The Human Race Has, Maybe, Thirty-five Years Left

After that, people will start eating plankton. Or people

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> In the seventh century, according to the records of the Church of Mayo, two kings of Erin summoned the principal clergy and laity to a council at Temora, in consequence of a general dearth, the land not being sufficient to support the increasing population. The chiefs...decreed that a fast should be observed both by clergy and laity so that they might with One accord solicit God to prayer to remove by some species of pestilence the burthensome multitudes of the inferior people... St. Geraid and his associates suggested that it would be more conformable to the Divine Nature and not more difficult to multiply the fruits of the earth than to destroy its inhabitants. An amendment was accordingly moved "to supplicate the Al-mighty not to reduce the number of men till it answered the quantity of corn usually produced, but to increase the produce of the land so that it might satisfy the wants of the people." However. the nobles and clergy, headed by St. Fechin, bore down the opposition and called for a pestilence on the lower orders of the people. According to the records a pestilence was given, which included in its ravages the authors of the petition, the two kings who had summoned the convention, with St. Fechin, the King of Ulster and Munster and a third of the nobles concerned....
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> —A Treatise on Plague, by W.J. Simpson

In a year of poor harvest. the weight of the burthensorne multitudes lies heavy upon the shoulders of the affluent. My grandfather had a book that his father gave him, presented upon his reaching young manhood; and whether it was given with a kind word or a black look, I can't say, but the title was Where to Emigrate and Why, My grandfather headed West—this at a time when emigration remained plausible for young men found to be surplus upon the home ground.

Today the crowd is global. There is no place to go. There has never been such a crowd, and in no time at all now it's going to be twice as big. As for man's efforts to cope, the performance of St. Fechin suggests a certain lack of promise. Perhaps the mildest we can hope for is the suggestion of a prominent anthropologist that birth-control agents be applied liberally to the public water supply.

The case is this: Fifteen thousand years ago the earth probably held fewer people than New York City does today. The population doubled slowly at that time—say every forty thousand years. Today there are more than three billion people in the world and the rate of increase is almost a thousand times greater. Doubling occurs in less than forty years.

On a graph the human population line now rises almost vertically, which will not continue—there must be leveling off or decline. Leveling seems rational. Decline can be a landslide, as the history of the Irish and the lemming imply. The critical period near a population peak is likely to be a time of anxiety, of extreme unease. Thus President Johnson told the troops in Korea last year: "Don't forget, there are only two hundred

million of us in the world of three billion. They want what we've got and we aren't going to give it to them.'' (Quoted by John Gerassi, in *The New York Review of Books.)*

In the United States a huge majority sees population as infinitely less threatening than crime and communism. Population crisis in America tends to become a cliche—a joke in the newspapers about standing room only in the year 2600. After which the matter may be dismissed—possibly it's something the Chinese are up to.

A few—the ecologically-minded, some Senators and scientists and academicians—cry out that growth and change are tearing the world apart. But on television the audience cheers a father of ten; and in Washington the political leadership continues heavily occupied in the shadows, scuffling with crime and communism, hustling money for defense and space and the war, and plotting ways to insure more growth and change.

Population increase and technological change are immense forces driving the world ahead at an accelerating pace into a turbulent and highly uncertain future. The effect of these forces upon the United States is already profound; no Island of Affluence or Fortress America notions are likely for long to fend off the future, or to make a particle of difference in the logic of vertical increase.

To grasp the implications, look first at the world that remains poor, then at the changes wrought in man and animal by extreme crowding, and finally at the consequences in the U.S.

Begin with India.

I: THE CITY OF THE FUTURE

> At Sealdah Station, Calcutta, misery radiates outward . . . dusty streets straggle away in every direction lined with tiny shacks built of metal scraps, pieces of old baskets, strips of wood, and gunnysacks. In the dark interiors of the shacks, small fires glow through the smoke, and dark faces gaze out at children playing in the urinous-smelling, fly-infested streets. In a few years the children who survive ... will grow taller and thinner and stand in the streets like ragged skeletons, barefoot, hollow-eyed, blinking their apathetic stares out of grey, dusty faces . . . Calcutta today . . . swollen by millions of refugees until the streets are spotted with their sleeping bodies . . . may very well represent the City of the Future.
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> —Philip Appleman, in *The Silent Explosion*

In Calcutta six hundred thousand people sleep, eat, live in the streets —lacking even the shacks Appleman saw at Sealdah Station. The American visitor sees these thousands lying upon the ground "like little bundles of rags''; sees "women huddling over little piles of manure, patting it into cakes for fuel; children competing with dogs for refuse"—and reacts with shock and revulsion. A student told Appleman. "I wanted to run away, to weep. I was disgusted, horrified. saddened.. .."

Calcutta stands for three worldwide forces—burgeoning population ; food shortage ; a torrent of migration to the cities.

Today there are about five hundred million people in India. In thirty years or so there may well be one billion. Most Indians live in rural villages—but the villages are overflowing. The surrounding lands no longer produce enough food. The excess population drifts into the big coastal cities where there is hope of food; Calcutta has become an immense breadline where the starving from the countryside gather to feed on grain from American ships.

The vision of six hundred thousand people lying in the streets at night—a prostrate breadline waiting for Midwestern grain—must be burned into the mind if the fate of the third world (and of the United States) is to assume reality. Because as the population rises, the supply of grain is running out. This is true not only for India but for two-thirds of the human population. All over the third world the City of the Future is a place where the rural poor gather to await the grain handout from abroad, while it lasts.

From Calcutta, draw the implications for the third (so-called "underdeveloped") world—briefly, as follows:

- The I960 population of the developed world was about 900.000,- 000; that of the third world ran over 2,000,000,000.
- The agricultural land resources of the two parts of the world are approximately equal.
- By the year 2000—in less than thirty-three years—the developed world must feed 1,300,- 000,000 on its half of the world's croplands. The third world will have to feed about 5,000,000,000 people on its half.
- The industrial states have moved on to high- yield agriculture, getting maximum production from the land. The third world must make the same transition—but there very well may not be time to make it before mass famine sets in.

The bind is this: There is a desperate need to cut population growth and to raise food production within the next three decades. The most urgent period will be the ten or fifteen years immediately ahead. All right, then, say the hopeful—birth control: but Cora Du Bois, an anthropologist with much experience in India, reports that ". . . any effective reduction of population growth among heavily breeding rural populations is not foreseeable in less than possibly fifty years. I believe this is a question on which it is wise to have no illusions."

Nor is the prospect for rapid increase in food supply much brighter. On the contrary, according to Lester R. Brown, an economist with the U.S. Department of Agriculture: "The food problem emerging in the less-developed regions may be one of the most nearly insoluble problems facing man over the next few decades."

There are, nevertheless, a few optimists. Some talk of farming the sea, eating plankton; but this will not help anyone soon. Anyway, says William Vogt, who is experienced, "Few of the people who advocate this. I am sure, have tasted plankton. . . ."

Recently, an optimist of some renown appeared—Donald J. Bogue, a sociologist at the University of Chicago. He said the United Nations' projections of about six billion people by the year 2000 are exaggerated: Dr. Bogue predicted a rapid decline in growth after 1975. The immediate reaction of his colleagues was disappointing. Dr. Bogue said, "Most were angry. I found no one who agreed with me."

Perhaps the most disturbing thing about the present world-population situation, as Dr. Bogue himself suggested, is the almost uniformly pessimistic outlook of so many very capable people who have examined the matter closely. Lloyd V. Berkner. a leading American scientist, remarked that in the third world, "We are probably already beyond the point at which a sensible solution is possible." Eugene R. Black, when he was president of the World Bank. said. "We are coming to a situation in which the optimist will be the man who thinks that present living standards can be maintained."

Dr. B.R. Sen. Director-General of the United Nations Food and Agriculture Organization, has said. "The next thirty-five years . . . will be a most critical period in man's history. Either we take the fullest measures to raise productivity and to stabilize

population growth, or we will face disaster of an unprecedented magnitude. We must be warned ... of unlimited disaster."

In Pakistan. President Ayub said in 1964, "In ten years' time, human beings will eat human beings in Pakistan."

The third world, then, is in acute danger of entering into a descending spiral where each successive failure reinforces the last in a descent toward chaos. The process may have begun. There is a tendency in the U.S. to believe it will be possible to isolate ourselves from this, retreat into the land of affluence. For a while perhaps.

Consider this: As of 1954 the United States was using about fifty percent of the raw material resources consumed in the world each year. The rate of consumption has been rising and by 1980 the U.S. could be consuming more than eighty- three percent of the total.

Today the U.S. is a net importer of goods. Its reliance on foreign trade grows each year. The third world, in the meantime, sees industrialization as the road to salvation; its demand for raw material can be expected to accelerate. Today we can soothe the hungry by offering a certain amount of food and aid. Tomorrow we will be competing for raw material and there will be no spare food to offer. The prospect is not bright. As Professor Harold A. Thomas, Jr. of Harvard's Center for Population Studies put it, ". . . unless we engage ourselves today in problems of development of the poor nations. the conditions under which we live during the next two generations may not be attractive. The fuel required to sustain our mammoth technological apparatus may constitute a gross drain on the resources of the earth. Other societies cannot be expected to regard this favorably. A vista of an enclave of privilege in an isolated West is not pleasant to contemplate. Wise and human political institutions do not thrive in beleaguered citadels."

II: THE MOUSE EXPLOSION

> *Mice were generated and "boiled over" the towns and fields in the midst of that region, and there was a confusion of great death in the land.* —Vulgate 1, Kings, v. 6

The periodic, vast increase in numbers of field mic. is a peculiar and ancient phenomenon, and men have long feared it. In the cult of Apollo this fear gave rise to religious ceremonies—the keepers of Apollo's temple kept tame mice in the sanctuary and a colony of them beneath the altar.

Aristotle was astounded by the capacity of mice to increase. "The rate of propagation of field mice in country places, and the destruction that they cause, are beyond all telling. In many places their number is so incalculable that but very little of the corn crop is left to the farmer; and so rapid is their mode of proceeding that sometimes a small farmer will one day observe that it is time for reaping. and on the following morning, when he takes his reapers afield, he finds his entire crop devoured. Their disappearance is unaccountable: in a few days not a mouse will be there to be seen. . . ."

The mouse horde has for centuries represented a serious problem in Europe. Charles Elton, the director of the Bureau of Animal Population at Oxford, has described one historic outbreak in France: ". . . an impressive picture of insurgent subterranean activity, of

devastation breaking like a flood upon the crops. All man's vigilance and care are taxed by the multitude of small, swift, flitting forms that infest the ground and devour all living plants. Poison, plowing, fumigation, trenches, and prayers, all these can scarcely stop the destruction. ... In [1822] Alsace was absolutely in the power of mice. 'It was a living and hideous scourging of the earth, which appeared perforated all over, like a sieve.'"

The animal responsible for this devastation is normally quite inconspicuous—a tiny creature, short-legged, short-tailed, broad of face—known commonly as the meadow mouse, or vole. The vole rarely travels more than twenty-five feet from its burrow. It lives less than a year. But during its short life it is absolutely voracious. Each day it consumes its own weight in food. First it takes care of the plants aboveground; then it burrows down after roots and tubers. In an orchard, voles may girdle and kill trees.

The vole population follows a typical four-year cycle of rise and fall, proceeding from relative scarcity to a peak of abundance, then declining and beginning the cycle all over again. The remarkable thing about voles is their capacity under certain

circumstances to increase to enormous numbers within a single breeding season. On occasion—in Europe this occurs perhaps once in a generation— there is an increase of truly catastrophic proportions, a "scourging of the earth." as in Alsace in 1822.

There have been a good many locally catastrophic mouse population explosions in the United States, the most severe in the far West. Perhaps the most devastating of all was centered in Oregon just a few years ago, and the damage to crops ran into millions of dollars. Wells were polluted because of the numbers of voles that fell into them. In the most heavily infested areas there were two or three thousand mice to the acre and their burrows crisscrossed the ground like a lace network. One man counted twenty-eight thousand burrow entrances in an area a little over two hundred feet square.

The end of a mouse outbreak is always abrupt. At the peak, food begins to run short and crowding leads to tension and fighting, it is as though a tremor of anxiety had begun to run through the whole population—tension, food shortage, the stress of crowding (with demonstrable physical effects), disease, fighting, cannibalism—all these appear and lead into the descending spiral, a rapid decline that ends in mass die-off. Toward the end. predatory birds gather in spectacular numbers to feed on the mouse horde. Only then does the earth begin to recover.

The vole cycle gives a broad picture of population dynamics, of catastrophic increase in numbers. In recent years, studies done by John B. Calhoun have shown in great detail just what happens to social behavior under such circumstances. Dr. Calhoun worked with rats in captivity, and he found that under extreme crowding startling behavioral changes occurred. Among male rats these changes ranged from "sexual deviation to cannibalism and from frenetic overactivity to a pathological withdrawal." Among female rats the number of miscarriages increased, nest-building ability deteriorated, and so did the ability to care for the young.

The female rats built no nests at all under extreme crowding, but bore their young on the floor of the pen where the young rats were easily scattered and few survived. Females lost the ability to transport the young. En route somewhere a female would set a young rat down and then, distracted, wander off and forget it. The scattered young were seldom nursed, finally were left to die.

Dr. Calhoun developed a term for the social deterioration occurring under extreme crowding; he called it the "behavioral sink."

III: CANDELARIA

India gets the publicity; but Latin America is the fastest-growing region of the world and one of the most unstable. The shock of population growth there can be incredible. By one estimate there are a million deaths a year from starvation and malnutrition. A Notre Dame sociologist. Professor Donald N. Barrett, describes a slum where "two or three children (are) dying per week because of the ravenous dogs." Today the populations of Latin America and North America are not far apart; by the end of this century Latin America could easily have as many people as China today—750,-000,000. dwarfing the U.S.

The population of India doubles every thirty-one years; in Colombia it doubles in twenty-three years and there are rural areas doubling in sixteen. In a brief space, it is probably impossible really to convey what this means. A Colombian doctor who has been in the midst of it has said the implications are "almost beyond comprehension." To see. even to a small extent, what this means, look at the village of Candelaria and what Dr. Alfredo Aguirre found there—as he reported it to *The Population Council.*

Candelaria is semi-rural—a village where, quite literally, people are multiplying at such a rate in relation to resources that almost everything has broken down. Big families are crammed into tiny rooms in flimsy shacks: there isn't enough food; what food there is goes mainly to the father because he must work in the nearby cane fields or sugar mills. The children go hungry and, as Dr. Aguirre put it. "undernourishment means early death for many of the children. and if death fails to intervene . . . [there will be] delay in walking, retardation in speech development, difficulties in relating to other people ... a diminished capacity to adapt."

The adolescent in this world "may exhibit antisocial tendencies [and] ultimately abandons school without having developed any skills. Finally he joins the mass of unemployed . . . tends to flaunt authority . . . cannot adapt to a social system that involves laws and mores of which he is unaware because nobody has ever taught him, and that apparently deny to him and his family the right of survival." This is the analytic language of social science; behind it is the reality of Colombia: a country on the edge of revolution. with guerrilla bands in the mountains, disaffection in the cities, extremes of poverty and affluence, and one of the highest homicide rates in the world.

The typical young girl in Candelaria has a child or two in her teens. She is unmarried, illiterate or semiliterate, has no way to support the children. She has. Dr. Aguirre says, two options:

"One is to seek a more or less stable marital relationship, not just out of sexual instinct but from economic necessity, although this means sacrificing her own freedom,

since in this type of relationship it is the man who decides how long it shall last, who distributes the family income according to his own convenience (other women, alcoholic beverages, etc.), and who determines the number of children to be conceived.

"The other solution to the mother's problems is the death of the child ('masked infanticide') in which children between six months and four years of age are often allowed to die when attacked by any disease. . . . We have even seen mothers who objected to their children being treated and [who] were upset when curative measures were successful. No less rarely, such children are abandoned in the hospital. ... A frequent indication of 'masked infanticide' is apparent when a mother or a couple of very limited means approaches the physician for a 'death certificate' for their child without any emotion or anguish..."

Candelaria is the human equivalent of Calhoun's behavioral sink.

IV: REUNION AND TIKOPIA

> Reunion is an island in the Indian Ocean: *"The accounts of the first visitors* [sixteenth century] *are a description of Eden."*

The French geographer Pierre Gourou has described what happened thereafter. First, European settlers set up coffee and sugar plantations on the island and ran them with slave labor. (Islands were favored; the slaves couldn't run off.) By 1848 there were 61,000 slaves and 45.000 free, and in that year the slaves were freed. The planters were unwilling to change their approach—that is, to pay and otherwise treat the blacks as free men. So the ex-slaves tended to move up onto the island's steep interior slopes, where they practiced subsistence farming on small plots. The big planters imported Indian labor to work the plantations. The smaller planters found they could no longer compete. They were forced to abandon their plantations; they moved up onto the slopes with the freed slaves.

Through World War II, the population grew with fair speed and regularity. The island changed—plants and animals native to it were exterminated. Cultivation of the steep slopes caused heavy erosion, threatening the future of the subsistence farmers. And in the course of a century. the quality of the lives of those small planters driven onto the slopes with the former slaves had changed remarkably. "Their ancestors, three to four generations before, had stone houses and fireplaces, and spun and wove wool; but these people live in plank or leaf houses, have no fireplaces. and shiver in their thin cotton clothes."

After World War II modern medicine and sanitation brought a quick drop in the death rate, and the population began shooting upward. There were 310,000 inhabitants in 1957; there may well be 620,000 by 1980. There is no place for the overflow; unemployment is swelling. The situation. as Gourou says, "is really alarming."

Tikopia is an island in the Pacific where the "primitive" people in residence learned to regulate their own numbers by, as Raymond Firth put it. "restraint on the part of the male." The Tikopian recognized that their environment was limited, that the island could support only so many people. They acted accordingly, with a remarkably clear vision of the consequences if they should fail. An islander told Firth, "Families by Tikopia custom are made corresponding to orchards in the woods. If children are produced in plenty, then they go and steal because their orchards are few. So families in our land are not made large in truth; they are made small. If the family groups are large, they go and steal, they eat from the orchards, and if this goes on they kill each other."

It may be that the Tikopia were rare among human societies in their acute awareness of cause and effect. But the point is that they did have ways of limiting their numbers, and used them, as have many other premodern peoples. And in this they were typical of animals generally.

All animals produce more young should bombard the senses. Even at its most obscure it must remain far more accessible than "classical" music. Accessibility, like fun. is part of its aesthetic. The perplexing question is what happens when all those students in grad school come to understand this? Let us assume that the other tradition is dead. Environmental art, including rock, is the new tradition. Does that mean a rock establishment in the universities?

Father John Culkin, Director of the Communications Center at Fordham University, thinks it could happen: "Never underestimate the power of formal education to ruin anything." Peter Winkler, who doesn't think he'll ever compose rock because his own education has already rendered him unfit, prays Culkin is wrong. But maybe Kurt Von Meier has the answer. He thinks college is becoming passe.

"In the next couple of years I figure nobody who's really worthwhile will even start college anyway." he explains.

Soon, the rock and roll dropout may be a thing of the past.

than necessary to maintain their numbers. So if a species is to stay within the limits of its food supply, some check on numbers is essential. Such checks are quite common—predators, disease, the maintenance of territory or of hierarchies or peck orders, etc. The ultimate check of famine operates on a large scale rather rarely, because the other checks have kept population within limits of the food supply.

But all this assumes an undisturbed environment and a complex one. In a disturbed environment peculiar things begin to happen. For example, where man disturbs the plant environment through cultivation. weeds proliferate as they would not ordinarily in the wild. Where man cultivates a single crop over wide acreage, destructive insect populations like the boll weevil multiply as they would not normally in a natural environment. Great mouse plagues occur where man sets up ideal conditions for them. This suggests something about the difference between Reunion and Tikopia.

In Tikopia. over many generations, men have learned to live within the limitations of their world. Every man is in close touch with the essentials of life- with food, water, shelter. education of the young. Every man is aware of outer limits. To put it in computer jargon, there is a daily feedback which tells a man what his situation is, and there is an ancient pattern of tradition which tells him how then to carry on.

Reunion is a disturbed environment. and in this it is typical of most of the modern world. Reunion is peopled with uprooted Europeans, uprooted Africans, uprooted Indians, people for whom all the old patterns and traditions have been smashed by a galaxy of new forces. In the shock of change all the old ways of dealing with the world are forgotten. Or they don't work anymore. Or they are illegal. The uprooted man is at first baffled and disorganized because nothing works anymore. Then, increasingly.

he is bitter. The old selfregulating feedback systems will not be restored in a day; if they are restored at all, it will take generations.

In the meantime almost everyone on earth is out of touch with the essentials, with the clear view of outer limits possessed by the Tikopian. Nowhere is the evidence of shattered patterns, of drift away from the awareness of essentials, more apparent today than in the United States.

V: THE AMERICAN ENVIRONMENT

The U.S. birthrate has been declining since 1957. Even if this decline continues, population will grow at an accelerating pace for some decades to come. There were 100,000,000 Americans about fifty years ago. There are 200,000,000 now; there will be 300,000,000 by 2000, assuming the continued *decline* in the birthrate; and there could well be 400,000,000 by 2015 or 2020. Note that each time the population increases by 100,000.- 000, it takes far less time than it took to add the previous 100,000,000. This is one aspect of acceleration, and today acceleration touches everything.

Today, according to one student of American society, "It takes only a year or two for the exaggerations to come true. Nothing will remain in the next ten years. Or there will be twice as much of it." (Warren G. Bennis, in *Technology Review.)*

To Americans, growth has always been a "good"—growth stocks, the Soaring Sixties, the Baby Boom, the Biggest Little City in the West, etc. India has a population crisis; the U.S. has "growth," the booster philosophy, "Dig We Must for a Growing New York." The dismal side of all this is becoming only too apparent today: in the birth of the city that never ends; in the difficulty of getting anywhere within that city, or of getting out of it, or of finding (once out of it) any place worth getting to that isn't already overrun with other escapees; in the air and water pollution; in the difficulty of finding a doctor; in the evolution of the Kafka- esque bureaucracy, corporate and governmental.

All this is rather well-known. Some aspects of the situation are less well-known. For example:

1. Water. A recent writer in *Science* said, "A permanent water shortage affecting our standard of living will occur before the year 2000." This, of course, has all kinds of ramifications. Consider just one. In the Western states forty percent of all agriculture (and much allied enterprise) depends on irrigation. Much of this may have to be abandoned. Gerald W. Thomas, the Dean of Agriculture at Texas Technological College, writes that some of this agriculture "may have to be shifted back to the more humid zones in the next fifty years." This is likely to mean higher costs to consumers. And of course the more humid Eastern zones are precisely the ones now urbanizing most rapidly.

2. Urbanization. We are spreading out over the landscape at a phenomenal rate. Highways now cover with concrete an area the size of Massachusetts, Connecticut,

Vermont, Rhode Island and Delaware. William Vogt has recorded the fact that the National Golf Foundation desires to cover an area the size of New Hampshire and Rhode Island with new golf courses. In downtown Los Angeles sixty-six percent of the land is Uken up by parking lots or streets; in the whole Los Angeles area one-third of the land is paved. The trend is toward the creation of Los Angeles everywhere. We are developing urban complexes so vast that one can travel a hundred and more miles before reaching open country. The leapfrogging, haphazard pattern of development hastens the process of spread; in California, housing that need have covered only twenty-six square miles actually knocked out two hundred square miles of farmland.

3. Mobility. Automobiles are multiplying three times faster than people and five times faster than roads necessary to accommodate them. Freeways are obsolete before completion. If all our registered vehicles were laid end to end, the line would begin to approach in length the total mileage of city streets in the United States. Which suggests why Boston had a traffic jam a few years ago—no special cause—that froze the entire downtown area for five hours. Or why a single New Jersey jam lasted seven hours and tied up a million and a half vehicles. Senator Claiborne Pell of Rhode Island, who put all these facts in a book called *Megalopolis Unbound,* believes that the search for perfect mobility is leading to total immobility.

4. Farmlands. The spread of the cities takes at least a million and a half acres of open land every year, fifty percent more than a decade ago. The popular outcry has been minor; after all we have had huge crop surpluses. But now there is some concern. Maurice L. Peterson, Dean of Agriculture for the University of California, has said that "urbanization of prime farmland is one of the most serious problems facing us in agriculture. The population is increasing at a far more rapid rate than our ability to produce food, and farmers are being forced up into the hills, where it costs more to produce." California produces twenty-five percent of the nation's table food, forty- three percent of fresh vegetables, forty-two percent of nut and fruit crops. By conservative estimate, half of California's prime cropland will go to housing and industry in the next thirty-three years; pessimists believe it will be eighty percent.

   The U.S. seems unlikely to have a food problem soon; it has enormous capabilities in food production. This capability has a price, however, as two of our ecologists, William Vogt and Raymond F. Dasmann, have made quite clear. American rivers run brown because they are full of earth washed from the fields bordering them. Twenty years ago, Dr. Vogt wrote: "American civilization, founded on nine inches of topsoil, has now lost one third of this soil." Part of the Sahara and much of the barren wasteland of the Middle East is, to a large extent, man-made desert. In

the dust-bowl regions of the American Southwest, Dr. Dasmann has said, "What the Bedouin took centuries to achieve, we have almost equaled in decades."

5. The economics of change. The biggest public-works project in history, according to President Eisenhower, was the $41,000,000,000 public highway project undertaken during his Administration. (When the American people voted for it through their Congress, said Lewis Mumford, "the most charitable thing to assume . . . is that they hadn't the faintest notion of what they were doing.") But the requirements just ahead make the highway program look like a county supervisors' boondoggle. A Congressional committee recently put the cost of providing clean water at $100,000,000,000. The effort to do something about air pollution is likely to cost at least as much in the next thirty years. Senator Ribicoff says city rehabilitation will require $1,- 000,000,000,000. A housing expert sees the need for $100,000,000,000 (a popular figure) in Federal housing aid. The population of the country will double in fifty years. This means—if the living standard is to be maintained or improved—something close to a doubling of facilities, public and private. Will we, then, duplicate in fifty years, and pay for, what has taken much of the nation's history to produce? Or will we balk at the effort and the cost, and suffer a gradual decline in the quality of our lives? The evidence is powerful—in failed school bond issues, deteriorating environment, overburdened public facilities—that we are balking already. Eugene Black's description of the optimist as a man who believes living standards can be maintained takes on new life.

6. Pollution. Everybody knows something about air and water pollution today. But there are exotic effects which remain less well known:

    a. Pesticides are essential to high- yield agriculture as now practiced in the U.S. Pesticides wash from field to river to sea, where they are concentrated by diatoms. I quote now from Lloyd V. Berkner, who is studying the phenomenon in detail. "Now the point is this: Our supply of atmospheric oxygen comes largely from these diatoms—they replenish all of the atmospheric oxygen every two thousand years as it is used up. But if our pesticides should be reducing the supply of diatoms or forcing evolution of less productive mutants, we might find ourselves running out of atmospheric oxygen."

    b. Agricultural fertilizers are another essential of high-yield agriculture, as now practiced. They are used in ever-greater quantities each year. Nitrates from these fertilizers are getting into water supplies both in the U.S. and Europe. At a certain level of concentration, the water becomes toxic. At least one town. Garden Grove. California, has had to shut down some of the wells providing its public water supply because of nitrate contamination. Other towns scattered around the nation have begun to discover similar problems.

In Minnesota, during one three-year period, fourteen infant deaths were attributed to nitrates in well water.

c. Dr. Barry Commoner reported recently (in his book. *Science and Survival)* that the burning of fuels has caused the carbon-diox ide content of the earth's atmosphere to rise fourteen percent in the past century. This has produced a general warming effect on the atmosphere. The President's Science Advisory Committee concludes that this warming may begin melting the Antarctic ice cap by the year 2000 (raising sea levels four feet a decade and. of course, finally inundating huge land areas and major cities, like New York).

d. There is a call for nuclear power today to replace coal or oil-fired electric generating units and thus reduce air pollution. Frank M. Stead, when he was with the California Department of Public Health, concluded that in his state after 1980 "electrical power sources must be progressively replaced with nuclear sources if clean air is to be maintained."

   A Congressional subcommittee headed by Representative Emilio Q. Daddario of Connecticut concerns itself specifically with science and the effects of technological change. The subcommittee reported recently: "There has been little progress in devising a way to get rid of the toxic by-products [of the nuclear power plant]. The best we can do with radioactive waste is what we first thought of—bury it. But someday that system will no longer be feasible. Then what? ... At this point there is no convincing evidence that anyone really knows." Yet nuclear power plants are being planned or built countrywide.

   The United States, of course, lacks a monopoly on nuclear power. In a recent book. *Inherit the Earth,* the zoologist N.J. Berrill finds that radioactive wastes from atomic-energy plants already constitute a worldwide problem—"country after country is already dumping them into the sea, to contaminate or poison whatever life there be. Our total inheritance seems to be at stake if no restraint appears.''

e. More on California. Mr. Stead, the environmental health expert, has said: "It is dearly evident . . . that between now and 1980 the gasoline- powered engine must lx? phased out [in California] and replaced with an electrical power package. . . . The only realistic way ... is to demand it by law." The forces working against this—considering many of our largest corporations are based on the auto industry—are vast.

The fundamental question here is this: To what extent today are we threatened by the very technology— and the institutions—we find essential to support a rapidly expanding population? The technology will not be abandoned. It is put to new uses every day, and with almost no thought of ultimate effects.

VI: THE CULTURAL SHOCK FRONT

The point should be clear—change occurs today at a fantastic pace in the U.S. and the pace is accelerating. We have no real idea where it all leads, any more than we know what to do with the hot waste from nuclear power plants. We rocket along, straight into the unknown, treasuring a Panglossian notion that somehow it will all work out for the best. This is true in the technological sense; equally so in the social sense.

For some the strain of contemporary life is already too great. Medicine links the stress ailments—heart disease, mental aberration, ulcers (which appear commonly in overcrowded animals)—to the tempo of modern life. Psychiatry recognizes an "automation syndrome" in which older workers, replaced by a machine, may break down, suffer amnesia or commit suicide. One sociologist predicts increasing alcoholism in the automated factory—this in a nation which now has one of the world's most substantial alcoholism problem.

In a sense today you can feel a tremor of anxiety through the whole society—feel it in the city riots, in the war, in the accelerating crime rate, in widespread unrest, unease, disaffection, tendency to drop out, turn on, drink up. You hear it in the cry for more police to "deal with the situation in the cities." You hear it in the shrillness of the extremist— the point being not what is said but the anxiety exhibited and the high decibel count. All this is directly related to population growth, to crowding, movement and swift social and technological change.

Sir Julian Huxley said the "stress effect of overcrowding and frustration ... is undoubtedly operating on the inhabitants of any city with over a million inhabitants in the world today, and has, to my mind, very serious implications." (This idea was belittled at length recently in a rather strange article by Irving Kristol. My money remains on Sir Julian.)

Keeping in mind the stress effect, the pace of growth and change, consider this: Population will grow by at least fifty percent in the U.S. during the next thirty-three years, barring catastrophe. During the same period U.S. urban population will come close to doubling. Thus in the most congested areas the effects of simple population growth will be doubled by the effects of movement and migration. Urban areas in the U.S. will grow at about the same rate as the population of India. India today we consider to be in a state of population crisis—but in the U.S. the boosters are still in charge. When the population hit 170.000,000 in 1957, Secretary of Commerce Sinclair Weeks said, "I am happy to welcome this vast throng of new customers for America's

goods and services. They help insure a rising standard of living. . . Four years later the population hit 185,- 000,000 and Secretary Luther Hodges led a round of cheers at the Commerce Department.

The effects of social and technological change, of growth and movement —these are already great in the United States and they will be compounded in the next thirty years. Some central cities will become highly unstable places, and what we now see in terms of crime, rioting and disaffection is just a preview. Today in the U.S. nearly everyone belongs to the class of the uprooted. The factory worker's daughter moves into the middle class; the commuter migrates daily to the city; the executive living in Louisville develops little concern for the affairs of his town because next year the company will shift him to Des Moines; the rural family migrates to the city and disintegrates; the more affluent flee the city for the suburbs; Easterners go West. Everyone, everything is in motion—as never before, anywhere.

The newspapers are filled with stories of turmoil in the world; factories harbor a new technology that is in the process of antiquating the skills of millions of workers; schools prepare the young for a world, and for jobs, that no longer exist; the accumulation of knowledge is so swift that "a major problem in research is to find out what has been done by oth- ers so as to avoid rediscovering the same information." Our institutions were formed for—and mentally and emotionally our political and other leaders exist in—a world that has ceased to be.

"I think," said the biophysicist John R. Platt, "we may be now in the time of most rapid change in the whole evolution of the human race, either past or to come. It is a kind of cultural 'shock front,' like the shock fronts that occur in aerodynamics when the leading edge of an airplane wing moves faster than the speed of sound and generates the sharp pressure wave that causes the . . . sonic boom."

Look at what's coming. The first industrial revolution replaced the pick-and-shovel man. Skilled scientists and administrators may survive the second (cybernetic) revolution, as Norbert Wiener said, but "taking the second revolution as accomplished, the average man of mediocre attainments or less has nothing to sell that is worth anyone's money to buy." In other words, the computer today functions at the high-school graduate level. High-school graduates are becoming industrially superfluous: so is the middle-management echelon.

Automation creates some jobs, of course—there is a demand today for more skilled and educated workers. So it's essential to upgrade education, make everyone skilled. Yet there is evidence that American schools have declined steadily in quality for years now. Considering the pace at which the school system has grown, this will hardly come as a stunning surprise.

In a sample study made during an eighteen-month period twenty-five percent of the men who took the Selective Service test failed the mental part of it. There are more than fifty million people in the country who failed to make it through high school, and sometime ago the Labor Department estimated that thirty percent of students might be high-school dropouts in the 1960's. Whatever the demand for skills may be

or may lie- come, we are turning out masses of young who will be unable to cope in a cybernated world.

It becomes essential, then, to "improve the schools." But the rigidity of the educational bureaucracy is legendary. It would be difficult to change the direction of this bureaucracy in any circumstances. It will inevitably be far harder at a time when the attention of that bureaucracy is focused primarily on problems of growth and change—as it must be for the next thirty years at least.

As recently as 1963, thirty-six percent of all vocational education funds went to what must be the single most rapidly declining major area of employment in the nation—agriculture. An investment, that is, in training for non-jobs. Much of the rest of the vocational-education money went into home economics. All of which says something profound about the relevance of our education efforts, about the intellects in charge, and the capacity for change.

Today the United States has the highest rate of unemployment as well as the highest rate of public dependency and population growth of any modern industrial state. From here on, according to Philip M. Hauser, former chief of the Bureau of the Census, population growth will "worsen the U.S. employment problem, greatly increase the magnitude of juvenile delinquency, exacerbate already dangerous race tensions, inundate the secondary schools and colleges . . . augment urban congestion and further subvert the traditional American Government system."

There are between thirty and forty million people living below the poverty level in the U.S. today. The rural Negro's movement to the city and the middle-class flight to the suburbs is reaching a crescendo. In Washington ninety percent of the schoolchildren are Negro, in Manhattan seventy-five percent are Negro or Puerto Rican—indicating the future city population. In the cities Negro unemployment averages about ten percent—there are areas where it runs much higher, up to twenty-five percent or more. Nor is this likely to be the peak. Commissioner of Labor Statistics Arthur M. Ross of the U.S. Department of Labor has said Negro unemployment could be running three or four times higher within eight years if present trends continue.

This could mean unemployment rates of thirty or forty percent and up for the city Negro. The industries that might hire them are moving to the suburbs. In Chicago in recent years seventy-seven percent of new plants have located outside the main metropolitan area; in Los Angeles eighty-five percent. The newspapers lately have been full of the exodus from New York—the black man reaches the promised land, and the white man packs it up and takes it to Westchester.

The prospect ahead for the thirty, odd millions of poor is more poverty, or the dole, or some form of Federal work project, perhaps all three; and it seems highly likely that even all three will provide no real solution. The crowd, or the mob, seems likely to reappear as a force in politics. Watts was a prelude.

The cultural shock front is an area of extreme turbulence, of buffeting, of exotic and swift currents. The question is whether the society we've known in the U.S. will survive passage through it.

VII: TRANSFORMATION

Dr. Platt is one of a group of people who sees the present as a critical period of transition. A brief composite of the group's view might go like this:

For most of his two million years, man has operated in a fairly stable— slow to change—world. Stone Age. From generation to generation there was almost no social or technological change. There was no gap between generations; father was like son was like grandson; they shared the same world, the same outlook. And every man was in touch with the essentials.

All this began to change with the advent of agriculture about 10,000 years ago. Food surpluses appeared. A few people, then, had time to do something other than hunt and cultivate. The efforts of the few led to civilization and to the accumulation of new knowledge. Knowledge brought innovation, changes in the accumulated human pattern of two million years. The more knowledge accumulated, the more innovation there was, until the process of change accelerated into the dizzy pattern of the present.

Dr. Platt sees the period of accelerating change—civilization—as transitional, the step between the old stability of the Stone Age and some new stability that may last equally long. Either we reach this new stability or, you might say, the whole thing goes belly-up. Because the pace of change can't accelerate indefinitely.

The present is probably the critical period in the transition. Dr. B. R. Sen, you remember, saw the next thirty-five years as decisive in terms of food. A sharp decline in population growth must come soon, or the likelihood is reduction through famine, war and disease. Aside from the population imbalance, the other major obstacle of the transition period is the danger of nuclear war.

Dr. Platt sees a limit here, too, because the big powers are playing nuclear roulette, and in the mathematical sense if you continue to do this, "It finally, certainly, kills you . . . some have estimated that our 'halflife' under these circumstances—that is, the probable number of years before these repeated confrontations add up to a fifty-fifty chance of destroying the human race forever— may be only about ten or twenty years . . . this cannot continue. No one lives very long walking on loose rocks at the edge of a precipice."

Do we make our way into the new stability, or do we not? The class divides into optimists and pessimists. Assume we make it. There is again a division into optimists and pessimists, the question being, this time: Do we emerge into Churchill's sunlit uplands or into Orwell's 1984?

To find an answer you have to consider that:

World population is almost certain to double before any final stability is reached.

The growth of a crowd inevitably restricts freedom. In the packed subway, finally, you are unable to raise your arms.

The crowd must be more highly organized as it grows, to avoid chaos and to permit the technology which supports the crowd to function.

Cybernetics and game theory will inform the actions of government —the process is underway in the United States. This will, very likely, have effects foreseen by Norbert Wiener and the Dominican friar, Pere Dubarle. The process is exquisitely simple. In the game with the individual, as Father Dubarle put it, "The *machines a gouverner* will define the State as the best-informed player. . . ."

The players are likely to be cooperative. Because each will be a specialist. Technology demands it, and the specialist is by definition the Dependent Man. He cannot provide the essentials of life for himself. He is dependent upon others to provide, to create opinion, order, to *know what must be done.*

Dependent Man, properly fed and educated, is Acquiescent Man—he who lets others do it. Programmed for conformity. "Orthodoxy means . . . not needing to think. Orthodoxy is unconscious," said George Orwell.

Herein lies the chief danger of the U.S. becoming a beleaguered citadel in a world entering the descending spiral; the already great pressures for conformity would become overwhelming.

Sometimes the elements of the Orwellian world seem remarkably close. "The control of human behavior by artificial means will have become by the year 2000 a frightening possibility. Government—'big brother'— might use tranquilizers, or hallucinogens like L.S.D., to keep the population from becoming unruly or overindependent. More and more subtle forms of conditioning will lead people to react in predictable ways desired by government or by commercial interests without people quite knowing how they are hoodwinked . . ."—thus H. Bentley Glass, biologist and vice- president of the State University of New York at Stony Brook.

Recently Representative Daddario's subcommittee raised the question whether we may not reach a day when "a magnetic public personality, provided with sufficient funds to place his image electronically before the populace as often as the psychologically programmed computers dictate, will automatically be guaranteed election."

Which sounds like Buck Rogers stuff, until you remember that the gravity belt is here, and so are Senator Murphy and Governor Reagan and now yet another television personality—the Governor of Oregon, Thomas McCall.

The Human Race Has, Maybe, Thirty-Five Years Left

by David Lyle

After that, people will start eating plankton. Or people

In the seventh century, according to the records of the Church of Moye, two kings of Erin summoned the principal clergy and laity to a council at Temora in consequence of a general dearth, the land not being sufficient to support the increasing population. The chiefs decreed that a fast should be observed both by clergy and laity so that they might with one accord solicit God in prayer to remove by some species of pestilence the burthensome multitudes of the inferior people. . . . St. Gerald and his associates suggested that it would be more conformable to the Divine Nature and not more difficult to multiply the fruits of the earth than to destroy its inhabitants. An amendment was accordingly moved "to supplicate the Almighty not to reduce the number of men till it answered the quantity of corn usually produced, but to increase the produce of the land so that it might satisfy the wants of the people." However, the nobles and clergy, headed by St. Fechin, bore down the opposition and called for a pestilence on the lower orders of the people. According to the records a pestilence was given, which included in its ravages the authors of the petition, the two kings who had summoned the convention, with St. Fechin, the King of Ulster and Munster and a third of the nobles concerned.

—*A Treatise on Plague* by W. J. Simpson

In a year of poor harvest, the weight of the burthensome multitudes lies heavy upon the shoulders of the affluent. My grandfather had a book that his father gave him, presented upon his reaching young manhood, and whether it was given with a kind word or a black look, I can't say, but the title was *Where to Emigrate and Why*. My grandfather headed West—this at a time when emigration remained plausible for young men found to be surplus upon the home ground.

Today the crowd is global. There is no place to go. There has never been such a crowd, and in no time at all now, it's going to be twice as big. As far man's efforts to cope, the performance of St. Fechin suggests a certain lack of promise. Perhaps the mildest we can hope for is the suggestion of a prominent anthropologist that birth-control agents be applied liberally to the public water supply.

The case is this: Fifteen thousand years ago the earth probably held fewer people than New York City does today. The population doubled slowly at that time—say every forty thousand years. Today there are more than three billion people in the world and the rate of increase is almost a thousand times greater. Doubling occurs in less than forty years.

On a graph the human population line now rises almost vertically, which will not continue—there must be leveling off or decline. Leveling seems rational. Decline can be a landslide, as the history of the Irish and the lemming imply. The critical period near a population peak is likely to be a time of anxiety, of extreme unease. Thus President Johnson told the troops in Korea last year: "Don't forget, there are only two hundred million of us in the world of three billion. They want what we've got and we aren't going to give it to them." (Quoted by John Gerassi in *The New York Review of Books*.)

In the United States a huge majority sees population as infinitely less threatening than crime and communism. Population crisis in America tends to become a cliché—a joke in the newspapers about standing room only in the year 2600. After which the matter may be dismissed—possibly it's something the Chinese are up to.

A few—the ecologically minded, some Senators and scientists and academicians—cry out that growth and change are tearing the world apart. But on television the audience cheers a father of ten, and in Washington the political leadership continues heavily occupied in the shadows, scuffling with crime and communism, hustling money for defense and space and the war, and plotting ways to insure more growth and change.

Population increase and technological change are immense forces driving the world ahead at an accelerating pace into a turbulent and highly uncertain future. The effect of these forces upon the United States is already profound; no Island of Affluence or Fortress America notions are likely for long to fend off the future, or to make a particle of difference in the logic of vertical increase.

To grasp the implications, look first at the world that remains poor, then at the changes wrought in man and animal by extreme crowding, and finally at the consequences in the U.S.

Begin with India.

I. THE CITY OF THE FUTURE

At Sealdah Station, Calcutta, misery radiates outward. . . . dusty streets straggle away in every direction lined with tiny shacks built of metal scraps, pieces of old baskets, strips of wood and gunny sacks. In the dark interiors of the shacks, small fires glow through the smoke and dark faces gaze out at children playing in the urinous-smelling, fly-infested streets. In a few years the children who survive . . . will grow taller and thinner and stand in the streets like wrapped skeletons, barefoot, hollow-eyed, blinking their apathetic stares out of grey, dusty faces. . . . Calcutta today . . . swollen by millions of refugees until the streets are spotted with their sleeping bodies . . . may very well represent the City of the Future.

—Philip Appleman, in *The Silent Explosion*

In Calcutta six hundred thousand people sleep, eat, live in the streets—lacking even the shacks Appleman saw at Sealdah Station. The American visitor sees these thousands lying upon the ground "like little bundles of rags" . . . sees "women huddling over little piles of manure, patting it into cakes for fuel, children competing with dogs for refuse"—and reacts with shock and revulsion. A student told Appleman, "I wanted to run away, to weep. I was disgusted, horrified, saddened. . . ."

Calcutta stands for three worldwide forces—burgeoning population, food shortage, a torrent of migration to the cities.

Today there are about five hundred million people in India. In thirty years or so there may well be one billion. Most Indians live in rural villages—but the villages are overflowing. The surrounding lands no longer produce enough food. The excess population drifts into the big coastal cities where there is hope of food. Calcutta has become an immense breadline where the starving from the countryside gather to feed on grain from American ships.

The vision of six hundred thousand people lying in the streets at night—a prostrate breadline waiting for Midwestern grain—must be burned into the mind if the fate of the third world (and of the United States) is to assume reality. Because as the population rises, the supply of grain is running out. This is true not only for India but for two-thirds of the human population. All over the third world the City of the Future is a place where the rural poor gather to await the grain handout from abroad, while it lasts.

From Calcutta, draw the implications for the third (so-called "underdeveloped") world—briefly, as follows:

- The 1960 population of the developed world was about 900,000,000; that of the third world ran over 2,000,000,000.
- The agricultural land resources of the two parts of the world are approximately equal.
- By the year 2000—in less than thirty-three years—the developed world must feed 1,300,000,000 on its half of the world's croplands. The third world will have to feed about 5,000,000,000 people on its half.

- The industrial states have moved on to high-yield agriculture, getting maximum production from the land. The third world must make the same transition—but there very well may not be time to make it before mass famine sets in.

The bind is this. There is a desperate need to cut population growth and to raise food production within the next three decades. The most urgent period will be the ten or fifteen years immediately ahead. All right, then, say the hopeful—birth control. But Cora Du Bois, an anthropologist with much experience in India, reports that ". . . any effective reduction of population growth among heavily breeding rural populations is not foreseeable in less than possibly fifty years. I believe this is a question on which it is wise to have no illusions."

Nor is the prospect for rapid increase in food supply much brighter. On the contrary, according to Lester R. Brown, an economist with the U.S. Department of Agriculture, "The food problem emerging in the less-developed regions may be one of the most nearly insoluble problems facing man over the next few decades."

There are, nevertheless, a few optimists. Some talk of farming the sea, eating plankton, but this will not help anyone soon. Anyway, says William Vogt, who is experienced, "Few of the people who advocate this, I am sure, have tasted plankton. . . ."

Recently, an optimist of some renown appeared—Donald J. Bogue, a sociologist at the University of Chicago. He said the United Nations' projections of about six billion people by the year 2000 are exaggerated; Dr. Bogue predicted a rapid decline in growth after 1975. The immediate reaction of his colleagues was disappointing. Dr. Bogue said, "Most were angry. I found no one who agreed with me."

Perhaps the most disturbing thing about the present world-population situation, as Dr. Bogue himself suggested, is the almost uniformly pessimistic outlook of so many very capable people who have examined the matter closely. Lloyd V. Berkner, a leading American scientist, remarked that in the third world, "We are probably already beyond the point at which a sensible solution is possible." Eugene R. Black, when he was president of the World Bank, said, "We are coming to a situation in which the optimist will be the man who thinks that present living standards can be maintained."

Dr. B. R. Sen, Director-General of the United Nations Food and Agriculture Organization, has said, "The next thirty-five years . . . will be a most critical period in man's history. Either we take the fullest measures to raise productivity and to stabilize population growth, or we will face disaster of an unprecedented magnitude. We must be warned . . . of unlimited disaster."

In Pakistan, President Ayub said in 1964, "In ten years' time, human beings will eat human beings in Pakistan."

The third world, then, is in acute danger of entering into a descending spiral where each successive failure reinforces the last in a descent toward chaos. The process may have begun. There is a tendency in the U.S. to believe it will be possible to isolate ourselves from this, retreat into the land of affluence. For a while, perhaps.

Consider this: As of 1954 the United States was using about fifty percent of the raw material resources consumed in the world each year. The rate of consumption has been rising and by 1980 the U.S. could be consuming more than eighty-three percent of the total.

Today the U.S. is a net importer of goods. Its reliance on foreign trade grows each year. The third world, in the meantime, sees industrialization as the road to salvation; its demand for raw material can be expected to accelerate. Today we can soothe the hungry by offering a certain amount of food and aid. Tomorrow we will be competing for raw material and there will be no spare food to offer.

The prospect is not bright. As Professor Harold A. Thomas Jr. of Harvard's Center for Population Studies put it, ". . . unless we engage ourselves today in problems of development of the poor nations, the conditions under which we live during the next two generations may not be attractive. The fuel required to sustain our mammoth technological apparatus may constitute a gross drain on the resources of the earth. Other societies cannot be expected to regard this favorably. A vista of an enclave of privilege in an isolated West is not pleasant to contemplate. Wise and human political institutions do not thrive in beleaguered citadels."

II. THE MOUSE EXPLOSION

Mice were generated and "boiled over" the towns and fields in the midst of that region, and there was a confusion of great death in the land.

—Vulgate I, Kings v, 6

The periodic vast increase in numbers of field mice is a peculiar and ancient phenomenon and men have long feared it. In the cult of Apollo this fear gave rise to religious ceremonies—the keepers of Apollo's temple kept tame mice in the sanctuary and a colony of them beneath the altar.

Aristotle was astounded by the capacity of mice to increase. "The rate of propagation of field mice in country places and the destruction that they cause are beyond all telling. In many places their number is so incalculable that but very little of the corn crop is left to the farmer; and so rapid is their mode of proceeding that sometimes a small farmer will one day observe that it is time for reaping, and on the following morning, when he takes his reapers afield, he finds his entire crop devoured. Their disappearance is unaccountable: in a few days not a mouse will be there to be seen. . . ."

The mouse horde has for centuries represented a serious problem in Europe. Charles Elton, the director of the Bureau of Animal Population at Oxford, has described one historic outbreak in France: ". . . an impressive picture of insurgent subterranean activity, of devastation breaking like a flood upon the crops. All man's vigilance and cars are taxed by the multitude of small, swift, flitting forms that infest the ground and devour all living plants. Poison, plowing, fumigation, trenches and prayers, all these can scarcely stop the destruction. . . . In [1822] Alsace was absolutely in the power of mice. It was a living and hideous scourging of the earth which appeared perforated all over like a sieve."

The animal responsible for this devastation is normally quite inconspicuous—a tiny creature, short-legged, short-tailed, broad of face—known commonly as the meadow mouse or vole. The vole rarely travels more than twenty-five feet from its burrow. It lives less than a year. But during its short life it is absolutely voracious. Each day it consumes its own weight in food. First it takes care of the plants aboveground; then it burrows down after roots and tubers. In an orchard, voles may girdle and kill trees.

The vole population follows a typical four-year cycle of rise and fall, proceeding from relative scarcity to a peak of abundance, then declining and beginning the cycle all over again. The remarkable thing about voles is their capacity under certain circumstances to increase to enormous numbers within a single breeding season. On occasion—in Europe this occurs perhaps once in a generation—there is an increase of truly catastrophic proportions, a "scourging of the earth" as in Alsace in 1822.

There have been a good many locally catastrophic mouse population explosions in the United States, the most severe in the far West. Perhaps the most devastating of all was centered in Oregon just a few years ago, and the damage to crops ran into millions of dollars.

Wells were polluted because of the numbers of voles that fell into them. In the most heavily infested areas there were two or three thousand mice to the acre and their burrows crisscrossed the ground like a lace network. One man counted twenty-eight thousand burrow entrances in an area a little over two hundred feet square.

The end of a mouse outbreak is always abrupt. At the peak, food begins to run short and crowding leads to tension and fighting. It is as though a tremor of anxiety had begun to run through the whole population—tension, food shortage, the stress of crowding (with demonstrable physical effects), disease, fighting, cannibalism—all these appear and lead into the descending spiral, a rapid decline that ends in mass die-off. Toward the end, predatory birds gather in spectacular numbers to feed on the mouse horde. Only then does the earth begin to recover.

The vole cycle gives a broad picture of population dynamics, of catastrophic increase in numbers. In recent years, studies done by John B. Calhoun have shown in great detail just what happens to social behavior under such circumstances. Dr. Calhoun worked with rats in captivity, and he found that under extreme crowding startling behavioral changes occurred. Among male rats these changes ranged from "sexual deviation to cannibalism and from frenetic overactivity to a pathological withdrawal." Among female rats the number of miscarriages increased, nest-building ability deteriorated, and so did the ability to care for the young.

The female rats built no nests at all under extreme crowding, but bore their young on the floor of the pen where the young rats were easily scattered and few survived. Females lost the ability to transport the young. En route somewhere a female would set a young rat down and then, distracted, wander off and forget it. The scattered young were seldom nursed, finally were left to die.

Dr. Calhoun developed a term for the social deterioration occurring under extreme crowding; he called it the "behavioral sink."

III: CANDELARIA

India gets the publicity, but Latin America is the fastest growing region of the world and one of the most unstable. The shock of population growth there can be incredible. By one estimate there are a million deaths a year from starvation and malnutrition. A Notre Dame sociologist, Professor Donald N. Barrett, describes a slum where "two or three children [are] dying per week because of the ravenous dogs." Today the populations of Latin America and North America are not far apart; by the end of this century Latin America could easily have as many people as China today—750,000,000, dwarfing the U.S.

The population of India doubles every thirty-one years; in Colombia it doubles in twenty-three years and there are rural areas doubling in sixteen. In a brief space it is probably impossible really to convey what this means. A Colombian doctor who has been in the midst of it has said the implications are "almost beyond comprehension." To see, even to a small extent, what this means, look at the village of Candelaria and what Dr. Alfredo Aguirre found there—as he reported it to *The Population Council*.

Candelaria is semi-rural—a village where, quite literally, people are multiplying at such a rate in relation to resources that almost everything has broken down. Big families are crammed into tiny rooms in flimsy shacks; there isn't enough food; what food there is goes mainly to the father because he must work in the nearby cane fields or sugar mills. The children go hungry and, as Dr. Aguirre put it, "undernourishment means early death for many of the children, and if death fails to intervene . . . [there will be] delay in walking, retardation in speech development, difficulties in relating to other people . . . a diminished capacity to adapt."

The adolescent in this world "may exhibit antisocial tendencies [and] ultimately abandons school without having developed any skills. Finally he joins the mass of unemployed . . . tends to flaunt authority . . . cannot adapt to a social system that involves laws and mores of which he is unaware because nobody has ever taught him, and that apparently deny to him and his family the right of survival." This is the analytic language of social science; behind it is the reality of Colombia, a country on the edge of revolution, with guerrilla bands in the mountains, disaffection in the cities, extremes of poverty and affluence, and one of the highest homicide rates in the world.

The typical young girl in Candelaria has a child or two in her teens. She is unmarried, illiterate or semiliterate, has no way to support the children. She has, Dr. Aguirre says, two options:

"One is to seek a more or less stable marital relationship, not just out of sexual instinct but from economic necessity, although this means sacrificing her own freedom, since in this type of relationship it is the man who decides how long it shall last, who distributes the family income according to his own convenience (other women, alcoholic beverages, etc.), and who determines the number of children to be conceived.

"The other solution to the mother's problems is the death of the child ('masked infanticide') in which children between six months and four years of age are often allowed to die when attacked by any disease. . . . We have even seen mothers who objected to their children being treated and [who] were upset when curative measures were successful. No less rarely, such children are abandoned in the hospital. . . . A frequent indication of 'masked infanticide' is apparent when a mother or a couple of very limited means approaches the physician for a 'death certificate' for their child without any emotion or anguish. . . ."

Candelaria is the human equivalent of Calhoun's behavioral sink.

IV. REUNION AND TIKOPIA

Reunion is an island in the Indian Ocean. "*The accounts of the first visitors* [sixteenth century] *are a description of Eden.*"

The French geographer Pierre Gourou has described what happened thereafter. First, European settlers set up coffee and sugar plantations on the island and ran them with slave labor. (Islands were favored; the slaves couldn't run off.) By 1848 there were 61,000 slaves and 45,000 free, and in that year the slaves were freed. The planters were unwilling to change their approach—that is, to pay and otherwise treat the blacks as free men. So the ex-slaves tended to move up onto the island's steep interior slopes, where they practiced subsistence farming on small plots. The big planters imported Indian labor to work the plantations. The smaller planters found they could no longer compete. They (Continued on page 176)

Photographed by Carl Fischer

NINE HEROES

Thirty-eight people heard Kitty Genovese cry out for help and did nothing, a circumstance that was immediately seized upon as a paradigm for our times. Perhaps it is. But let the historians of the future take note that in a grubbily selfish decade there were a few Americans, at least, capable of selflessness. To set the record straight we present nine of them here, and we begin with Gloria Cassidy, shown above with her brothers Gregory and Sean. Gloria had no need to ask whether or not she was her brothers' keeper; she assumed she was, and kept them. On October 27, 1965, a fire broke out in the twins' bedroom in their New York City apartment. Mrs. Cassidy roused her six children and got them outside, but in the confusion Sean and Gregory, then three years old, ran back into their room and hid in a closet. Gloria heard their screams and ran back to find them. She brought them out one at a time—first Sean, then Gregory. "The pain from the flames was so bad I thought I'd go out of my mind," she said. Gloria suffered third-degree burns over most of her body and was hospitalized for three months. She was then thirteen years old. She was presented with the Young American Medal for Bravery by the President of the United States.

Photographed by Duane Michals

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places) and provide lyrics that make good sense within the framework. Composers show a similar sophistication. But rock cannot approach the complexity and subtlety of classical music or even good jazz and remain rock. Arthur Berger, who holds the Naumberg Chair of Music at Brandeis University, is one academic who seems to have an understanding of some of this.

"All sound isn't of one kind," Berger says. "The Beatles are current for a number of months and then they fade. Art music is not entertainment music because art is not consumed. The fact that other kinds of art can develop doesn't replace what's going on unless that happens to wear itself out."

Once again, whether The Beatles mightn't remain current for more than a couple of months is immaterial. The point is that rock does not succeed classical music. It does not even run alongside classical music. It is a different thing. In fact it is new as entertainment as well as art. It should not be appreciated but absorbed on a subconscious level. It should bombard the senses. Even at its most obscure it must remain far more accessible than "classical" music. Accessibility, like fun, is part of its aesthetic. The perplexing question is what happens when all those students in grad school come to understand this? Let us assume that the other tradition is dead. Environmental art, including rock, is the new tradition. Does that mean a rock establishment in the universities?

Father John Culkin, Director of the Communications Center at Fordham University, thinks it could happen. "Never underestimate the power of formal education to ruin anything." Peter Winkler, who doesn't think he'll ever compose rock because his own education has already rendered him unfit, prays Culkin is wrong. But maybe Kurt Van Meter has the answer. He thinks college is becoming passé.

"In the next couple of years I figure nobody who's really worthwhile will even start college anyway," he explains.

Soon the rock and roll dropout may be a thing of the past. ##

THE HUMAN RACE HAS MAYBE THIRTY-FIVE YEARS LEFT

(Continued from page 118) were forced to abandon their plantations, they moved up onto the slopes with the freed slaves.

Through World War II the population grew with fair speed and regularity. The island changed—plants and animals native to it were exterminated. Cultivation of the steep slopes caused heavy erosion, threatening the future of the subsistence farmers. And in the course of a century the quality of the lives of those small planters driven onto the slopes with the former slaves had changed remarkably. "Their ancestors three to four generations before had stone houses and fireplaces and spun and wove wool, but these people live in plank or leaf houses, have no fireplaces, and shiver in their thin cotton clothes."

After World War II modern medicine and sanitation brought a quick drop in the death rate and the population began shooting upward. There were 310,000 inhabitants in 1957; there may well be 620,000 by 1980. There is no place for the overflow; unemployment is swelling. The situation, as Gourou says, "is really alarming."

Tikopia is an island in the Pacific where the "primitive" people in residence learned to regulate their own numbers by, as Raymond Firth put it, "restraint on the part of the male." The Tikopian recognized that their environment was limited, that the island could support only so many people. They acted accordingly with a remarkably clear vision of the consequences if they should fail. An islander told Firth: "Families by Tikopia custom are made corresponding to orchards in the woods. If children are produced in plenty, then they go and steal because their orchards are few. So families in our land are not made large; in truth, they are made small. If the family groups are large they go and steal, they eat from the orchards, and if this goes on they kill each other."

It may be that the Tikopia were rare among human societies in their acute awareness of cause and effect. But the point is that they did have ways of limiting their numbers and used them as have many other premodern peoples. And in this they were typical of animals generally.

All animals produce more young than necessary to maintain their numbers. So if a species is to stay within the limits of its food supply some check on numbers is essential. Such checks are quite common—predators, disease, the maintenance of territory or of hierarchies or peck orders, etc. The ultimate check of famine operates on a large scale rather rarely, because the other checks have kept population within limits of the food supply.

But all this assumes an undisturbed environment and a complex one. In a disturbed environment peculiar things begin to happen. For example, where man disturbs the plant environment through cultivation, weeds proliferate as they would not ordinarily in the wild. Where man cultivates a single crop over wide acreage, destructive insect populations like the boll weevil multiply as they would not normally in a natural environment. Great mouse plagues occur where man sets up ideal conditions for them. This suggests something about the difference between Reunion and Tikopia.

In Tikopia over many generations men have learned to live within the limitations of their world. Every man is in close touch with the essentials of life—with food, water, shelter, education of the young. Every man is aware of outer limits. To put it in computer jargon, there is a daily feedback which tells a man what his situation is, and there is an ancient pattern of tradition which tells him how then to carry on.

Reunion is a disturbed environment and in this it is typical of most of the modern world. Reunion is peopled with uprooted Europeans, uprooted Africans, uprooted Indians, people for whom all the old patterns and traditions have been smashed by a galaxy of new forces. In the shock of change all the old ways of dealing with the world are forgotten. Or they don't work anymore. Or they are illegal. The uprooted man is at first baffled and disorganized because nothing works anymore. Then increasingly he is bitter. The old self-regulating feedback systems will not be restored in a day. If they are restored at all it will take generations.

In the meantime almost everyone on earth is out of touch with the essentials, with the clear view of outer limits possessed by the Tikopian. Nowhere is the evidence of shattered patterns, of drift away from the awareness of essentials, more apparent today than in the United States.

V THE AMERICAN ENVIRONMENT

The U.S. birthrate has been declining since 1957. Even if this decline continues, population will grow at an accelerating pace for some decades to come. There were 100,000,000 Americans about fifty years ago. There are 200,000,000 now; there will be 300,000,000 by 2000, assuming the continued decline in the birthrate, and there could well be 400,000,000 by 2010 or 2020. Note that each time the population increases by 100,000,000 it takes far less time than it took to add the previous 100,000,000. This is our aspect of acceleration, and today acceleration touches everything.

Today, according to one student of American society, "It takes only a year or two for the exaggerations to come true. Nothing will remain in the next ten years. Or there will be twice as much of it." (Warren G. Bennis, in *Technology Review*.)

To Americans, growth has always been a "good"—growth stocks, the Soaring Sixties, the Baby Boom, the Biggest Little City in the West, etc. India has a population crisis, the U.S. has "growth," the booster philosophy, "Dig We Must for a Growing New York." The dismal side of all this is becoming only too apparent today: in the birth of the city that never ends, in the difficulty of getting anywhere within that city or of getting out of it, or of finding (once out of it) any place worth getting to that isn't already overrun with other escapees; in the air and water pollution; in the difficulty of finding a doctor; in the evolution of the Kafkaesque bureaucracy, corporate and governmental.

All this is rather well-known. Some aspects of the situation are less well known. For example:

1. Water. A recent writer in *Science* said, "A permanent water shortage affecting our standard of living will occur before the year 2000." This of course has all kinds of ramifications. Consider just one. In the Western states forty percent of all agriculture (and much allied enterprise) depends on irrigation. Much of this may have to be abandoned. Gerald W. Thomas, the Dean of Agriculture at Texas Technological College, writes that some of this agriculture "may have to be shifted back to the more humid zones in the next fifty years." This is likely to mean higher costs to consumers. And of course the more humid Eastern zones are precisely the ones now urbanizing most rapidly.

2. Urbanization. We are spreading out over the landscape at a phenomenal rate. Highways now cover with concrete an area the size of Massachusetts, Connecticut, Vermont, Rhode Island and Delaware. William Vogt has recorded the fact that the National Golf Foundation desires to cover an area the size of New Hampshire and Rhode Island with new golf courses. In downtown Los Angeles sixty-six percent of the land is taken up by parking lots or streets. In the whole Los Angeles area one third of the land is paved. The trend is toward the creation of Los Angeles everywhere. We are developing urban complexes so vast that one can travel a hundred and more miles before reaching open country. The leapfrogging, haphazard pattern of development hastens the process of spread. In California, housing that need have covered only twenty-six square miles actually knocked out two hundred square miles of farm land.

3. Mobility. Automobiles are multiplying three times faster than people and five times faster than roads necessary to accommodate them. Freeways are obsolete before completion. If all our registered vehicles were laid end to end the line would begin to approach in length the total mileage of city streets in the United States. Which suggests why Boston had a traffic jam a few years ago—no special reason—that froze the entire downtown area for five hours. Or why a single New Jersey jam lasted seven hours and tied up a million and a half vehicles. Senator Claiborne Pell of Rhode Island, who put all these facts in a book called *Megalopolis Unbound*, believes that the search for perfect mobility is leading to total immobility.

4. Farmlands. The spread of the cities takes at least a million and a half acres of open land every year, fifty percent more than a decade ago. The popular outcry has been minor; after all we have had huge crop surpluses. But now there is some concern. Maurice L. Peterson, Dean of Agriculture for the University of California, has said that "urbanization of prime farmland is one of the most serious problems facing us in agriculture. The population is increasing at a far more rapid rate than our ability to produce food, and farmers are being forced up into the hills, where it costs more to produce." California produces twenty-five percent of the nation's table food, forty-three percent of fresh vegetables, forty-two percent of nut and fruit crops. By conservative estimate half of California's prime cropland will go to housing and industry in the next thirty-three years; pessimists believe it will be eighty percent.

The U.S. seems unlikely to have a food problem soon; it has enormous capabilities in food production. This capability has a price, however, as two of our ecologists, William Vogt and Raymond F. Dasmann, have made quite clear. American rivers run brown because they are full of earth washed from the fields bordering them. Twenty years ago Dr. Vogt wrote, "American civilization, founded on nine inches of topsoil, has now lost one third of this soil." Part of the Sahara and much of the barren wasteland of the Middle East is, to a large extent, man-made desert. In the dust bowl regions of the American Southwest, Dr. Dasmann has said, "What the Bedouin took centuries to achieve, we have almost equaled in decades."

5. The economics of change. The biggest public works project in history, according to President Eisenhower, was the $41,000,000,000 public highway project undertaken during his Administration. (When the American people voted for it through their Congress, said Lewis Mumford, "the most charitable thing to assume ... is that they hadn't the faintest notion of what they were doing.") But the requirements just ahead make the highway program look like a county supervisor's boondoggle. A Congressional committee recently put the cost of providing clean water at $100,000,000,000. The effort to do something about air pollution is likely to cost at least as much in the next thirty years. Senator Ribicoff says city rehabilitation will require $1,000,000,000,000. A housing expert sees the need for $100,000,000,000 (a popular figure) in Federal housing aid. The population of the country will double in fifty years. This means

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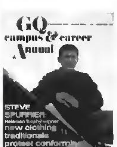

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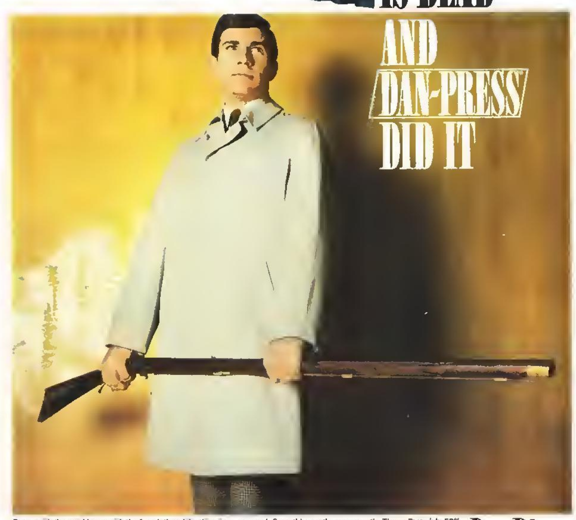

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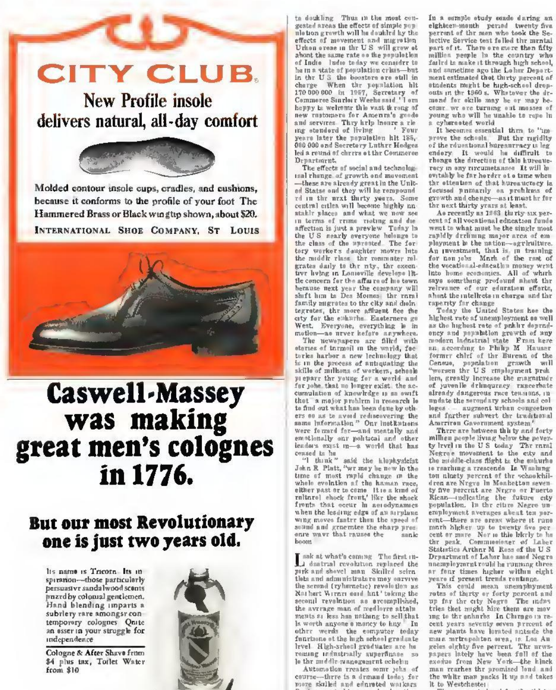
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