

THE POPULATION QUESTION REVISITED

BY GEORGE MOFFETT

Despite surprising reductions in birth rates in many parts of the world, more than 90 million people are being added to the Earth each year. World population is now approaching six billion, up from only three billion in 1960.

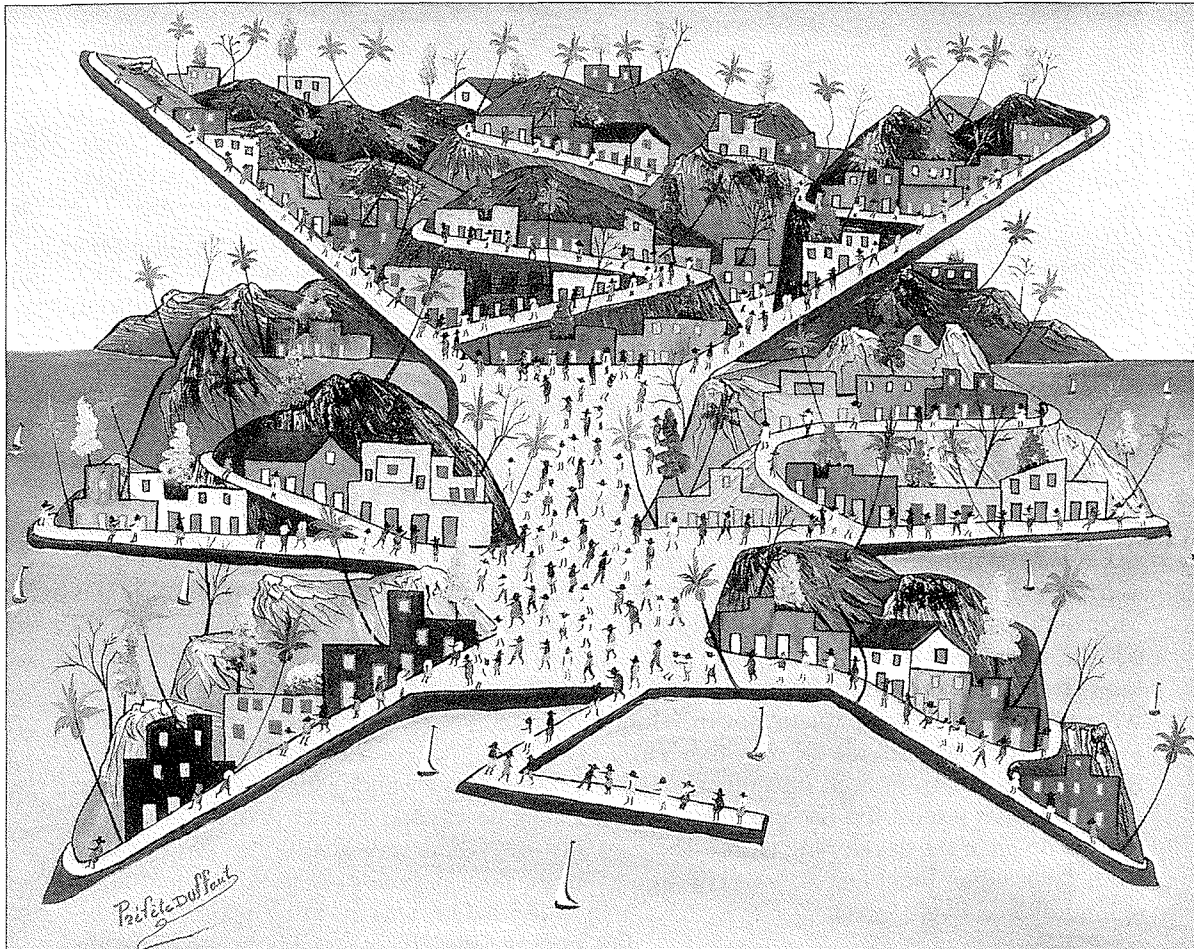
During the next 20 years, it could increase by as much as 40 percent, to almost eight billion people, or by less than 30 percent, to about 7.2 billion.

The difference will depend in part upon decisions that are made by the United Nations International Conference on Population and Development, to be held in Cairo this September. Behind the conference, George Moffett explains, simmers a long debate between those who see the rise in population as a clear and mounting danger and those who argue that such growth ranks low, if at all, among the world's problems.

There are two ways to view the extraordinary growth in human numbers that has occurred during the last half of the 20th century. One is with trepidation. The other is with hope. During a recent three-year tour of duty as a newspaper correspondent in the Middle East, I found abundant cause for both.

Trepidation comes more easily in a region

where continuing high rates of population growth have contributed to a visible array of political, economic, and social problems. It is an emotion evoked merely by walking down the street in a city like Algiers. The vacant stares of the jobless men who wile away long hours on street corners and in coffee houses because they have nothing else to do tell a disturbing story. These poor are part of an army of unemployed men and women that includes



Jamel, a painting by the 20th-century Haitian artist Préfète Duffaut

three-quarters of Algerians between the ages of 16 and 29. Their circumstances are bleak for many reasons. An inefficient socialist economy and 30 years of increasingly corrupt one-party rule have done their damage, but there is something else at work and it bears down more heavily each year on Algeria's future. It is the relentless onrush of humanity that has magnified inefficiency and mismanagement, that has swelled the ranks of the jobless, and that has led even hard-core optimists to wonder whether this once-proud nation can ever regain its footing. The despair reflected on the faces in Algiers tells one side of the population story.

But there is a more hopeful side to the

subject as well. I discovered it one day while reporting on the consequences of rapid population growth in Egypt. After interviewing the usual government officials and population experts, I was directed to a small family-planning clinic, located near Cairo's infamous "City of the Dead," a sprawling group of cemeteries that is now home to half a million living Cairenes who have nowhere else to reside. It was there that I met Aziza.

Until three years before, Aziza had been one of the majority of Egyptian women who, according to one Egyptian public-opinion poll, wanted to stop having children but did not know how. Just how to use the birth control devices passed out by a local government



Cairo, site of this year's population conference, is the world's 12th most populous city. It currently has 97,106 residents per square mile.

clinic was a mystery. Family and friends warned her of grave side effects if she tried. Meanwhile, the children, five born into the squalor of her teeming Cairo neighborhood, kept coming. At the clinic she finally found what she needed: a sympathetic doctor who took the time to provide advice that cut through the layers of fear, ignorance, and suspicion that attend the use of contraceptives in much of the developing world. Three years later, when I met her, Aziza's children still numbered five.

The uncertainties occasioned by world population pressure are nothing new. Despairing or hopeful, thousands of books have been written on the subject, and virtually all of them have something to do with a dramatic historical trend that began around the turn of the 17th century and that will probably end sometime during the 22nd. Throughout most of human history the world's population remained below 250 million, capped by birth rates and death rates locked in a seemingly permanent

equilibrium. But sometime after 1600 the line demographers use on graphs to plot population growth began to stir, then took an unexpected—and until now permanent—turn upward. The ascent was slow at first. The line probably crossed the half-billion mark sometime during the 17th century. Nudged along by improvements in agriculture and public health and then by the Industrial Revolution, it climbed higher through the 18th century. After the turn of the 19th century it reached a milestone, passing the one billion mark for the first time in human history. This was not long after the English economist Thomas Malthus penned his famous essay warning that such growth would outpace food supplies and keep mankind in the grip of poverty.

The line continued upward into the present century and began its steepest ascent in the years after World War II, when two developments sent death rates plummeting in the poor nations of Asia, Africa, and Latin America. One was the introduction of antibiotics and the advent of public health programs that led to mass immunizations and improvements in sanitation and water supplies. The other was an agricultural revolution based on chemical fertilizers, irrigation, and improved seed strains that dramatically expanded food supplies. The combined effect was to reduce mortality rates. But with no corresponding drop in birth rates, the population line was propelled into the demographic stratosphere. By the 1960s, the *rate* of population growth reached 2.1 percent globally and 2.5 percent among developing countries—the highest

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ever recorded—and then dropped off. But, driven by the disproportionately large percentage of young people in the nations of the Third World, the line plotting the actual growth in human numbers continued its upward course.

The world's population now stands at about 5.6 billion, on its way to six billion by the turn of the century. At current growth rates it will double by 2035, while in Africa, where growth rates remain the highest in the world, population will double in just over half that time, from 670 million today to 1.4 billion around 2015. Exactly when and at what level global population growth will finally peak is extremely difficult for demographers to predict. Several decades of the fastest population growth in human history still lie ahead, according to the United Nations. If fertility declines fast enough, the line will begin to level off sometime after the middle of the 21st century. If it does not, its ascent will continue into the 22nd. Its long upward journey will then, finally, be at an end.

Although many specialists believe that rapid population growth is a root cause of economic underdevelopment, political instability, and environmental degradation, the population issue has evoked little public concern in the United States since the late 1960s and early 1970s, when books such as Paul Ehrlich's *Population Bomb* and the Club of Rome's *Limits to Growth* created a stir with projections of famine and economic collapse. Nor has it assumed over the past decade the kind of priority among American policymakers that it was once given by one secretary of state, Dean Rusk, who warned during the 1960s that bringing nuclear weapons and high global population growth rates under control were the two greatest challenges facing mankind.

According to one recent Gallup poll, only 50 percent of Americans believe it is in the best interest of the United States to help other nations slow their population growth. Only four percent more support providing U.S. economic or technical assistance to curb population growth in developing nations. Asked how

best to help developing countries protect their environments, only a slightly higher number in other Western democracies, queried on the eve of the Rio "Earth Summit" in 1992, endorsed supplying family-planning information.

Such apathy is bound up with a problem long familiar to pollsters: that long-term trends and complex issues of public policy are beyond the ken of all but the most educated members of the public. But neither ignorance nor apathy will spare Western nations from the implications of the growing body of evidence that population expansion, alone or in conjunction with other factors, is having significant and adverse consequences, and not just in poor nations.

In the United States, which has a population growth rate five times that of western Europe and four times that of Japan, immigration and natural population growth are occurring so fast that the U.S. Census Bureau was recently forced to revamp its long-term projections. In the late 1980s, the bureau projected that the nation's population would peak at slightly over 300 million just before the mid-21st century. New projections issued just four years later put the 2050 total at between 383 and 500 million, with continuing increases projected through the 21st century. The result: Today's American children could end their lives in a United States almost twice as crowded as it is today.

Elsewhere, the effects of rapid population growth are far more severe. Among the wealthy industrial nations of Europe, population increases lie behind significant new social tensions and the growth of pernicious right-wing political movements. The cause: a steady flow of people crossing the Mediterranean in search of jobs that North Africa's inefficient economies are unable to generate fast enough to keep up with population growth. Six million Africans now live in France and Germany alone, adding to the existing burden of absorbing refugees from the former Soviet bloc, Turkey, and Asia. The visible manifestations are shantytowns and street

crime and outbursts of anti-immigrant violence. The region with the world's lowest rate of population growth is bracing itself against worse to come from the region with the world's highest rate. Africa, which today has about the same number of inhabitants as Europe, will have three times Europe's population within a generation.

Elsewhere in the developing world, demographic change is contributing to political and social dislocations that could put the most serious strains on the international system in the post-Cold War world. All around the developing world, governments are struggling to counteract the effects of rapid population growth on domestic economies, particularly on the potential for job creation. Some 500 million people are already un- or underemployed in developing countries, and 30 million more are entering the job market each year, according to the United Nations Population Fund. Many experts doubt that capital and technology can be created fast enough in poor countries to keep up with the demand. Population growth, meanwhile, has magnified the problems created by bad government policies and social inequities, contributing to extensive deforestation, land degradation, overcropping, urban overcrowding, regional tensions, and, in countries such as Algeria, worrisome political trends.

"Population projections out to 2050 are dramatic and have dramatic implications," say John Steinbruner, director of foreign policy studies at the Brookings Institution. "Along with the internationalization of the economy and the information revolution, population creates an entirely new set of circumstances, altering the character of what we understand to be security. We have a major story on our hands here, and people will eventually have to notice."

II

Unlikely as it may seem in a world of nearly six billion people, population was a concern in

a world one-twentieth that size. The reason is not so surprising: Long before human numbers began to have an impact on the global environment, they had an impact on the local environment. The specter of widespread deforestation and soil erosion in ancient Greece, for instance, occasioned mostly by overgrazing, convinced Plato and Herodotus that the city-states of Attica had to balance population growth with available resources. Moderation in population size as in all other matters, the Greek philosopher and the Greek historian reasoned, was desirable. Aristotle, the intellectual godfather of the pessimistic persuasion of many modern-day demographers, anticipated other problems that would attend rapid population growth. It is necessary that the state "take care that the increase of the people should not exceed a certain number," he cautioned, adding that the failure to do so "is to bring certain poverty on the citizens." It is evident, Aristotle warned, that "if the people increased, many of them must be very poor."

Across the Mediterranean, in the capital of the great empire of antiquity, Cicero believed that there could never be such a thing as too many Romans. But a neighbor of later times was unconvinced. When "every province of the world so teems with inhabitants that they can neither subsist where they are nor remove elsewhere . . . it must come about that the world will purge itself through floods, plagues, or famines," warned the Florentine statesman Niccolò Machiavelli, early in the 16th century.

To a list that included environmental degradation and poverty, Sir Walter Raleigh a century later added another danger of rapid population growth: imperialism. "When any country is overlaid by the multitude which live upon it, there is a natural necessity compelling it to disburden itself and lay the load upon others, by right or wrong," wrote the explorer, who had reason to know.

Plato and Aristotle, Machiavelli and Raleigh provided one answer—a resounding yes—to the central demographic question of the ages: Is there such a thing as too many



The "dismal scientist," Thomas Malthus (1766-1834)

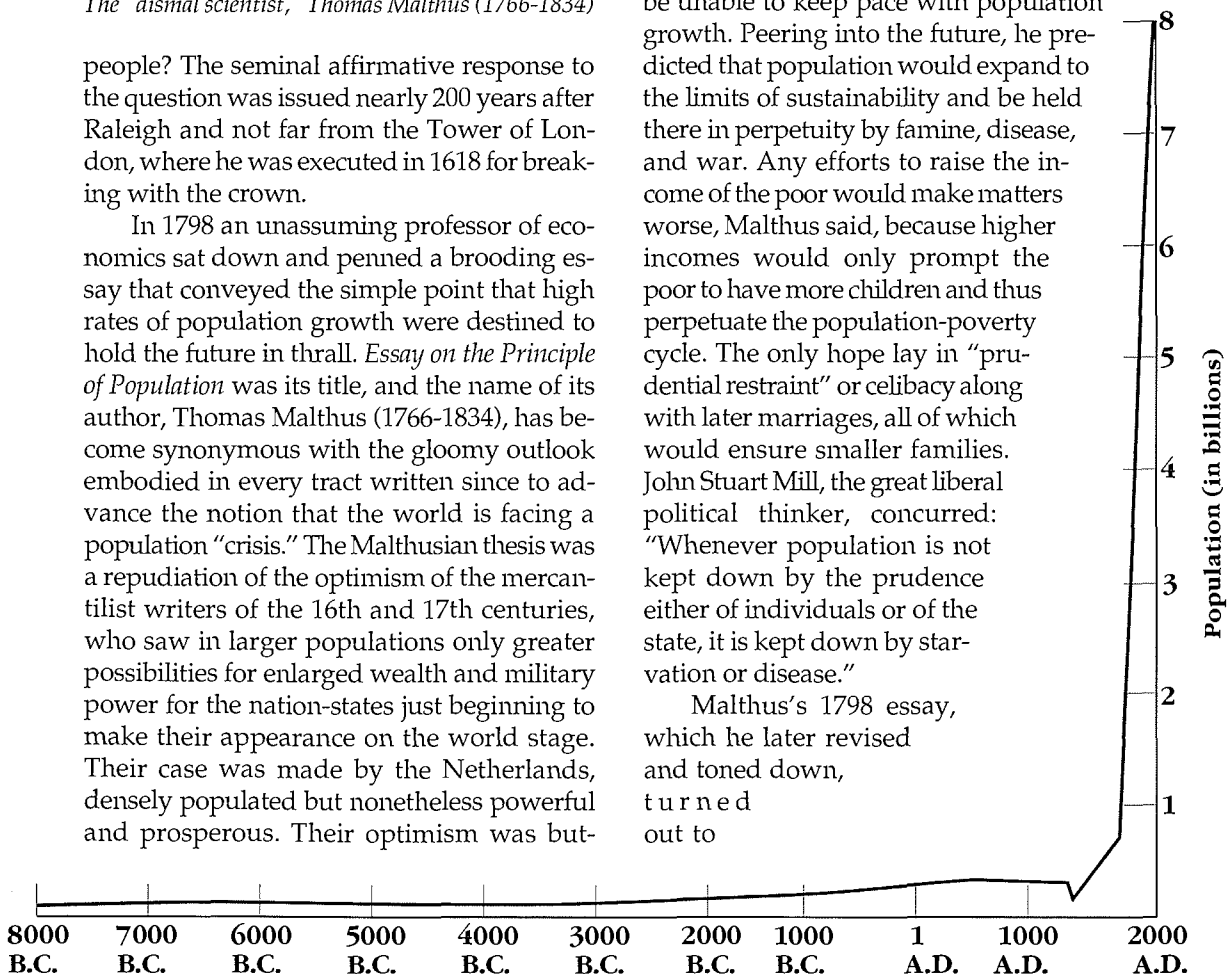
people? The seminal affirmative response to the question was issued nearly 200 years after Raleigh and not far from the Tower of London, where he was executed in 1618 for breaking with the crown.

In 1798 an unassuming professor of economics sat down and penned a brooding essay that conveyed the simple point that high rates of population growth were destined to hold the future in thrall. *Essay on the Principle of Population* was its title, and the name of its author, Thomas Malthus (1766-1834), has become synonymous with the gloomy outlook embodied in every tract written since to advance the notion that the world is facing a population "crisis." The Malthusian thesis was a repudiation of the optimism of the mercantilist writers of the 16th and 17th centuries, who saw in larger populations only greater possibilities for enlarged wealth and military power for the nation-states just beginning to make their appearance on the world stage. Their case was made by the Netherlands, densely populated but nonetheless powerful and prosperous. Their optimism was but-

tressed by utopian writers such as France's Marquis de Condorcet, who wrote convincing assurances that man's technology and ingenuity would combine to create the economic opportunities needed to accommodate expanding populations. But by Malthus's time such opportunities seemed remote. Industrialization had created great wealth but also great poverty in Britain, which reeled from a series of economic crises and bad harvests.

The man at the center of the great demographic debate was an immensely popular figure in London, a tall and handsome scholar, "in appearance and conduct a perfect gentleman," according to a contemporary magazine. Malthus looked out from Britain's cauldron of troubles and concluded that progress would be stymied because economic growth and food production would be unable to keep pace with population growth. Peering into the future, he predicted that population would expand to the limits of sustainability and be held there in perpetuity by famine, disease, and war. Any efforts to raise the income of the poor would make matters worse, Malthus said, because higher incomes would only prompt the poor to have more children and thus perpetuate the population-poverty cycle. The only hope lay in "prudential restraint" or celibacy along with later marriages, all of which would ensure smaller families. John Stuart Mill, the great liberal political thinker, concurred: "Whenever population is not kept down by the prudence either of individuals or of the state, it is kept down by starvation or disease."

Malthus's 1798 essay, which he later revised and toned down, turned out to



Religion and Family Planning

Padre Alberto Marquez Aquino's church, Maria Madre, is located in the sprawling western reaches of Mexico City, the second largest city in the world. A Roman Catholic priest for more than 20 years, Marquez is a respected figure in this lower-middle-class community, where the church retains a strong hold on popular affections and loyalties. He speaks as a man who has no doubt about the church's position on contraception but understands the struggles of those who do. He also grasps the surprising fact, borne out by a large body of anecdotal evidence, that despite the church's well-publicized views on the subject, very many Catholics do not understand the large area of permissibility that enables Catholics to space children and to use natural means of contraception to limit family size.

"Many people think that the church says they should have a lot of kids," the soft-spoken cleric explains. "Others think that Catholicism is totally against any type of contraception and family planning. Maybe 10 percent know what the church really feels. And because they don't understand what the church doctrine is, they don't even think about it and they do what they want to do. Some feel guilty, but most are simply ignorant of the church's true position."

As the senior priest of Maria Madre for the past seven years, Marquez has spent dozens of hours talking to parishioners about natural methods of birth control. "If they really understood that natural methods do work," he insists, "they would not use artificial contraceptives." Father Marquez has no way of knowing how many obey because most parishioners no longer confess to using modern contraceptives. But he is worried that the battle is being lost—and not without reason. If the statistics are accurate, Mexico has become a nation of Catholics who believe themselves faithful despite a breach over the essential issue of contraception. Across Mexico and around the Catholic world, a historic transformation of lay attitudes toward contraception is taking place as the relentless pace of modernization is forcing millions of believers to revise their ideas about what is morally correct and religiously acceptable.

In Latin America, where half the world's 800 million Catholics reside, this transformation has already produced significant demographic changes. A continent that used to be the object of gloomy demographic predictions, similar to those now made about Africa, is today a notable, if not uniform, family-planning success story. "In terms of attitudes toward family planning, Latin America is like Berlin after the wall came down," says Paul Burgess, a former priest and Vatican official who is an expert on population issues. "It's a whole new era."

In many individual countries, Catholics use contraceptives at rates equal to or higher than among adherents of other faiths. Of those who do not, religion is usually not the main reason. Meanwhile, despite pressure from the church, governments in most Catholic countries are now committed to family planning and have invested large sums to make contraceptives widely available.

On the matter of specific contraceptive choice, public attitudes in Mexico and elsewhere across Latin America are also largely at variance with Catholic teachings. Despite the church's 1975 ban on sterilization, 20 percent of Latin American couples of reproductive age use sterilization and the proportion is rising fast, according to one UN study. Fully one-fourth of married women of reproductive age in Brazil have been sterilized, one-third in Panama and El Salvador, and 40 percent in Puerto Rico, which has the highest rate in the world. And these trends show no sign of leveling off. Among women in their later thirties and early forties the figures are higher still. As for the pill, banned in the church's definitive 1968 encyclical *Humanae Vitae*, only northern and western Europe surpass Catholic Latin America in its use. Together the pill and female sterilization account for two-thirds of all contraceptive use in Latin America and the Caribbean.

The use of modern birth-control devices is just as widespread in Catholic nations outside Latin America, testifying to the prevalence of what Pope John Paul II has described as the "contraceptive mentality." The prime example lies outside the pope's front door. Italy, where condoms can be

purchased within sight of the Vatican, has the highest contraceptive prevalence rate (nearly 80 percent) and the lowest fertility rate (1.3 children per woman) ever recorded. According to the World Health Organization, the country's birthrate has declined by half since the early 1960s. Italy now produces fewer children in relation to its population than any country in the world.

Nor is Catholicism the only religion buffeted by the contraceptive revolution. Millions of Muslims have responded by accenting a more permissive side of their theology. In the process they have removed one barrier to reducing fertility in the Muslim crescent of South Asia and the Arab world, where birthrates are among the highest in the world.

Just what is and what is not allowed under Muslim law is a matter of debate. Throughout the 1,400-year history of Islam, the world's second largest faith, children have been considered one of the greatest blessings of God. The religion's long tradition, based on the Prophet Muhammad's injunction to "marry and have children"—the Islamic equivalent of the enjoinder in Genesis to "go forth and multiply"—is one reason why large families have been the rule in Muslim nations.

But in the Muslim world, as in Catholic nations, old teachings are bumping up against the hard realities of population trends that have fundamentally altered daily life. In Egypt, Mohammed Sayeed Tantawi, a government-appointed mufti, or interpreter of religious law, speaks with authority as a keeper of doctrine for the world's 850 million Sunni Muslims. "Islam provides no opposition to controlling birth. There is no Koranic verse which forbids family planning," says the cleric. "I personally, if I were to have a meeting with the pope at the Vatican, would explain to him that the Shari'a of Islam does not forbid family planning as long as the couple sees that there is a necessity for it."

The implications of high birth rates in the Arab world dawned first upon politicians whose jobs depend on keeping up with spiraling demands for jobs, food, and housing. More than three decades ago, Tunisia's long-time leader Habib Bourghiba warned of "a human tidal wave that is implacably

rising—rising more quickly than our capacity to support ourselves."

"What good is it to increase our agricultural production and our mineral wealth if the population continues its anarchic and demential growth?" Bourghiba asked when he established the region's first successful family-planning program.

Thirty years later, the logic of family planning extends even to the bastion of Shi'ite orthodoxy, Iran. When they seized control from the shah in 1979, the country's new Islamic rulers sneered at birth control as a Western plot. Fifteen years later, faced with twice the population but the same fixed, oil-based annual income, the mullahs have caught the spirit. With the zeal of converts, they have created a family-planning program that includes everything from aggressive public education to free vasectomies to financial disincentives that discourage anything larger than a three-child family.

The ethics of reproduction are also changing in Hindu nations. Like most of the world's major faiths, Hinduism is pronatalist and patriarchal. Sons are extremely important because, among other reasons, males are responsible for the funeral rites that ensure the survival of the souls of the departed. In rural Nepal, the emphasis on sons has been so great that couples traditionally have as many as six children to ensure two surviving sons, according to research conducted by the Ford Foundation's James Ross.

But in Nepal, as elsewhere, new factors have altered the calculus of reproduction. With less and less agricultural land to divide among heirs, the economics of having large families has been altered. As a result, religious considerations favoring large families have taken a back seat to the necessity of having fewer children so that they can be educated for salaried jobs. The trend toward smaller families in Nepal has been abetted by the increasing availability of health-care services that have raised child survival rates, and by the provision of basic family-planning services by the government.

In nearly every region of the world, similar circumstances have prompted millions of believers to separate their reproductive decisions from their religious faith.

—G.M.

be one of the more influential economic treatises ever written; it set the terms of a demographic debate that has lasted to the present day. The essayist William Godwin, whose optimism Malthus had set out to repudiate in his own work, was nevertheless impressed by it and called Malthus "the most daring and gigantic of all innovators." Thomas Carlyle was depressed by it and dubbed Malthus's new discipline the "dismal science." Decades later Karl Marx was simply angered by it, and he vilified the essay as "nothing more than a schoolboyish, superficial plagiarism [that] does not contain a single sentence thought out by [Malthus] himself." More vociferous than Marx was Friedrich Engels, co-author of *Das Kapital*, who thundered against "this vile and infamous doctrine, this repulsive blasphemy against man and nature. Here, brought before us at last," Engels roared, "is the immorality of the economists in its highest form." Part of Malthus's pessimism stemmed from the conviction that when population increased, the price of labor would drop. In short, too many people would mean lower wages and more poverty. Marx and Engels rejoined that low wages were not a function of population but of class exploitation, which resulted from the concentration of wealth in the hands of a few. Factor out the inequities of capitalism, they argued, and population growth would pose no problem.

The other main criticism of Malthus, echoed by Marx but anticipated nearly a century earlier by the French utopians, was that technology would offset the diminishing price of labor, rescuing mankind from a future of population-induced food shortages. "New instruments, machines, and looms can add to man's strength and improve at once the quality and accuracy of his productions, and can diminish the time and labor that has to be expended on them. The obstacles still in the way of this progress will disappear," Condorcet predicted in an essay published in 1795, a year after his death. "A very small amount of

ground will be able to produce a great quantity of supplies."

Malthus was burdened by fatalism induced by fears of population growth and resource shortages. His critics were buoyed by optimism induced by faith in market forces and the power of technology. Together they defined the poles of a debate that, under far different circumstances, continues today. Once confined to economists, it is now largely waged between economists, on the one hand, and biologists and environmentalists, on the other. Once focused on conditions in the industrialized nations, the debate now centers on the implications of rapid population growth in less developed countries where the lion's share of growth is now occurring. Once limited to issues such as industrial wages and food supplies, it now extends to the viability of the very ecological support systems on which human life depends. Only the question remains the same, though with numbers that Malthus, who lived in a world of less than one billion inhabitants, would have trouble comprehending: Can the planet, regions of which are already sagging under the weight of its 5.6 billion passengers, sustain five or 10 billion more?

The modern demographic debate has been set in the context of unprecedented population growth rates that took off in Malthus's day and peaked during the late 1960s. Surveying the developing world, modern Malthusians, who for the first three decades after World War II included the vast majority of population experts, were sure that population growth was largely responsible for the famines, economic slumps, and political unrest that were endemic in the post-colonial era. To this scene of disarray they brought a bold policy prescription unknown to Malthus: family planning. The use of modern contraceptives, they argued, would reduce fertility and speed economic and political development.

One school of modern Malthusians believed that population growth retards economic development. Too many people, the

reasoning went, leads inevitably to poverty and unemployment. It was a view that deeply influenced American policymakers during the Cold War, who worried that rapid population growth would prevent or retard development, thus opening the door to communism in the Third World. They responded by adding a family-planning component to U.S. aid programs starting in the 1960s. Another more pessimistic version of modern Malthusianism dealt less with economics and more with the ecological limits to growth. Because supplies of life-supporting resources such as land, water, and minerals are finite, pessimists argued, high rates of population growth could endanger the survival of humanity.

This gloomy perspective was given enormous credibility by a publishing event in 1972 that, as demographer Kingsley Davis notes, seemed at the time to settle the debate in favor of the alarmists. In that year a group of scholars associated with the Massachusetts Institute of Technology fed data on land use, food supplies, pollution, and patterns of industrialization and resource use into a computer and watched in awe as it cranked out projections of a bleak future for humankind. They concluded that the world's population would grow so fast, that pollution would reach such high levels, and that resources would be drawn down so far and so fast that the inevitable result would be "overshoot" and "collapse." They called their study *The Limits to Growth*. As Donella Meadows, a Dartmouth College biophysicist and one of the report's principal authors, later put it, "The world is racing ahead like a speeding car heading for an accident." The only way to avoid such an accident, the authors argued, was to slow industrial and population growth.

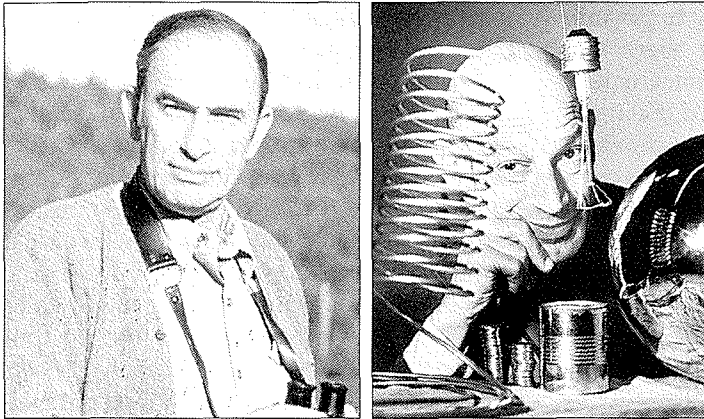
But even as *The Limits to Growth* succeeded in galvanizing public concern that a population crisis was at hand, the aura of crisis it helped to create unexpectedly dissipated almost as fast as it had gathered. By the

mid-1970s fears of famine began to diminish because of the green revolution in Asia and Latin America, the latest manifestation of a two-century advance in agricultural productivity that has continued to the present day. Meanwhile in many developing nations birth-rates began to drop from historic highs attained in the late 1960s, presaging eventual population stabilization. Elsewhere in the developing world, economic growth rates started to rise, notably in the densely populated nations of East Asia. Suddenly the correlation between population and underdevelopment was in doubt.

Such doubts energized the smaller community of demographic revisionists, who emerged to do battle with their Malthusian brethren. The most vocal among them were New Right conservatives and libertarians who unexpectedly resurrected the old Marxist critique of Malthus, arguing that faulty economics, not high levels of population growth, was the cause of scarcity. Unlike Marx, they looked to an unfettered market economy, not socialism, to create opportunities for the earth's masses.

Harbingers of this revisionist view had appeared in the 1930s, when a few writers ventured the opinion that, in the industrialized nations at least, population growth could stimulate economic growth. In the mid-1930s, Harvard University economist Alvin Hansen had argued that underemployment and underinvestment during the Great Depression were the result of insufficient population growth, a view elaborated by the influential British economist John Maynard Keynes. After World War II, conservative economists reaffirmed the link between population growth and business expansion. "The importance of family growth for business activity is beginning to be realized by business planners," *U.S. News & World Report* noted in 1950. "They are revising upward their estimates of future markets."

The notion that population growth is a



The population antagonists: Paul Ehrlich (left) and Julian Simon

neutral or even positive phenomenon gained wider acceptance during the 1970s, when many of the earlier apocalyptic forecasts failed to come true. Contrary to such predictions, nearly all the indices of human progress have improved since the dawn of the industrial age. Aggregate statistics indicate that life expectancy, literacy, global economic output, and per capita income are all at unprecedentedly high levels, despite rapid population growth. Infant mortality rates, mineral prices, and food prices, meanwhile, have fallen to record low levels.

"The data shows that Malthus had it backwards," wrote David Osterfeld, a political scientist whose book *Prosperity and Planning* was published just before his death in 1992. "The population explosion didn't limit production. It was made possible by the explosion of production, of resources, food, scientific information, and medical advances. Thus, if anything, the limits to growth are receding rather than growing nearer and the world is therefore growing relatively less populated."

Predictions of catastrophe have been wrong on two counts, according to revisionists. The first is that economic models, including the one used for *The Limits to Growth*, project outcomes far into the future using the technology and know-how in existence today and thus vastly underestimate the potential achievements of

future generations. The other, related mistake is the persistent tendency of Malthusians to underestimate human ingenuity. If population growth creates problems, revisionists say, then history has proved time and again that it also calls forth the innovations needed to solve them. One case in point is the green revolution, which catapulted growth in agricultural output above population growth rates in some of the most densely packed nations on earth. "The basic problem," concluded Osterfeld, "is that Malthus underestimated everybody's intelligence but his own."

III

Like David and Goliath, two combatants have stood out from the academic armies engaged in the great demographic debate. Both prefer to think of themselves as David, the virtuous underdog. But both are more like Goliath, armed to the teeth, in this case with graphs, charts, and computer models designed to penetrate the other's intellectual defenses. The *New York Times Magazine* has called these rivals "the Cassandra and the Dr. Pangloss of our era." According to script, one is an environmentalist—Paul Ehrlich of Stanford University—and the other is an economist—Julian Simon of the University of Maryland.

Paul Ehrlich first came to notice when, as a young biologist, he wrote the book that carried the population issue from the precincts of academe to a mass popular audience. *The Population Bomb* (1968) built upon a simple mathematical calculation: finite natural resources divided by a rapidly expanding population. The nearly inevitable result, Ehrlich wrote, was mass starvation and ecological overload. "The birthrate must be brought into balance with the deathrate or mankind will breed itself into oblivion,"

Ehrlich warned. "We can no longer afford merely to treat the symptoms of the cancer of population growth; the cancer itself must be cut out. Population control is the only answer."

The Population Bomb sold three million copies and made Ehrlich the leading Jeremiah of his age. Thirty books, dozens of articles, and innumerable media appearances later, he is still the most sought-after expert on the population issue. Unlike Cassandra, the mythical figure whose dark predictions were always right but usually ignored, Ehrlich has commanded and held a large popular following. His biggest media triumph was an appearance on the Johnny Carson show in 1970, earned by the overwhelming success of *The Population Bomb*. A scheduled 10-minute interview turned into a 45-minute media event that produced the biggest response in the show's history, generating 5,000 letters to Carson in the weeks that followed. Admirers and critics alike attribute Ehrlich's success to a glib speaking style and a gift for analogy, talents he has harnessed to the task of purveying to popular audiences a compelling image of imminent disaster.

But fame has brought criticism as well as praise. Ehrlich is repeatedly reminded that some of the dark prophecies contained in his book have failed to materialize. Hardest to live down has been a projection of massive famine within a decade of the book's publication. "In the 1970s the world will undergo famines—hundreds of millions are going to starve to death in spite of any crash programs embarked upon now," Ehrlich had warned. He acknowledges the error but insists that developments in the quarter century since the book was published—global warming, for example—have proved that, if anything, his prediction was not pessimistic enough. On balance, Ehrlich maintains, ecologists have been better forecasters than economists. Among the latter, Ehrlich likes to point out the one who in the 1950s predicted that India would be one

of the strongest nations on earth by the end of the century precisely because of its large population.

"It's true that we didn't foresee the great success of the green revolution," Ehrlich says. "But it's also true that we missed a lot of other things: depletion of the ozone layer, acid rain, the accelerating destruction of tropical forests, playing Russian roulette with the atmosphere—all of which are at least partly due to population growth. It makes you wonder what else is going on out there that we don't know about yet. We did miss a lot of stuff. But the fact remains that we were too optimistic."

Ehrlich bristles at the charge that he blames environmental degradation entirely on population growth, particularly in poor nations where it is occurring at the fastest rates. "We've published more pounds of paper than anyone else trying to explain that the real problem is overconsumption in the United States," he says, referring to various academic colleagues, including his Stanford biologist wife, Anne, with whom he has collaborated in print. "Seventy percent of global environmental damage is because of the rich countries. The problem is not just the poor."

But rapid population growth, which is mainly among the poor, ranks a close second in Ehrlich's hierarchy of concerns. Some economists say declining population growth rates have defused the population bomb. Ehrlich disagrees. With China factored out, fertility in less developed countries remains high, he says. Even in countries with successful family-planning programs, such as Indonesia and Mexico, fertility declines have stalled well above replacement level. Not to worry about birthrates and not to promote family planning aggressively under such circumstances, Ehrlich says, is folly.

When asked about his adversary, Julian Simon, Ehrlich is equally direct: "It's as if Julian Simon were saying that we have a geocentric universe at the same time NASA is saying the earth rotates around the sun. There's no reconciling these views. When

The Cost of a Solution

Any sound strategy for slowing global population growth will have to include several elements. One is a strong emphasis on economic development, which demonstrably reduces the demand for large families. Another is the promotion of greater equality between the sexes. But no single measure will have a greater short-term payoff than extending family-planning programs so that safe and effective birth control methods are made universally available.

Demographic and health surveys conducted in dozens of developing nations indicate that 125 million women who want to space their children or stop having children altogether are not using contraceptives. Just by tapping into the demand that already exists, the public and private agencies and commercial outlets that dispense contraceptives could, by the most conservative estimates, increase contraceptive use in developing nations to at least 60 percent of couples. There are 180 million more couples who might use contraceptives if they were available.

Compared to the benefits, the costs of tapping in are minimal. Right now a total of about \$5 billion is spent annually on family-

planning services, three-quarters of which comes from the developing countries themselves. To stabilize population below 10 billion, it will be necessary to reach the replacement-level fertility rate of 2.1 children per family early in the next century. That means between 70 and 75 percent of couples will need to use contraceptives, a level of use that would increase the total annual cost of family planning to about \$11 billion (in 1993 dollars) by the end of the decade, rising to around \$14 billion in 2015, with outside donors picking up an increased share. The cost would total \$17 billion in the year 2000 if a broader array of reproductive health services were included. For the United States, for example, this would mean increasing annual expenditures on population planning from \$500 million to about \$1.3 billion (\$1.9 billion including other reproductive health services) by the end of the decade, still a small share of U.S. foreign aid but arguably the most effective in terms of its contribution to the welfare of developing nations.

The strongest indication that such an investment would be cost-effective is that an estimated one-quarter of births in the develop-

you launch a space shuttle you don't trot out the flat-earthers to be commentators. They're outside the bounds of what ought to be discourse in the media. In the field of ecology, Simon is the absolute equivalent of the flat-earthers."

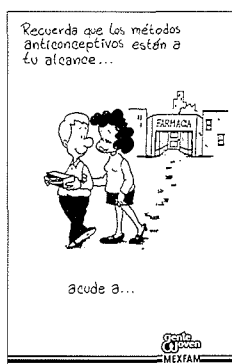
The two combatants, now both in their early sixties, have never met in person. But corresponding in 1980, they arranged the 20th-century equivalent of a duel to determine whose view of the future was more accurate. Ehrlich and two colleagues accepted a long-standing Simon bet that the prices of five minerals—tin, copper, tungsten, chrome, and nickel were

agreed upon—would be lower in 10 years. They wagered \$1,000, but the real stakes were much higher. "We knew if we bet on metals there would be a fair chance we'd lose," Ehrlich says now. "But we knew at the very least that if we took him on we could keep him quiet for a decade. The bet was trivial: We could have bet on the state of the atmosphere or on biodiversity loss, but it would be too hard to determine who won. With metals it's unambiguous." As it happened, the price behavior of metals—and what it says about future scarcity—turned out to be the trump card in Simon's hand.

It was Dr. Pangloss in Voltaire's *Candide* who advanced the sunny notion that "all is for

ing world (excluding China) are unintended and that 25–50 million abortions are performed each year, many or most in countries where planning programs are weak. Corroborating evidence is supplied by national fertility surveys, which indicate that in most countries outside of subSaharan Africa more than two-thirds of all married women want to limit their family size or to space the births of their children. Today less than half of women in developing countries are using modern contraception, just over one-third not counting China. In most countries, all that's missing to increase these figures is the means.

The simple truth is that rapid population growth is one of the few solveable problems in an otherwise complicated world. Four decades of experience with family planning have made abundantly clear which programs and methods work best. Lessons learned in countries from Thailand to Mexico are even



now being incorporated into the practice of countries that were late to set up population programs.

"Family planning is one thing we know how to do well so let's get on with it and rejoice," says Malcolm Potts, a professor of public health at the University of California at Berkeley. "Just provide services in a respectful way, listen to what people want, provide good geographically, culturally, and economically accessible services and fertility falls. That's what the data show."

As Potts notes, rapid population growth is no longer a problem looking for a solution but a solution looking for resources. It was the resources of the industrialized nations that helped lower death rates in the developing world half a century ago, contributing to the population explosion that has occurred there since. The idea of investing the modest resources now needed to lower birth rates has appealing symmetry. More to the point, such an investment would be the consummate act of enlightened self-interest on the part of wealthy nations, which, in the absence of such support, will not long remain isolated from the daunting consequences of rapid global population growth.

—G.M.

the best in this best of all possible worlds." For Julian Simon, there has been much to be sunny about lately. Fifteen years ago he was on the sidelines of the great demographic debate, a man of unorthodox views and—as a professor of business administration—atypical qualifications. An intense and prolific advocate like Ehrlich, he has since elbowed his way into the debate and nearly single-handedly shifted the mainstream in his direction. Although he has not won the popular acclaim of his Stanford nemesis, even some of his critics concede that his optimism is not altogether ungrounded.

Simon was not always sanguine about the population issue. When he was younger, he

says, he "enlisted in the great war to reduce population growth." He set out to learn the theory and data of demography. In the process he came across the statistical correlations between population growth and economic growth developed by demographer-economists Simon Kuznets and Richard Easterlin that challenged the conventional wisdom. "I realized the data did not square with the theory that population growth causes resource depletion and environmental degradation. So I decided I'd better follow the path of the data, not the theory." It was a path that led to the conclusion that the population growth that is a curse to Malthusians is really a blessing in disguise.

One reason, he says, is that by stimulating larger demand for goods and services, population growth expands markets, and thus leads to economic growth. Another reason is that population is the necessity that is the mother of invention—in particular the invention of the technologies that Simon is convinced will “liberate production from the land, find substitute materials, and overcome damage to the ecological base.” It was the massive growth of population in southern Asia, he points out, that set agronomists to work on the package of technologies that created the green revolution. “Again and again,” Simon says, “temporary scarcities induced by the growth of population and income have induced the search for solutions which, when found, left us better off than if the scarcities had never arisen.” Simon’s views burst forth upon an increasingly divided population community in 1980 in an article in the prestigious journal *Science*. There he argued that government should not interfere with high fertility because “more people not only means the use of more resources but more units of creativity and productivity. More people compete creatively for ways to develop or find substitutes. Thus the world’s resources are not finite.”

If Ehrlich’s *Population Bomb* was “a gloomy book for a gloomy age,” as Jonathan Mann writes in the *Atlantic Monthly*, Simon’s seminal and highly controversial article was a cheerful rebuttal for an era determined not to be pessimistic about much of anything. The article and Simon’s later writings found a receptive audience among many conservatives (including the editors of the *Wall Street Journal*), making the Maryland economist an influential figure during the presidential administrations of Ronald Reagan and George Bush.

Though rarely the dominant view, the notion that population growth can confer benefits on society has a long history and distinguished expositors going back at least as far as Condorcet. Simon’s contribution was to make the populationist argument so aggressively that it commanded attention, even as it made him the archenemy of the environ-

mental movement. “A lot of what Simon said had been said earlier but ignored,” says Fairfield University sociologist Dennis Hodgson, who has written widely on the demographic debate. “What Simon did was to marshal the arguments and put them forth in a form that was difficult to ignore, and he did it at a time when people were more receptive to them.”

On at least one issue Simon was right, and the cost to Ehrlich and his friends was \$1,000, paid without comment and on time in 1990. When it comes to so-called nonrenewable resources, the economist had insisted, the whole concept of “finiteness” was meaningless because reserves of any mineral are merely a function of price and demand. Natural resources “will progressively become less scarce and less costly, and will constitute a smaller portion of our expenses in future years,” Simon says.

As it turned out, despite a population increase of nearly one billion during the decade, the price of each of the five metals indeed dropped. And despite massive increases in the demand for metals since the start of the industrial age, supplies of most minerals have not shrunk but expanded. Rising prices have made deeper extraction financially rewarding. Improved methods of locating minerals have been discovered. Businesses and consumers are more conservation-minded. The use of alternatives has increased. The result: Reserves of copper, to choose but one example, grew from 91 million tons in 1950 to 555 million tons in the early 1980s, according to UN statistics.

If price is any indication of scarcity, food and minerals have never been more abundant, confirms the Cato Institute’s Stephen Moore. “Measured in terms of how long a person must work to purchase them, natural resources were 20 percent cheaper on average in 1990 than in 1980, half as costly as in 1950, and five times less costly than in 1900.” Ehrlich concedes that over the short term prices have fallen. But even if Simon has been

right so far with respect to some nonrenewable resources, he says, the combination of continued population growth and increased global consumption is catapulting the world toward a point of diminishing returns. More to the point, it is not minerals but the depletion of renewable resources such as air, water, and soil that poses the real risk to the future of humankind. Despite the still-prevalent impression that the future is secure, Ehrlich says, appearances can be deceiving.

IV

When *The Population Bomb* was written, the earth had 3.4 billion inhabitants. The addition of more than two billion since then has done little to diminish the intensity of the great demographic debate, nor to break the stalemate that has existed since the battle was joined by the revisionists during the 1970s. It is a debate that, to the consternation of a confused public and frustrated policymakers, has generated more heat than light. It is a debate that has failed to establish with any certainty whether there are limits to growth and, if there are, when they might be reached.

That the debate has been so inconclusive has several explanations. Not the least important is the extent to which the opposing sides have been talking past each other. Economists typically think in terms of labor, capital, and production; ecologists think in terms of finite supplies of land and water and natural habitat. Economists say the ecosystem is basically healthy; ecologists worry that it may be on the verge of being irreparably damaged. Economists celebrate the prosperity of densely packed countries such as Japan; ecologists fret that Japan is merely exporting the environmental costs of such crowding by exploiting the forests and mineral resources of other countries.

Economists accent aggregate trends and exult that, on average, the world's citizens are better fed, housed, educated, and cared for medically than ever before; ecologists accent

the maldistribution of such gains and fret that aggregate statistics provide cold comfort to the hundreds of millions in individual countries who have not benefited by them and who live on the hard edge of want and starvation.

It is as if the two sides, which have access to the very same data, are talking about different subjects, and in a sense they are. Nathan Keyfitz, a professor emeritus of sociology and population at Harvard, has spent considerable time analyzing the debate. It is stuck on dead center, he concludes, because the parties to it live in "largely noncommunicating worlds." One problem, says Keyfitz, is that many of the participants in the debate have drawn conclusions that extend far beyond their specific areas of professional expertise. Within their own disciplines, he says, individual scholars are held to a high standard of scholarship: "There's enough internal discipline that if there's a flaw in their logic or a contradictory argument, they won't be able to get away with it." But when economists and ecologists range beyond their disciplines—as when economists talk about biodiversity loss or ecologists about the price behavior of minerals—they venture into a realm that has fewer checks and balances, permitting predictions, generalizations, and conclusions that under normal circumstances might not pass muster. The result has been a gap between levels of analysis that, in turn, has led to irreconcilable conclusions, as the point-counterpoint debate between Ehrlich and Simon on the subject of biodiversity illustrates.

Simon insists that there is no scientific proof that species are becoming extinct at any significant rate and that until there is, scientists should operate on the assumption that losses are minimal. For his part, Ehrlich cites frightening statistics on deforestation—the direct cause of species loss—which give a misleading impression of quantitative certainty. There are, in fact, large data gaps. Rates of deforestation and reforestation in China, for example, are virtually unknown to Western scientists. Many scientists

The Urban Explosion

While world population is expected to be at least three times as large in 2025 as it was in 1950, urban population will have increased six times during the same period. In 1950, fewer than one in three people lived in cities, and only two cities—New York and London—held more than eight million people. There are 20 such megacities today, 14 of them in the developing world. In developing countries, the urban sector will absorb virtually all the increase in population between now and 2025; it has absorbed 49 percent of the increase since 1950. In a few years, cities of the developing world will contain twice as many inhabitants as those in developed countries, and by 2020, they will have three times as many. Demographer Robert Fox puts the case nicely when he writes, “The urban explosion, after all, is now essentially the population explosion.”

In earlier centuries, cities grew slowly and could rely, as Jane Jacobs has argued, on an economic relationship with the hinterland. Time and resources allowed infrastructure to be created ahead of or at least in step with immigration. This pattern of growth remains characteristic of cities in developed countries, whose urban population is already three-quarters of the size it is projected to reach in 2025. With developing countries, however, the situation is quite different. Cities in the de-

veloping world, already huge, are projected to triple in size by 2025 and to increase by 80 million people a year for some time after that. The suddenness and magnitude of this increase beggars anything that the more developed countries have known. Moreover, the importation of grain from Europe and America has broken the economic links tying urban areas to the productivity of the surrounding countryside. This is especially true in nations dominated by one enormous metropolitan area—San José in Costa Rica, Lima in Peru. The political and economic resources, and the extended periods of time, that allowed developed countries to urbanize gradually are not available in the developing world.

The cities of the developing countries now provide one springboard for international migration. Immigrants, legal and illegal, arriving in developed countries now tend to have an urban background; unable to find jobs in Cairo or Djakarta, they are attracted to Los Angeles or London, especially since enclaves of their countrymen already live in those cities. Thus the urbanization of the developing world may presage increasingly strong pressures to immigrate to urban centers in the North.

—Mark Sagoff, Director,
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nevertheless believe that forests in general and rain forests in particular, where most species are found, are disappearing at an alarming rate. Bruce Wilcox of the Institute for Sustainable Development reconciles the opposing views: “There’s no question that a loss of rain forest is occurring at a catastrophic rate, but there’s no way we can produce statistics to prove it with more than plus or minus 50 percent confidence.”

The problem is that the very frameworks the two sides have built up make them mutually incomprehensible, says Nathan Keyfitz. “Because of the overlap of interests, those preoccupied with months are at the moment engaged in a lively controversy with those preoccupied by millennia. . . . When biologists and economists try to talk to one another the biologists speak concretely about the fragile character of rain forests and the economists

more broadly about the power of substitution impelled by the price system. There is plenty of goodwill but effectively no dialogue."

Keyfitz uses the world's fisheries to illustrate the problem of communication. The economist's goal is to optimize the catch. He judges success based on how the equipment on the boat is operating, by the efficiency of boat and crew, by how many fish are caught. His frame of reference is only one part of the commodity cycle: If the maximum number of fish is caught, providing the greatest array of choices at the lowest possible prices to consumers, the operation is a success. He thinks in the relatively short term and with a focus on human needs.

The biologist is willing to reduce efficiency in the interest of sustaining the catch. He judges success by how effectively human needs are reconciled with the needs of the ecosystem. His frame of reference is the entire commodity cycle, and he worries that the economist's objective is consistent with the destruction of the habitat. He thinks in the longer term and with a focus on balancing the needs of humankind with other species that share our habitat. The differences reduce to a question of values: Is saving fish or meeting consumer needs at the lowest cost the higher good?

The failure of the dialogue to clarify the effects of population growth on ecosystems and mineral supplies has other causes. One study conducted in 1980 examined seven economic-demographic models constructed to project the future of food and resource supplies and pollution levels. Though each was serious and academically rigorous, their results were dramatically different, ranging from the doomsday scenarios projected in *The Limits to Growth* to the far more benign projections of study groups based in Argentina and Japan. The problem, as Keyfitz notes, is that

"no one of them proves anything" because all of them reflect the assumptions factored into them.

The problem of bias is not confined to econometric and biometric models. It runs deep in disciplines nominally dedicated to the search for truth and whose analysis is essential to answering the questions that relate most directly to the future of humankind. As



The People's Republic of China advocates one child per family.

noted by Michael Teitelbaum and Jay Winter, co-authors of an informative essay on the demographic debate, the adversaries in it have been curiously united by a tendency to marginalize or exclude information or frames of reference incompatible with their own. The selective use of evidence, in turn, has had the effect of oversimplifying an immensely complex subject, driving wedges between disciplines that need to cooperate. The tendency is reinforced by the way research grants are awarded. To facilitate grant making, science is compartmentalized into various narrow sub-disciplines by megafunders such as the National Science Foundation and the National Institutes of Health. The process has retarded the kind of interdisciplinary research required by complex environmental and population issues.

Perhaps in the end, as the American Enterprise Institute's Nick Eberstadt suggests, it is no more reasonable to expect that demographers can come up with comprehen-

sive "laws of population" than to expect historians to create a unified theory of history. "For all the mathematical rigor of some of its investigations," writes Eberstadt (*WQ*, Winter '86), "population studies is a field of social inquiry. . . . Researchers may uncover relationships between population change and prosperity, poverty, or war in particular places at particular times, but none of these findings can be generalized to cover the world at large."

Even so, the debate that has raged over these very issues has been bad for all the disciplines involved and worse for the policymakers who have been left on their own to formulate responses to one of the most pressing of world problems. Worse yet, it has sent a signal to policymakers and the public both that, in the absence of a consensus on what its implications are, population growth can safely be ignored.

V

A quarter century after books such as *The Population Bomb* and *The Limits to Growth* reignited and popularized the debate over the consequences of population growth, important tactical gains have been won by those who challenge their apocalyptic view of the future. Economists such as Julian Simon and the American Enterprise Institute's Ben Wattenberg have made it impossible to ignore the huge contributions science has made to human welfare, even in the face of the most rapid population growth in history, or to discount the argument that further advances could diminish the impact of projected future increases. In the presence of decades of declining prices, meanwhile, the case for limiting population growth is now rarely argued on the basis that supplies of non-renewable resources are likely to be jeopardized in the near term by rapid population growth. Many mainstream Malthusians are more guarded about using the word *crisis* to describe the implications of population growth. Their willingness at least to gesture to the arguments

made by their opposite numbers, the cornucopian economists, has become an unexpected new form of political correctness. Still, while the global community of population experts is generally less skeptical of the cornucopian thesis, worries persist among many, probably most, that, as Rockefeller University demographer Joel Cohen notes, even if Malthus has been wrong for the past two centuries he may not be wrong for the next two.

The population community's nagging concern about the future is based on a fear that the stunning technological advances that have so far mitigated the worst effects of rapid population growth may have merely postponed, not necessarily precluded, an ultimate day of reckoning. While most specialists acknowledge that technologies such as those of the green revolution have rescued humankind from hunger and want, some point out that such advances occurred when global consumption rates and real annual increases in population growth were smaller than they may be in the near-to medium-term future. Within the next half century, the UN projects, twice as many people will be seeking three times the food and fiber and four times the energy and engaging in five to 10 times the level of economic activity. That means dramatically greater energy use, more resource consumption, more wastes, and more environmental degradation associated with mining and refining nonrenewable natural resources. Moreover, while the point has been proven that rapid economic and population growth can occur simultaneously, such growth has not been taking place in an infinite world but within the confines of a closed biosphere, which is now exhibiting unmistakable signs of overburden.

"You can't ignore the forces that have worked in the past: technological innovation and market adjustments. In the future, these could take different forms and operate even more rapidly than before," acknowledges the World Resources Institute's Robert Repetto. "But when you think about the expansion in

the scale of the population and the scale of economic activity, especially in the Third World, there's every reason to believe that renewable resources are going to be altered drastically, probably irreversibly: forests, coral reefs, wetlands, wildlife habitat, soils."

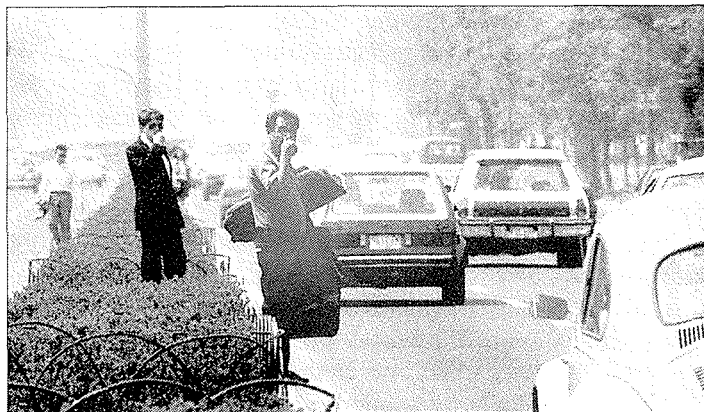
In general, population experts appear less confident that "skilled, spirited, hopeful people," to quote Julian Simon, can make social and economic contributions significant enough to compensate for their absolute numbers, especially under the conditions of poverty and overcrowding that hold so many in the grip of ignorance, joblessness, and ill health. They are also less sanguine about the long-term implications of what British ecologist Paul Harrison describes as the "enigma" of the simultaneous depletion and expansion of nonrenewable resources. Economists have made much of the paradox that even as demand has increased for many nonrenewable resources, supplies have expanded and prices have dropped. Harrison voices what may be the more prevalent view, that under the impact of rising consumption rates and population growth, a point of diminishing returns may eventually be reached: "The magic porridge pot that has spewed forth riches in the past may work for us for a few decades more. But it would be imprudent to rely on it forever. A world of 10-to-16 billion people cannot continue to consume resources at current Western levels. Something has to give."

Studies to establish undisputed cause-and-effect relationships between population growth and environmental degradation have been too few, too country-specific, or, like one conducted recently by the International Union for the Conservation of Nature (IUCN) and reported by the UN Population Fund, too circumstantial to be definitive. After surveying habitat loss in

50 African and Asian nations, the IUCN concluded that the 20 percent of countries that lost the most habitat (averaging 85 percent) had 1,900 people per square kilometer on average, while the 20 percent that had the least loss of habitat (averaging 41 percent) had only 300 people per square kilometer on average.

While highly suggestive, such studies have not always met the test of scientific proof. But for most policymakers, enough such suggestive studies have been conducted to justify measures to limit population growth. As one World Bank official notes, inferences have often had to substitute for conclusive data to justify investments by national governments and international lending institutions in population programs. No airtight case has been made, for example, that population retards economic development, he says. "But we do know that too many births too closely spaced strongly correlates with infant mortality, and that large families diminish the productivity of women and increase national health costs. Those are the arguments we use at the Bank [to secure money for population programs]. We're coming in the side door, but it's honest and it works."

The growing body of solid and circumstantial evidence linking rapid population growth with environmental degradation is so worrisome that even the scientists some economists have been banking on to rescue the



Toxic smog: an indirect product of Mexico City's 15 million population

future have been gripped by a belated failure of confidence. In one widely noted warning issued jointly in 1992, the U.S. National Academy of Sciences and the Royal Academy of London predicted that if current population and consumption trends continue, "science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world. . . . Some of the environmental changes may produce irreversible damage to the Earth's capacity to sustain life."

Another warning, dispatched the same year and signed by 1,700 scientists, including more than 100 Nobel laureates, cautioned that "pressure resulting from unrestrained population growth puts demands on the natural world that can overwhelm any efforts to achieve a sustainable future. Not more than one or two decades remain before the chance to avert the threat we now confront will be lost and the prospect for humanity (and nature) immeasurably diminished." Yet another report, this one issued by 56 national academies of science in October 1993, cautioned that "it is not prudent to rely on science and technology alone to solve problems created by rapid population growth, wasteful resource consumption, and poverty."

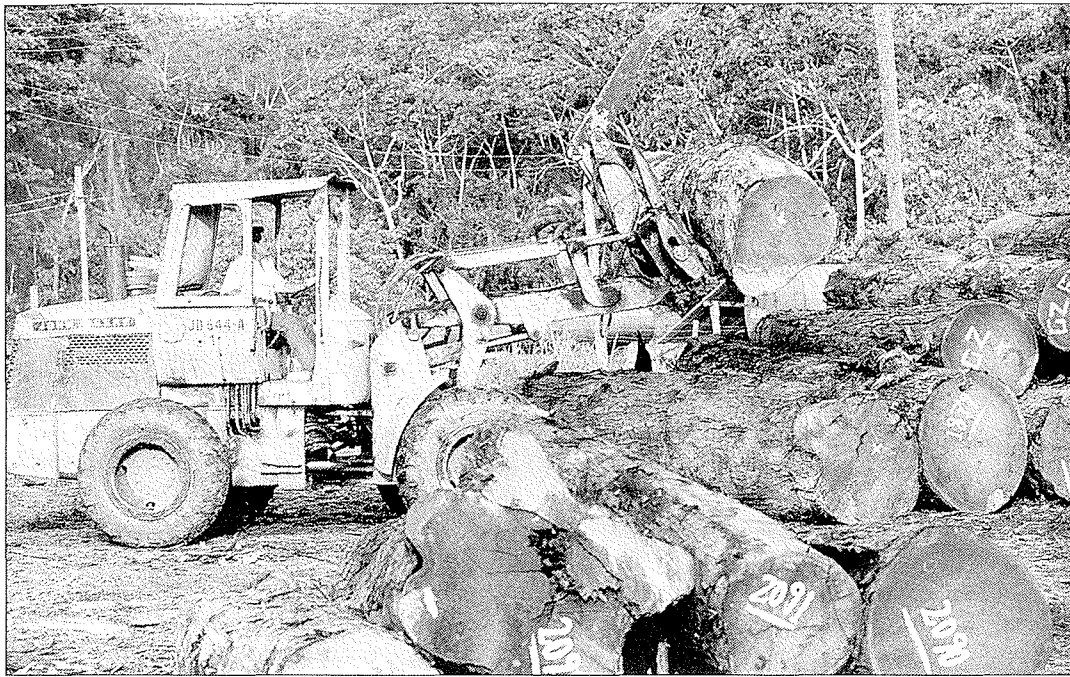
Buttressing that view are growing indications that environmental change may be occurring on a scale unprecedented since the advent of the glacial ages one million years ago, and that population growth is one contributing factor. Permanent damage to fragile local ecosystems has already resulted, and many demographers and scientists worry that the added pressures likely to be imposed by simultaneous increases in population and living standards could catapult worrisome global trends across critical environmental thresholds. Meanwhile, as Robert Repetto notes, even though the world's renewable resources—water, soils, and living organisms—have yielded increasing production, it has been at the cost of sacrificing current and

future productivity, which could undermine the capacity of many countries to provide for the much-larger populations expected in the near future.

The problem is epitomized in the forests of Guatemala, where settlers have hacked out the only living available to them, halving the country's last remaining forested area in less than two decades. Haiti, which has one of the highest population densities in the world, is a worse case. While it was once heavily wooded, only two percent of the country remains forested, and those trees that still stand are at the mercy of more than six million people starved for fuel wood. Thirty years from now, 12 million Haitians will compete for what's left. Population is not the only reason for Haiti's deforestation. But as one population expert notes, if impoverished Haitians turn the country's last trees into firewood, irreversible damage may be done to Haiti's watershed and eventually to its arable land and fresh water—results paralleled in other countries, including India, where deforestation has caused flooding during the rainy season and water shortages during the dry season.

Deforestation has also led to the loss of one of the most important habitats for animal and plant species, along with wetlands and coral reefs. As already noted, scientists have been unable to estimate reliably either the number of species in nature or the rate of their loss. But their presumptive reasoning has not led to encouraging conclusions. Most species live in tropical rain forests. But the rain forests are now disappearing in Washington state-sized chunks each year, according to the UN Food and Agriculture Organization. In the handful of nations where the world's remaining tropical forestland is concentrated, population doubling times are as short as 22 years. With most of the wood harvested in developing countries used for fuel, a drastic shrinkage of forests and species seems all but certain.

But the problem is not just forests. At stake is the extent to which all the earth's "renewable" resources and its ability to absorb



Clearing the mahogany forests in Bolivia

wastes are being taxed by a combination of bad government policies, inappropriate technology, high levels of consumption, and rapidly growing populations. However much scientists and economists may differ on the scope and implications of such global changes, the fact is that most developing nations now operate on the assumption—correct or incorrect—that rapid population growth is a serious problem that needs to be addressed quickly and decisively. Accordingly, nearly all have adopted ambitious programs to lower birthrates, sometimes adopting coercive measures at which even staunch Malthusians have winced.

Government leaders have been galvanized not only by the conviction that rapid population growth will mortgage economic development but by a lengthening inventory of small and large environmental calamities to which population pressures have contributed. All across the developing world, for example, population growth, livestock, and wasteful agricultural practices are putting pressure on soils, contributing to the process of desertifi-

cation that has led to a steady exodus from the land. And desertification is only the most extreme result of the relentless pressure that is being placed on land to feed swelling populations. As much as half the world's wetlands have been drained to provide farmland since the turn of the century. Meanwhile, the world fish catch, which provides the main source of protein for the population of 40 countries, has leveled off and may have reached a point of diminishing returns because of overharvesting and the destruction of spawning habitats, according to the Worldwatch Institute.

Fresh water, the resource whose shortage is most likely to impinge on human development, is also under pressure, in substantial part because of population growth. In 1990, one-third of a billion people lived in countries defined as water-stressed or water-scarce, according to Population Action International (PAI). Without a breakthrough in desalination technologies, the number could increase to three billion, or one in every three people, by 2025,

mostly in Africa and Asia. Compounding scarcity is the growing problem of water degradation caused by salt-water intrusions, chemical pollutants, and human sewage.

The effect of population growth on finite water supplies is illustrated by comparing Iran and Great Britain. In 1990, the two countries had the same number of inhabitants—just under 60 million—and access to equivalent amounts of renewable fresh water. Assuming supplies remain stable, by 2025 Iran will have only half the amount of water per capita that it has now because its population, according to the UN's medium projection, will double. In Britain, where population is expected to grow by only five percent during the same period, per capita availability will remain close to what it is today.

As PAI reports, there is no more fresh water on the planet today than there was 2,000 years ago. Yet the earth's population today is more than 20 times greater, which is one reason why chronic freshwater shortages are expected soon in Africa and the Middle East, northern China, parts of India and Mexico, the western United States, northeastern Brazil, and several former Soviet republics. More troubling, some of the highest population growth rates are occurring in some of the most arid regions. "Within a decade," PAI reports, "water could overshadow oil as a scarce and precious commodity at the center of conflict and peacemaking."

Water is a natural renewable resource. But like land and ambient air, it can also be a repository for waste, which is yet another reason many demographers and scientists view the future with misgivings. Human activity has severely taxed the planet's absorptive capacity. Vast flows of toxic chemical and human wastes now pollute the earth's rivers, streams, and oceans, damaging aquatic life and posing health hazards to humans. Air pollution from factory emissions, motor vehicles, and utilities has brought disease to European forests and to crops in Africa, has damaged the ozone layer, and has loaded the atmosphere with greenhouse gas-

ses. The estimated global emissions of carbon from fossil fuels alone have tripled since 1950.

As in the case of global warming, global environmental degradation has mostly to do with profligate energy use in the First World. Japan, western Europe, and the former Soviet republics account for about 35 percent of the carbon emitted into the atmosphere through the combustion of fossil fuels. The United States, with five percent of the world's population, accounts for another 25 percent of carbon emissions. Per capita fossil fuel consumption is actually declining in the United States, but the decline has been more than offset by an annual population growth of 2.6 million. As a result, the U.S. contribution of carbon to the atmosphere continues to increase.

But the balance between developed and developing countries is beginning to shift as living standards, and thus energy and resource use, gradually rise in developing countries. Such improvements hint at what many environmentalists see as a potentially tragic paradox: that human progress may push environmental degradation to a point that produces human suffering. Given the persistently high rates of population growth in many developing nations, the environmental effects of even small increases in per capita consumption could be magnified, shifting more of the blame for global environmental degradation to poor countries. The Third World share of the global consumption of aluminum and copper alone rose from 10 percent in 1977 to 18 percent in 1987, according to one study. If incomes in less developed countries continue to grow at about three percent annually, 40 years from now "these countries will produce more than half the global waste loadings (though still less per capita than the rich nations), and the world economy will be five times as large as it is today," according to Mark Sagoff of the University of Maryland's Institute for Philosophy and Public Policy.

The dark threat posed by the combination of simultaneous population and consumption increases in the developing world is suggested in projections issued by the Futures Group, a strategic-planning firm in Washington, based on a study conducted in the Philippine capital of Manila. That city's population of eight million will soar to 12 million within 20 years under a low-growth scenario, and to 16 million under a high-growth projection. Concurrently the number of motor vehicles in Manila is projected to double, from one for every 10 people to one for every five. The level of air pollution from particulate matter in Manila is already three times the maximum level deemed safe by the U.S. Environmental Protection Agency. With the projected population and consumption increases, the volume will rise to between 25,000 and 33,000, or nearly six times maximum safe levels. Such dry statistics translate into an enormous human tragedy, which, for monetary and bureaucratic reasons, is unlikely to be mitigated by pollution-control efforts.

"In the absence of legal, regulatory, and incentive programs, there's no chance of tight emission controls," says the Futures Group's John Freymann. "What the figures demonstrate to policymakers is that lowering population growth is a fundamental part of any environmental strategy."

In the end, the concern exhibited by large numbers of population specialists is mostly inferential, an educated hunch about global trends backed up largely by evidence drawn from local trends that the order of population growth projected for the future will pose challenges of unprecedented magnitude. But it is a hunch that has generated a degree of passion even among normally dispassionate natural scientists.

VI

Economists, demographers, and ecologists have managed to agree on at least one thing: that population growth is only one factor con-

tributing to environmental degradation. The consensus holds that poverty and inappropriate government policies are the main problems—so far. In many developing nations, sluggish economic performance has led directly or indirectly to measures that have had a lethal impact on forestlands. Unable to keep up repayment of massive foreign debts incurred in the 1960s and 1970s, for example, many developing nations have been pressured by international lending institutions to accept austerity measures that have led to deep cuts in government services. The result has been the dislocation of the poorest and most dispossessed, some of whom have spilled into virgin forests in countries such as Guatemala. Countries such as Brazil, which have been pressured to generate more foreign exchange, have exploited the forests for minerals and timber for export, often with devastating ecological results.

Governments have frequently made matters worse by granting concessions to cattle ranchers on terms that have created incentives for reckless exploitation, or by granting squatters' rights to settlers who "improve" the land by clearing it. In the notable case of Costa Rica, squatters who clear forestland are entitled to sell it to parties who are allowed to take immediate title. As a study of Costa Rica released by the World Resources Institute concludes, "many enterprising poor and landless could make a business of simply clearing marginal public and private lands, selling them to eager cattle ranchers or other speculators, and moving on to repeat the process."

The classic example of synergy between population and bad government policies, and an underlying cause of much of the deforestation in Latin America, is the inequitable landholding patterns that have long existed in many Latin American nations. Under conditions of low population growth, these patterns have had minimal impact on forestland. But where the growth in real numbers occurs rapidly—which is to say, in nearly every de-

veloping nation—such patterns have pushed poor farmers into the only areas remaining for exploitation. Land redistribution could sharply reduce the impact of population growth on forestland but has occurred in only a handful of nations,

Richard Bilborrow, a demographer at the Carolina Population Center in Chapel Hill, North Carolina, has studied the process of deforestation in Guatemala for nearly two decades. He holds the view that population growth is an indirect but highly important agent of deforestation. "Population growth leads to fragmentation of the land and forces people to migrate to other parts of the country, where they continue the process of deforestation," he says. "The exact amount of deforestation is directly related to the size of the families that engage in it."

In theory, one means to retard deforestation would be to create jobs in regions like the Petèn in Guatemala to discourage farmers from expanding into cattle ranching, which is far more lucrative but also more destructive to soils and forests. One means to do that would be for the government to invest in low-impact eco-tourism facilities that would create the demand for cooks, drivers, tour guides, and other service workers. The problem is that even prosperity could rebound to the detriment of the Petèn's remaining forests.

"The non-governmental organizations all assume that if the farmers make a good living from tourism that they won't go into or expand cattle ranching, but there's always the possibility that they might," says the anthropologist Norman Schwartz, who has been doing fieldwork in Guatemala since the 1960s. "If they make more money from tourism they might expand the size of their ranches because they'll have extra income to invest. In that case, the forests won't be helped but hurt."

The good news is that where economic or tenurial policies encouraging land clearing have been changed—as in Costa Rica and Brazil, for example—deforestation rates have

slowed. The bad news is that such changes are rare and unlikely to be enacted and implemented in other countries in time to save more than a fraction of the vast forests that once covered countries such as Guatemala and the Philippines. The reasons are largely political. Unlike logging interests and large landowners, forests as a rule have no constituency, although a green movement is beginning to take shape in the forested nations of Central and South America.

In the last analysis, such cases as Guatemala, Costa Rica, and the Philippines may best explain why the future looks so uncertain to so many population experts. It is not that the future has to be so, but that it is likely to be so given the factors that countervail against humankind's indisputable ingenuity and innovative technology. One such factor is economic: Poor nations are simply unable to afford environmentally sound consumption and production practices. Another factor is political: In the face of widespread poverty, diverting resources to environmental protection is largely out of the question.

"Given the problems that Guatemala faces," Norman Schwartz explains, "who could give conservation first priority? You're facing a hungry population, increasing land shortages in the mountains, ethnic problems, urban unemployment, anti-government guerrillas, a powerful oligarchy that says land distribution is a communist plot. As important as land conservation is, there are other things that, no matter what you believe, are just going to get first priority."

Even if governments were not so constrained, they would have only limited ability, for example, to enforce revised property laws designed to prevent squatters from despoiling forestlands. As for reducing poverty, perhaps the principal cause of deforestation, it is a task that is likely to take more time than the forests have available at current rates of destruction. It is precisely such limitations that cause environmentalists to worry. If poverty remains perva-

sive, if the regulatory arm of government remains weak, or if governments continue to make bad policies, the doubling or tripling of populations that is likely before population stabilization occurs seems certain to become the most important factor in the process of deforestation, placing much of the world's remaining forestland in jeopardy.

Environmental writer Clive Ponting makes the point that human history is one long record of humanity's attempts to circumvent the limitations imposed by nature. The biggest departure from these limitations has been the growth in human numbers that, Ponting says, has far exceeded a level supportable by natural ecosystems. The departure was made possible first by advances in agriculture, then by the use of fossil fuel energy, which opened the door to the quantum increases in the production of goods required to support a growing population.

As viewed by some, the escape from nature's constraints has been a triumph of human ingenuity, a testament to the promise of technology. As viewed by a large number of natural scientists, it has been something else, rather more of a borrowing against time than a permanent escape from ecological lim-

its. If bad policy, social inequities, and simple incompetence were the only factors contributing to environmental degradation, the debate between the optimists and the pessimists would be academic. But increasingly, there are signs that there is something more involved. As Population Action International's Robert Engelman points out, bad policy is nothing new. Social inequities are ancient. Land has always been badly distributed. Why is it, then, that only in the past three decades has deforestation suddenly begun occurring at such a rapid rate all over the tropics? Why is it that peasant-farmers have suddenly become such lethal, if unwitting, agents of forest destruction? Many scientists now believe that the answer may have something to do with the synergy between bad policy and population growth that appears to be tending toward a dangerous critical mass.

When population growth was slow and other frontiers remained to be conquered, the latitude for bad judgment and bad policy was broad. With population high, the latitude is shrinking. In the past, the planet forgave humankind's excesses and mistakes, except in local settings. But with more than five billion inhabitants, the Earth is now considerably less forgiving. It is likely to become even less so as the human race presses on toward its next five billion.