid mathematical basis for the observation that age often correlates with conservatism: time passes more swiftly for the old.

When a fifty-year-old father tells his fifteen-year-old son that he will have to wait two years before he can have a car of his own, that interval of 730 days represents a mere 4 percent of the father's lifetime to date. It represents over 13 percent of the boy's lifetime. It is hardly strange that to the boy the delay seems three or four times longer than to the father. Similarly, two hours in the life of a four-year-old may be the felt
equivalent of twelve hours in the life of her twenty-four-year-old mother. Asking the child to wait two hours for a piece of candy may be the equivalent of asking the mother to wait fourteen hours for a cup of coffee. There may be a biological basis as well, for such differences in subjective response to time. "With advancing age," writes psychologist John Cohen of the University of Manchester, "the calendar years seem progressively to shrink. In retrospect every year seems shorter than the year just completed, possibly as a result of the gradual slowing down of metabolic processes." In relation to the slowdown of their own biological rhythms, the world would appear to be moving faster to older people, even if it were not.

Whatever the reasons, any acceleration of change that has the effect of crowding more situations into the experiential channel in a given interval is magnified in the perception of the older person. As the rate of change in society speeds up, more and more older people feel the difference keenly. They, too, become dropouts, withdrawing into a private environment, cutting off as many contacts as possible with the fastmoving outside world, and, finally, vegetating until death. We may never solve the psychological problems of the aged until we find the means—through biochemistry or re-education—to alter their time sense, or to provide structured enclaves for them in which the pace of life is controlled, and even, perhaps, regulated according to a "sliding scale" calendar that reflects their own subjective perception of time. Much otherwise incomprehensible conflict—between generations, between parents and children, between husbands and wives—can be traced to differential responses to the acceleration of the pace of life. The same is true of clashes between cultures.

Each culture has its own characteristic pace. F. M. Esfandiary, the Iranian novelist and essayist, tells of a collision between two different pacing systems when German engineers in the pre-World War II period were helping to construct a railroad in his country. Iranians and Middle Easterners generally take a far more relaxed attitude toward time than Americans or Western Europeans. When Iranian work crews consistently showed up for work ten minutes late, the Germans, themselves superpunctual and always in a hurry, fired them in droves. Iranian engineers had a difficult time persuading them that by Middle Eastern standards the workers were being heroically punctual, and that if the firings continued there would soon be no one left to do the work but women and children. This indifference to time can be maddening to those who are fastpaced and clock-conscious. Thus Italians from Milan or Turin, the industrial cities of the North, look down upon the relatively slow-paced Sicilians, whose lives are still geared to the slower rhythms of agriculture. Swedes from Stockholm or Göteborg feel the same way about Laplanders. Americans speak with derision of Mexicans for whom mañana is soon enough. In the United States itself, Northerners regard Southerners as slow-moving, and middle-class Negroes condemn working-class Negroes just up from the South for operating on "C.P.T."—Colored People's Time. In contrast, by comparison with almost anyone else, white Americans and Canadians are regarded as hustling, fast-moving go-getters.
Populations sometimes actively resist a change of pace. This explains the pathological antagonism toward what many regard as the "Americanization" of Europe. The new technology on which superindustrialism is based, much of it blue-printed in American research laboratories, brings with it an inevitable acceleration of change in society and a concomitant speed-up of the pace of individual life as well. While anti-American orators single out computers or Coca-Cola for their barbs, their real objection may well be to the invasion of Europe by an alien time sense. America, as the spearhead of super-industrialism, represents a new, quicker, and very much unwanted tempo.

To understand why acceleration in the pace of life may prove disruptive and uncomfortable, it is important to grasp the idea of "durational expectancies."
Man's perception of time is closely linked with his internal rhythms. But his responses to time are culturally conditioned. Part of this conditioning consists of building up within the child a series of expectations about the duration of events, processes or relationships. Indeed, one of the most important forms of knowledge that we impart to a child is a knowledge of how long things last. This knowledge is taught, in subtle, informal and often unconscious ways. Yet without a rich set of socially appropriate durational expectancies, no individual could function successfully.

From infancy on the child learns, for example, that when Daddy leaves for work in the morning, it means that he will not return for many hours. (If he does, something is wrong; the schedule is askew. The child senses this. Even the family dog—having also learned a set of durational expectancies—is aware of the break in routine.) The child soon learns that "mealtime" is neither a one-minute nor a five-hour affair, but that it ordinarily lasts from fifteen minutes to an hour. He learns that going to a movie lasts two to four hours, but that a visit with the pediatrician seldom lasts more than one. He learns that the school day ordinarily lasts six hours. He learns that a relationship with a teacher ordinarily extends over a school year, but that his relationship with his grandparents is supposed to be of much longer duration. Indeed, some relationships are supposed to last a lifetime. In adult behavior, virtually all we do, from mailing an envelope to making love, is premised upon certain spoken or unspoken assumptions about duration.

It is these durational expectancies, different in each society but learned early and deeply ingrained, that are shaken up when the pace of life is altered. This explains a crucial difference between those who suffer acutely from the accelerated pace of life and those who seem rather to thrive on it. Unless an individual has adjusted his durational expectancies to take account of continuing acceleration, he is likely to suppose that two situations, similar in other respects, will also be similar in duration. Yet the accelerative thrust implies that at least certain kinds of situations will be compressed in time.
The individual who has internalized the principle of acceleration—who understands in his bones as well as his brain that things are moving faster in the world around him—makes an automatic, unconscious compensation for the compression of time. Anticipating that situations will endure less long, he is less frequently caught off guard and jolted than the person whose durational expectancies are frozen, the person who does not routinely anticipate a frequent shortening in the duration of situations.

In short, the pace of life must be regarded as something more than a colloquial phrase, a source of jokes, sighs, complaints or ethnic putdowns. It is a crucially important psychological variable that has been all but ignored. During past eras, when change in the outer society was slow, men could, and did, remain unaware of this variable. Throughout one's entire lifetime the pace might vary little. The accelerative thrust, however, alters this drastically. For it is precisely through a step-up in the pace of life that the increased speed of broad scientific, technological and social change makes itself felt in the life of the individual. A great deal of human behaviour is motivated by attraction or antagonism toward the pace of life enforced on the individual by the society or group within which he is embedded. Failure to grasp this principle lies behind the dangerous incapacity of education and psychology to prepare people for fruitful roles in a super-industrial society.

We develop a throw-away mentality to match our throw-away products. This mentality produces, among other things, a set of radically altered values with respect to property. But the spread of disposability through the society also implies decreased durations in man-thing relationships. Instead of being linked with a single object over a relatively long span of time, we are linked for brief periods with the succession of objects that supplant it.

It is therefore true that the consumer is sometimes caught in a carefully engineered trap—an old product whose death has been deliberately hastened by its manufacturer, and the simultaneous appearance of a "new improved" model advertised as the latest heaven-sent triumph of advanced technology. Nevertheless, these reasons by themselves cannot begin to account for the fantastic rate of turnover of the products in our lives. Rapid obsolescence is an integral part of the entire accelerative process—a process involving not merely the life span of sparkplugs, but of whole societies. Bound up with the rise of science and the speed-up in the acquisition of knowledge, this historic process can hardly be attributed to the evil design of a few contemporary hucksters.

Clearly, obsolescence occurs with or without "planning." With respect to things, obsolescence occurs under three conditions. It occurs when a product literally deteriorates to the point at which it can no longer fulfill its functions—bearings burn out, fabrics tear, pipes rust. Assuming the same functions still need to be performed for the consumer, the failure of a product to perform these functions marks the point at which its replacement is required. This is obsolescence due to functional failure. Obsolescence also occurs when some new product arrives on the scene to perform these functions more effectively than the old product
could. The new antibiotics do a more effective job of curing infection than the old. The new computers are infinitely faster and cheaper to operate than the antique models of the early 1960's. This is obsolescence due to substantive technological advance.

But obsolescence also occurs when the needs of the consumer change, when the functions to be performed by the product are themselves altered. These needs are not as simply described as the critics of planned obsolescence sometimes assume. An object, whether a car or a can opener, may be evaluated along many different parameters. A car, for example, is more than a conveyance. It is an expression of the personality of the user, a symbol of status, a source of that pleasure associated with speed, a source of a wide variety of sensory stimuli—tactile, olfactory, visual, etc. The satisfaction a consumer gains from such factors may, depending upon his values, outweigh the satisfaction he might receive from improved gas consumption or pickup power.

The traditional notion that each object has a single easily definable function clashes with all that we now know about human psychology, about the role of values in decision-making, and with ordinary common sense as well. All products are multi-functional.

The nomad of the past moved through blizzards and parching heat, always pursued by hunger, but he carried with him his buffalo-hide tent, his family and the rest of his tribe. He carried his social setting with him, and, as often as not, the physical structure that he called home. In contrast, the new nomads of today leave the physical structure behind. (It becomes an entry in the tables showing the turnover rate for things in their lives.) And they leave all but their family, the most immediate social setting, behind.

Today change is so swift and relentless in the techno-societies that yesterday's truths suddenly become today's fictions, and the most highly skilled and intelligent members of society admit difficulty in keeping up with the deluge of new knowledge—even in extremely narrow fields.

A BLIZZARD of BEST SELLERS
This impermanence is reflected in society in many subtle ways. A single dramatic example is the impact of the knowledge explosion on that classic knowledge-container, the book. As knowledge has become more plentiful and less permanent, we have witnessed the virtual disappearance of the solid old durable leather binding, replaced at first by cloth and later by paper covers. The book itself, like much of the information it holds, has become more transient.

A decade ago, communications systems designer Sol Cornberg, a radical prophet in the field of library technology, declared that reading would soon cease to be a primary form of information intake. "Reading and writing," he suggested, "will become obsolete skills."

The industrial revolution, bringing with it the enormous elaboration of the mass media, thus alters radically the nature of the messages received by the ordinary individual. In addition to receiving uncoded messages from the environment, and coded but casual messages from the people around him, the individual now begins to receive a growing
number of coded but pre-engineered messages as well.
These engineered messages differ from the casual or do-it-yourself product in one crucial respect: Instead of being loose or carelessly framed, the engineered product tends to be tighter, more condensed, less redundant. It is highly purposive, preprocessed to eliminate unnecessary repetition, consciously designed to maximize informational content. It is, as communications theorists say, "information-rich." This highly significant but often overlooked fact can be observed by anyone who takes the trouble to compare a tape recorded sample of 500 words of ordinary household conversation (i.e., coded, but casual) with 500 words of newspaper text or movie dialogue (also coded, but engineered). Casual conversation tends to be filled with repetition and pauses. Ideas are repeated several times, often in identical words, but if not, then varied only slightly.

In contrast, the 500 words of newspaper copy or movie dialogue are carefully pre-edited, streamlined. They convey relatively non-repetitive ideas. They tend to be more grammatically accurate than ordinary conversation and, if presented orally, they tend to be enunciated more clearly. Waste material has been trimmed away. Editor, writer, director—everyone involved in the production of the engineered message—fights to "keep the story moving" or to produce "fast-paced action." It is no accident that books, movies, television plays, are so frequently advertised as "high-speed adventure," "fast-reading," or "breathless." No publisher or movie producer would dare advertise his work as "repetitive" or "redundant."

Thus, as radio, television, newspapers, magazines and novels sweep through society, as the proportion of engineered messages received by the individual rises (and the proportion of uncoded and coded casual messages correspondingly declines), we witness a profound change: a steady speed-up in the average pace at which image-producing messages are presented to the individual. The sea of coded information that surrounds him begins to beat at his senses with new urgency. This helps account for the sense of hurry in everyday affairs. But if industrialism is marked by a communication's speed-up, the transition to super-industrialism is marked by intense efforts to accelerate the process even further. The waves of coded information turn into violent breakers and come at a faster and faster clip, pounding at us, seeking entry, as it were, to our nervous system.

In the United States today the median time spent by adults reading newspapers is fifty-two minutes per day. The same person who commits nearly an hour to newspapers also spends time reading magazines, books, signs, billboards, recipes, instructions, labels on cans, advertising on the back of breakfast food boxes, etc. Surrounded by print, he "ingests" between 10,000 and 20,000 edited words per day of the several times that many to which he is exposed. The same person also probably spends an hour and a quarter per day listening to the radio—more if he owns an FM receiver. If he listens to news, commercials, commentary or other such programs, he will, during this period, hear about 11,000 pre-processed words. He also spends several hours watching television—add another 10,000 words or so, plus a sequence of carefully arranged, highly
Nothing, indeed, is quite so purposive as advertising, and today the average American adult is assaulted by a minimum of 560 advertising messages each day. Of the 560 to which he is exposed, however, he only notices seventy-six. In effect, he blocks out 484 advertising messages a day to preserve his attention for other matters. All this represents the press of engineered messages against his senses. And the pressure is rising. In an effort to transmit even richer image-producing messages at an even faster rate, communications people, artists and others consciously work to make each instant of exposure to the mass media carry a heavier informational and emotional freight. Thus we see the widespread and increasing use of symbolism for compacting information. Today advertising men, in a deliberate attempt to cram more messages into the individual's mind within a given moment of time, make increasing use of the symbolic techniques of the arts. Consider the "tiger" that is allegedly put in one's tank. Here a single word transmits to the audience a distinct visual image that has been associated since childhood with power, speed, and force. The pages of advertising trade magazines like *Printer's Ink* are filled with sophisticated technical articles about the use of verbal and visual symbolism to accelerate image-flow. Indeed, today many artists might learn new image-accelerating techniques from the advertising men.

If the ad men, who must pay for each split second of time on radio or television, and who fight for the reader's fleeting attention in magazines and newspapers, are busy trying to communicate maximum imagery in minimum time, there is evidence, too, that at least some members of the public want to increase the rate at which they can receive messages and process images. This explains the phenomenal success of speed-reading courses among college students, business executives, politicians and others. One leading speed-reading school claims it can increase almost anyone's input speed three times, and some readers report the ability to read literally tens of thousands of words per minute—a claim roundly disputed by many reading experts. Whether or not such speeds are possible, the clear fact is that the rate of communication is accelerating. Busy people wage a desperate battle each day to plow through as much information as possible. Speed-reading presumably helps them do this. The impulse toward acceleration in communications is, however, by no means limited to advertising or to the printed word. A desire to maximize message content in minimum time explains, for example, the experiments conducted by psychologists at the American Institutes for Research who played taped lectures at faster than normal speeds and then tested the comprehension of listeners. Their purpose: to discover whether students would learn more if lecturers talked faster.

The same intent to accelerate information flow explains the recent obsession with split-screen and multiscreen movies. At the Montreal World's Fair, viewers in pavilion after pavilion were confronted not with a traditional movie screen on which ordered visual images appear in sequence, but with two, three, or five screens, each of them hurling messages at the viewer at the same time. On these, several stories play themselves out at the same time, demanding of the viewer the ability to accept many more messages simultaneously than any movie-goer in the
past, or else to censor out, or block, certain messages to keep the rate of
date-input, or image-stimulation, within reasonable limits.
The author of an article in *Life*, entitled "A Film Revolution to Blitz
Man's Mind," accurately describes the experience in these words: "Having
to look at six images at the same time, having to watch in twenty minutes
the equivalent of a full length movie, excites and crams the mind."
Elsewhere he suggests that another multi-screen film "by putting more into
a moment, condenses time."
Even in music the same accelerative thrust is increasingly evident. A
conference of composers and computer specialists held in San Francisco
not long ago was informed that for several centuries music has been
undergoing "an increase in the amount of auditory information transmitted
during a given interval of time," and there is evidence also that musicians
today play the music of Mozart, Bach and Haydn at a faster tempo than
that at which the same music was performed at the time it was composed.
We are getting Mozart on the run.

THE SEMI-LITERATE SHAKESPEARE
If our images of reality are changing more rapidly, and the machinery of
image-transmission is being speeded up, a parallel change is altering the
very codes we use. For language, too, is convulsing. According to
lexicographer Stuart Berg Flexner, senior editor of the *Random House
Dictionary of the English Language*, "The words we use are changing
to faster today—and not merely on the slang level, but on every level. The
rapidity with which words come and go is vastly accelerated. This seems
to be true not only of English, but of French, Russian and Japanese as
well."
Flexner illustrated this with the arresting suggestion that, of the
estimated 450,000 "usable" words in the English language today, only
perhaps 250,000 would be comprehensible to William Shakespeare. Were
Shakespeare suddenly to materialize in London or New York today, he
would be able to understand, on the average, only five out of every
nine words in our vocabulary. The Bard would be a semi-literate.
This implies that if the language had the same number of words in
Shakespeare's time as it does today, at least 200,000 words—perhaps
several times that many—have dropped out and been replaced in the
intervening four centuries. Moreover, Flexner conjectures that a full third
of this turnover has occurred within the last fifty years alone. This, if
correct, would mean that words are now dropping out of the language and
being replaced at a rate at least three times faster than during the base
period 1564 to 1914.

This high turnover rate reflects changes in things, processes, and
qualities in the environment. Some new words come directly from the
world of consumer products and technology. Thus, for example, words
like "fast-back," "wash-and-wear" or flashcube" were all propelled into the
language by advertising in recent years. Other words come from the
headlines. "Sit-in" and "swim-in" are recent products of the civil rights
movement; "teach-in" a product of the campaign against the Vietnam war;
"be-in" and "love-in" products of the hippie subculture. The LSD cult has
brought with it a profusion of new words—"acid-head," "psychedelic,"
etc.
THE CYBORGS AMONG US
Today the man with a pacemaker or a plastic aorta is still recognizably a man. The inanimate part of his body is still relatively unimportant in terms of his personality and consciousness. But as the proportion of machine components rises, what happens to his awareness of self, his inner experience? If we assume that the brain is the seat of consciousness and intelligence, and that no other part of the body affects personality or self very much, then it is possible to conceive of a disembodied brain—a brain without arms, legs, spinal cord or other equipment—as a self, a personality, an embodiment of awareness. It may then become possible to combine the human brain with a whole set of artificial sensors, receptors and effectors, and to call that tangle of wires and plastic a human being. All this may seem to resemble medieval speculation about the number of angels who can pirouette on a pinhead, yet the first small steps toward some form of man-machine symbiosis are already being taken. Moreover, they are being taken not by a lone mad scientist, but by thousands of highly trained engineers, mathematicians, biologists, surgeons, chemists, neurologists and communications specialists.

In the meantime, research from countless sources contributes toward the eventual symbiosis. In one of the most fascinating, frightening and intellectually provocative experiments ever recorded, Professor Robert White, director of neurosurgery at the Metropolitan General Hospital in Cleveland, has given evidence that the brain can be isolated from its body and kept alive after the "death" of the rest of the organism. The experiment, described in a brilliant article by Oriana Fallaci, saw a team of neurosurgeons cut the brain out of a rhesus monkey, discard the body, then hook the brain's carotid arteries up to another monkey, whose blood then continued to bathe the disembodied organ, keeping it alive. Said one of the members of the medical team, Dr. Leo Massopust, a neurophysiologist: "The brain activity is largely better than when the brain had a body ... No doubt about it. I even suspect that without his senses, he can think more quickly. What kind of thinking, I don't know. I guess he is primarily a memory, a repository for information stored when he had his flesh; he cannot develop further because he no longer has the nourishment of experience. Yet this, too, is a new experience."
The brain survived for five hours. It could have lasted much longer, had it served the purposes of research. Professor White has successfully kept other brains alive for days, using machinery, rather than a living monkey, to keep the brain washed with blood. "I don't think we have reached the stage," he told Miss Fallaci, "where you can turn men into robots, obedient sheep. Yet ... it could happen, it isn't impossible. If you consider that we can transfer the head of a man onto the trunk of another man, if you consider that we can isolate the brain of a man and make it work without its body ... To me, there is no longer any gap between science fiction and science ... We could keep Einstein's brain alive and make it function normally."
Not only, Professor White implies, can we transfer the head of one man to the shoulders of another, not only can we keep a head or a brain "alive" and functioning, but it can all be done, with "existing techniques." Indeed, he declares, "The Japanese will be the first to [keep an isolated human head alive]. I will not, because I haven't resolved as yet this
dilemma: Is it right or not?” A devout Catholic, Dr. White is deeply troubled by the philosophical and moral implications of his work. As the brain surgeons and the neurologists probe further, as the bioengineers and the mathematicians, the communications experts and robotbuilders become more sophisticated, as the space men and their capsules grow closer and closer to one another, as machines begin to embody biological components and men come bristling with sensors and mechanical organs, the ultimate symbiosis approaches. The work converges. Yet the greatest marvel of all is not organ transplantation or symbiosis or underwater engineering. It is not technology, nor science itself.

The greatest and most dangerous marvel of all is the complacent past-orientation of the race, its unwillingness to confront the reality of acceleration. Thus man moves swiftly into an unexplored universe, into a totally new stage of eco-technological development, firmly convinced that "human nature is eternal" or that "stability will return." He stumbles into the most violent revolution in human history muttering, in the words of one famous, though myopic sociologist, that "the processes of modernization ... have been more or less 'completed.'" He simply refuses to imagine the future.

A SYSTEM OF SKILLS
Unfortunately, this necessary diversification of data offerings will deepen the problems of overchoice in our lives. Any program of diversification must therefore be accompanied by strong efforts to create common reference points among people through a unifying system of skills. While all students should not study the same course, imbibe the same facts, or store the same sets of data, all students should be grounded in certain common skills needed for human communication and social integration.

If we assume a continuing rise in transience, novelty and diversity, the nature of some of these behavioral skills becomes clear. A powerful case can be made, for example, that the people who must live in superindustrial societies will need new skills in three crucial areas: learning, relating and choosing.

Learning. Given further acceleration, we can conclude that knowledge will grow increasingly perishable. Today's "fact" becomes tomorrow's "misinformation." This is no argument against learning facts or data—far from it. But a society in which the individual constantly changes his job, his place of residence, his social ties and so forth, places an enormous premium on learning efficiency. Tomorrow's schools must therefore teach not merely data, but ways to manipulate it. Students must learn how to discard old ideas, how and when to replace them. They must, in short, learn how to learn.

Early computers consisted of a "memory" or bank of data plus a "program" or set of instructions that told the machine how to manipulate the data. Large late-generation computer systems not only store greater masses of data, but multiple programs, so that the operator can apply a variety of programs to the same data base. Such systems also require a "master program" that, in effect, tells the machine which program to apply and when. The multiplication of programs and addition of a master program vastly increased the power of the computer. A similar strategy can be used to enhance human adaptability. By
instructing students how to learn, unlearn and relearn, a powerful new dimension can be added to education. Psychologist Herbert Gerjuoy of the Human Resources Research Organization phrases it simply: "The new education must teach the individual how to classify and reclassify information, how to evaluate its veracity, how to change categories when necessary, how to move from the concrete to the abstract and back, how to look at problems from a new direction—how to teach himself. Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned how to learn."

**Relating.** We can also anticipate increasing difficulty in making and maintaining rewarding human ties, if life pace continues its acceleration. Listening intently to what young people are saying makes it clear that the once-simple business of forging real friendships has already assumed new complexity for them. When students complain, for instance, that "people can't communicate," they are not simply referring to crossing the generational divide, but to problems they have among themselves as well. "New people in the last four days are all the ones that I remember," writes Rod McKuen, a songwriter and poet currently popular among the youth. Once the transience factor is recognized as a cause of alienation, some of the superficially puzzling behavior of young people becomes comprehensible. Many of them, for example, regard sex as a quick way to "get to know someone." Instead of viewing sexual intercourse as something that follows a long process of relationship-building, they see it, rightly or not, as a shortcut to deeper human understanding. The same wish to accelerate friendship helps explain their fascination with such psychological techniques as "sensitivity training," "Tgrouping," "micro-labs," so-called "touchie-feelie" or non-verbal games, and the whole group dynamics phenomenon in general. Their enthusiasm for communal living, too, expresses the underlying sense of loneliness and inability to "open up" with others.

All these activities throw participants into intimate psychological contact without lengthy preparation, often without advance acquaintance. In many cases, the relationships are short-lived by design, the purpose of the game being to intensify affective relationships despite the temporariness of the situation.

By speeding the turnover of people in our lives, we allow less time for trust to develop, less time for friendships to ripen. Thus we witness a search for ways to cut through the polite "public" behaviour directly to the sharing of intimacy.

One may doubt the effectiveness of these experimental techniques for breaking down suspicion and reserve, but until the rate of human turnover is substantially slowed, education must help people to accept the absence of deep friendships, to accept loneliness and mistrust—or it must find new ways to accelerate friendship formation. Whether by more imaginative grouping of students, or by organizing new kinds of work-teams, or through variations of the techniques discussed above, education will have to teach us to relate.

**Choosing.** If we also assume that the shift toward super-industrialism will multiply the kinds and complexities of decisions facing the individual, it becomes apparent that education must address the issue of overchoice directly.
Adaptation involves the making of successive choices. Presented with numerous alternatives, an individual chooses the one most compatible with his values. As overchoice deepens, the person who lacks a clear grasp of his own values (whatever these may be) is progressively crippled. Yet the more crucial the question of values becomes, the less willing our present schools are to grapple with it. It is no wonder that millions of young people trace erratic pathways into the future, ricocheting this way and that like unguided missiles.

In pre-industrial societies, where values are relatively stable, there is little question about the right of the older generation to impose its values on the young. Education concerns itself as much with the inculcation of moral values as with the transmission of skills. Even during early industrialism, Herbert Spencer maintained that "Education has for its object the formation of character," which, freely translated, means the seduction or terrorization of the young into the value systems of the old. As the shock waves of the industrial revolution rattled the ancient architecture of values and new conditions demanded new values, educators backed off. As a reaction against clerical education, teaching facts and "letting the student make up his own mind" came to be regarded as a progressive virtue. Cultural relativism and an appearance of scientific neutrality displaced the insistence on traditional values. Education clung to the rhetoric of character formation, but educators fled from the very idea of value inculcation, deluding themselves into believing that they were not in the value business at all.

Today it embarrasses many teachers to be reminded that all sorts of values are transmitted to students, if not by their textbooks then by the informal curriculum—seating arrangements, the school bell, age segregation, social class distinctions, the authority of the teacher, the very fact that students are in a school instead of the community itself. All such arrangements send unspoken messages to the student, shaping his attitudes and outlook. Yet the formal curriculum continues to be presented as though it were value-free. Ideas, events, and phenomena are stripped of all value implications, disembodied from moral reality.

By now the accelerative thrust triggered by man has become the key to the entire evolutionary process on the planet. The rate and direction of the evolution of other species, their very survival, depends upon decisions made by man. Yet there is nothing inherent in the evolutionary process to guarantee man's own survival. Throughout the past, as successive stages of social evolution unfolded, man's awareness followed rather than preceded the event. Because change was slow, he could adapt unconsciously, "organically." Today unconscious adaptation is no longer adequate. Faced with the power to alter the gene, to create new species, to populate the planets or depopulate the earth, man must now assume conscious control of evolution itself. Avoiding future shock as he rides the waves of change, he must master evolution, shaping tomorrow to human need. Instead of rising in revolt against it, he must, from this historic moment on, anticipate and design the future.

This, then, is the ultimate objective of social futurism, not merely the transcendence of technocracy and the substitution of more humane, more
far-sighted, more democratic planning, but the subjection of the process of evolution itself to conscious human guidance. For this is the supreme instant, the turning point in history at which man either vanquishes the processes of change or vanishes, at which, from being the unconscious puppet of evolution he becomes either its victim or its master. A challenge of such proportions demands of us a dramatically new, a more deeply rational response toward change. This book has had change as its protagonist—first as potential villain and then, it would seem, as potential hero. In calling for the moderation and regulation of change, it has called for additional revolutionary changes. This is less paradoxical than it appears. Change is essential to man, as essential now in our 800th lifetime as it was in our first. Change is life itself. But change rampant, change unguided and unrestrained, accelerated change overwhelming not only man's physical defenses but his decisional processes—such change is the enemy of life.

Our first and most pressing need, therefore, before we can begin to gently guide our evolutionary destiny, before we can build a humane future, is to halt the runaway acceleration that is subjecting multitudes to the threat of future shock while, at the very same moment, intensifying all the problems they must deal with—war, ecological incursions, racism, the obscene contrast between rich and poor, the revolt of the young, and the rise of a potentially deadly mass irrationalism.

There is no facile way to treat this wild growth, this cancer in history. There is no magic medicine, either, for curing the unprecedented disease it bears in its rushing wake: future shock. I have suggested palliatives for the change-pressed individual and more radically curative procedures for the society—new social services, a future-facing education system, new ways to regulate technology, and a strategy for capturing control of change. Other ways must also be found. Yet the basic thrust of this book is diagnosis. For diagnosis precedes cure, and we cannot begin to help ourselves until we become sensitively conscious of the problem. These pages will have served their purpose if, in some measure, they help create the consciousness needed for man to undertake the control of change, the guidance of his evolution. For, by making imaginative use of change to channel change, we cannot only spare ourselves the trauma of future shock, we can reach out and humanize distant tomorrows.