Population Growth

The most impoverished and the wealthiest countries are experiencing an explosive increase in population.

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A literate person can scarcely remain unaware today of the accelerated growth of world population. In fact, the phrase "population explosion" has been reiterated so often that it is becoming a candidate for cliché of the year. The three books about population under review here have all avoided "population explosion" in their titles, although the expression is found on the first page in two of the three. Two of these books—**Population Control**, edited by Melvin G. Shimm (Oceana Publications, New York, 1961. 253 pp. $6) and **Population Perspectives**, by Philip M. Hauser (Rutgers University Press, New Brunswick, N.J., 1961. 183 pp. $3.50)—are concerned primarily with rapid growth and its implications, while the other—**Population**, by William Petersen (Macmillan, New York, 1961. 652 pp. $7.95)—is a textbook that includes growth, with no special emphasis, in the many aspects of human population it covers.

The facts of contemporary population growth certainly justify the attention it is receiving. On the assumption that the human species originated 300,000 years ago with two persons, until A.D. 1650 the average time required for the population of the world to double was more than 10,000 years. Then it doubled in less than 200 years (1650 to 1840), again in about 90 years (1840 to 1930), and is now increasing at a rate that would cause doubling every 35 to 40 years. The rate of increase is still accelerating so that each new projection of world population for the rest of this century typically revises upwards the estimate it replaces. The most recent bases for revision of estimated growth rates were the censuses made during 1960 and 1961 in various countries of Southeast Asia. Growth in India, Pakistan, Thailand, Sarawak, and the Philippines was revealed by these censuses as substantially more rapid than had been expected. A fair estimate of the current rate of world population growth is now nearer to 2 percent per annum (doubling time 35 years) than to the 1.6 percent (doubling time 41 years) implicit in the population projections published by the United Nations in 1958.

Causes, Consequences, Cures

There are two forms of explosive growth in the world population. Each has its own set of causes, and each generates a very different set of likely consequences. The most rapid acceleration in the past two decades (the acceleration that has contributed the most to faster world poulation growth, the acceleration that continues today) is in the population of the low-income, nonindustrialized countries of Asia, Africa, and Latin America. In these countries, annual births exceed 4 percent of the population, while annual deaths range from less than 1 percent to somewhat more than 2 percent. Birth rates remain high because the attitudes and customs that promote high fertility are not yet changing. Deliberate control of fertility within marriage has not become a common mode of behavior. Death rates have fallen and continue to fall, because almost everyone is favorably disposed to low mortality (unlike low fertility) and because modern technology has come to include low-cost methods of controlling diseases. With modest foreign assistance, even the most impoverished countries can use these new public health techniques to achieve a marked and rapid decline in death rates. Very high birth rates, combined with low and still declining death rates, produce an annual rate of growth of more than 2 percent for the underdeveloped world, with many individual instances of growth in excess of 3 percent and some of over 3.5 percent a year. Rates in excess of 3 percent may become the norm for low-income countries before the current acceleration in growth spends itself.

The second form of rapid population growth is confined to a few highly industrialized countries—the United States, Canada, Australia, and New Zealand. (One might add the U.S.S.R. It has about the same birth and death rates as these countries, but it differs in that deliberate control of fertility may not yet have extended as fully throughout the Soviet population. The major decline in fertility from preindustrial levels occurred within the past two or three decades in Russia, but it started something like a century or more ago in the other countries.) Before World War II these four countries had achieved, in common with Western Europe, expectations of life in excess of 60 years. The birth rate in these countries (again in common with Western Europe) had culminated many decades of decline with rates that went below the requirements for population replacement in the United States and Australia, to levels that would have provided a nearly stationary population in New Zealand and a population that doubled only every 90 years in Canada. Since 1940 these countries have experienced a prolonged rise in fertility. Their current birth and death rates, if continued, would cause doubling in a period ranging from every 30 years (in New Zealand) to every 40 years (in Australia).

The accelerated growth of population in the low-income countries has been caused by declining mortality, with fertility remaining essentially constant. Most of the acceleration in this group of high-income countries, on the other hand, has been caused by an increase in fertility. The acceleration in the underdeveloped countries continues today, whereas growth in this group of industrialized countries has leveled off (or declined slightly) in the past 2 or 3 years.

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Two Aspects of Growth

The social and economic implications of these two forms of rapid growth are quite diverse. High rates of growth in the underdeveloped areas are a major barrier to rapid improvement of their levels of living and bring into question the feasibility of modernizing their economies, of achieving universal education, and even of their continuing to avoid famines and epidemics. There is no question that the United States, Canada, Australia, and New Zealand can "afford" rapid growth, at least for a few more decades, and that they can continue to increase per capita incomes substantially. In fact, rapid growth in population is a stimulus to business activity, and though it makes some social and economic problems more acute, it helps to alleviate others. In a period of no more than a century or so, however, continued rapid growth would create a painful shortage of space, even in the United States. In 150 years the number of people in the United States would approach the number currently inhabiting the whole world.

Any policy designed to reduce growth rates would necessarily be very different in the low-income countries, on the one hand, and in the four high-growth industrialized countries, on the other. In the low-income countries the *idea* of voluntary control over the number of children is not a genuinely accepted possibility. A basic change in attitudes must occur before married couples can be expected to exercise the considerable care required to restrain fertility. Experience indicates that the crucial needed change is in values, attitudes, and motivation, rather than in mere knowledge about and availability of contraceptive devices. In the history of industrialized countries, adequate changes in values and attitudes have always been part of the social transformation that accompanied the modernization of their economies. Once deliberate planning of family size becomes common, fertility can be expected to fall far below preindustrial levels.

In the four high-fertility industrialized countries, on the other hand, the idea of deliberate family limitation is well established. In the United States, for example, 90 percent of white couples with no fertility impairment use some form of contraception when the wife is over 30. To introduce the idea of family planning to the remaining small minority of American couples whose fertility is not subject to effective voluntary control would have only a slight effect on the national birth rate. Our fertility is high essentially because couples who are deliberately choosing the number of children they want are choosing two, three, and four. Spinsterhood and childlessness have nearly disappeared, and the one-child family has become a rarity, but very large families (six or more children) are apparently not returning.

The reader who wishes to become better informed on these issues can profit in very different ways from each of the three books under review. *Population* is an elementary textbook, suited, I would judge, for use in a freshman course or in a junior college. It is a smoothly written, largely nontechnical introduction to the study of population. The first part of the book is a survey of the population of the United States, covering the history of its growth, including immigration, fertility, and mortality, and analyzing its age and sex structure and their determinants, its ethnic composition, and its location pattern (including urbanization). The first part terminates with a chapter on population projections. The second section discusses the population of primitive societies, of preindustrial civilization, and population during the industrial revolution, in totalitarian societies (not a very successful chapter), and in underdeveloped countries. The final section is devoted to the determinants, in general, of mortality, fertility, and migration, and includes a summary and critique of Malthusian theory. This book contains much nondemographic material, and it is marred by occasional errors. For example, on page 21 the median age is used as an admittedly very approximate but "best available" index of mortality. Actually it is an index of *fertility* and is virtually independent of mortality, as is correctly noted on page 80. On page 32 it is asserted that from 1850 to 1900 the decline in mortality was greater than in fertility, yet Tables 1-1 and 5-1 make it clear, even with generous allowance for faulty data, that natural increase became smaller, not larger. *Population* will serve the reader who wishes to gain a general idea of what demography is about but who does not want a high level of precision or technique.

Population Perspectives is an elaboration of three lectures delivered by Hauser in the Brown and Haley series at the University of Puget Sound. After a brief summary of the world "population explosion," Hauser turns to the population explosion in the United States, and then to the particular explosion in the metropolitan areas. For each of these latter explosions there is a section entitled "Facts" and one entitled "Consequences." This book is written with Hauser's typical force and clarity. It is perfectly suited to familiarize the intelligent lay reader with the current and future demographic problems of the United States.

Hauser discusses current trends in growth and sex distribution and shows how the dependency burden in the United States (dependents per person of working age) will continue to increase, how the pressure on educational facilities and on the quality of education will continue to mount during the 1960's, how the age structure of the labor force will change, how the number of households is due to expand rapidly, and how the ethnic and cultural composition of the population is changing. The many problems arising from the rapid relocation of our growing population into metropolitan areas—especially into the peripheral rings of these areas—are discussed with particular force and insight. The book shows signs of haste in its preparation. There are misprints—"30 hour week" for 40 hour week (on page 66), and "a density of one person per square foot . . . in less than 200 years" when 600 years was intended (on page 87) —and there is a curious set of arithmetical mistakes on pages 18 and 19: Hauser asserts that Asia would have to increase the aggregate income 62-fold by the year 2000 to achieve the per capita income of North America in 1950, and that to achieve this she would have "to more than double her income each year"! If Asia were to more than double her income each year for 50 years (indicated by the context as the period considered) Asian income per capita would be more than 50×10^{12} times greater than per capita income in North America in 1950. Actually, the required increase is about 8.6 percent per year.

Population Control is a collection of symposium papers originally appearing as volume 25, number 3, of *Law and Contemporary Problems*, a quarterly published by the Duke University School of Law. It begins with articles

on world population growth and its relation to resources and technology and to space and culture. There follow articles on eugenics and euthenics and on the current status of contraception, abortion, and sterilization. The next three articles cover the evolution of Catholic and Protestant views of population control and the population policies in Communist countries. There are then three articles on population control in underdeveloped areas in general, and in Puerto Rico and India in particular, with an intervening article by two economists attempting to interpret population control in Japan. The volume closes with a discussion of legal and political aspects of population control in the United States and with a speculative discussion of the relation between population growth and the tendency toward less individualistic, more highly organized, and even authoritarian political institutions.

This book is less unified than the other two, as is to be expected of a symposium publication. It is also more scholarly, and it brings together a useful collection of thoughtful papers that are very informative on many of the key issues that population poses for our society.

Big Leap Forward

Sciences in Communist China. A symposium presented at the New York Meeting of the AAAS, 26–27 December 1960. AAAS Publication No. 68. Sidney H. Gould, Ed. The Association, Washington, D.C., 1961. xii + 872 pp. Illus. Members, $12; others, $14.

It is not inconceivable that historians of the future may consider the emergence of China as a major industrial power to be the most important development of the second half of our century. After a sleep of many centuries and an uneasy awakening, the giant is now flexing his muscles while the rest of the world is beginning to watch. Since 1949 the number of Western scientists who have visited China has not been large, and much of the published information on scientific and technical progress is only available in Chinese. The decision of the National Science Foundation and the American Association for the Advancement of Science to hold, in December 1960, a symposium on the present state of science in China was a most timely one. The present book contains the 26 lectures given at this meeting, and the AAAS as well as the editor must be congratulated on having brought out this volume packed with topical information within 6 months of the symposium.

There are five sections, dealing respectively with the social sciences, biology and medicine, the earth and the atmosphere, mathematics and physics, and finally engineering and electronics. All the authors have gone to a great deal of trouble in trying to piece together from papers and articles an image of the state of their subject in China. On the whole they have succeeded remarkably well, presenting, in the natural sciences and engineering at least, a consistent and convincing picture of rapid progress from a state of great backwardness. This progress has not anywhere caught up with science and technology in the West or in the Soviet Union, but there are many indications that the next 10 years will see this happen in some fields. In view of the agricultural character of China, the chapter on this subject is particularly interesting, and so are the references to the position of traditional Chinese medicine and pharmacology in relation to Western developments, which are introduced side by side. Altogether the reader has the impression that he is being given a fair and unbiased account of what is happening in China.

Such an account becomes more difficult when the relations between science and politics are discussed, and for this reason the section on these aspects of the problem is not generally as satisfactory as that on the natural sciences. I, for one, would find it difficult to agree with some of the gloomy conclusions drawn by Theodore Hsi-en Chen on the effect of "indoctrination" on scientists. Only one of the authors, J. T. Wilson, a Canadian geophysicist, has visited China in the last 10 years, and his impressions, which appear to be similar to my own, contrast strongly with Chen's opinion. Wilson says: "I was agreeably surprised by what I saw in China. The government clearly believes in and supports education and science. Many scientists from the old regime had remained. Although overworked, they have never before had so much support."

The ample and solid information given in the present book will go a long way toward bringing the work of the Chinese scientists to the notice of their Western colleagues. It can be strongly recommended to all who are in search of facts and source material on the sciences in China.

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Nucleic Acids

Polynucleotides. Natural and synthetic nucleic acids. Robert F. Steiner and Ronald Beers, Jr. Elsevier, Amsterdam; Van Nostrand, Princeton, N.J., 1961. viii + 404 pp. Illus. $17.

In an area of research where significant results appear with great frequency, specialized monographs are exceptionally useful not only to research participants but also to those spectators who wish to delve more deeply into a particular subject. Steiner and Beers have written such a book in their *Polynucleotides*, which is a detailed and authoritative account of a number of topics in the field of nucleic acids. The choice of subject matter was evidently dictated in considerable part by the research interests of the authors, which include the enzymology and macromolecular physical chemistry of the polynucleotides. To extensive discussion of these topics, chapters on the chemistry of nucleotides, their linkage in polymers, and the biological role of nucleic acids have been added. Almost everything the authors selected is treated in a most perceptive manner. The chapters on the macromolecular properties of the polynucleotides constitute the best and most up-to-date review of this subject available at this time, and this topic follows upon a most detailed description of the enzymology of polynucleotide phosphorylases. Only the final chapter, on the function of deoxyribonucleic and ribonucleic acids, is somewhat sketchy and not quite up to the high standard set by the rest of the book.

Practically all items in the bibliography refer to articles that appeared before 1960. The subsequent 18 months have seen a number of important developments related to the physical chemistry, biosynthesis, and function of nucleic acids, so there is already a need for substantial additions to a number of the topics discussed. However, very