Future Shock
by Alvin Toffler

Chapter 4

THINGS: THE THROW-AWAY SOCIETY

"Barbie," a twelve-inch plastic teen-ager, is the best-known and best-selling doll in history. Since its introduction in 1959, the Barbie doll population of the world has grown to 12,000,000—more than the human population of Los Angeles or London or Paris. Little girls adore Barbie because she is highly realistic and eminently dress-upable. Mattel, Inc., makers of Barbie, also sells a complete wardrobe for her, including clothes for ordinary daytime wear, clothes for formal party wear, clothes for swimming and skiing.

Recently Mattel announced a new improved Barbie doll. The new version has a slimmer figure, "real" eyelashes, and a twist-and-turn waist that makes her more humanoid than ever. Moreover, Mattel announced that, for the first time, any young lady wishing to purchase a new Barbie would receive a trade-in allowance for her old one.

What Mattel did not announce was that by trading in her old doll for a technologically improved model, the little girl of today, citizen of tomorrow's super-industrial world, would learn a fundamental lesson about the new society: that man's relationships with *things* are increasingly temporary.

The ocean of man-made physical objects that surrounds us is set within a larger ocean of natural objects. But increasingly, it is the technologically produced environment that matters for the individual. The texture of plastic or concrete, the iridescent glisten of an automobile under a streetlight, the staggering vision of a cityscape seen from the window of a jet—these are the intimate realities of his existence. Man-made things enter into and color his consciousness. Their number is expanding with explosive force, both absolutely and relative to the natural environment. This will be even more true in super-industrial society than it is today.

Anti-materialists tend to deride the importance of "things." Yet things are highly significant, not merely because of their functional utility, but also because of their psychological impact. We develop relationships with things. Things affect our sense of continuity or discontinuity. They play a role in the structure of situations and the foreshortening of our relationships with things accelerates the pace of life.

Moreover, our attitudes toward things reflect basic value judgments. Nothing could be more dramatic than the difference between the new breed of little girls who cheerfully turn in their Barbies for the new improved model and those who, like their mothers and grandmothers before them, clutch lingeringly and lovingly to the same doll until it disintegrates from sheer age. In this difference lies the contrast between past and future, between societies based on permanence, and the new, fast-forming society based on transience.

THE PAPER WEDDING GOWN

That man-thing relationships are growing more and more temporary may be illustrated by examining the culture surrounding the little girl who trades in her doll. This child soon learns that Barbie dolls are by no means the only physical objects that pass into and out of her young life at a rapid clip. Diapers, bibs, paper napkins, Kleenex, towels, non-returnable soda bottles—all are used up quickly in her home and ruthlessly eliminated. Corn muffins come in baking tins that are thrown away after one use. Spinach is encased in plastic sacks that can be

dropped into a pan of boiling water for heating, and then thrown away. TV dinners are cooked and often served on throw-away trays. Her home is a large processing machine through which objects flow, entering and leaving, at a faster and faster rate of speed. From birth on, she is inextricably embedded in a throw-away culture.

The idea of using a product once or for a brief period and then replacing it, runs counter to the grain of societies or individuals steeped in a heritage of poverty. Not long ago Uriel Rone, a market researcher for the French advertising agency Publicis, told me: "The French housewife is not used to disposable products. She likes to keep things, even old things, rather than throw them away. We represented one company that wanted to introduce a kind of plastic throw-away curtain. We did a marketing study for them and found the resistance too strong." This resistance, however, is dying all over the developed world.

Thus a writer, Edward Maze, has pointed out that many Americans visiting Sweden in the early 1950's were astounded by its cleanliness. "We were almost awed by the fact that there were no beer and soft drink bottles by the roadsides, as, much to our shame, there were in America. But by the 1960's, lo and behold, bottles were suddenly blooming along Swedish highways ... What happened? Sweden had become a buy, use and throw-away society, following the American pattern." In Japan today throw-away tissues are so universal that cloth handkerchiefs are regarded as old fashioned, not to say unsanitary. In England for sixpence one may buy a "Dentamatic throw-away toothbrush" which comes already coated with toothpaste for its one-time use. And even in France, disposable cigarette lighters are commonplace. From cardboard milk containers to the rockets that power space vehicles, products created for short-term or one-time use are becoming more numerous and crucial to our way of life.

The recent introduction of paper and quasi-paper clothing carried the trend toward disposability a step further. Fashionable boutiques and working-class clothing stores have sprouted whole departments devoted to gaily colored and imaginatively designed paper apparel. Fashion magazines display breathtakingly sumptuous gowns, coats, pajamas, even wedding dresses made of paper. The bride pictured in one of these wears a long white train of lace-like paper that, the caption writer notes, will make "great kitchen curtains" after the ceremony.

Paper clothes are particularly suitable for children. Writes one fashion expert: "Little girls will soon be able to spill ice cream, draw pictures and make cutouts on their clothes while their mothers smile benignly at their creativity." And for adults who want to express their own creativity, there is even a "paint-yourself-dress" complete with brushes. Price: $2.00.

Price, of course, is a critical factor behind the paper explosion. Thus a department store features simple A-line dresses made of what it calls "devil-may-care cellulose fiber and nylon." At $1.29 each, it is almost cheaper for the consumer to buy and discard a new one than to send an ordinary dress to the cleaners. Soon it will be. But more than economics is involved, for the extension of the throw-away culture has important psychological consequences.

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.

THE MISSING SUPERMARKET

The shift toward transience is even manifest in architecture—precisely that part of the physical environment that in the past contributed mostly heavily to man's sense of permanence. The child who trades in her Barbie doll cannot but also recognize the transience of buildings and other large structures that surround her. We raze landmarks. We tear down whole streets and cities and put new ones up at a mind-numbing rate.

"The average age of dwellings has steadily declined," writes E. F. Carter of the Stanford Research Institute, "from being virtually infinite in the days of caves to ... approximately a hundred years for houses built in United States colonial days, to about forty years at present." And Michael Wood, an English writer comments: The American "... made his world yesterday, and he knows exactly how fragile, how shifting it is. Buildings in New York literally disappear overnight, and the face of a city can change completely in a year."

Novelist Louis Auchincloss complains angrily that "The horror of living in New York is living in a city without a history ... All eight of my great-grandparents lived in the city ... and only one of the houses they lived in ... is still standing. That's what I mean by the vanishing past." Less patrician New Yorkers, whose ancestors landed in America more recently, arriving there from the barrios of Puerto Rico, the villages of Eastern Europe or the plantations of the South, might voice their feelings quite differently. Yet the "Vanishing past" is a real phenomenon, and it is likely to become far more widespread, engulfing even many of the history-drenched cities of Europe.

Buckminster Fuller, the designer-philosopher, once described New York as a "continual evolutionary process of evacuations, demolitions, removals, temporarily vacant lots, new installations and repeat. This process is identical in principle to the annual rotation of crops in farm acreage—plowing, planting the new seed, harvesting, plowing under, and putting in another type of crop ... Most people look upon the building operations blocking New York's streets ... as temporary annoyances, soon to disappear in a static peace. They still think of permanence as normal, a hangover from the Newtonian view of the universe. But those who have lived in and with New York since the beginning of the century have literally experienced living with Einsteinian relativity."

That children, in fact, internalize this "Einsteinian relativity" was brought home to me forcibly by a personal experience. Some time ago my wife sent my daughter, then twelve, to a supermarket a few blocks from our Manhattan apartment. Our little girl had been there only once or twice before. Half an hour later she returned perplexed. "It must have been torn down," she said, "I couldn't find it." It hadn't been. New to the neighborhood, Karen had merely looked on the wrong block. But she is a child of the Age of Transience, and her immediate assumption—that the building had been razed and replaced—was a natural one for a twelve-year-old growing up in the United States at this time. Such an idea would probably never have occurred to a child faced with a similar predicament even half a century ago. The physical environment was far more durable, our links with it less transient.

THE ECONOMICS OF IMPERMANENCE

In the past, permanence was the ideal. Whether engaged in handcrafting a pair of boots or in constructing a cathedral, all man's creative and productive energies went toward maximizing the durability of the product. Man built to last. He had to. As long as the society around him was relatively unchanging each object had clearly defined functions, and economic logic dictated the policy of permanence. Even if they had to be repaired now and then, the boots that cost fifty dollars and lasted ten years were less expensive than those that cost ten dollars and lasted only a year.

As the general rate of change in society accelerates, however, the economics of permanence are—and must be—replaced by the economics of transience.

First, advancing technology tends to lower the costs of manufacture much more rapidly than the costs of repair work. The one is automated, the other remains largely a handcraft operation. This means that it often becomes cheaper to replace than to repair. It is economically sensible to build cheap, unrepairable, throwaway objects, even though they may not last as long as repairable objects.

Second, advancing technology makes it possible to improve the object as time goes by. The second generation computer is better than the first, and the third is better than the second. Since we can anticipate further technological advance, more improvements coming at ever shorter intervals, it often makes hard economic sense to build for the short term rather than the long. David Lewis, an architect and city planner with Urban Design Associates in Pittsburgh, tells of certain apartment houses in Miami that are torn down after only ten years of existence. Improved air conditioning systems in newer buildings hurt the rentability of these "old" buildings. All things considered, it becomes cheaper to tear down the ten-year-old buildings than to modify them.

Third, as change accelerates and reaches into more and more remote corners of the society, uncertainty about future needs increases. Recognizing the inevitability of change, but unsure as to the demands it will impose on us, we hesitate to commit large resources for rigidly fixed objects intended to serve unchanging purposes. Avoiding commitment to fixed forms and functions, we build for short-term use or, alternatively, attempt to make the product itself adaptable. We "play it cool" technologically.

The rise of disposability—the spread of the throw-away culture—is a response to these powerful pressures. As change accelerates and complexities multiply, we can expect to see further extensions of the principle of disposability, further curtailment of man's relationships with things.

THE PORTABLE PLAYGROUND

There are other responses besides disposability that also lead to the same psychological effect. For example, we are now witnessing the wholesale creation of objects designed to serve a series of short-term purposes instead of a single one. These are not throw-away items. They are usually too big and expensive to discard. But they are so constructed that they may be dismantled, if necessary, and relocated after each use.

Thus the board of education of Los Angeles has decided that fully 25 percent of that city's classrooms will, in the future, be temporary structures that can be moved around as needed. Every major United States school district today uses some temporary classrooms. More are on the way. Indeed, temporary classrooms are to the school construction industry what paper dresses are to the clothing industry—a foretaste of the future.

The purpose of temporary classrooms is to help school systems cope with rapidly shifting population densities. But temporary classrooms, like disposable clothes, imply man-thing relationships of shorter duration than in the past. Thus the temporary classroom teaches something even in the absence of a teacher. Like the Barbie doll, it provides the child with a vivid lesson in the impermanence of her surroundings. No sooner does the child internalize a thorough knowledge of the classroom—the way it fits into the surrounding architecture, the way the desks feel on a hot day, the way sound reverberates in it, all the subtle smells and textures that individualize any structure and lend it reality—than the structure itself may be physically removed from her environment to serve other children in another place.

Nor are mobile classrooms a purely American phenomenon. In England, architect Cedric Price has designed what he calls a "thinkbelt"—an entirely mobile university intended to serve 20,000 students in North Staffordshire. "It will," he says, "rely on temporary buildings rather than permanent ones." It will make "great use of mobile and variable physical enclosures"—classrooms, for example, built inside railroad cars so that they may be shunted anywhere along the four-mile campus.

Geodesic domes to house expositions, air-inflated plastic bubbles for use as command posts or construction headquarters, a whole array of pick-up-and-move temporary structures are flowing from the drawing boards of engineers and architects. In New York City, the Department of Parks has decided to build twelve "portable playgrounds"—small, temporary playgrounds to be installed on vacant city lots until other uses are found for the land, at which time the playgrounds can be dismounted and moved elsewhere. There was a time when a playground was a reasonably permanent fixture in a neighborhood, when one's children and even, perhaps, one's children's children might, each in their turn, experience it in roughly the same way. Super-industrial playgrounds, however, refuse to stay put. They are temporary by design.

THE MODULAR "FUN PALACE"

The reduction in the duration of man-thing relationships brought about by the proliferation of throw-away items and temporary structures is further intensified by the rapid spread of "modularism." Modularism may be defined as the attempt to lend whole structures greater permanence at the cost of making their sub-structures less permanent. Thus Cedric Price's "thinkbelt" plan proposes that faculty and student apartments consist of pressed-steel modules that can be hoisted by crane and plugged into building frames. The frames become the only relatively permanent parts of the structure. The apartment modules can be shifted around as needed, or even, in theory, completely discarded and replaced.

It needs to be emphasized here that the distinction between disposability and mobility is, from the point of view of the duration of relationships, a thin one. Even when modules are not discarded, but merely rearranged, the result is a new configuration, a new entity. It is as if one physical structure had, in reality, been discarded and a new one created, even though some or all of the components remain the same.

Even many supposedly "permanent" buildings today are constructed on a modular plan so that interior walls and partitions may be shifted at will to form new enclosure patterns inside. The mobile partition, indeed, might well serve as a symbol of the transient society. One scarcely ever enters a large office today without tripping over a crew of workers busily moving desks and rearranging interior space by reorganizing the partitions. In Sweden a new triumph of modularism has recently been achieved: in a model apartment house in Uppsala *all* walls and closets are movable. The tenant needs only a screwdriver to transform his living space completely, to create, in effect, a new apartment.

Sometimes, however, modularity is directly combined with disposability. The simple, ubiquitous ballpoint pen provides an example. The original goose-quill pen had a long life expectancy. Barring accident, it lasted a long time and could be resharpened (i.e., repaired) from time to time to extend its life. The fountain pen, however, was a great technological advance because it gave the user mobility. It provided a writing tool that carried its own inkwell, thus vastly increasing its range of usefulness. The invention of the ball point consolidated and extended this advance. It provided a pen that carried its own ink supply, but that, in addition, was so cheap it could be thrown away when empty. The first truly disposable pen-and-ink combination had been created.

We have, however, not yet outgrown the psychological attitudes that accompany scarcity. Thus there are still many people today who feel a twinge of guilt at discarding even a spent ball-point pen. The response of the pen industry to this psychological reality was the creation of a ball-point pen built on the modular principle—an outer frame that the user could keep, and an inner ink module or cartridge that he could throw away and replace. By making the ink cartridge expendable, the whole structure is given extended life at the expense of the sub-structure.

There are, however, more parts than wholes. And whether he is shifting them around to create new wholes or discarding and replacing them, the user experiences a more rapid through-put of things through his life, a generalized decline in the average duration of his relationship with things. The result is a new fluidity, mobility and transience.

One of the most extreme examples of architecture designed to embody these principles was the plan put forward by the English theatrical producer Joan Littlewood with the help of Frank Newby, a structural engineer, Gordon Pask, a systems consultant, and Cedric Price, the "thinkbelt" architect.

Miss Littlewood wanted a theater in which versatility might be maximized, in which she might present anything from an ordinary play to a political rally, from a performance of dance to a wrestling match—preferably all at the same time. She wanted, as the critic Reyner Banham has put it, a "zone of total probability." The result was a fantastic plan for "The Fun Palace," otherwise known as the "First Giant Space Mobile in the World." The plan calls not for a multi-purpose building, but for what is, in effect, a larger than life-sized Erector Set, a collection of modular parts that can be hung together in an almost infinite variety of ways. More or less "permanent" vertical towers house various services—such as toilets and electronic control units—and are topped by gantry cranes that lift the modules into position and assemble them to form any temporary configuration desired. After an evening's entertainment, the cranes come out, disassemble the auditoria, exhibition halls and restaurants, and store them away.

Here is the way Reyner Banham describes it: "... the Fun Palace is a piece of ten-year-expendable urban equipment ... Day by day this giant neo-Futurist machine will stir and reshuffle its movable parts—walls and floors, ramps and walks, steerable escalators, seating and roofing, stages and movie screens, lighting and sound systems—sometimes with only a small part walled in, but with the public poking about the exposed walks and stairs, pressing buttons to make things happen themselves.

"This, when it happens (and it is on the cards that it will, somewhere, soon) will be indeterminacy raised to a new power: no permanent monumental interior space or heroic silhouette against the sky will survive for posterity ... For the only permanently visible elements of the Fun Palace will be the 'life-support' structure on which the transient architecture will be parasitic."

Proponents of what has become known as "plug-in" or "clip-on" architecture have designed whole cities based on the idea of "transient architecture." Extending the concepts on which the Fun Palace plan is based, they propose the construction of different types of modules which would be assigned different life expectancies. Thus the core of a "building" might be engineered to last twenty-five years, while the plug-in room modules are built to last only three years. Letting their imaginations roam still further, they have conjured up mobile skyscrapers that rest not on fixed foundations but on gigantic "ground effect" machines or hovercraft. The ultimate is an entire urban agglomeration freed of fixed position, floating on a cushion of air, powered by nuclear energy, and changing its inner shape even more rapidly than New York does today.

Whether or not precisely these visions become reality, the fact is that society is moving in this direction. The extension of the throw-away culture, the creation of more and more

temporary structures, the spread of modularism are proceeding apace, and they all conspire toward the same psychological end: the ephemeralization of man's links with the things that surround him.

THE RENTAL REVOLUTION

Still another development is drastically altering the man-thing nexus: the rental revolution. The spread of rentalism, a characteristic of societies rocketing toward super-industrialism, is intimately connected with all the tendencies described above. The link between Hertz cars, disposable diapers, and Joan Littlewood's "Fun Palace," may seem obscure at first glance, but closer inspection reveals strong inner similarities. For rentalism, too, intensifies transience.

During the depression, when millions were jobless and homeless, the yearning for a home of one's own was one of the most powerful economic motivations in capitalist societies. In the United States today the desire for home ownership is still strong, but ever since the end of World War II the percentage of new housing devoted to rental apartments has been soaring. As late as 1955 apartments accounted for only 8 percent of new housing starts. By 1961 it reached 24 percent. By 1969, for the first time in the United States, more building permits were being issued for apartment construction than for private homes. Apartment living, for a variety of reasons, is "in." It is particularly in among young people who, in the words of MIT Professor Burnham Kelly, want "minimum-involvement housing."

Minimum involvement is precisely what the user of a throw-away product gets for his money. It is also what temporary structures and modular components foster. Commitments to apartments are, almost by definition, shorter term commitments than those made by a homeowner to his home. The trend toward residential renting thus underscores the tendency toward ever-briefer relationships with the physical environment.*

More striking than this, however, has been the recent upsurge of rental activity in fields in which it was all but unknown in the past. David Riesman has written: "People are fond of their cars; they like to talk about them—something that comes out very clearly in interviews—but their affection for any one in particular rarely reaches enough intensity to become long-term." This is reflected in the fact that the average car owner in the United States keeps his automobile only three and a half years; many of the more affluent trade in their automobiles every year or two. In turn, this accounts for the existence of a twenty-billion-dollar used car business in the United States. It was the automotive industry that first succeeded in destroying the traditional notion that a major purchase had to be a permanent commitment. The annual model changeover, high-powered advertising, backed by the industry's willingness to offer trade-in allowances, made the purchase of a new (or new used) car a relatively frequent occurrence in the life of the average American male. In effect, it shortened the interval between purchases, thereby shortening the duration of the relationship between an owner and any one vehicle.

In recent years, however, a spectacular new force has emerged to challenge many of the most deeply ingrained patterns of the automotive industry. This is the auto rental business. Today in the United States millions of motorists rent automobiles from time to time for periods of a few hours up to several months. Many big-city dwellers, especially in New York where parking is a nightmare, refuse to own a car, preferring to rent one for weekend trips to the country, or even for in-town trips that are inconvenient by public transit. Autos today can be rented with a minimum of red tape at almost any US airport, railroad station or hotel.

Moreover, Americans have carried the rental habit abroad with them. Nearly half a million of them rent cars while overseas each year. This figure is expected to rise to nearly a million by 1975, and the big American rental companies, operating now in some fifty

countries around the globe, are beginning to run into foreign competitors. Simultaneously, European motorists are beginning to emulate the Americans. A cartoon in *Paris Match* shows a creature from outer space standing next to his flying saucer and asking a gendarme where he can rent an auto. The idea is catching on.

The rise of auto rentals, meanwhile, has been paralleled by the emergence in the United States of a new kind of general store—one which sells nothing but rents everything. There are now some 9000 such stores in the United States with an annual rental volume on the order of one billion dollars and a growth rate of from 10 to 20 percent per year. Virtually 50 percent of these stores were not in business five years ago. Today, there is scarcely a product that cannot be rented, from ladders and lawn equipment to mink coats and originals Rouaults.

In Los Angeles, rental firms provide live shrubs and trees for real estate developers who wish to landscape model homes temporarily. "Plants enhance—rent living plants," says the sign on the side of a truck in San Francisco. In Philadelphia one may rent shirts. Elsewhere, Americans now rent everything from gowns, crutches, jewels, TV sets, camping equipment, air conditioners, wheelchairs, linens, skis, tape recorders, champagne fountains, and silverware. A West Coast men's club rented a human skeleton for a demonstration, and an ad in the *Wall Street Journal* even urges: "Rent-a-Cow."

Not long ago the Swedish women's magazine *Svensk Damtidning* ran a five-part series about the world of 1985. Among other things, it suggested that by then "we will sleep in built-in sleeping furniture with buttons for when we eat breakfast or read, or else we will rent a bed at the same place that we rent the table and the paintings and the washing machine."

Impatient Americans are not waiting for 1985. Indeed, one of the most significant aspects of the booming rental business is the rise of furniture rental. Some manufacturers and many rental firms will now furnish entire small apartments for as little as twenty to fifty dollars per month, down to the drapes, rugs and ashtrays. "You arrive in town in the morning," says one airline stewardess, "and by evening you've got a swinging pad." Says a Canadian transferred to New York: "It's new, it's colorful, and I don't have to worry about carting it all over the world when I'm transferred."

William James once wrote that "lives based on having are less free than lives based either on doing or on being." The rise of rentalism is a move away from lives based on having and it reflects the increase in doing and being. If the people of the future live faster than the people of the past, they must also be far more flexible. They are like broken field runners—and it is hard to sidestep a tackle when loaded down with possessions. They want the advantage of affluence and the latest that technology has to offer, but not the responsibility that has, until now, accompanied the accumulation of possessions. They recognize that to survive among the uncertainties of rapid change they must learn to travel light.

Whatever its broader effects, however, rentalism shortens still further the duration of the relationships between man and the things that he uses. This is made clear by asking a simple question: How many cars—rented, borrowed or owned—pass through the hands of the average American male in a lifetime? The answer for car owners might be in the range of twenty to fifty. For active car renters, however, the figure might run as high as 200 or more. While the buyer's average relationship with a particular vehicle extends over many months or years, the renter's average link with any one particular car is extremely short-lived.

Renting has the net effect of multiplying the number of people with successive relationships to the same object, and thus reducing, on average, the duration of such relationships. When we extend this principle to a very wide range of products, it becomes clear that the rise of rentalism parallels and reinforces the impact of throw-away items, temporary structures and modularism.

TEMPORARY NEEDS

It is important here to turn for a moment to the notion of obsolescence. For the fear of product obsolescence drives businessmen to innovation at the same time that it impels the consumer toward rented, disposable or temporary products. The very idea of obsolescence is disturbing to people bred on the ideal of permanence, and it is particularly upsetting when thought to be planned. Planned obsolescence has been the target of so much recent social criticism that the unwary reader might be led to regard it as the primary or even exclusive cause of the trend toward shorter relational durations.

There is no doubt that some businessmen conspire to shorten the useful life of their products in order to guarantee replacement sales. There is, similarly, no doubt that many of the annual model changes with which American (and other) consumers are increasingly familiar are not technologically substantive. Detroit's autos today deliver no more mileage per gallon of gasoline than they did ten model changes back, and the oil companies, for all the additives about which they boast, still put a turtle, not a tiger, in the tank. Moreover, it is incontestable that Madison Avenue frequently exaggerates the importance of new features and encourages consumers to dispose of partially worn-out goods to make way for the new.

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.

An excellent illustration of this occurred not long ago when I watched a little boy purchase half a dozen pink erasers at a little stationery store. Curious as to why he wanted so many of them, I picked one up for closer examination. "Do they erase well?" I asked the boy. "I don't know,." he said, "but they sure smell good!" And, indeed, they did. They had been heavily perfumed by the Japanese manufacturer perhaps to mask an unpleasant chemical odor. In short, the needs filled by products vary by purchaser and through time.

In a society of scarcity, needs are relatively universal and unchanging because they are starkly related to the "gut" functions. As affluence rises, however, human needs become less directly linked to biological survival and more highly individuated. Moreover, in a society caught up in complex, high-speed change, the needs of the individual—which arise out of his interaction with the external environment—also change at relatively high speed. The more rapidly changing the society, the more temporary the needs. Given the general affluence of the new society, he can indulge many of these short-term needs.

Often, without even having a clear idea of what needs he wants served, the consumer has a vague feeling that he wants a change. Advertising encourages and capitalizes on this feeling, but it can hardly be credited with having created it single-handedly. The tendency toward shorter relational durations is thus built more deeply into the social structure than arguments over planned obsolescence or the manipulative effectiveness of Madison Avenue would suggest.

The rapidity with which consumers' needs shift is reflected in the alacrity with which buyers abandon product and brand loyalty. If Assistant Attorney General Donald F. Turner, a leading critic of advertising, is correct, one of the primary purposes of advertising is to create "durable preferences." If so, it is failing, for brand-switching is so frequent and common that it has become, in the words of one food industry publication, "one of the national advertiser's major headaches."

Many brands drop out of existence. Among brands that continue to exist there is a continual reshuffling of position. According to Henry M. Schachte, "In almost no major consumer goods category ... is there a brand on top today which held that position ten years ago." Thus among ten leading American cigarettes, only one, Pall Mall, maintained in 1966 the same share of the market that it held in 1956. Camels plunged from 18 to 9 percent of the market; Lucky Strike declined even more sharply, from 14 to 6 percent. Other brands moved up, with Salem, for example, rising from 1 to 9 percent. Additional fluctuations have occurred since this survey.

However insignificant these shifts may be from the long-run view of the historian, this continual shuffling and reshuffling, influenced but not independently controlled by advertising, introduces into the short-run, everyday life of the individual a dazzling dynamism. It heightens still further the sense of speed, turmoil and impermanence in society.

THE FAD MACHINE

Fast-shifting preferences, flowing out of and interacting with high-speed technological change, not only lead to frequent changes in the popularity of products and brands, but also shorten the life cycle of products. Automation expert John Diebold never wearies of pointing

out to businessmen that they must begin to think in terms of shorter life spans for their goods. Smith Brothers' Cough Drops, Calumet Baking Soda and Ivory Soap, have become American institutions by virtue of their long reign in the market place. In the days ahead, he suggests, few products will enjoy such longevity. Every consumer has had the experience of going to the supermarket or department store to replace some item, only to find that he cannot locate the same brand or product. In 1966 some 7000 new products turned up in American supermarkets. Fully 55 percent of all the items now sold there did not exist ten years ago. And of the products available then, 42 percent have faded away altogether. Each year the process repeats itself in more extreme form. Thus 1968 saw 9,500 new items in the consumer packaged-goods field alone, with only one in five meeting its sales target. A silent but rapid attrition kills off the old, and new products sweep in like a ride. "Products that used to sell for twenty-five years," writes economist Robert Theobald, "now often count on no more than five. In the volatile pharmaceutical and electronic fields the period is often as short as six months." As the pace of change accelerates further, corporations may create new products knowing full well that they will remain on the market for only a matter of a few weeks.

Here, too, the present already provides us with a foretaste of the future. It lies in an unexpected quarter: the fads now sweeping over the high technology societies in wave after wave. In the past few years alone, in the United States, Western Europe and Japan, we have witnessed the sudden rise or collapse in popularity of "Bardot hairdos," the "Cleopatra look," James Bond, and Batman, not to speak of Tiffany lampshades, Super-Balls, iron crosses, pop sunglasses, badges and buttons with protest slogans or pornographic jokes, posters of Allen Ginsberg or Humphrey Bogart, false eyelashes, and innumerable other gimcracks and oddities that reflect—are tuned into—the rapidly changing pop culture.

Backed by mass media promotion and sophisticated marketing, such fads now explode on the scene virtually overnight—and vanish just as quickly. Sophisticates in the fad business prepare in advance for shorter and shorter product life cycles. Thus, there is in San Gabriel, California, a company entitled, with a kind of cornball relish, Wham-O Manufacturing Company. Wham-O specializes in fad products, having introduced the hula hoop in the fifties and the so-called Super-Ball more recently. The latter—a high-bouncing rubber ball— quickly became so popular with adults as well as children that astonished visitors saw several of them bouncing merrily on the floor of the Pacific Coast Stock Exchange. Wall Street executives gave them away to friends and one high broadcasting official complained that "All our executives are out in the halls with their Super-Balls." Wham-O, and other companies like it, however, are not disconcerted when sudden death overtakes their product; they anticipate it. They are specialists in the design and manufacture of "temporary" products.

The fact that fads are generated artificially, to a large extent, merely underscores their significance. Even engineered fads are not new to history. But never before have they come fleeting across the consciousness in such rapid-fire profusion, and never has there been such smooth coordination between those who originate the fad, mass media eager to popularize it, and companies geared for its instantaneous exploitation.

A well-oiled machinery for the creation and diffusion of fads is now an entrenched part of the modern economy. Its methods will increasingly be adopted by others as they recognize the inevitability of the ever-shorter product cycle. The line between "fad" and ordinary product will progressively blur. We are moving swiftly into the era of the temporary product, made by temporary methods, to serve temporary needs.

The turnover of things in our lives thus grows even more frenetic. We face a rising flood of throw-away items, impermanent architecture, mobile and modular products, rented goods and commodities designed for almost instant death. From all these directions, strong pressures converge toward the same end: the inescapable ephemeralization of the man-thing relationship.

The foreshortening of our ties with the physical environment, the stepped-up turnover of things, however, is only a small part of a much larger context. Let us, therefore, press ahead in our exploration of life in high transience society.

Chapter 19

TAMING TECHNOLOGY

Future shock—the disease of change—can be prevented. But it will take drastic social, even political action. No matter how individuals try to pace their lives, no matter what psychic crutches we offer them, no matter how we alter education, the society as a whole will still be caught on a runaway treadmill until we capture control of the accelerative thrust itself.

The high velocity of change can be traced to many factors. Population growth, urbanization, the shifting proportions of young and old—all play their part. Yet technological advance is clearly a critical node in the network of causes; indeed, it may be the node that activates the entire net. One powerful strategy in the battle to prevent mass future shock, therefore, involves the conscious regulation of technological advance.

We cannot and must not turn off the switch of technological progress. Only romantic fools babble about returning to a "state of nature." A state of nature is one in which infants shrivel and die for lack of elementary medical care, in which malnutrition stultifies the brain, in which, as Hobbes reminded us, the typical life is "poor, nasty, brutish, and short." To turn our back on technology would be not only stupid but immoral.

Given that a majority of men still figuratively live in the twelfth century, who are we even to contemplate throwing away the key to economic advance? Those who prate anti-technological nonsense in the name of some vague "human values" need to be asked "which humans?" To deliberately turn back the clock would be to condemn billions to enforced and permanent misery at precisely the moment in history when their liberation is becoming possible. We clearly need not less but more technology.

At the same time, it is undeniably true that we frequently apply new technology stupidly and selfishly. in our haste to milk technology for immediate economic advantage, we have turned our environment into a physical and social tinderbox.

The speed-up of diffusion, the self-reinforcing character of technological advance, by which each forward step facilitates not one but many additional further steps, the intimate link-up between technology and social arrangements—all these create a form of psychological pollution, a seemingly unstoppable acceleration of the pace of life.

This psychic pollution is matched by the industrial vomit that fills our skies and seas. Pesticides and herbicides filter into our foods. Twisted automobile carcasses, aluminum cans, non-returnable glass bottles and synthetic plastics form immense kitchen middens in our midst as more and more of our detritus resists decay. We do not even begin to know what to do with our radioactive wastes—whether to pump them into the earth, shoot them into outer space, or pour them into the oceans.

Our technological powers increase, but the side effects and potential hazards also escalate. We risk thermopollution of the oceans themselves, overheating them, destroying immeasurable quantities of marine life, perhaps even melting the polar icecaps. On land we concentrate such large masses of population in such small urban-technological islands, that we threaten to use up the air's oxygen faster than it can be replaced, conjuring up the possibility of new Saharas where the cities are now. Through such disruptions of the natural ecology, we may literally, in the words of biologist Barry Commoner, be "destroying this planet as a suitable place for human habitation."

TECHNOLOGICAL BACKLASH

As the effects of irresponsibly applied technology become more grimly evident, a political backlash mounts. An offshore drilling accident that pollutes 800 square miles of the Pacific triggers a shock wave of indignation all over the United States. A multi-millionaire industrialist in Nevada, Howard Hughes, prepares a lawsuit to prevent the Atomic Energy Commission from continuing its underground nuclear tests. In Seattle, the Boeing Company fights growing public clamor against its plans to build a supersonic jet transport. In Washington, public sentiment forces a reassessment of missile policy. At MIT, Wisconsin, Cornell, and other universities, scientists lay down test tubes and slide rules during a "research moratorium" called to discuss the social implications of their work. Students organize "environmental teach-ins" and the President lectures the nation about the ecological menace. Additional evidences of deep concern over our technological course are turning up in Britain, France and other nations.

We see here the first glimmers of an international revolt that will rock parliaments and congresses in the decades ahead. This protest against the ravages of irresponsibly used technology could crystallize in pathological form—as a future-phobic fascism with scientists substituting for Jews in the concentration camps. Sick societies need scapegoats. As the pressures of change impinge more heavily on the individual and the prevalence of future shock increases, this nightmarish outcome gains plausibility. It is significant that a slogan scrawled on a wall by striking students in Paris called for "death to the technocrats!"

The incipient worldwide movement for control of technology, however, must not be permitted to fall into the hands of irresponsible technophobes, nihilists and Rousseauian romantics. For the power of the technological drive is too great to be stopped by Luddite paroxysms. Worse yet, reckless attempts to halt technology will produce results quite as destructive as reckless attempts to advance it.

Caught between these twin perils, we desperately need a movement for responsible technology. We need a broad political grouping rationally committed to further scientific research and technological advance—but on a selective basis only. Instead of wasting its energies in denunciations of The Machine or in negativistic criticism of the space program, it should formulate a set of positive technological goals for the future.

Such a set of goals, if comprehensive and well worked out, could bring order to a field now in total shambles. By 1980, according to Aurelio Peccei, the Italian economist and industrialist, combined research and development expenditures in the United States and Europe will run to $73 billion per year. This level of expense adds up to three-quarters of a trillion dollars per decade. With such large sums at stake, one would think that governments would plan their technological development carefully, relating it to broad social goals, and insisting on strict accountability. Nothing could be more mistaken.

"No one—not even the most brilliant scientist alive today—really knows where science is taking us," says Ralph Lapp, himself a scientist-turned-writer. "We are aboard a train which is gathering speed, racing down a track on which there are an unknown number of switches leading to unknown destinations. No single scientist is in the engine cab and there may be demons at the switch. Most of society is in the caboose looking backward."

It is hardly reassuring to learn that when the Organization for Economic Cooperation and Development issued its massive report on science in the United States, one of its authors, a former premier of Belgium, confessed: "We came to the conclusion that we were looking for something ... which was not there: a science policy." The committee could have looked even harder, and with still less success, for anything resembling a conscious technological policy.

Radicals frequently accuse the "ruling class" or the "establishment" or simply "they" of controlling society in ways inimical to the welfare of the masses. Such accusations may have

occasional point. Yet today we face an even more dangerous reality: many social ills are less the consequence of oppressive control than of oppressive lack of control. The horrifying truth is that, so far as much technology is concerned, no one is in charge.

SELECTING CULTURAL STYLES

So long as an industrializing nation is poor, it tends to welcome without argument any technical innovation that promises to improve economic output or material welfare. This is, in fact, a tacit technological policy, and it can make for extremely rapid economic growth. It is, however, a brutally unsophisticated policy, and as a result all kinds of new machines and processes are spewed into the society without regard for their secondary or long-range effects.

Once the society begins its take-off for super-industrialism, this "anything goes" policy becomes wholly and hazardously inadequate. Apart from the increased power and scope of technology, the options multiply as well. Advanced technology helps create overchoice with respect to available goods, cultural products, services, subcults and life styles. At the same time overchoice comes to characterize technology itself.

Increasingly diverse innovations are arrayed before the society and the problems of selection grow more and more acute. The old simple policy, by which choices were made according to short-run economic advantage, proves dangerous, confusing, destabilizing.

Today we need far more sophisticated criteria for choosing among technologies. We need such policy criteria not only to stave off avoidable disasters, but to help us discover tomorrow's opportunities. Faced for the first time with technological overchoice, the society must now select its machines, processes, techniques and systems in groups and clusters, instead of one at a time. It must choose the way an individual chooses his life style. It must make super-decisions about its future.

Furthermore, just as an individual can exercise conscious choice among alternative life styles, a society today can consciously choose among alternative cultural styles. This is a new fact in history. In the past, culture emerged without premeditation. Today, for the first time, we can raise the process to awareness. By the application of conscious technological policy— along with other measures—we can contour the culture of tomorrow.

In their book, *The Year 2000,* Herman Kahn and Anthony Wiener list one hundred technical innovations "very likely in the last third of the twentieth century." These range from multiple applications of the laser to new materials, new power sources, new airborne and submarine vehicles, three-dimensional photography, and "human hibernation" for medical purposes. Similar lists are to be found elsewhere as well. In transportation, in communications, in every conceivable field and some that are almost inconceivable, we face an inundation of innovation. In consequence, the complexities of choice are staggering.

This is well illustrated by new inventions or discoveries that bear directly on the issue of man's adaptability. A case in point is the so-called OLIVER* that some computer experts are striving to develop to help us deal with decision overload. In its simplest form, OLIVER would merely be a personal computer programmed to provide the individual with information and to make minor decisions for him. At this level, it could store information about his friends' preferences for Manhattans or martinis, data about traffic routes, the weather, stock prices, etc. The device could be set to remind him of his wife's birthday—or to order flowers automatically. It could renew his magazine subscriptions, pay the rent on time, order razor blades and the like.

As computerized information systems ramify, moreover, it would tap into a worldwide pool of data stored in libraries, corporate files, hospitals, retail stores, banks, government

agencies and universities. OLIVER would thus become a kind of universal question-answerer for him.

However, some computer scientists see much beyond this. It is theoretically possible, to construct an OLIVER that would analyze the content of its owner's words, scrutinize his choices, deduce his value system, update its own program to reflect changes in his values, and ultimately handle larger and larger decisions for him.

Thus OLIVER would know how its owner would, in all likelihood, react to various suggestions made at a committee meeting. (Meetings could take place among groups of OLIVERs representing their respective owners, without the owners themselves being present. Indeed, some "computer-mediated" conferences of this type have already been held by the experimenters.)

OLIVER would know, for example, whether its owner would vote for candidate X, whether he would contribute to charity Y, whether he would accept a dinner invitation from Z. In the words of one OLIVER enthusiast, a computer-trained psychologist: "If you are an impolite boor, OLIVER will know and act accordingly. If you are a marital cheater, OLIVER will know and help. For OLIVER will be nothing less than your mechanical alter ego." Pushed to the extremes of science fiction, one can even imagine pinsize OLIVERs implanted in baby brains, and used, in combination with cloning, to create living—not just mechanical—alter egos.

Another technological advance that could enlarge the adaptive range of the individual pertains to human IQ. Widely reported experiments in the United States, Sweden and elsewhere, strongly suggest that we may, within the foreseeable future, be able to augment man's intelligence and informational handling abilities. Research in biochemistry and nutrition indicate that protein, RNA and other manipulable properties are, in some still obscure way, correlated with memory and learning. A large-scale effort to crack the intelligence barrier could pay off in fantastic improvement of man's adaptability.

It may be that the historic moment is right for such amplifications of humanness, for a leap to a new superhuman organism. But what are the consequences and alternatives? Do we want a world peopled with OLIVERs? When? Under what terms and conditions? Who should have access to them? Who should not? Should biochemical treatments be used to raise mental defectives to the level of normals, should they be used to raise the average, or should we concentrate on trying to breed super-geniuses?

In quite different fields, similar complex choices abound. Should we throw our resources behind a crash effort to achieve low-cost nuclear energy? Or should a comparable effort be mounted to determine the biochemical basis of aggression? Should we spend billions of dollars on a supersonic jet transport—or should these funds be deployed in the development of artificial hearts? Should we tinker with the human gene? Or should we, as some quite seriously propose, flood the interior of Brazil to create an inland ocean the size of East and West Germany combined? We will soon, no doubt, be able to put super-LSD or an anti-aggression additive or some Huxleyian soma into our breakfast foods. We will soon be able to settle colonists on the planets and plant pleasure probes in the skulls of our newborn infants. But should we? Who is to decide? By what human criteria should such decisions be taken?

It is clear that a society which opts for OLIVER, nuclear energy, supersonic transports, macroengineering on a continental scale, along with LSD and pleasure probes, will develop a culture dramatically different from the one that chooses, instead, to raise intelligence, diffuse anti-aggression drugs and provide low-cost artificial hearts.

Sharp differences would quickly emerge between the society that presses technological advance selectively, and that which blindly snatches at the first opportunity that comes along. Even sharper differences would develop between the society in which the pace of

technological advance is moderated and guided to prevent future shock, and that in which masses of ordinary people are incapacitated for rational decision-making. In one, political democracy and broad-scale participation are feasible; in the other powerful pressures lead toward political rule by a tiny techno-managerial elite. Our choice of technologies, in short, will decisively shape the cultural styles of the future.

This is why technological questions can no longer be answered in technological terms alone. They are political questions. Indeed, they affect us more deeply than most of the superficial political issues that occupy us today. This is why we cannot continue to make technological decisions in the old way. We cannot permit them to be made haphazardly, independently of one another. We cannot permit them to be dictated by short-run economic considerations alone. We cannot permit them to be made in a policy vacuum. And we cannot casually delegate responsibility for such decisions to businessmen, scientists, engineers or administrators who are unaware of the profound consequences of their own actions.

* On-Line Interactive Vicarious Expediter and Responder. The acronym was chosen to honor Oliver Selfridge, originator of the concept.

TRANSISTORS AND SEX

To capture control of technology, and through it gain some influence over the accelerative thrust in general, we must, therefore, begin to submit new technology to a set of demanding tests before we unleash it in our midst. We must ask a whole series of unaccustomed questions about any innovation before giving it a clean bill of sale.

First, bitter experience should have taught us by now to look far more carefully at the potential physical side effects of any new technology. Whether we are proposing a new form of power, a new material, or a new industrial chemical, we must attempt to determine how it will alter the delicate ecological balance upon which we depend for survival. Moreover, we must anticipate its indirect effects over great distances in both time and space. Industrial waste dumped into a river can turn up hundreds, even thousands of miles away in the ocean. DDT may not show its effects until years after its use. So much has peen written about this that it seems hardly necessary to belabor the point further.

Second, and much more complex, we must question the long-term impact of a technical innovation on the social, cultural and psychological environment. The automobile is widely believed to have changed the shape of our cities, shifted home ownership and retail trade patterns, altered sexual customs and loosened family ties. In the Middle East, the rapid spread of transistor radios is credited with having contributed to the resurgence of Arab nationalism. The birth control pill, the computer, the space effort, as well as the invention and diffusion of such "soft" technologies as systems analysis, all have carried significant social changes in their wake.

We can no longer afford to let such secondary social and cultural effects just "happen." We must attempt to anticipate them in advance, estimating, to the degree possible, their nature, strength and timing. Where these effects are likely to be seriously damaging, we must also be prepared to block the new technology. It is as simple as that. Technology cannot be permitted to rampage through the society.

It is quite true that we can never know all the effects of any action, technological or otherwise. But it is not true that we are helpless. It is, for example, sometimes possible to test new technology in limited areas, among limited groups, studying its secondary impacts before releasing it for diffusion. We could, if we were imaginative, devise living experiments, even volunteer communities, to help guide our technological decisions. Just as we may wish

to create enclaves of the past where the rate of change is artificially slowed, or enclaves of the future in which individuals can pre-sample future environments, we may also wish to set aside, even subsidize, special high-novelty communities in which advanced drugs, power sources, vehicles, cosmetics, appliances and other innovations are experimentally used and investigated.

A corporation today will routinely field test a product to make sure it performs its primary function. The same company will market test the product to ascertain whether it will sell. But, with rare exception, no one post-checks the consumer or the community to determine what the human side effects have been. Survival in the future may depend on our learning to do so.

Even when life-testing proves unfeasible, it is still possible for us systematically to anticipate the distant effects of various technologies. Behavioral scientists are rapidly developing new tools, from mathematical modeling and simulation to so-called Delphi analyses, that permit us to make more informed judgments about the consequences of our actions. We are piecing together the conceptual hardware needed for the social evaluation of technology; we need but to make use of it.

Third, an even more difficult and pointed question: Apart from actual changes in the social structure, how will a proposed new technology affect the value system of the society? We know little about value structures and how they change, but there is reason to believe that they, too, are heavily impacted by technology. Elsewhere I have proposed that we develop a new profession of "value impact forecasters"—men and women trained to use the most advanced behavioral science techniques to appraise the value implications of proposed technology.

At the University of Pittsburgh in 1967 a group of distinguished economists, scientists, architects, planners, writers, and philosophers engaged in a day-long simulation intended to advance the art of value forecasting. At Harvard, the Program on Technology and Society has undertaken work relevant to this field. At Cornell and at the Institute for the Study of Science in Human Affairs at Columbia, an attempt is being made to build a model of the relationship between technology and values, and to design a game useful in analyzing the impact of one on the other. All these initiatives, while still extremely primitive, give promise of helping us assess new technology more sensitively than ever before.

Fourth and finally, we must pose a question that until now has almost never been investigated, and which is, nevertheless, absolutely crucial if we are to prevent widespread future shock. For each major technological innovation we must ask: What are its accelerative implications?

The problems of adaptation already far transcend the difficulties of coping with this or that invention or technique. Our problem is no longer the innovation, but the chain of innovations, not the supersonic transport, or the breeder reactor, or the ground effect machine, but entire inter-linked sequences of such innovations and the novelty they send flooding into the society.

Does a proposed innovation help us control the rate and direction of subsequent advance? Or does it tend to accelerate a host of processes over which we have no control? How does it affect the level of transience, the novelty ratio, and the diversity of choice? Until we systematically probe these questions, our attempts to harness technology to social ends—and to gain control of the accelerative thrust in general—will prove feeble and futile.

Here, then, is a pressing intellectual agenda for the social and physical sciences. We have taught ourselves to create and combine the most powerful of technologies. We have not taken pains to learn about their consequences. Today these consequences threaten to destroy us. We must learn, and learn fast.

A TECHNOLOGY OMBUDSMAN

The challenge, however, is not solely intellectual; it is political as well. In addition to designing new research tools—new ways to understand our environment—we must also design creative new political institutions for guaranteeing that these questions are, in fact, investigated; and for promoting or discouraging (perhaps even banning) certain proposed technologies. We need, in effect, a machinery for screening machines.

A key political task of the next decade will be to create this machinery. We must stop being afraid to exert systematic social control over technology. Responsibility for doing so must be shared by public agencies and the corporations and laboratories in which technological innovations are hatched.

Any suggestion for control over technology immediately raises scientific eyebrows. The specter of ham-handed governmental interference is invoked. Yet controls over technology need not imply limitations on the freedom to conduct research. What is at issue is not discovery but diffusion, not invention but application. Ironically, as sociologist Amitai Etzioni points out, "many liberals who have fully accepted Keynesian economic controls take a laissez-faire view of technology. Theirs are the arguments once used to defend laissez-faire economics: that any attempt to control technology would stifle innovation and initiative."

Warnings about overcontrol ought not be lightly ignored. Yet the consequences of lack of control may be far worse. In point of fact, science and technology are never free in any absolute sense. Inventions and the rate at which they are applied are both influenced by the values and institutions of the society that gives rise to them. Every society, in effect, does pre-screen technical innovations before putting them to widespread use.

The haphazard way in which this is done today, however, and the criteria on which selection is based, need to be changed. In the West, the basic criterion for filtering out certain technical innovations and applying others remains economic profitability. In communist countries, the ultimate tests have to do with whether the innovation will contribute to overall economic growth and national power. In the former, decisions are private and pluralistically decentralized. In the latter, they are public and tightly centralized.

Both systems are now obsolete—incapable of dealing with the complexity of super-industrial society. Both tend to ignore all but the most immediate and obvious consequences of technology. Yet, increasingly, it is these non-immediate and non-obvious impacts that must concern us. "Society must so organize itself that a proportion of the very ablest and most imaginative of scientists are continually concerned with trying to foresee the long-term effects of new technology," writes O. M. Solandt, chairman of the Science Council of Canada. "Our present method of depending on the alertness of individuals to foresee danger and to form pressure groups that try to correct mistakes will not do for the future."

One step in the right direction would be to create a technological ombudsman—a public agency charged with receiving, investigating, and acting on complaints having to do with the irresponsible application of technology.

Who should be responsible for correcting the adverse effects of technology? The rapid diffusion of detergents used in home washing machines and dishwashers intensified water purification problems all over the United States. The decisions to launch detergents on the society were privately taken, but the side effects have resulted in costs borne by the taxpayer and (in the form of lower water quality) by the consumer at large.

The costs of air pollution are similarly borne by taxpayer and community even though, as is often the case, the sources of pollution are traceable to individual companies, industries or government installations. Perhaps it is sensible for de-pollution costs to be borne by the public as a form of social overhead, rather than by specific industries. There are many ways

to allocate the cost. But whichever way we choose, it is absolutely vital that the lines of responsibility are made clear. Too often no agency, group or institution has clear responsibility.

A technology ombudsman could serve as an official sounding board for complaints. By calling press attention to companies or government agencies that have applied new technology irresponsibly or without adequate forethought, such an agency could exert pressure for more intelligent use of new technology. Armed with the power to initiate damage suits where necessary, it could become a significant deterrent to technological irresponsibility.

THE ENVIRONMENTAL SCREEN

But simply investigating and apportioning responsibility after the fact is hardly sufficient. We must create an environmental screen to protect ourselves against dangerous intrusions as well as a system of public incentives to encourage technology that is both safe and socially desirable. This means governmental and private machinery for reviewing major technological advances *before* they are launched upon the public.

Corporations might be expected to set up their own "consequence analysis staffs" to study the potential effects of the innovations they sponsor. They might, in some cases, be required not merely to test new technology in pilot areas but to make a public report about its impact before being permitted to spread the innovation through the society at large. Much responsibility should be delegated to industry itself. The less centralized the controls the better. If self-policing works, it is preferable to external, political controls.

Where self-regulation fails, however, as it often does, public intervention may well be necessary, and we should not evade the responsibility. In the United States, Congressman Emilio Q. Daddario, chairman of the House Subcommittee on Science, Research and Development, has proposed the establishment of a Technology Assessment Board within the federal government. Studies by the National Academy of Sciences, the National Academy of Engineering, the Legislative Reference Service of the Library of Congress, and by the science and technology program of the George Washington University are all aimed at defining the appropriate nature of such an agency. We may wish to debate its form; its need is beyond dispute.

The society might also set certain general principles for technological advance. Where the introduction of an innovation entails undue risk, for example, it might require that funds be set aside by the responsible agency for correction of adverse effects should they materialize. We might also create a "technological insurance pool" to which innovation-diffusing agencies might pay premiums.

Certain large-scale ecological interventions might be delayed or prohibited altogether—perhaps in line with the principle that if an incursion on nature is too big and sudden for its effects to be monitored and possibly corrected, it should not take place. For example, it has been suggested that the Aswan Dam, far from helping Egyptian agriculture, might someday lead to salinization of the land on both banks of the Nile. This could prove disastrous. But such a process would not occur overnight. Presumably, therefore, it can be monitored and prevented. By contrast, the plan to flood the entire interior of Brazil is fraught with such instant and imponderable ecological effects that it should not be permitted at all until adequate monitoring can be done and emergency corrective measures are available.

At the level of social consequences, a new technology might be submitted for clearance to panels of behavioral scientists—psychologists, sociologists, economists, political scientists—who would determine, to the best of their ability, the probable strength of its

social impact at different points in time. Where an innovation appears likely to entail seriously disruptive consequences, or to generate unrestrained accelerative pressures, these facts need to be weighed in a social cost-benefit accounting procedure. In the case of some high-impact innovations, the technological appraisal agency might be empowered to seek restraining legislation, or to obtain an injunction forcing delay until full public discussion and study is completed. In other cases, such innovations might still be released for diffusion—provided ample steps were taken in advance to offset their negative consequences. In this way, the society would not need to wait for disaster before dealing with its technology-induced problems.

By considering not merely specific technologies, but their relationship to one another, the time lapse between them, the proposed speed of diffusion, and similar factors, we might eventually gain some control over the pace of change as well as its direction.

Needless to say, these proposals are themselves fraught with explosive social consequences, and need careful assessment. There may be far better ways to achieve the desired ends. But the time is late. We simply can no longer afford to hurtle blindfolded toward super-industrialism. The politics of technology control will trigger bitter conflict in the days to come. But conflict or no, technology must be tamed, if the accelerative thrust is to be brought under control. And the accelerative thrust must be brought under control, if future shock is to be prevented.

NOTES

Bracketed [ ] *numbers indicate items listed in the accompanying* Bibliography. *Thus, in the* Notes [*1*] *will stand for the first item in the* Bibliography, Design for a Brain *by W. Ross Ashby.*

CHAPTER ONE

PAGE

12   The Thomson comparison appears in [175], p. 1.

13   Bagrit is quoted from *The New York Times,* March 17, 1965.

13   The Diebold item is from [57], p. 48.

13   Read's statement is found in his essay, "New Realms of Art" in [302], p. 77.

13   The Marek quote is from [165], pp. 20-21. A remarkable little book.

13   Boulding on post-civilization: [134], p. 7.

13   Boulding's reference to Julius Caesar is from "The Prospects of Economic Abundance," his lecture at the Nobel Conference, Gustavus Adolphus College, 1966.

14   Figures on US agricultural output are from "Malthus, Marx and the North American Breadbasket" by Orville Freeman in *Foreign Affairs*, July, 1967, p. 587.

15   There is, as yet, no widely accepted or wholly satisfactory term to describe the new stage of social development toward which we seem to be racing. Daniel Bell, the sociologist, coined the term "post-industrial" to signify a society in which the economy is largely based on service, the professional and technical classes dominate, theoretical knowledge is central, intellectual technology—systems analysis, model building, and the like—is highly developed, and technology is, at least potentially, capable of self-sustaining growth. The term has been criticized for suggesting that the society to come will no longer be technologically based—an implication that Bell specifically and carefully avoids.

Kenneth Boulding's favorite term, "post-civilization," is employed to contrast the future society with "civilization"—the era of settled communities, agriculture, and war. The difficulty with "post-civilization" is its hint that what will follow will somehow be barbaric. Boulding rejects this mis-connotation as vigorously as Bell does his. Zbigniew Brzezinski's choice is the "technotronic society," by which he means one based heavily on advanced communications and electronics. The objection to this is that, in its heavy emphasis on technology, and, in fact, on a special form of technology, it does little to characterize the social aspects of the society.

Then, of course, there is McLuhan's "global village" and "electric age"—once again an attempt to describe the future in terms of one or two rather narrow dimensions: communications and togetherness. A variety of other terms are possible, too: transindustrial, post-economic, etc. My own choice, after all is said and done, is "super-industrial society." It, too, suffers from serious shortcomings. It is intended to mean a complex, fast-paced society dependent upon extremely advanced technology and a post-materialist value system.

15   Fourastié is quoted in [272], p. 28.

15   U Thant's statement is quoted in [217], p. 184.

CHAPTER TWO

19   The progeria case is reported in the Toronto *Daily Star,* March 8, 1967.

22   Huxley on the tempo of change is from [267], pp. viii-ix.

23   Data on growth of cities are from *Ekistics,* July, 1965, Table 4, p. 48.

23   Estimate of the rate of urbanization is from *World Health,* December, 1964, p. 4.

24   French productivity data from [283], p. 64.

26   Early transportation speeds are estimated in "Biggest Challenge: Getting Wisdom" by Peter Goldmark in *Printer's Ink,* May 29, 1964, p. 280. See also: [137], p. 61 and [151], p. 5.

27   For material on the delay between invention and application, see [291], pp. 47-48.

27   The reference to Appert is drawn from "Radiation Preservation of Food" by S. A. Goldblith, *Science Journal,* January, 1966, p. 41.

28   *T*he Lynn study is reported briefly in "Our Accelerating Technological Change" by Frank Lynn, *Management Review,* March, 1967, pp. 67-70. See also: [64], pp. 3-4.

28   Young's work is found in "Product Growth Cycles—A Key to Growth Planning" by Robert B. Young, Menlo Park, Calif.: Stanford Research Institute. Undated.

30   Data on book production are drawn from [206], p. 21, [200], p. 74, and [207], article on Incunabuli.

31   The rate of discovery of new elements is given in [146], Document I, p, 21.

34   Erikson's statement appears in [105], p. 197.

CHAPTER THREE

38   Data on the brain drain is from "Motivation Underlying the Brain Drain" [131], pp. 438, 447.

39   The passage of time as experienced by different age groups is discussed in "Subjective Time" by John Cohen in [342], p. 262.

40   Author's interviews with F. M. Esfandiary.

41   For further discussion of cultural differences in attitudes toward time, see "White People's Time, Colored People's Time" by Jules Henry in *Trans-action,* March-April, 1965, pp. 31-34.

42   On man's biological rhythms, see "The Physiological Control of Judgments of Duration: Evidence for a Chemical Clock" by Hudson Hoagland in [339].

        The notion of "durational expectancy" is supported by research on the eating habits of the obese. Psychologist Stanley Schachter has shown, by making imaginative use of clocks that run at half the normal speed, that hunger is partly conditioned by one's perception of time. See: "Obesity and Eating" by Stanley Schachter in *Science,* August 23, 1968, pp. 751-756.

45   Albee and Clurman quotes are from the latter's essay on the former, *The New York Times,* November 13, 1966.

CHAPTER FOUR

51   The Barbie story is told in "Marketing Briefs," *Business Week,* March 11, 1967, p. 188.

55   Age of dwellings is discussed in "Homes of the Future" by E. F. Carter in [136], vol. 2, p. 35.

55   Michael Wood has caught the spirit of transcience in his article, "America the Unreal" in *New Society,* April 14, 1966.

55   Auchincloss is quoted from *The New York Times,* March 17, 1966.

56   Buckminster Fuller's remark is from [146], Document 3, pp. 61-62.

58   Data on portable classrooms are drawn from *The Schoolhouse in the City,* a report of the Educational Facilities Laboratories, Inc. Not to be confused with [115].

60   For a description of the "thinkbelt" idea, see "Potteries Thinkbelt" by Cedric Price, *New Society,* June 2, 1966, p. 14.

62   The development of clip-on architecture is described by Reyner Banham in *Design Quarterly 63*. Minneapolis: Walker Art Center, 1965.

63   Data on the rental business are partially based on: Correspondence with C. A. Siegfried, Jr., Executive Secretary, American Rental Association.

      "You Name It—We Rent It" by Harland Manchester, *Reader's Digest,* July, 1966, p. 114.

66   *Svensk Damtidning,* November 2, 1965.

67   Rentalism has many unnoticed implications. A continuing swing toward rentalism could profoundly alter the balance of power between producer and consumer in many industries. The rise of vast rental organizations on a national and even international scale places a powerful new force between the producer and the ultimate consumer. Hertz and Avis, for example, operate such large fleets of autos and purchase on so large a scale, that they can win price, design, and service concessions from the manufacturers that no individual car buyer could hope to obtain. The same is true in any industry. Thus the formation of large rental organizations, by concentrating purchasing power, creates countervailing force in the precise Galbraithian sense of the term. This fact has not been overlooked by the American automotive manufacturers, at least one of which, Ford, has looked into the possibility of heading off this development by going directly into the rental business itself.

Even if manufacturers go into the rental business themselves, rentalism compels them to make revolutionary changes in organization and outlook. Whereas the ordinary producer need not concern himself too greatly with what happens to his product after it is sold, those who rent equipment are responsible for servicing it. This puts extreme pressure on them to improve the reliability of the product. In turn, this may require a radical reorientation of management thinking, right down to the design level.

Not long ago I interviewed the chief engineer of one of the largest corporations in the United States—a company which, like some computer manufacturers, rents its equipment directly to the user. I asked whether this had any implications for his engineering staff. His reply dramatically revealed the contrast between design for sale and design for rental:

The first thing you have to do is change the attitude of the people you're hiring ... A lot of engineers we hire from other industries come in here and are happy when they can save two cents for us by redesigning some part. We have to explain that cutting a corner like that could cost us a service call, and a service call costs us from $20 to $30 ... It's a rough proposition to get people educated for high quality and reliability in the product after they've been trained in other ways. It boils down to this: we don't ship our headaches. Our headaches may go out the shipping door, but as long as we are responsible for servicing them, they remain our headaches.

The economics of rentalism could raise the quality of products and relieve consumers of the increasingly exasperating problems of service and repair.

But the implications of rentalism go even further, for they tend to speed up the already highly accelerated pace of technological change. The company that sells a product disposes of it once and for all. The company that rents a product may get that product back. Rental

arrangements are short term. This mean that, if a technologically advanced model appears on the market, a renter can, with little difficulty, unburden himself of the old model and switch to the new. This raises for some manufacturers the specter of receiving thousands of their products back all at once—a terrifying prospect that compels them to pour a high percentage of their revenues into research and development in a frantic, never-ending effort to stay ahead of the pack. It is no accident that IBM, which rents its computers, or Xerox Corporation, which rents its copying machines, are both so deeply committed to R&D. As Joseph Wilson, president of Xerox, has put it: "We, not our customers, must assume the risk of obsolescence."

Rentalism also holds deep and as yet little known implications for the financial structure of any economy. It conjures up, for one thing, the image of a completely propertyless society. Whether this image is realistic or not, rentalism alters the flow of capital in the society. The manufacturer or rental organization advances capital for use by the consumer. This permits consumers to shift capital out of what economists term "real and personal property" and into securities. Indeed, if one imagines an entire society built on rentalism, in which vast rental organizations have become the pivots of power and profit, the best investment of all might turn out to be shares in the rental organizations.

70 Turner is quoted from [67], p. 41.

70 On brand switching and share of market see [67], p. 54.

71 The turnover of top brands is discussed in "Advertising, Competition, and the Anti-Trust Laws" by Henry Schachtre in *26 American Bar Association Anti-Trust Section,* p. 161.

71 Diebold's comments are in [57], pp. 19-20.

71 On rates of attrition among consumer products, see *The New York Times,* June 9, 1967; also *Time,* October 24, 1969, p. 92.

72 Theobald is quoted from [63], p. 29.

CHAPTER FIVE

75 The Fuller estimates are from [146], Document 3, pp. 28-29.

77 Transport problems of the developing nations are examined in "Immobility: Barrier to Development" by Wilfred Owen in [243], p. 30.

78 Drucker is quoted from [140], p. 92.

78 The nomadic city dweller is discussed in "Are We a Nation of Cities?" by Daniel Elazar, *Public Interest,* Summer, 1966, p. 53.

78 The figure on Americans who move is drawn from *Population Characteristics,* Series P-20, # 188. US Department of Commerce, August 14, 1969.

79 French data from "A Cohort Analysis of Geographical and Occupational Mobility" by Guy Pourcher in *Population*, March-April, 1966.

 See also: Supplement to Chapter Five, "Les Moyens de Regulation de la Politique de l'Emploi" by Thérèse Join-Lambert and François Lagrange in *Review Française du Travail,* January-March, 1966, pp. 305-307.

81 Intra-US brain drain is examined in "An Exploratory Study of the Structure and Dynamics of the R&D Industry" by Albert Shapero, Richard P. Howell, and James R. Tombaugh. Menlo Park, California: Stanford Research Institute, June, 1964.

82 Whyte is quoted from [197], p. 269.

82   Jacobson story from *Wall Street Journal,* April 26, 1966.

A more recent study of executive mobility has found that a middle manager can anticipate being moved once every two to five years. One executive reported moving 19 times in 25 years. Eighty percent of the companies surveyed were increasing the rate of transfer. See paper by William F. Glueck in the *Journal of Management Studies,* Vol. 6, #2 or summary in *New Society,* July 17, 1969, p. 98.

84   Dichter's remark is from [76], p. 266.

85   Hitch-hikers: see "Traveling Girls" by Ellen Goyder, *New Society,* January 20, 1966, p. 5.

86   Touraine is quoted from *Acceptance and Resistance,* [49], p. 95.

86   Clark is cited in [249], p. 26.

88   The emotional response of the mover is the subject of "Grieving for a Lost Home" by Marc Fried in [241], p. 151, 160.

88   Interview with Monique Viot.

88   Clifton Fadiman's account appears in his essay, "Mining-Camp Megalopolis" in *Holiday,* October, 1965, p. 8.

88   For the Crestwood Heights study, see [236], p. 360.

88-89   Tyhurst's statement is from his paper "The Role of Transition States—Including Disasters—in Mental Illness" in [33], p. 154.

92   Dyckman's comment is found in "The Changing Uses of the City" in [173], p. 154.

93   The demise of geography has, of course, important implications for the future of the city. According to Melvin M. Webber, Professor of City Planning at Berkeley, "A new kind of large-scale urban society is emerging that is increasingly independent of the city ... Because societies in the past had been spatially and locally structured, and because urban societies used to be exclusively city-based, we seem still to assume that territoriality is a necessary attribute of social systems." This, he argues, leads us to wholly misunderstand such urban problems as drug addiction, race riots, mental illness, poverty, etc. See his provocative essay, "The Post-City Age" in *Daedalus,* Fall, 1968, pp. 1091-1110.

93   Average residence duration is taken from "New Urban Structures" by David Lewis in [131], p. 313.

CHAPTER SIX

96   References to Weber, Simmel and Wirth are from [239], pp. 70-71.

98   Cox on limited involvements: [217], pp. 41-46.

102   On the number of people who preceded us, see "How Many People Have Lived on Earth?" by Nathan Keyfitz in *Demography,* 1966, vol 3, #2, p. 581.

104   Integrator concept and Gutman quote from "Population Mobility in the American Middle Class" by Robert Gutman in [241], pp. 175-182.

106   *Crestwood Heights* material is from [236], p. 365.

107   Barth quote from [216], pp. 13-14.

109   *Fortune* survey in [84], pp. 136-155.

110   I am indebted to Marvin Adelson, formerly Principal Scientist, System Development Corp., for the idea of occupational trajectories.

110 The quote from Rice is from "An Examination of the Boundaries of Part-Institutions" by A. K. Rice in *Human Relations, vol.* 4, #4, 1951, p. 400.

112 Job turnover among scientists and engineers discussed in "An Exploratory Study of the Structure and Dynamics of the R&D Industry" by Albert Shapero, Richard P. Howell, and James R. Tombaugh. Menlo Park, California: Stanford Research Institute, 1966, p. 117.

112 Westinghouse data from "Creativity: A Major Business Challenge" by Thomas J. Watson, Jr., *Columbia Journal of World Business,* Fall, 1965, p. 32.

112 British advertising turnover rates from "The Rat Race" by W. W. Daniel in *New Society,* April 14, 1966, p. 7.

112 Leavitt quoted from "Are Managers Becoming Obsolete?" by Harold F. Leavitt in *Carnegie Tech Quarterly,* November, 1963.

113 Company officials' quotes from "The Churning Market for Executives," by Seymour Freedgood in *Fortune,* September, 1965, pp. 152, 236. See also: [84], p. 71.

113 S.R.I. quote is from [183], p. 148.

116 Class differences in mobility are discussed in "The Human Measure," by Leonard Duhl in [51], p. 138 and in "Urban Design and Mental Health," by Leonard Duhl in *AIA Journal,* March, 1961, p. 48.

117 Lipset and Bendix [242], p. 249.

117 Warner quoted from [350], p. 51 and [96], p. 62.

120 Florence estimate is drawn from "The Pattern of Cities to Come," *New Society,* March 10, 1966, p. 6.

120 Gurevitch study and Milgram data can be found in "The Small-World Problem," by Stanley Milgram in *Psychology Today,* May, 1967, pp. 61-67.

120 The Nebraska study is detailed in "The Primary Relations of Middle-Class Couples," by Nicholas Babchuk and Alan P. Bates in [122], p. 126.

121 Pupil turnover: "The Schoolhouse in the City," a report by the Educational Facilities Laboratories, Inc., 1966, p. 8. Not to be confused with [115].

121 Whyte quote in [197], p. 383.

122 Moore study mentioned in *American Education,* April, 1967.

Poignant note on transcience from bulletin board of communal farm, U.S.A., Summer, 1969. Quoted in *Difficult But Possible Supplement to Whole Earth Catalog,* September, 1969, p. 23.

"I hope that this week is the Farm's lowest point for the summer, because if it gets any lower I don't have a decent place to live ... I think of this as my (at least) temporary home. And I like my home to be clear of broken glass and papers, my tools and supplies put away, I like to keep track of my guests, take care of my animals ... But this farm is far from that ...

"Our average farmer (Asshole) says to himself: 'I'm here visiting (for a day, a week, a month or a year) and I'm not really a part of this farm, just a guest, so I can't do anything really effective about the Farm's condition ...' I believe the key to the problem is: STABILITY LEADS TO A FEELING OF COMMUNITY.

"We have very little sense of community here ... This is social decay: where the natural forces of the family (helping, loving, working together) are driven out by selfishness ... I believe that the decay, the pigs-at-the-trough feeling, is caused by the INSTABILITY.

"When a stable group of ten lives together for weeks, natural forces work *for* community feeling. When the Farm is more than 20% tourists, when the family feeling is broken every day or two by departures and arrivals, I see no hope."

CHAPTER SEVEN

126   For Weber, see Chapter Eight in [256].

129   Zakon cited in "Finding Buyers for the Bad Buys," *Business Week,* September 13, 1969, pp. 49-51.

129   Organizational change is discussed in "Reorganizing for Results" by D. Ronald Daniel in *Harvard Business Review,* November-December, 1966, p. 96; also in "Patterns of Organization Change" by Larry E. Greiner in *Harvard Business Review,* May-June, 1967, pp. 119-120.

131   Gardner quoted from [39], p. 26.

134   On scientific task forces and the rise of "non-routine" industries, see "The Usefulness of Scientists" by Howard Reiss and Jack Balderston in *International Science and Technology,* May, 1966, p. 44; and a profile of George Kozmetsky in "How a Businessman Ramrods a B-School" in *Business Week,* May 24, 1969, p. 84.

135   Schon is quoted from [179], vol. 1, p. 106.

137   "The Decline of Hierarchy in Industrial Organizations" is discussed by William H. Read in *Business Horizons,* Fall, 1965, pp. 71-75.

142   For quotes from Warren Bennis on this page and in the remainder of Chapter Seven, see his articles: "Beyond Bureaucracy" in *Transaction,* July-August, 1965, pp. 31-35; and "Changing Organizations" in the *Journal of Applied Behavioral Science,* Vol. 2, #3, p. 261. For more detailed treatment see [252].

146   Guzzardi is from [84], p. 71.

146   Gardner is quoted from [39], p. 83.

148   Pareto is quoted in [19], p. 231.

CHAPTER EIGHT

153-54 Not only are British prime ministers moving in and out of office faster since the days of Lloyd George, but the rate of turnover among other cabinet ministers has risen, too. According to political scientist Anthony King of the University of Essex, "Britain now has one of the most rapid rates of turnover in high ministerial office of any major country in the Western world— or the Eastern for that matter. The rate is considerably higher than in Britain before 1939 or 1914." See "Britain's Ministerial Turnover," *New Society,* August 18, 1966, p. 257.

154   Fishwick's quote is from "Is American History A Happening?" by Marshall Fishwick in *Saturday Review,* May 13, 1967, p. 20.

154   Klapp is cited from [228], pp. 251, 261.

156   Childe quoted from [203], pp. 108-109.

159   For information on childrearing, see [102], pp. 168-169.

159   The spread of Freudianism is discussed in [190], pp. 94-95.

161   Mr. Cornberg's quote can be found in "Libraries" by Alvin Toffler in *Bricks and Mortarboards,* A Report from Educational Facilities Laboratories, Inc., on College Planning and Building, p. 93.

166   For exposure to advertising messages see [65], pp. 5-6.

168   On the conference of composers and computer specialists, see *The New York Times,* November 14, 1966.

169   The acceleration of music is also commented on by David Riesman in [192], p. 178. Professional composers and musicians I have asked generally confirm the belief that, note for note, we are playing faster today. (We are also, for whatever *that* means, playing classical music at higher pitches.)

169   Quotes from Flexner are taken from an interview with the author.

171   The article on Sontag and "camp" appeared in *Time,* December 11, 1964, p. 75.

173   Hauser reference is from [208], vol. 4, p. 167.

174   The turnover of art schools is noted in "Stop Wasting Time" by Robert Hughes in *New Society,* February 2, 1967, pp. 170-171.

174   McHale's comments are from his essay "The Plastic Parthenon" (draft version) from *Lineastruttura,* June, 1966; and from his "The Expendable Ikon" in *Architectural Design,* February/March, 1959. See also [164].

177   Rate of conceptual turnover in science is drawn from [200], p. 163.

179   Comments on the costs of relearning are from "The Changing Nature of Human Nature" by Harold D. Lasswell in the *American Journal of Psychoanalysis,* vol. XXVI, #2, p. 164.

CHAPTER NINE

188   On ocean mining and Spiess, see *The New York Times,* July 17, 1966; "Lure of a Lost World" in the *Kaiser Aluminum News,* #2, 1966; and "The Feedback between Technology and Values" by T. J. Gordon in [131], pp. 167-169. See also: "Aquaculture" by John Bardach, *Science,* September 13, 1968, pp. 1098-1106. Data on world fishing industry will be found in [130], p. 43.

191   Dr. Walter Orr Roberts is quoted from his essay "Science—the Wellspring of Our Discontent" in *Space Digest,* June, 1967, p. 78.

192   Statement by the American Meteorological Society is from "Forecast: Weatherman in the Sky" in *Time,* July 29, 1966, p. 18. See also: "Weather Modification" by Gordon J. F. MacDonald in *Science Journal,* January, 1968, p. 39.

193   For Capek, see [271].

193   Use of fish and dolphins is described in various issues of the *Bulletin of the Centre d'Etude des Consequences Generales des Grandes Techniques Nouvelles.* See especially #32, June, 1965; #33, August-September, 1965; and #35, January, 1966.

193   For data on communication between man and dolphin, see [294] and subsequent works by Lilly.

194   Thomson on animals: [175], p. 125.

194   Clarke's quote is from [137], p. 24.

149   Delgado's famed experiment is summarized in popular form in *Science Digest,* August, 1965, p. 38. See his book: [275].

195   Johnson is quoted from his paper, "Horizons of Industrial Microbiology' in *Impact,* vol. XVII, #3. For an excellent non-technical introduction to microbiology, see also: "Living Chemical

Factories" by Robert K. Finn and Victor H. Edwards in *Engineering,* a Cornell University quarterly, Winter, 1968, vol. 2.

195   Tiselius quoted from his interview with the author.

196   Fourastié is cited from [78], p. 17.

197   Information on cloning is drawn from "Experimental Genetics and Human Evolution" by Joshua Lederberg, a mimeographed paper, Department of Genetics, Stanford University School of Medicine, and from author's interview with Lederberg.

200   The work of Hafez and Petrucci is reported in "On the Frontiers of Medicine," *Life,* September 10, 1965, and in "The New Man—What Will He Be Like," by Albert Rosenfeld, *Life,* October 1, 1965.

201   Cawein and the "blue people" are reported in *Medicine at Work,* vol. 6, #4.

201   Gordon is quoted from [149], p. 34.

202   William Tenn's comments on genetic architecture are from "The Playboy Panel—1984 and Beyond" in *Playboy*, July, 1963, p. 36.

202   Haldane and Lederberg are cited from [177], pp. 354, 362.

203   Sinsheimer's remarks are from "The End of the Beginning," his speech at the 75th Anniversary Conference of the California Institute of Technology.

204   On the likelihood of various horrors, Dr. Hotchkiss is quoted from *Science Digest,* October, 1965, p. 7; the controversy between Neyfakh and Petropavlovsky is described in "Spectre of a Genetic 'Arms Race'" by Victor Zorza in *Guardian Weekly,* December 13, 1969, p. 6.

206   Annual Report of the Russell Sage Foundation, 1967-1968, pp. 13, 15.

206   Lederberg is quoted here from his interview with the author.

206   Professor Kenedi is cited from [136], p. 204.

208   Pickering is quoted from his "Reflections on Research and the Future of Medicine," in *Science,* July 22, 1966, p. 442.

210   Robot material drawn in part from interviews with H. D. Block and his papers, including: "Bionics and Robots" in *Engineering,* a Cornell University quarterly, Winter, 1968; and "The Perceptron: A Model for Brain Functioning, I" in *Reviews of Modern Physics,* vol. 34, #1, pp. 123-135. See also: "The Psychology of Robots" by Henry Block and Herbert Ginsburg in *Psychology Today,* April, 1968, pp. 50-55.

210   On the controversy over computer chess, see *Alchemy and Artificial Intelligence* by Hubert L. Dreyfus, RAND Paper P-3244, the RAND Corporation, Santa Monica, California, 1964, and the *SICART Newsletter* of the Association for Computing Machinery, October and December, 1967.

212   For more on cybernetic medicine, see [285], p. 281.

212   Gordon cited from [149], p. 170.

213   Page is quoted from [285], p. 282. The RAND data are found in [155], pp. 56-57.

214   Quotes from Drs. White and Massopust are found in "The Dead Body and the Living Brain" by Oriana Fallaci in *Look,* November 28, 1967, p. 99.

215   Editor on the telephone and press coverage of Wright Brothers are described in [162], p. 11.

215   Newcomb quote is from [137], p. 2.

216   The infeasibility of the automobile is cited in [97], p. 177.

216   The millionth Ford: see [270], p. 151.

216   Rutherford is discussed in [306], p. 34.

CHAPTER TEN

222   Demby quotes from interviews with the author.

222   British Overseas Airways Corporation venture in experientialism is described in *The New York Times,* September 13 and 16, 1969.

229   "Hon" is described in the *Scandinavian Times,* August-September, 1966. The author visited the Moderna Museet during the summer of 1966 and "experienced" the show himself.

229   Cerebrum: the author donned the diaphanous robes on opening night. Cerebrum is described in the *Village Voice,* November 7, 1968, pp. 10-11.

231   The case of the topless prize is reported in *Sweden Now,* April, 1968, p. 6.

234   Stanford Research Institute quote is drawn from "A Social and Cultural Framework for 1975" by Ely M. Brandes and Arnold Mitchell in [183], p. 172.

235   For data on earlier maturation of children, see [166], pp. 39-40.

CHAPTER ELEVEN

238   Lundberg is quoted from [163], p. 295.

238   Wolf's remarks are from an interview with the author.

239   On leisure as a family-cement, see [183], p. 7.

239   Greenberg is quoted from an interview with the author.

240   Weitzen's comments are from his article, "The Programmed Child," in *Mademoiselle,* January, 1966, pp. 70-71.

240   The "multi-mouse" experiments are reported in *The New York Times,* May 30, 1968.

242   Margaret Mead on childlessness: from her paper "The Life Cycle and its Variations: The Division of Roles" in [132], p. 872.

245   For the novels of Skinner and Rimmer, see [125], [126], and [328].

246   The work of the Ecumenical Institute is described in *The New York Times,* November 9, 1968.

248   The British Sexual Offenses Act became law on July 27, 1967.

250   Nelson Foote is cited in "The American Family Today" by Reuben Hill in [109], pp. 93-94.

252   The black civil rights worker is quoted from "... Because He was Black and I was White" by Elizabeth Sutherland in *Mademoiselle,* April, 1967, p. 244.

253   The Swedish article is from *Svensk Damtidning,* November 9, 1965. It is Part 4 of a five-part series entitled "Woman '85."

253   Keil and Lazure are both quoted in "Trial by Marriage," *Time,* April 14, 1967, p. 112.

258   Neugarten is quoted from her unpublished paper, "The Changing Age-Status System." On early childbearing, see also: [121], p. 68 and [118], p. 33.

CHAPTER TWELVE

263   The Ellul quotes can be found in [186], pp. 77, 80, and 93.

264   On Toynbee, see specifically: "Why I Dislike Western Civilization" by Arnold Toynbee in *The New York Times Magazine,* May 10, 1964.

265   For the Kenneth Schwartz quote, see his "Fragmentation of the Mass Market" in *Dun's Review,* July, 1962. See also: "More Sense About Market Segmentation" by William H. Reynolds in *Harvard Business Review,* September-October, 1965.

266   Saunders is cited in "Putting a New Face on the Office," *Business Week,* September 13, 1969, p. 152.

266   Yavitz is quoted from his article, "The Anomie of the 'Paper Factory' Worker." Hare's remarks are from his paper, "The Horse that Can Save More than a Kingdom." Both appear in the *Columbia Journal of World Business,* vol. VII, #3, pp. 32, 59

268   The Mustang quote is found in "Anti-technology" by Reyner Banham in *New Society,* May 4, 1967, p. 645; see also "Selling the Golden Calf" by Jeremy Bugler in *New Society,* October 17, 1968, p. 556.

269   McLuhan: from "The Future of Education" by Marshall McLuhan and George B. Leonard, *Look,* February 21, 1967, p. 23.

270   Data on literary diversity are from [206], p. 83.

271   McHale is quoted from his paper, "Education for Real" in the *World Academy of Art and Science Newsletter,* Transnational Forum, June, 1966, p. 3.

273   On tendencies toward differentiation in education, see "Decentralizing Urban School Systems" by Mario Fantini and Richard Magat; "The Community-Centered School" by Preston Wilcox; and "Alternatives to Urban Public Schools" by Kenneth Clark, all in [115].

277   London movies are discussed in "The Smaller the Better," *Economist,* January 11, 1969, p. 66.

On diversity of film fare, an advertisement placed in *The New York Times* of August 10, 1969, by Walter Reade, Jr., a leading film exhibitor, is worth quoting:

The movie-goers of this country are not as homogeneous or as sophisticated as you might think ... It isn't widely known but many films are designed and produced exclusively for specific regions of the country, and with specific audiences in mind.

Two years ago there was a Don Knotts comedy called *The Ghost and Mr. Chicken,* a low-budget Hollywood film that earned a phenomenal $2.5 million—outside of New York. Who saw it? The Middle West and the South, in the 'grass roots' areas, which also like films about stock car racing, and with country music themes. Another Hollywood studio has been very successful with a series of 'beach party' and motorcycle films. These surface only briefly in New York but are a staple of suburban drive-in theaters and their predominantly under-25 audiences.

The West Coast is offered dozens of Japanese films, because of its large Oriental population, while New York sees only one or two a year ... What are we to make of the failure of *Isadora* in Los Angeles, and its success here? What of *The Shameless Old Lady*—successful here *and* Los Angeles, not so elsewhere?

277   An interesting experiment in providing radio services for small, homogeneous audiences has taken place in Buffalo, New York, where station WBFO-FM has set up a storefront studio in the black ghetto. There, people from the neighborhood, itself, produce six hours of programming aimed at informing their neighbors about job opportunities, health measures, black history and culture.

278   Trends in the magazine industry are discussed in *The New York Times,* April 17, 1966, April 27, 1969; *The Wall Street Journal,* August 18, 1964; and in "Aiming at the Hip" in *Time,* June 2, 1967. See also: "Fat Days for the 'How-To' Publishers," *Business Week,* July 30, 1966; and "City Magazines are the Talk of the Town," *Business Week,* February 18, 1967.

279   On underground press, see "Admen Groove on Underground," in *Business Week,* April 12, 1969.

280   Moosmann is quoted from interview with the author.

282   For Naughton, see "Goodbye to Gutenberg" in *News*week, January 24, 1966; Japanese developments are reported in *The Times* (London), December 12, 1969.

CHAPTER THIRTEEN

288   On surfers, see Nadeau [231], p. 144 and "Is J. J. Really King of the Surf" by Jordan Bonfante in *Life,* June 10, 1966, p. 81.

289   For a colorful account of life among the sky-divers, see "Death-Defying Sports of the Sixties" by Mario Puzo in *Cavalier,* December, 1965, p. 19.

289   Data on the decline of the society's overall commitment to work are to be found in [74], pp. 13-14.

290   Pynchon:[235].

290   Sheckley's story is found in [237].

291   Age segregation is discussed in "The Youth Ghetto" by John Lofland in the *Journal of Higher Education,* March, 1968, pp. 126-139.

292   James W. Carey's remarks are from his paper, "Harold Adams Innis and Marshall McLuhan," given at the Association for Education in Journalism Convention, Iowa City, Iowa, August 28-September 3, 1966.

293   Post-marital tribalism is examined in "The World of the Formerly Married" by Morton M. Hunt in *McCall's,* August, 1966.

295   The best short account of the origins and early development of the hippie movement is found in "A Social History of the Hippies" by Warren Hinckle in *Ramparts,* March, 1967, p. 5. See also: [223], pp. 63-68.

295   On distinctions among hippie-like subcults, see "Tell It Like It Really Is ..." by David Andrew Seeley, *Center Diary,* May-June, 1967.

296   The death of the hippie movement is reported in "Love is Dead" by Earl Shorris in *The New York Times Magazine,* October 29, 1967, p. 27.

297   For an early description of the skinhead phenomenon, see "Hippies vs. Skinheads," *Newsweek,* October 6, 1969, p. 90.

297   Material on street gangs: [240]; [114], p. 20; and "Violence" by James Q. Wilson in [179], vol. 4, p. 7.

299   Gardner on conformity is from [39], pp. 62-63.

299   Material on the Temne people is from "Independence and Conformity in Subsistence-Level Societies" by J. W. Berry in the *Journal of Personality and Social Psychology,* December, 1967, p. 417.

CHAPTER FOURTEEN

304   The loss of consensus is discussed in "Anything Goes: Taboos in Twilight" by Paul D. Zimmerman in *Newsweek,* November 13, 1967, p. 74.

305   Gruen reports his work in "Composition and Some Correlates of the American Core Culture" in Ps*ychological Reports,* vol. 18, pp. 483-486. Material is drawn from this source and from an interview.

305   The life style of the English gentleman is examined in [215], p. 138.

308   Klapp is quoted from [228], pp. 37-38.

308   On the West Side Intellectual subcult, see [234].

308   For the role of life style models, see "The New Heroes" by John Speicher in *Cheetah,* November, 1967, pp. 27-28.

309   Ginsberg's letter is from "In the beginning, Leary turned on Ginsberg and saw that it was good ..." by Timothy Leary in *Esquire,* July, 1968, p. 87.

314   On the pressure of overchoice: The adoption of a style also relates to the conquest of unpredictability in the society. As the level of novelty around us rises, we become more uncertain of the behavior of other individuals, leading to a withdrawal of commitment, a fear of self-revelation or deep feelings. When young people don outlandish costumes, thrift-store gowns and kooky hats, they touch off a subtle fear among the "straights" in society because they announce, by their clothing, that their behavior is likely to be unpredictable. The strength of their attachment to their own subculture, at the same time, derives from the fact that within the group, unpredictability is reduced. They can make better predictions about the behavior of their peers and subcult colleagues than about the outside world. Adoption of a life style and the affiliation with a subcult can be seen as efforts to lower the level of novelty or unpredictability in the microenvironment.

321   Mannheim is quoted from [189], p. 46.

321   The Gross quote is from "The State of the Nation: Social Systems Accounting" by Bertram M. Gross in [313], p. 198.

CHAPTER FIFTEEN

327   The "human ecology" approach to medicine is discussed in "The Doctor, His Patient, and the Environment" by Lawrence E. Hinkle, Jr., in *The American Journal of Public Health,* January, 1964, p. 11.

328   Material on life changes research is based partially on interviews with Dr. Thomas H. Holmes of the University of Washington School of Medicine; and Dr. Ransom J. Arthur and E. K. Eric Gunderson of the U.S. Navy Medical Neuropsychiatric Research Unit, San Diego.

See the following papers in the *Journal of Psychosomatic Research:*

"A Longitudinal Study of Life-Change and Illness Patterns" by Richard H. Rahe, Joseph D. McKean, Jr., and Ransom J. Arthur. vol. 10, 1967, pp. 355-366.

"The Social Readjustment Rating Scale" by Thomas H. Holmes and Richard H. Rahe. vol. 11, 1967, pp. 213-218.

"Magnitude Estimations of Social Readjustments" by Minoru Masuda and Thomas H. Holmes. Vol. 11, 1967, pp. 219-225.

"The Social Readjustment Rating Scale: A Cross-Cultural Study of Japanese and Americans" by Minoru Masuda and Thomas H. Holmes. vol. 11, 1967, pp. 227-237.

"Quantitative Study of Recall of Life Events" by Robert L. Casey, Minoru Masuda, and Thomas H. Holmes. vol. 11, 1967, pp. 239-247.

"Seriousness of Illness Rating Scale" by Allen R. Wyler, Minoru Masuda and Thomas H. Holmes. vol. 11, 1968, pp. 363-374.

and:

"Social and Environmental Factors in Illness Behavior" by E. K. Eric Gunderson, Richard H. Rahe, and Ransom J. Arthur. Paper presented to the Annual Meetings of the Western Psychological Association, San Diego, California, March, 1968.

"Life Crisis and Disease Onset—I. Qualitative and Quantitative Definition of the Life Crisis and its Association with Health Change; II. A Prospective Study of Life Crises and Health Changes," by Richard H. Rahe and Thomas H. Holmes. (Mimeo) Department of Psychiatry, University of Washington School of Medicine, Seattle, Washington.

The general pattern discovered in these studies is supported by the findings of George Brown and J. L. T. Birley of the Social Psychiatry Unit, Maudsley Hospital, London. Brown and Birley studied cases of schizophrenic relapse and correlated them with life change histories. See: *Journal of Health and Social Behavior,* vol. 9, ¶3 (1968), p. 263.

333 The death rate of spouses is studied in "The Mortality of Widowers" by Michael Young, Bernard Benjamin and Chris Wallis, in *Lancet,* August 31, 1963, pp. 454-456.

334 For a brief but comprehensive treatment of the orientation response, see [21].

Also:

"Neurophysiological Contributions to the Subject of Human Communication" by Mary A. B. Brazier in [7], p. 63.

"Neuronal Models and the Orienting Reflex" by E. N. Sokolov in Brazier, M. A. B. (ed.), *The Central Nervous System and Behavior,* New York: J. Macy, 1960, pp. 187-276.

"Higher Nervous Functions: The Orienting Reflex" by E. N. Sokolov, *Annual Review of Physiology,* 1963, vol. 3, pp. 545-580.

"Neuronal Model of the Stimulus: I. The Formation of a Neuronal Model by Repeated Representation of the Stimulus," by E. N. Sokolov in *Rep. Acad. Pedagog. Sc.,* USSR (1959), pp. 93-96 (in Russian).

335 Lubin is quoted from an interview with the author.

338 No discussion of the adaptive reaction and stress can overlook Dr. Hans Selye whose work laid the basis for much of the research conducted in recent years. His book [26] has become a classic.

A brief section on ACTH and its relation to stress appears in [10], p. 306. See also [12], pp. 330-334.

339 Levi's work is discussed in [20]; in "Life Stress and Urinary Excretion of Adrenaline and Noradrenaline" by Lennart Levi in [24]; and in "Conditions of Work and Their Influence on Psychological and Endocrine Stress Reactions" by J. Froberg, C. Karlsson, L. Levi, L. Lidberg and K. Seeman, Report #8, The Laboratory for Clinical Stress Research, Karolinska Sjukhuset, Stockholm, October, 1969.

340 Dubos is quoted from his speech at the Nobel Conference, Gustavus Adolphus College, 1966, entitled "Adaptation to the Environment and Man's Future."

340 Selye is quoted from [26], p. 176.

341 Data on the effects of crowding will be found in [343]. See also "Population Density and Social Pathology" by John B. Calhoun in [241]; and *The New York Times*, December 28, 1966.

341   Hinkle's studies are reported in his paper, "Studies of Human Ecology in Relation to Health and Behavior," *BioScience,* August, 1965, pp. 517-520.

342   Selye: [26], p. vii.

CHAPTER SIXTEEN

343   The limits of the nervous system are discussed in "Curiosity and Exploration," by D. E. Berlyne, *Science,* July 1, 1966, p. 26.

See also a highly significant paper by Bruce L. Welch entitled "Psychophysiological Response to the Mean Level of Environmental Stimulation: A Theory of Environmental Integration." It appears in [32]. Welch posits a general level of stimulation which he terms the MLES (Mean Level of Environmental Stimulation) and shows how fluctuations in this level can produce distinct physiological and behavioral changes in men and animals.

The effects of understimulation are examined in "Adaptation of Small Groups to Extreme Environments," by E. K. Eric Gunderson and Paul D. Nelson, *Aerospace Medicine,* December, 1963, p. 1114.

Also:

"Biographical Predictors of Performance in an Extreme Environment," by E. K. Eric Gunderson and Paul D. Nelson in the *Journal of Psychology,* 1965, #61, pp. 59-67.

"Emotional Health in Extreme and Normal Environments," by E. K. Eric Gunderson. Paper presented at the International Congress on Occupational Health, Vienna, September 19-24, 1966.

"Performance Evaluations of Antarctic Volunteers," by E. K. Eric Gunderson, Report #64-19, US Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

344   The case of the Chindit soldier is described in the *Daily Telegraph,* (London) August 30, 1966.

345   The Normandy research is reported in "Combat Neurosis. Development of Combat Exhaustion" by R. L. Swank and E. Marchand in the *Archives of Neurology and Psychiatry,* LV, 236; 1946. An earlier report is to be found in "Chronic Symptomatology of Combat Neurosis" by R. L. Swank and B. Cohen in *War Medicine,* VIII, 143; 1945.

345   Swank is quoted in [25], pp. 38-39.

346   The Waco disaster is described in [23], p. 311.

346   The Udall case is covered in [16]. For a more general study of disaster behavior, see [54].

347   On culture shock: see "Personality Determinants and Assessment," by Sven Lundstedt, *Journal of Social Issues*, July, 1963, p. 3.

348   Sensory deprivation experiments are described in "Sensory and Perceptual Deprivation" by Thomas I. Myers in [32].

Also:

"Effects of Experiential Deprivation Upon Behavior in Animals," by John L. Fuller, paper presented at Third World Congress of Psychiatry, Montreal, 1961. A shorter version will be found in [31].

"Emotional Symptoms in Extremely Isolated Groups," by E. K. Eric Gunderson, *Archives of General Psychiatry,* October, 1963, pp. 362-368.

"Summary of Research in Sensory Deprivation and Social Isolation," by Howard H. McFann, *NATO Symposium on Defense Psychology,* August, 1961.

350   Neural transmission rates are given in "Biological Models and Empirical Histories of the Growth of Organizations" by Mason Haire in [37], p. 375 and in [279], p. 107.

350   A lucid introduction to information theory is found in "Coping with Administrators' Information Overload" by James G. Miller, Mental Health Research Institute, University of Michigan. Paper delivered at the First Institute on Medical School Administration, Association of American Medical Colleges in Atlanta, Georgia, October, 1963.

351   Limitations on information processing capacity in humans are discussed in [22], pp. 41-42.

352   The breakdown of worker performance is described in [6], pp. 47-53.

Also:

"Automation: Some underlying Psychological Processes," by E. D. Poulton, *Transactions* (Journal of the Association of Industrial Medical Officers) 15 (3) 96-99, 1965.

The mental rather than muscular limitations are noted in "Components of Skilled Performance" by Michael I. Posner, *Science,* June 24, 1966, pp. 1712-1718.

353   Information glut is discussed in "A Theoretical Review of Individual and Group Psychological Reactions to Stress" by James G. Miller in Grosser *et al.,* [14], p. 14.

353   The possible relationship of overload to mental illness is examined in *Disorders of Communication*, vol. XLII, Research Publications, Association for Research in Nervous and Mental Disease, 1964, pp. 98-99.

Also: "Schizophrenic-like Responses in Normal Subjects Under Time Pressure" by G. Usdansky and L. J. Chapman, *Journal of Abnormal and Social Psychology, 60*, pp. 143-146, 1960.

356   The Gross quote is from his paper, "The State of the Nation: Social Systems Accounting" in [313], p. 250.

358   Reaction time is discussed in "Information Processing in the Nervous System" by D. E. Broadbent, *Science,* October 22, 1965, p. 460.

358   For an insightful discussion of the modes of organizational response to overload conditions, see "Information Input Overload: Features of Growth in Communications-Oriented Institutions" by Richard L. Meier in [41], pp. 233-273.

Also:

"Some Sociological Aspects of Message Load" by Lindsey Churchill in [41], pp. 274-284.

The strategies of denial, specialization, reversion and super-simplification are analogues of some familiar organizational responses discussed in these papers.

363   For "paradoxical phase" see [25], pp. 30-32, 44.

363   Violence as a response to stress is discussed in "Violence and Man's Struggle to Adapt," by Marshall F. Gilula and David N. Daniels, *Science,* April 25, 1969, p. 404.

363   *Japan Times,* July 3, 1966.

364   The story of the Crete cop-outs is told in "Crete: A Stop in the New Odyssey," by Thomas Thompson, *Life,* July 19, 1968, p. 23.

365   The nervous breakdown analogy is from "Has This Country Gone Mad?" by Daniel P. Moynihan, *Saturday Evening Post,* May 4, 1968, p. 13.

366   The Bierl quote is from the Thompson story in *Life,* July 19, 1968, p. 28.

A Note on Understimulation:

The emphasis in this chapter has been on the problems of overstimulation. What is striking to anyone who reads through the scientific literature is the similarity of human response to both high *and* low stimulation. Apparently, when men are pushed either above or below the adaptive range, they exhibit some of the same symptoms of distress. Thus psychologists have recently completed extensive studies of the men who live in the seven US outposts in Antarctica. The most inhospitable environment inhabited by man, Antarctica subjects these men to enforced monotony and understimulation. The Amundsen-Scott station at the South Pole is literally isolated from the rest of the world, except for sporadic radio communications, for ten months of the year. Temperatures plummet to as low as -100° (F) and the winds that sweep across the ice sometimes reach velocities of 100 mph. In all these outposts small groups of men are compelled to live indoors, in extremely close quarters, for protracted periods. Life inside these stations is probably as "changeless" as in any social environment in which modern men find themselves.

According to E. K. Eric Gunderson and Paul D. Nelson, in the studies noted above, "Under conditions of restricted stimulation and activity for prolonged periods, participants reported an increase in the incidence and severity of emotional and somatic symptoms, particularly on items reflecting sleep disturbances, depression, irritability, and anxiety." The men felt leaden and fatigued. Some suffered loneliness and depression. Many exhibited extremely short tempers, flaring easily into anger.

The chronicles of polar explorers confirm the picture of psychological distress. There are repeated references to "polar ennui" and frequent symptoms of withdrawal and deadly apathy. Admiral Byrd, for example, after five months of total isolation at a remote weather station, suffered a behavior breakdown whose effects lasted for months afterward. In his diary, Byrd wrote: "Mornings it's a tough job to drive myself out of the sleeping bag. I feel as if I had been drugged. But I tell myself, over and over again, that if I give in—if I let this stupor claim me—I may never awake ... Why bother? ... Why not let things drift? ... That is the direction of everlasting peace. So why resist?" (Byrd, R. E., *Alone,* New York: Putnam, 1938.)

Significantly, one of the worst punishments known to man is solitary confinement—a situation in which the individual is not only cut off from the stimulation of social interaction, but deprived of change and novelty of any kind. For this reason, it is employed by interrogators and psychologists to "soften up" prisoners whom they wish to brainwash.

It was, in fact, the successful brainwashing of captured American troops by the Red Chinese and North Koreans during the Korean conflict that spurred research into "sensory deprivation."

The psychologist D. O. Hebb, a pioneer in this field, found that monotonous sensory stimulation produces confusion—a disruption of the ability to think clearly. His associates, Heron, Scott, Bexton and Doane, confirmed that stimuli-deprived subjects had difficulty concentrating. The volunteers reported anxiety, somatic complaints, occasional hallucinations, and difficulty in judging the passage of time.

Myers, a US Navy researcher, summarized a decade of sensory deprivation research: "Most subjects find sensory isolation difficult to endure, are tempted to withdrawal, and have little appetite to repeat the experience... . Subjects have unusual and compelling reactions. They experience severe tedium, restlessness, anxiety, difficulty in mental concentration, blurring of the boundaries of sleeping and waking activities and of reality ... Performance on intellectual tasks tends to decline ... " In a word, according to Myers, "Sensory deprivation apparently increases the desire for informative stimulation, though not necessarily the desire for relatively redundant and meaningless stimulation." ("Sensory and Perceptual Deprivation" by Thomas I. Myers in [32]).

Moving out of the laboratory, we find that certain employees in advanced automated plants frequently exhibit similar symptoms of understimulation. These workers are compelled to spend many hours alone in control booths scanning a variety of dials and screens for signs of

equipment breakdown. But while there are many signals for them to monitor, the signals are, by and large, repetitive and predictable. Only rarely is there an "abnormal" or novel signal. When novelty is too low, the worker's alertness fades and he increasingly misses or fails to report abnormalities. Boredom sets in, and his very self-confidence evaporates. He begins to doubt his own ability to distinguish between normal and abnormal signals. (See [6]).

There is convincing evidence, moreover, that when deprived of the necessary stimulation we will take action to create it. Like the laboratory monkey who pushes a lever hundreds of times per hour for no reward other than the opportunity to look out a window, man exhibits a deep-seated hunger for novelty when his environment becomes too changeless. He attempts to alter his surroundings, to create change, thereby bringing the level of stimulation back into the "adaptive range."

So strong is man's need to stay within the adaptive range that internal mechanisms sometimes take over when the external environment fails to provide the needed excitement. Recent scientific research suggests that dreaming is a way of boosting the level of arousal of the brain and body at a time when they are largely cut off from needed external stimuli. Something analogous to dreaming seems to occur even in unborn babies. Indeed, the "rapid eye movements" associated with dreaming occur more frequently in young children than in adults, and even more frequently in the foetus.

This suggests that within the womb, the least externally stimulating environment of all, internal stimulation keeps the brain, the neutral network and the endocrine systems in action. Later, as the baby develops into an adult, as levels of external stimulation rise, and as the individual develops greater control over his external environment, dreaming and rapid eye movements tend to fall off in frequency.

To sum up: when the level of environmental stimulation or change falls below a certain point, the individual is forced below his adaptive range, he suffers distinct distress and takes action to increase the level of stimulation. When the level of environmental stimulation forces him above his adaptive range, he exhibits many of the same symptoms—anxiety, confusion, irritability, and eventual apathy. In this situation, as we see in Chapter 17, the individual strives to reduce stimulation. In short, all of us, from before the instant of birth to our very deathbed, wage a continuing, sometimes desperate, sometimes quite creative struggle to keep the level of stimulation from pushing us above or below our adaptive range.

CHAPTER SEVENTEEN

371   The Manus story is told in [44], p. 415.

374   Selye references are from [26], pp. 265, 269.

382   Fuller is quoted from interview with the author.

383   The 100,000 figure is extrapolated from *Population Characteristics*, U.S. Department of Commerce, August 14, 1969, Series P-20, #188, p. 161.

384   Situational grouping material was developed in interviews with Gerjuoy.

387   For a discussion of crisis intervention, see "Crisis: A Review of Theory, Practice and Research" by Allen Darbonne in *International Journal of Psychiatry*, November, 1968, p. 372.

388   The reference to half-way houses in the penal field is from "Correctional Institutions in a Great Society" by Daniel Glaser in *Excerpta Criminologica*, 3 (2/3) -3-6, 1965.

388   An analogous proposal for adapting slum dwellers to new housing has been made by Margaret Mead. See *Chicago Sun-Times,* November 2, 1966.

389   Khartoum: based on author's interview with Doxiadis.

393   Gardner on continuity is from [39], p. 6.

394   Kimball is quoted from his introduction to [50], p. xvii.

394   Coon's remark is from his paper, "Growth and Development of Social Groups" in [177], p. 124.

394   Data on Christmas cards are based on *Preliminary 1967 Census of Manufactures.* Industry Series—Greeting card publishers. MC-67 (P-27C-1) US Department of Commerce.

394   Family ritual is examined in [5], p. 32.

CHAPTER EIGHTEEN

401   Dewey and Hutchins are quoted in [112], the dedication and p. 70.

401   The Barzun reference is from [101], p. 125.

402   The significance of the clock is explored in "The Monastery and the Clock" by Lewis Mumford in [293], p. 61. See also the excellent paper entitled "Time, Work-Discipline, and Industrial Capitalism" by E. P. Thompson in *Past and Present*, December, 1967, pp. 56-97.

403   Snow is quoted from [306], p. 12.

406   For a description of McDonald's proposal see "Beyond the Schoolhouse" by Frederick J. McDonald in [115], p. 230.

406   On the proposed school in Bedford-Stuyvesant, see: "A College in the City: An Alternative" report issued by Educational Facilities Laboratories, Inc., March, 1969.

407   Howe's suggestions are in his paper, "This City as Teacher" in [115], p. 22.

414   Gerjuoy's comments are from an interview with the author.

415   McKuen is quoted [230], p. 60.

418   For Bowen quote, see [6], p. 52.

419   The development of future perspectives is examined in "Changes in Outlook on the Future Between Childhood and Adolescence" by Stephen L. Klineberg in the *Journal of Personality and Social Psychology*, vol. 7, #2, 1967, p. 192.

420   For Warner on time, see [350], pp. 54-55; Jaques is cited in [260], pp. 231-233. See also "A Note on Time-span and Economic Theory" by J. M. M. Hill in *Human Relations*, vol. XI, #4, p. 373.

421   The future as an organizing principle is studied in "The Future-Focused Role Image," an unpublished paper by Benjamin D. Singer, Department of Sociology, University of Western Ontario.

422   The comment on the lack of future perspective in the curriculum is from "Teaching the Future" by Ossip K. Flechtheim in *The Futurist,* February, 1968, p. 7.

422   Description of the Condry experiment is based on an interview With the experimenter and/or test materials. Publication planned by Professor Condry. See also: "Time and Social Class" by Lawrence L. Le Shan in [339].

424   The quote from Jungk is from his paper, "Technological Forecasting as a Tool of Social Strategy" in *Analysen und Prognosen,* January, 1989, p. 12.

425-26 For a fascinating account of experiments With future autobiographies of mental patients, see [345].

CHAPTER NINETEEN

429 Material on effects of technology is partially drawn from [332]. See also: "Man's Deteriorating Environment" by Julian Huxley and Max Nicholson in *The Times* (London), October 7, 1969.

430 Commoner quote is from "Attitudes Toward the Environment: A Nearly Fatal Solution." Paper presented at the Annual Meeting of the American Association for the Advancement of Science, Dallas, Texas, December, 1968.

See also: *The New York Times,* December 29, 1968.

430 For additional material on technological impacts, see [329] and *The New York Times* for March 31, April 15, and April 27, 1969.

430 The research moratorium is described in *The New York Times,* March 5, 1969.

430 Evidences of British concern are found in "Britain: Scientists Form New Group to Promote Social Responsibility" by D. S. Greenberg, *Science,* May 23, 1969, p. 931. For a report on international efforts, see "Of Muck and Men," *Economist,* December 20, 1969, p. 15.

430 Attitudes of the youth movement toward technocracy are discussed in "Altering the Direction of Technology" by Robert Jungk in *Student World,* #3, 1968. Geneva: World Student Christian Federation, p. 224.

431 Research and development figures are from [169], p. 24.

431 Lapp is quoted from [290], p. 29.

432 Lack of science policy is charged in OECD report [335]; see also *The New York Times,* January 13, 1968.

433 Technological likelihoods are discussed in [159], pp. 51-52.

434 OLIVER's potentials are explored in "Computer as a Communications Device" by J. C. R. Licklider and Robert W. Taylor in *Science and Technology,* April, 1968, p. 31.

435 For discussions of the supersonic transport, see "The SST and the Government: Critics Shout into a Vacuum," *Science,* September 8, 1967, and "Sonic Booms from Supersonic Transport" by Karl D. Kryter, *Science,* January 24, 1969.

436 The proposal for an artificial ocean in Brazil is described in "A Wild Plan for South America's Wilds" by Tom Alexander in *Fortune,* December, 1967, p. 148.

439 On forecasting value change, see "Value Impact Forecaster—A Profession of the Future" by Alvin Toffler in [131].

440-41 Scientists' resistance to regulation is commented on in "Change and Adaptation" by Amitai Etzioni in *Science,* December, 1966, p. 1533.

441 The case for the regulation of technology is argued in "The Control of Technology" by O. M. Solandt in *Science,* August 1, 1969. See also a thoughtful discussion of policy problems in science and technology in [333] and a short statement by the leading Congressional advocate of technological assessment in [314].

443 For detailed theoretical and historical studies of the problems of technological assessment, see the papers of Mayo, [323], [324], and [325]. See also: "Early Experiences With the Hazards of Medical Use of X-rays: 1896-1906" by Barbara Spencer Marx. Staff Discussion Paper 205. Program of Policy Studies in Science and Technology. Washington: George Washington University.

On the need for technological policy, see [290], p. 220.

CHAPTER TWENTY

446-47 Urbanologist Scott Greer is quoted from "Urban Environment: General" by Daniel P. Moynihan in [313], p. 497.

447 Author's interview with Raymond Fletcher.

447 Vickers is quoted from "Ecology, Planning and the American Dream" by Sir Geoffrey Vickers in [241], p. 374-395.

448 For Harrington's argument see [318].

448 Galbraith's position is elaborated in [82].

450 The Woodstock participant is quoted from *The New York Times,* August 25, 1969.

453 Information on the funds is from "Playboy's Guide to Mutual Funds" by Michael Laurence in *Playboy*, June, 1969, p. 152. The non-economic interests of mutual funds are discussed in "The Funds of the Future: 2000 A.D." by Alvin Toffler, Channing Balanced Fund Annual Report, New York, 1969, p. 6.

453 Ford's "program related investment" program is described in "New Options in the Philanthropic Process," Ford Foundation Statement of policy, New York: Ford Foundation, 1968. See also: "New Agency Lends First Million to Aid Ghetto Businesses" by Vic Jameson in *Presbyterian Life,* reprint dated 1968; and mimeographed "PEDCO Guidelines for Loan Approval" issued by Presbyterian Economic Development Corp.

455 Udall is cited in "The Idea of a Social Report" by Daniel Bell in the *Public Interest,* Spring, 1969, p. 81.

455 Gross' quote is from his Preface to [313], p. ix.

455 The social indicators movement is one of the most significant forces in the social and behavioral sciences today. Yet, the literature is still small enough to be manageable. Five basic works are: [313], [317], [327], [330], [337].

461 Ogburn is cited from a longer discussion of prediction in [47], p. 304.

461 MacRae's remark is from his chapter, "The Crisis of Sociology" in [298].

462 For a valuable, though already dated listing and evaluation of forecasting methodologies, see [157].

Delphi is described in [155].

A short, useful introduction to Cross Impact work appears as "Initial Experiments with the Cross Impact Matrix Method of Forecasting" by T. J. Gordon and H. Hayward in *Futures,* December, 1968, pp. 100-116.

465 Christoph Bertram is quoted from his paper, "Models of Western Europe in the 1970's—the Alternative Choices" in *Futures,* December, 1968, p. 143.

472 For the report of President Eisenhower's goals commission, see [331]. The quotation is from p. xi.

472-73 Nixon: from *Statement by the President on the Establishment of a National Goals Research Staff,* White House Press Release, July 13, 1969.

474 "The Politics and Vision of the New Left" by Todd Gitlin, *Radical Education Project,* San Francisco. (mimeo) pp. 2, 5.

476 "The Application of Cybernetics to Psychiatry" by W. Ross Ashby in [48], p. 376; see also [1].

481   Osgood's Project PLATO is noted in "Report of Developments since the Conference of Overseas Sponsors held in London in November, 1965," Mankind 2000, London: Preparatory International Secretariat, August, 1966, p. 2; a further report appears in "Involving the Public in Futures" in *Futures,* September, 1968, p. 69.

481-82 The televised games are mentioned in *Education Daily,* April 25, 1969.

BIBLIOGRAPHY

Since articles, scientific and scholarly papers, and specialized reports are fully described in the accompanying Notes*, this listing is limited to books and to a small number of monographs and proceedings. I have grouped the entries under a few headings. These are not intended to indicate the main subject matter of the work, but the context in which I found it of interest.*

ADAPTATION / Individual

[1]   Ashby, W. Ross, *Design for a Brain.* (London: Chapman and Hall, 1952.)

[2]   Beer, Stafford, *Cybernetics and Management.* (New York: John Wiley, 1964.)

[3]   Berlyne, D. E., *Conflict, Arousal and Curiosity.* (New York: McGraw-Hill, 1960.)

[4]   Bettelheim, Bruno, *The Informed Heart.* (Glencoe, Ill.: The Free Press, 1960.)

[5]   Bossard, James H. S., and Boll, Eleanor S., *Ritual in Family Living.* (Philadelphia: University of Pennsylvania Press, 1950.)

[6]   Bowen, Hugh M., *Rational Design.* Reprint of seven articles from *Industrial Design,* February-August, 1964. (Distributed by Dunlap and Associates, Darien, Conn.)

[7]   Dance, Frank E. X., (ed.), *Human Communication Theory.* (New York: Holt, Rinehart and Winston, 1967.)

[8]   Dubos, René, *Man Adapting.* (New Haven: Yale University Press, 1965.)

[9]   Dunlop, John T., *Automation and Technological Change.* (Englewood Cliffs, N.J.: Prentice-Hall, 1962.)

[10]   Ganong, William F., *Review of Medical Physiology.* (Los Altos, California: Lange Medical Publications, 1967.)

[11]   Glass, David C., (ed.), *Environmental Influences.* (New York: Rockefeller University Press and Russell Sage Foundation, 1968.)

[12]   Goreman, Aubrey, and Bern, Howard A., *A Textbook of Comparative Endocrinology.* (New York: John Wiley, 1962.)

[13]   Grinker, Roy R., and Spiegel, John P., *Men Under Stress.* (New York: McGraw-Hill, 1945.)

[14]   Grosser, George M., Wechsler, Henry, and Greenblatt, Milton, (eds.), *The Threat of Impending Disaster.* (Cambridge, Mass.: The MIT Press, 1964.)

[15]   Gurin, Gerald, Veroff, Joseph, and Feld, Sheila, *Americans View Their Mental Health.* (New York: Basic Books, 1960.)

[16]   Hamilton, R. V., Taylor, R. M., and Rice, G. E., Jr., *A Social Psychological Interpretation of the Udall, Kansas, Tornado.* (Washington: National Academy of Sciences-National Research Council, 1955.)

[17]   Hollingshead, August B., and Redlich, Frederick C., *Social Class and Mental Illness.* (New York: John Wiley, 1964.)

[18]   James, William, *The Principles of Psychology.* (New York: Dover, 1958.) (2 vols.)

[19]   Lee, Alfred McClung, *Multi-Valent Man.* (New York: George Braziller, 1966.)

[20]   Levi, Lennart, *Stress.* (New York: Liveright, 1967.)

[21]   Lynn, R., *Attention, Arousal and the Orientation Reaction.* (Oxford: Pergamon, 1966.)

[22] Miller, George A., *The Psychology of Communication.* (New York: Basic Books, 1967.)

[23] Moore, H. E., *Tornadoes Over Texas.* (Austin, Texas: University of Texas Press, 1958.)

[24] Raab, Wilhelm, *Prevention of Ischemic Heart Disease: Principles and Practice.* (Springfield, Ill.: Chas. C. Thomas, 1966.)

[25] Sargant, William, *Battle for the Mind.* (London: Pan Books, 1963.)

[26] Selye, Hans, *The Stress of Life.* (New York: McGrawHill, 1956.)

[27] Skinner, B. F., *Science and Human Behavior.* (New York: The Free Press 1953.)

[28] Vernon, Jack, *Inside the Black Room.* (New York: Clarkson N. Potter, 1963.)

[29] Vickers, Sir Geoffrey, *The Art of Judgment.* (New York: Basic Books, 1965.)

[30] Wooldridge, Dean E., *The Machinery of the Brain.* (New York: McGraw-Hill, 1963.)

[31] —, *Proceedings of the Third World Congress of Psychiatry.* (Toronto: Toronto University Press, 1964.)

[32] —, *Symposium on Medical Aspects of Stress in the Military Climate.* (Washington: Walter Reed Army Institute of Research, Walter Reed Army Medical Center, 1964.)

[33] —, *Symposium on Preventive and Social Psychiatry.* (Washington: Walter Reed Army Institute of Research, Walter Reed Medical Center, 1957.)

ADAPTATION / Social

[34] Bloch, Herbert A., *Disorganization.* (New York: Alfred A. Knopf, 1952.)

[35] Demerath, N. J., and Peterson, Richard A., (eds.), *System, Change and Conflict.* (New York: The Free Press, 1967.)

[36] De Vries, Egbert, *Man in Rapid Social Change.* (New York: Doubleday, 1961.)

[37] Etzioni, Amitai and Eva, (eds.), *Social Change.* (New York: Basic Books, 1964.)

[38] Frank, Lawrence K., *Society as the Patient.* (New Brunswick, N.J.: Rutgers University Press, 1948.)

[39] Gardner, John, *Self-Renewal.* (Evanston, Ill.: Harper, 1963.)

[40] Lerner, Daniel, *The Passing of Traditional Society.* (New York: The Free Press, 1958.)

[41] Massarik, Fred, and Ratoosh, Philburn, (eds.), *Mathematical Explorations in Behavioral Science.* (Homewood, Ill.: Richard D. Irwin and Dorsey Press, 1965.

[42] Mead, Margaret, *Continuities in Cultural Evolution.* (New Haven: Yale University Press; 1964.)

[43] Mead, Margaret, (ed.), *Cultural Patterns and Technical Change.* (New York: New American Library, 1955.)

[44] Mead, Margaret, *New Lives for Old.* (New York: New American Library, 1956.)

[45] Meier, Richard L., *Developmental Planning.* (New York: McGraw-Hill, 1965.)

[46] Moore, Wilbert E., *Social Change.* (Englewood Cliffs, N.J.: Prentice-Hall, 1964.)

[47] Ogburn, William F., *On Culture and Social Change: Selected Papers.* (Chicago: University of Chicago Press, 1964.)

[48] Smith, Alfred G., (ed.), *Communications and Culture.* (New York: Holt, Rinehart and Winston, 1966.)

[49] Touraine, Alain, Durand, Claude, Pecaut, Daniel, and Willener, Alfred, *Workers' Attitudes to Technical Change.* (Paris: Organization for Economic Cooperation and Development, 1965.) (Summary version entitled *Acceptance and Resistance.*)

[50] Van Gennep, Arnold, *The Rites of Passage.* (Chicago: University of Chicago Press, 1960.)

[51] Wingo, Lowdon, Jr., (ed.), *Cities and Space.* (Baltimore: Johns Hopkins Press, 1963.)

[52] —, *Africa: Social Change and Mental Health.* (London: World Federation for Mental Health, 1959.)

[53] —, *Mental Health Aspects of Urbanization.* (London: World Federation for Mental Health, 1957.)

[54] —, *Training Requirements for Postattack Adaptive Behavior.* (Report for US Office of Civil Defense, prepared by Dunlap and Associates, Darien, Conn., December, 1965.)

[55] —, *Urban America and the Planning of Mental Health Services.* (Philadelphia: Group for the Advancement of Psychiatry, vol. V, Symposium No. 10, November, 1964.)

AUTOMATION

[56] Bagrit, Leon, *The Age of Automation.* (New York: New American Library, 1965.)

[57] Diebold, John, *Beyond Automation.* (New York: McGraw-Hill, 1964.)

[58] Friedmann, Georges, *Industrial Society.* (Glencoe, Ill.: The Free Press, 1955.)

[59] Greenberger, Martin, (ed.), *Computers and the World of the Future.* (Cambridge, Mass.: The MIT Press, 1962.)

[60] Henderson, Mary Stephens-Caldwell, *Managerial Innovations of John Diebold.* (Washington: The LeBaron Foundation, 1965.)

[61] Michael, Donald N., *Cybernation: The Silent Conquest.* (Santa Barbara, Calif.: Center for the Study of Democratic Institutions, 1962.)

[62] Simon, Herbert A., *The Shape of Automation for Men and Management.* (New York: Harper & Row, 1965.)

[63] Theobald, Robert, *The Challenge of Abundance.* (New York: New American Library, 1961.)

[64] —, *Technology and the American Economy.* (Report of the Commission on Technology, Automation and Economic Progress, Vol. 1, February, 1966.)

BUSINESS / ECONOMICS / CONSUMER PATTERNS

[65] Adams, Charles F., *Common Sense in Advertising.* (New York: McGraw-Hill, 1965.)

[66] Anshen, Melvin, and Bach, George Leland, (eds.), *Management and Corporations, 1985.* (New York: McGraw-Hill, 1960.)

[67] Backman, Julius, *Advertising and Competition.* (New York: New York University Press, 1967.)

[68] Baird, Mary K., *International Consumer Expenditure Patterns* (Report No. 196). (Menlo Park, Calif.: Stanford Research Institute, December, 1963.)

[69] Barish, Norman, and Verhulst, Michel, *Management Sciences in the Emerging Countries.* (Oxford: England-Alden Press, 1965.)

[70] Berle, Adolf A., Jr., *Power without Property.* (New York: Harcourt, Brace & World, 1959.)

[71] Best, Katherine, and Hillyer, Katherine, *Las Vegas: Playtown, USA.* (New York: David McKay, 1955.)

[72] Bogart, Ernest L., and Kemmerer, Donald L., *Economic History of the American People.* (New York: Longmans, Green, 1946.)

[73] Borges, Jorge Luis, *Labyrinths.* (New York: New Directions, 1964.)

[74] Boyd, Robert D., (ed.), *Changing Concepts of Productive Living.* (Madison, Wis.: University Extension, University of Wisconsin, 1957.)

[75] Brightbill, Charles K., *The Challenge of Leisure.* (Englewood Cliffs, N.J.: Prentice-Hall, 1960.)

[76] Dichter, Ernest, *Handbook of Consumer Motivations.* (New York: McGraw-Hill, 1964.)

[77] Fabricant, Solomon, *Basic Facts on Productivity Change.* (New York: National Bureau of Economic Research [Occasional Paper 63], 1959.)

[78] Fourastié, Jean, *Les 40,000 Heures.* (Paris: Editions Laffont, 1965.)

[79] Fuchs, Victor R., *The Growing Importance of the Service Industries.* (New York: National Bureau of Economic Research [Occasional Paper 96], 1965.)

[80] Galbraith, John Kenneth, *The Affluent Society.* (Boston: Houghton-Mifflin, 1958.)

[81] Galbraith, John Kenneth, *The Liberal Hour.* (New York: New American Library, 1960.)

[82] Galbraith, John Kenneth, *The New Industrial State.* (Boston: Houghton-Mifflin, 1967.)

[83] Gordon, Theodore J., *A Study of Potential Changes in Employee Benefits.* (Middletown, Conn.: Institute for the Future, April, 1969.) (3 vols).

[84] Guzzardi, Walter, Jr., *The Young Executives.* (New York: New American Library, 1966.)

[85] Johnson, Arno H., Jones, Gilbert E., and Lucas, Darrell B., *The American Market of the Future.* (New York: New York University Press, 1966.)

[86] Katona, George, *The Mass Consumption Society.* (New York: McGraw-Hill, 1964.)

[87] Larrabee, Eric, and Meyersohn, Rolf, (eds.), *Mass Leisure.* (Glencoe, Ill.: The Free Press, 1958.)

[88] Miller, Herman P., *Rich Man Poor Man.* (New York: Thomas Y. Crowell, 1964.)

[89] Packard, Vance. *The Hidden Persuaders.* (New York: David McKay, 1965.)

[90] Packard, Vance, *The Pyramid Climbers.* (New York: McGraw-Hill, 1962.)

[91] Packard, Vance, *The Waste Makers.* (New York: Pocket Books, 1964.)

[92] Scarff, Harold, *Multifamily Housing* (Report No. 151). (Menlo Park, Calif.: Stanford Research Institute, November, 1962.)

[93] Servan-Schreiber, J.-J., *The American Challenge.* (New York: Avon, 1967.)

[94] Tawney, R. H., *Religion and the Rise of Capitalism.* (New York: New American Library, 1948.)

[95] Uris, Auren, *The Executive Job Market.* (New York: McGraw-Hill, 1965.)

[96] Warner, W. Lloyd, and Abegglen, James, *Big Business Leaders in America.* (New York: Atheneum, 1963.)

[97] —, *How American Buying Habits Change.* (Washington: US Department of Labor, 1959.)

[98] —, *Markets of the Sixties* by the Editors of Fortune. (New York: Harper & Row, 1960.)

EDUCATION / YOUTH

[99]   Asbell, Bernard, *The New Improved American.* (New York: McGraw-Hill, 1965.)

[100] Ashby, Eric, *Technology and the Academics.* (New York: St. Martin's Press, 1963.)

[101] Barzun, Jacques, *The American University.* (New York: Harper & Row, 1968.)

[102] Brim, Orville G., Jr., *Education for Child Rearing.* (New York: The Free Press, 1965.)

[103] De Grazia, Alfred, and Sohn, David, (eds.), *Revolution in Teaching.* (New York: Bantam Books, 1964.)

[104] Dewey, John, *Democracy and Education.* (New York: The Free Press, 1966.)

[105] Erikson, Erik H., (ed.), *The Challenge of Youth.* (Garden City, New York: Anchor Books, 1963.)

[106] Erikson, Erik H., *Childhood and Society.* (New York: W. W. Norton, 1963.)

[107] Evans, Luther H., and Arnstein, George, (eds.), *Automation and the Challenge to Education.* (Washington: National Education Association, 1962.)

[108] Friedenberg, Edgar Z., *The Vanishing Adolescent.* (New York: Dell Publishing, 1959.)

[109] Ginzberg, Eli, (ed.), *The Nation's Children.* (New York: Columbia University Press, 1960.) (3 vols.)

[110] Hamblett, Charles, and Deverson, Jane, *Generation X.* (Greenwich, Conn.: Fawcett Publications, 1964.)

[111] Hirsch, Warner Z., (ed.), *Inventing Education for the Future.* (San Francisco: Chandler, 1967.)

[112] Hook, Sidney, *Education for Modern Man.* (New York: Dial Press, 1946.)

[113] Newson, John and Elizabeth, *Patterns of Infant Care in an Urban Community.* (Baltimore: Penguin Books, 1965.)

[114] Salisbury, Harrison E., *The Shook-Up Generation.* (Greenwich, Conn.: Fawcett World Library, 1958.)

[115] Toffler, Alvin, (ed.), *The Schoolhouse in the City.* (New York: Praeger, 1968.)

[116] Weerlee, Duco van, *Wat De Provo's Willen.* (Amsterdam: Unitgeverij De Bezige Bij, 1966.)

FAMILY / SEX

[117] Bell, Norman W., and Vogel, Ezra F., (eds.), *A Modern Introduction to the Family.* (Glencoe, Ill.: The Free Press, 1960.)

[118] Farber, Seymour, Mustacchi, Piero, and Wilson, Roger H. L., (eds.), *Man and Civilization.* (New York: McGraw-Hill, 1965.)

[119] Friedan, Betty, *The Feminine Mystique.* (New York: W. W. Norton, 1963.)

[120] Galdston, Iago, (ed.), *The Family in Contemporary Society.* (New York: International Universities Press, 1958.)

[121] Goode, William J., (ed.), *The Family.* (Englewood Cliffs, N. J.: Prentice-Hall, 1964.)

[122] Goode, William J., *Readings on the Family and Society.* (Englewood Cliffs, N. J.: Prentice-Hall, 1964.)

[123] Hunt, Morton M., *Her Infinite Variety.* (New York: Harper & Row, 1962.)

[124] Ogburn, W. F., and Nimkoff, M. F., *Technology and the Changing Family*. (Cambridge, Mass.: Houghton Mifflin Co., 1955.)

[125] Rimmer, Robert, *The Harrad Experiment*. (New York: Bantam Books, 1967.)

[126] Rimmer, Robert, *Proposition 31*. (New York: New American Library, 1968.)

[127] Schur, Edwin M., (ed.), *The Family and the Sexual Revolution*. (Bloomington, Ind.: Indiana University Press, 1964.)

FUTURE STUDIES

[128] Adelson, Marvin, *The Technology of Forecasting and the Forecasting of Technology* (Report SP 3151-000-01). (Santa Monica, Calif.: System Development Corporation, April, 1968.)

[129] Adelson, Marvin, *Toward a Future for Planning* (Report SP-2022). (Santa Monica, Calif.: System Development Corporation, June 1966.)

[130] Baade, Fritz, *The Race to the Year 2000*. (New York: Doubleday, 1962.)

[131] Baier, Kurt, and Rescher, Nicholas, *Values and the Future*. (New York: The Free Press, 1969.)

[132] Bell, Daniel, (ed.), *Toward the Year 2000*. (Boston: Houghton Mifflin, 1968.) (Book version of special issue of *Daedalus,* Summer, 1967, based on work *of* Commission on the Year 2000.)

[133] Bohler, Eugene, *El Futuro, Problema del Hombre Moderno*. (Madrid: Alianza Editorial, 1967.)

[134] Boulding, Kenneth, *The Meaning of the 20th Century*. (New York: Harper & Row, 1964.)

[135] Brown, Harrison, *The Challenge of Man's Future*. (New York: Viking, 1954).

[136] Calder, Nigel, (ed.), *The World in 1984*. (Baltimore: Penguin Books, 1965.) (2 vols.)

[137] Clarke, Arthur C., *Profiles of the Future*. (New York: Bantam Books, 1958.)

[138] De Jouvenel, Bertrand, *Futuribles*. (Santa Monica, Calif.: The RAND Corporation, January, 1965.)

[139] De Jouvenel, Bertrand, *The Art of Conjecture*. (New York: Basic Books, 1967.)

[140] Drucker, Peter F., *America's Next Twenty Years*. (New York: Harper & Row, 1955.)

[141] Drucker, Peter F., *The Age of Discontinuity*. (New York: Harper & Row, 1968.)

[142] Duffus, R. L., *Tomorrow's News*. (New York: W. W. Norton, 1967.)

[143] Ernst, Morris L., *Utopia 1976*. (New York: Rinehart, 1955.)

[144] Ewald, William R., Jr., (ed.), *Environment For Man*. (Bloomington, Ind.: Indiana University Press, 1967.)

[145] Franklin, H. Bruce, *Future Perfect*. (New York: Oxford University Press, 1966.)

[146] Fuller, R. Buckminster, and McHale, John, *World Design Science Decade, 1965-1975; Phase I Documents 1-4*. (Carbondale, Ill.: World Resources Inventory, Southern Illinois University, 1963.)

[147] Gabor, Dennis, *Inventing the Future*. (New York: Alfred A. Knopf, 1969.)

[148] Gibson, Tony, *Breaking in the Future*. (London: Hodder and Stoughton, 1965.)

[149] Gordon, Theodore J., *The Future*. (New York: St. Martin's Press, 1965.)

[150] Gordon, Theodore J., and Helmer, Olaf, *Report on a Long-Range Forecasting Study*. (Santa Monica, Calif.: The RAND Corporation, September, 1964.)

[151] Gross, Bertram M., *Space-Time and Post-Industrial Society.* (Syracuse, N. Y.: Maxwell Graduate School, Syracuse University. Comparative Administration Group Occasional Paper, May, 1966.)

[152] Gumucio, Mariano B., *Los Dias Que Vendrán.* (Caracas: Monte Avila Editores, 1968.)

[153] Heilbroner, Robert, *The Future as History.* (New York: Grove Press, 1959.)

[154] Helmer, Olaf, Gordon, Theodore J., Enzer, Selwyn, De Brigard, Raul, and Rochbert, Richard, *Development of Long-Range Forecasting Methods for Connecticut.* (Middletown, Conn.: Institute for the Future, September, 1969.)

[155] Helmer, Olaf, *Social Technology.* (New York: Basic Books, 1966.)

[156] Helton, Roy, *Sold Out to the Future.* (New York: Harper & Row, 1935.)

[157] Jantsch, Erich, *Technological Forecasting in Perspective.* (Paris: Organization for Economic Cooperation and Development, October, 1966.)

[158] Jungk, Robert, *Tomorrow is Already Here.* (New York: Simon and Schuster, 1954.)

[159] Kahn, Herman and Wiener, Anthony J., *The Year 2000.* (New York: Macmillan, 1967.)

[160] Kostelanetz, Richard, (ed.), *Beyond Left and Right.* (New York: William Morrow, 1968.)

[161] Lewinsohn, Richard, *Science, Prophecy and Prediction.* (Greenwich, Conn.: Fawcett, 1962.)

[162] Low, A. M., *What's the World Coming To?* (New York: J. B. Lippincott, 1951.)

[163] Lundberg, Ferdinand, *The Coming World Transformation.* (Garden City, N. Y.: Doubleday, 1963.)

[164] McHale, John, *The Future of the Future.* (New York: George Braziller, 1969.)

[165] Marek, Kurt W., *Yestermorrow.* (New York: Alfred A. Knopf, 1961.)

[166] Medawar, P. B., *The Future of Man.* (New York: New American Library, 1959.)

[167] Michael, Donald N., *The Unprepared Society.* (New York: Basic Books, 1968.)

[168] Pauwels, Louis, and Bergier, Jacques, *The Morning of the Magicians.* (New York: Stein and Day, 1963.)

[169] Peccei, Aurelio, *The Chasm Ahead.* (London: Macmillan, 1969.)

[170] Platt, John Rader, *The Step to Man.* (New York: John Wiley, 1966.)

[171] Polak, Fred L., *The Image of the Future.* (New York: Oceana Publications, 1961.) (2 vols.)

[172] Ritner, Peter, *The Society of Space.* (New York: Macmillan, 1961.)

[173] Rodwin, Lloyd, (ed.), *The Future Metropolis.* (New York: George Braziller, 1961.)

[174] Shinn, Roger L., *Tangled World.* (New York: Charles Scribner's Sons, 1965.)

[175] Thomson, George, *The Foreseeable Future.* (New York: Viking, 1960.)

[176] Vickers, Geoffrey, *Value Systems and Social Process.* (New York: Basic Books, 1968.)

[177] Wolstenholme, Gordon, (ed.), *Man and his Future.* (London: J. and A. Churchill, 1963.)

[178] Zwicky, Fritz, *Discovery, Invention, Research.* (Toronto: Macmillan, 1969.)

[179] —, *Commission on the Year 2000.* Working Papers. (Cambridge, Mass.: American Academy of Arts and Sciences, 1965-1967.) (5 vols.) Private circulation.

[180] —, *El Futuro Immediato,* (Barcelona: Plaza and Janes, 1969.)

[181] —, *Prospect for America: The Rockefeller Panel Reports.* (Garden City, N. Y.: Doubleday, 1961.)

[182] —, *Prospective Changes in Society by 1980.* (Denver: Designing Education for the Future, July, 1966.)

[183] —, *The World of 1975*. (Menlo Park, Calif.: Stanford Research Institute, 1964.)

Also consulted:

[184] *Analyse et Prévision* (Paris). A monthly.

Analysen und Prognosen (Berlin). A bi-monthly.

Futures (Surrey, England). A quarterly.

Futuribili (Rome) A quarterly.

Prospeccion Siglo XXI (Caracas). Irregular.

Prospective (Paris). Irregular.

The Futurist (Washington). A bi-monthly.

INDIVIDUALISM

[185] Brooks, John, *The One and The Many.* (New York: Harper & Row, 1962.)

[186] Ellul, Jacques, *The Technological Society.* (New York: Vintage Books, 1967.)

[187] Kardiner, Abram, *The Individual and His Society.* (New York: Columbia University Press, 1939.)

[188] Kluckhohn, Clyde, *Mirror For Man.* (Greenwich, Conn.: Fawcett, 1965.)

[189] Mannheim, Karl, *Systematic Sociology.* (New York: Grove Press, 1957.)

[190] Menaker, Esther and William, *Ego in Evolution.* (New York: Grove Press, 1965.)

[191] Odajnyk, Walter, *Marxism and Existentialism.* (Garden City, N. Y.: Anchor Books, 1965.)

[192] Riesman, David, *Abundance for What? and Other Essays.* (Garden City, N. Y.: Doubleday, 1964.)

[193] Riesman, David, with Glazer, Nathan and Denney, Reuel, *The Lonely Crowd.* (Garden City, N. Y.: Anchor Books, 1950.)

[194] Riesman, David, *Selected Essays from Individualism Reconsidered.* (New York: Doubleday, 1954.)

[195] Sayles, Leonard R., *Individualism and Big Business.* (New York: McGraw-Hill, 1963.)

[196] Tenn, William, *The Human Angle.* (New York: Ballantine, 1968.)

[197] Whyte, William H., *The Organization Man.* (New York: Simon and Schuster, 1956.)

INFORMATION / KNOWLEDGE

[198] Barraclough, Geoffrey, *An Introduction to Contemporary History.* (New York: Basic Books, 1964.)

[199] Barrett, William, *Irrational Man.* (Garden City, N. Y.: Doubleday Anchor, 1962.)

[200] Bell, Daniel, *The Reforming* of *General Education.* (New York: Columbia University Press, 1966.)

[201] Boulding, Kenneth, *The Image.* (Ann Arbor, Mich.: University of Michigan Press, 1956.)

[202] Bram, Joseph, *Language and Society.* (Garden City, N. Y.: Doubleday, 1955.)

[203] Childe, V. Gordon, *Society and Knowledge.* (New York: Harper & Row, 1956.)

[204] De Chardin, Teilhard, *The Phenomenon of Man.* (New York: Harper & Row, 1959.)

[205] De Fleur, Melvin L., and Larsen, Otto, *The Flow of Information.* (New York: Harper & Row, 1958.)

[206] Escarpit, Robert, *The Book Revolution.* (London: UNESCO and George, G. Harrap, 1966.)

[207] Glaister, G. A., *Encyclopedia of the Book.* (Cleveland: World Publishing, 1960.)

[208] Hauser, Arnold, *The Social History of Art.* (New York: Vintage Books, 1958.) (4 vols.)

[209] Knight, Arthur, *The Liveliest Art.* (New York: New American Library, 1959.)

[210] Kuhn, Thomas S., *The Structure of Scientific Revolutions.* (Chicago: University of Chicago Press, 1962.)

[211] Machlup, Fritz, *The Production and Distribution of Knowledge in the United States.* (Princeton, N. J.: Princeton University Press, 1962.)

[212] Robinson, John A. T., *Honest to God.* (London: SCM Press Ltd., 1963.)

LIFE STYLES / SUBCULTURES / INTERPERSONAL RELATIONS

[213] Amory, Cleveland, *Who Killed Society?* (New York: Harper & Row, 1960.)

[214] Baltzell, E. Digby, *The Protestant Establishment.* (New York: Random House, 1964.)

[215] Barber, Bernard, *Social Stratification.* (New York: Harcourt, Brace & World, 1957.)

[216] Barth, John, *The Floating Opera.* (New York: Avon Books, 1956.)

[217] Cox, Harvey, *The Secular City.* (New York: Macmillan, 1965.)

[218] Dahrendorf, Ralf, *Class and Class Conflict in Industrial Society.* (Stanford, Calif.: Stanford University Press, 1966.)

[219] Fishwick, Marshall, *The Hero, American Style.* (New York: David McKay, 1969.)

[220] Glazer, Nathan, and Moynihan, Daniel, *Beyond The Melting Pot.* (Cambridge, Mass.: The MIT Press, 1963.)

[221] Goffman, Erving, *Behavior in Public Places.* (New York: The Free Press, 1963.)

[222] Goffman, Erving, *Interaction Ritual.* (Garden City, N. Y.: Doubleday, 1967.)

[223] Goodman, Paul, *Growing Up Absurd.* (New York: Vintage Books, 1960.)

[224] Greer, Scott, *The Emerging City.* (New York: The Free Press, 1965.)

[225] Hausknecht, Murray, *The Joiners.* (New York: Bedminster Press, 1962.)

[226] Hyman, Herbert H., and Singer, Eleanor, (eds.), *Readings in Reference Group Theory and Research.* (New York: The Free Press, 1968.)

[227] Josephson, Eric and Mary, (eds.), *Man Alone.* (New York: Dell Publishing, 1962.)

[228] Klapp, Orrin E., *Symbolic Leaders.* (Chicago: Aldine, 1964.)

[229] McClelland, David C., *The Achieving Society.* (New York: The Free Press, 1961.)

[230] McKuen, Rod, *Stanyan Street and Other Sorrows.* (New York: Random House, 1963.)

[231] Nadeau, Remi, *California: The New Society.* (New York: David McKay Co., 1963.)

[232] Newcomb, Theodore M., and Wilson, Everett K., (eds.), *College Peer Groups.* (Chicago: Aldine, 1966.)

[233] Packard, Vance, *The Status Seekers.* (New York: David McKay, 1959.)

[234] Podhoretz, Norman, *Making It.* (New York: Random House, 1967.)

[235] Pynchon, Thomas, *The Crying of Lot 49.* (Philadelphia: J. B. Lippincott, 1966.)

[236] Seeley, John R., Sim, R. Alexander, and Loosley, Elizabeth W., *Crestwood Heights.* (New York: John Wiley, 1963.)

[237] Sheckley, Robert, *Untouched By Human Hands.* (New York: Ballantine Books, 1954.)

[238] Sherif, Muzafer, and Carolyn W., *Reference Groups.* (New York: Harper & Row, 1964.)

[239] Wirth, Louis, *On Cities and Social Life.* (Chicago: The University of Chicago Press, 1964.)

[240] Yablonsky, Lewis, *The Violent Gang.* (Baltimore: Penguin Books, 1966.)

MOBILITY

[241] Duhl, Leonard J., (ed.), *The Urban Condition,* (New York: Basic Books, 1963.)

[242] Lipset, Seymour M., and Bendix, Reinhard, *Social Mobility in Industrial Society.* (Berkeley, Calif.; University of California Press, 1964.)

[243] Morton, Herbert C., (ed.), *Brookings Papers on Public Policy.* (Washington: Brookings Institution, 1965.)

[244] Neymark, Ejnar, *Selectiv Rörlighet.* (Stockholm: Personaladministrativa Radet, 1961.)

[245] Österberg, Gunnar R., *An Empirical Study of Labour Reallocation Gains in Sweden Between 1950 and 1960.* (Stockholm: Industriens Utredningsinstitut, 1965.)

[246] Rundblad, Bengt G., *Arbetskraftens Rörlighet.* (Stockholm: Almqvist and Wiksells, 1964.)

[247] Weil, Simone, *The Need for Roots.* (Boston: Beacon Press, 1952.)

[248] Woodward, Eliot G., and Kaufman, Joan, *International Travel* (Report No. 193). (Menlo Park, Calif.: Stanford Research Institute, December, 1963.)

[249] —, *International Joint Seminar on Geographical and Occupational Mobility of Manpower, (Final Report).* (Paris: Organization for Economic Cooperation and Development, 1964.)

[250] —, *Joint International Seminar on Geographical and Occupational Mobility of Manpower; Supplement to the Final Report.* Castelfusano, Nov. 19-22, 1963. (Paris: Organization for Economic Cooperation and Development, 1964.)

[251] —, *L'Evolution de l'emploi dans les Etats membres (1954-1958).* (Brussels: Communaute Economique Europeene Commission, March, 1961.)

ORGANIZATION THEORY

[252] Bennis, Warren G., *Changing Organizations.* (New York: McGraw-Hill, 1966.)

[253] Blau, Peter M., *Bureaucracy in Modern Society.* (New York: Random House, 1956.)

[254] Blau, Peter M., and Scott, W. Richard, *Formal Organizations.* (San Francisco: Chandler, 1962.)

[255] Boulding, Kenneth, *The Organizational Revolution.* (New York: Harper & Row, 1953.)

[256] Gerth, H. H., and Mills, C. Wright, (eds.), *From Max Weber: Essays in Sociology.* (New York: Oxford University Press, 1958.)

[257] Gross, Bertram M., *The Managing of Organizations.* (New York: The Free Press, 1964.) (2 vols.)

[258] Kafka, Franz, *The Trial.* (New York: Alfred A. Knopf, 1945.)

[259] Likert, Rensis, *The Human Organization.* (New York: McGraw-Hill, 1967.)

[260] Rice, A. K., *The Enterprise and Its Environment.* (London: Tavistock Publications, 1963.)

PERMANENCE / CHANGE

[261] Donham, W. B., *Business Adrift.* (New York: Whittlesey House / McGraw-Hill, 1931.) (Introduction by Alfred North Whitehead.)

[262] Dunham, Barrows, *Giant in Chains.* (Boston: Little, Brown, 1953.)

[263] Gellner, Ernest, *Thought and Change.* (Chicago: University of Chicago Press, 1965.)

[264] Huxley, Julian, *Essays of a Humanist.* (New York: Harper & Row, 1964.)

[265] Huxley, Julian, *Man in the Modern World.* (New York: New American Library, 1959.)

[266] Huxley, Julian, *New Bottles for New Wine.* (New York: Harper & Row, 1957.)

[267] Huxley, Julian, *On Living in a Revolution.* (New York: Harper & Row, 1942.)

[268] Schon, Donald A., *Technology and Change.* (New York: Dell, 1967.)

[269] Van Gennep, Arnold, *The Rites of Passage.* (Chicago: The University of Chicago Press, 1960.)

SCIENCE / TECHNOLOGY

[270] Burlingame, Roger, *Machines that Built America.* (New York: New American Library, 1955.)

[271] Capek, Karel, *War with the Newts.* (New York: Bantam Books, 1964.)

[272] Cipolla, Carlo M., *The Economic History of World Population.* (Baltimore: Penguin Books, 1962.)

[273] Clarke, Arthur C., *The Challenge of the Spaceship.* (New York: Ballantine, 1961.)

[274] Clarke, Arthur C., (ed.), *Time Probe.* (New York: Dell, 1967.)

[275] Delgado, José M. R. *Physical Control of the Mind.* (New York: Harper & Row, 1969.)

[276] De Solla Price, Derek J., *Little Science, Big Science.* (New York: Columbia University Press, 1963.)

[277] De Solla Price, Derek J., *Science Since Babylon.* (New Haven: Yale University Press, 1961.)

[278] Dole, Stephen, *Habitable Planets for Man.* (Santa Monica, Calif.: The RAND Corp., March, 1964.)

[279] Ettinger, Robert C. W., *The Prospect of Immortality.* (New York: Doubleday, 1964.)

[280] Farrington, Benjamin, *Head and Hand in Ancient Greece.* (London: Watts and Co., 1947.)

[281] Fidell, Oscar, (ed.), *Ideas in Science.* (New York: Washington Square Press, 1966.)

[282] Forbes, R. J., and Dijksterhuis, E. J., *A History of Science and Technology.* (Baltimore: Penguin Books, 1963.) (2 vols.)

[283] Fourastié, Jean, *Idées Majeures.* (Paris: Editions Gonthier, 1966.)

[284] Fourastié, Jean, *Les Conditions de l'Esprit Scientifique.* (Paris: Editions Gallimard, 1966.)

[285] Gilman, William, *Science: U.S.A.* (New York: Viking, 1965.)

[286] Gordon, Theodore J., and Shef, Arthur L., *National Programs and the Progress of Technological Societies.* (Huntington Beach, Calif.: McDonnell Douglas Corporation, March, 1968.)

[287] Hanrahan, James S., and Bushnell, David, *Space Biology.* (New York: Science Editions, 1961.)

[288] Hulten, K. G. Pontus, *The Machine.* (New York: Museum of Modern Art, 1968.)

[289] Jewkes, John, Sawers, David, and Stillerman, Richard, *The Sources of Invention.* (New York: St. Martin's Press, 1958.)

[290] Lapp, Ralph E., *The New Priesthood.* (New York: Harper & Row, 1961.)

[291] Lesher, Richard, and Howick, George, *Background, Guidelines, and Recommendations for use in Assessing Effective Means of Channeling New Technologies in Promising Directions.* (Washington: National Commission on Technology, Automation and Economic Progress, November, 1965.)

[292] Levy, Lillian, (ed.), *Space: Its Impact on Man and Society.* (New York: W. W. Norton, 1965.)

[293] Lewis, Arthur O., Jr., (ed.), *Of Men and Machines.* (New York: E. P. Dutton, 1963.)

[294] Lilly, John C, *Man and Dolphin.* (New York: Pyramid, 1962.)

[295] London, Perry, *Behavior Control.* (New York: Harper & Row, 1969.)

[296] McLuhan, Marshall, *Understanding Media.* (New York: McGraw-Hill, 1965.)

[297] Newman, James R., (ed.), *What is Science?* (New York: Washington Square Press, 1961.)

[298] Plumb, J. H., (ed.), *Crisis in the Humanities.* (Baltimore: Penguin Books, 1964.)

[299] Rapport, Samuel, and Wright, Helen, *Science: Method and Meaning.* (New York: Washington Square Press, 1964.)

[300] Reichenbach, Hans, *The Rise of Scientific Philosophy.* (Los Angeles: University of California Press, 1951.)

[301] Schmeck, Harold, Jr., *The Semi-Artificial Man.* (New York: Walker, 1965.)

[302] Schnapper, M. B., (ed.), *New Frontiers of Knowledge.* (Washington: Public Affairs Press, 1957.)

[303] Schramm, Wilbur, (ed.), *Mass Communications.* (Urbana, Ill.: University of Illinois Press, 1960.)

[304] Shannon, C. E., and McCarthy, J., (eds.), *Automata Studies.* (Princeton, N. J.: Princeton University Press, 1956.)

[305] Snow, C. P., *Science and Government.* (Cambridge, Mass.: Harvard UniverSity Press, 1961.)

[306] Snow, C. P., *The Two Cultures and The Scientific Revolution.* (New York: Cambridge University Press, 1959.)

[307] Stover, Carl F., *The Government of Science.* (Santa Barbara, Calif.: The Center for the Study of Democratic Institutions, 1962.)

[308] Strachey, John, *The Strangled Cry.* (New York: William Sloane Associates, 1962.)

[309] Sullivan, Walter, *We Are Not Alone.* (New York: McGraw-Hill, 1964.)

[310] Vercors, *You Shall Know Them*. (New York: Popular Library, 1953.)

[311] Wiener, Norbert, *The Human Use of Human Beings*. (Garden City, N. Y.: Anchor Books, 1954.)

[312] —, *Implications of Biomedical Technology,* (Cambridge, Mass.: Harvard University Program on Technology and Society, Research Review No. 1.)

SOCIAL INDICATORS / PLANNING / TECHNOLOGICAL ASSESSMENT

[313] Bauer, Raymond A., (ed.), *Social Indicators*. (Cambridge, Mass.: The MIT Press, 1966.)

[314] Daddario, Emilio Q., *Technology Assessment*. Statement by the chairman of the Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, U.S. House of Representatives. Ninetieth Congress. First Session. (Washington: Government Printing Office, 1968.)

[315] Elsner, Henry, Jr., *The Technocrats*. (Syracuse, N. Y.: Syracuse University Press, 1967.)

[316] Gross, Bertram M., *A Great Society?* (New York: Basic Books, 1968.)

[317] Gross, Bertram M., (ed.), *Social Intelligence for America's Future*. (Boston: Allyn and Bacon, 1969.)

[318] Harrington, Michael, *The Accidental Century*. (New York: Macmillan, 1965.)

[319] Huxley, Aldous, *Brave New World*. (New York: Bantam Books, 1958.)

[320] Kahn, Alfred J., *Studies in Social Policy and Planning*. (New York: Russell Sage Foundation, 1969.)

[321] Kahn, Alfred J., *Theory and Practice of Social Planning*. (New York: Russell Sage Foundation, 1969.)

[322] Lyons, Gene M., *The Uneasy Partnership*. (New York: Russell Sage Foundation, 1969.)

[323] Mayo, Louis H., *Comments on Senate Resolution 78*. (Washington: George Washington University, March 4, 1969.)

[324] Mayo, Louis H., *The Technology Assessment Function*. Part I. Internal Reference Document 25. (Washington: George Washington University, July, 1968.)

[325] Mayo, Louis H., and Rao, P. L., *The Technological Assessment Function*. Part II. Internal Reference Document 25. (Washington: George Washington University, July, 1968.)

[326] Orwell, George, *1984*. (New York: New American Library, 1949.)

[327] Sheldon, Eleanor and Moore, Wilbert, *Indicators of Social Change*. (New York: Russell Sage Foundation, 1968.)

[328] Skinner, B. F., *Walden II*. (New York: Macmillan, 1962.)

[329] —, *Establish a Select Senate Committee on Technology and the Human Environment*, Hearings on Senate Resolution 68 before the Subcommittee on Intergovernmental Relations of the Committee on Government Operations, US Senate. (Washington: Government Printing Office, March and April, 1967.)

[330] —, *Full Opportunity and Social Accounting Act (Seminar)*. Hearings before the Subcommittee on Government Research, Committee on Government Operations, US Senate. Ninetieth Congress. First Session. S. 843, Parts 1-3. (Washington: Government Printing Office, 1967.)

[331] —, *Goals for Americans*. Report of the President's Commission on National Goals. (Englewood Cliffs, N. J.: Prentice-Hall, 1964.)

[332] —, *Inquiries, Legislation, Policy Studies Re: Science and Technology.* 2nd Progress Report. Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, US House of Representatives. Eighty-ninth Congress. Second Session. (Washington: Government Printing Office, 1966.)

[333] —, *Policy Issues in Science and Technology.* Third progress report. Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, US House of Representatives. Ninetieth Congress. Second Session. (Washington: Government Printing Office, 1968.)

[334] —, *Préparation du Ve Plan: Rapport sur les Principales Options.* (Paris: *Journal Officiel de la République Française,* 1964.)

[335] —, *Review of National Science Policy—United* States. (Paris: Organization for Economic Cooperation and Development, 1968.)

[336] —, *Technology Assessment Seminar.* Proceedings before the Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, US House of Representatives. (Washington: Government Printing Office, September, 1967.)

[337] —, *Toward A Social Report.* (Washington: US Department of Health, Education and Welfare, January, 1969.)

TIME

[338] Abé, Kobo, *The Woman in the Dunes.* (New York: Berkley, 1964.)

[339] Beardslee, David C., and Wertheimer, Michael, (eds.), *Readings in Perception.* (Princeton, N.J.: Van Nostrand, 1958.)

[340] Cohen, John, (ed.), *Readings in Psychology*. (London: Allen and Unwin, 1964.)

[341] De Grazia, Sebastian, *Of Time, Work and Leisure.* (New York: Twentieth Century Fund, 1962.)

[342] Fraser, J. T., (ed.), *The Voices of Time.* (New York: George Braziller, 1966.)

[343] Hall, Edward T., *The Hidden Dimension.* (New York: Doubleday, 1966.)

[344] Hall, Edward T., *The Silent Language.* (New York: Doubleday, 1959.)

[345] Israeli, Nathan, *Abnormal Personality and Time.* (New York: Science Press Printing Company, 1936.)

[346] Mac Iver, R. M., *The Challenge of The Passing Years.* (New York: Pocket Books, 1962.)

[347] Poulet, Georges, *Studies in Human Time.* (Baltimore: Johns Hopkins Press, 1956.)

[348] Priestley, J. B., *Man and Time*. (New York: Dell, 1964.)

[349] Wallis, Robert, *Time: Fourth Dimension of the Mind.* (New York: Harcourt, Brace & World, 1966.)

[350] Warner, W. Lloyd, *The Corporation in the Emergent American Society*. (New York: Harper & Row, 1962.)

GENERAL

[351] Berelson, Bernard, and Steiner, Gary A., *Human Behavior.* (New York: Harcourt, Brace & World, 1964.)

[352] Chapple, Eliot Dismore, and Coon, Carleton Stevens, *Principles of Anthropology*. (New York: Henry Holt, 1942.)

[353] Deutsch, Morton and Krauss, Robert M., *Theories in Social Psychology*. (New York: Basic Books, 1965.)

[354] Hartley, Eugene, Maccoby, Eleanor, and Newcomb, Theodore, (eds.), *Readings in Social Psychology*. (New York: Holt, Rinehart and Winston, 1947.)

[355] Lindzey, Gardiner, (ed.), *Handbook of Social Psychology*. (Cambridge, Mass.: Addison-Wesley, 1954.)

[356] Natanson, Maurice, (ed.), *Philosophy of the Social Sciences*. (New York: Random House, 1963.)

[357] Newcomb, Theodore, Turner, Ralph H., and Converse, Philip E., *Social Psychology*. (New York: Holt, Rinehart, and Winston, 1965.)

[358] Wattenberg, Ben J. with Scammon, Richard M., *This U.S.A.* (New York: Doubleday, 1965.)

[359] —, *The American Workers' Fact Book.* (Washington: United States Department of Labor, 1956.)

ABOUT THE AUTHOR

ALVIN TOFFLER has been an editor of FORTUNE and a Washington correspondent. He has written for scores of periodicals, ranging from LIFE, HORIZON and PLAYBOY to the ANNALS OF THE ACADEMY OF POLITICAL AND SOCIAL SCIENCE. He is the author of *The Culture Consumers* and the editor of the prize-winning volume *The Schoolhouse in the City*. He is now a Visiting Scholar at the Russell Sage Foundation. At the New School for Social Research, Mr. Toffler taught the "sociology of the future"—one of the first such courses in the world. In 1969 he was appointed a Visiting Professor at Cornell University, where he conducted research into future value systems. He lectures widely, is a member of the board of directors of the Salzburg Seminar in American Studies, and has served as an advisor to such organizations as the Rockefeller Brothers Fund, the I.B.M. Corporation and the Institute for the Future. He lives in Manhattan with his wife and teen-age daughter, and does much of his writing at their home in Ridgefield, Connecticut.

Future Shock is about the present.

Future Shock is about what is happening today to people and groups who are overwhelmed by change. Change affects our products, communities, organizations—even our patterns of friendship and love.

Future Shock vividly describes the emerging super-industrial world—tomorrow's family life, the rise of new businesses, subcultures, life-styles and human relationships—all of them temporary.

Future Shock illuminates the world of tomorrow by exploding countless clichés about today.

Future Shock will intrigue, provoke, frighten, encourage and, above all, *change* everyone who reads it.

Alvin Toffler, former Associate Editor of *Fortune*, has been a Visiting Professor at Cornell University and a Visiting Scholar at the Russell Sage Foundation. His books include *The Culture Consumers* and *The Schoolhouse in the City*. His articles have appeared in scholarly journals as well as such varied publications as *Life* and *Playboy*.