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# Demographic Dimensions of World Politics

## Population explosion has implications for the conflict between the free world and the Communist bloc.

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Politics in general, as well as world politics, is a branch of engineering—social engineering—not of science. Yet the consideration of the demographic aspects of world politics is not an inappropriate subject for a scientific journal. It is the purpose of this article to point to ways in which the findings of the science of demography illuminate various aspects of the world political scene.

There are various ways in which this subject can be developed, but I have arbitrarily chosen to discuss population factors in relation to politics, broadly conceived, on the global and on the international levels, respectively. By "global" problems I mean those that concern the earth as a whole; by "international" problems I mean those that arise among the various political subdivisions of the globe.

### Global Considerations

There is no world government charged with the task of achieving world order and performing other civil governmental functions for the earth as a whole. This, however, does not mean that there are no political problems of a global, as distinguished from an international, character. Some such global problems are in fact dealt with by the United Nations and its specialized agencies, which are, of course, organizations of individual sovereign nations rather than organs of world government. Examples of global problems—problems which transcend and cannot be contained within national boundaries—include health, weather, fallout, and the newly emergent problems of outer space. It is easy to demonstrate that the contemporary rate of world population growth also constitutes a global problem—one which would be of great concern to a world government if we had one, and one which is of increasing concern to various organs of the United Nations and the specialized agencies.

Although the first complete census of mankind has yet to be taken, it is possible to reconstruct, with reasonable accuracy, the history of world population growth. This history may be encapsulated in the following estimates of the population of the earth: at the end of the Neolithic period in Europe (8000 to 7000 B.C.) (*1*), 10 million; at the beginning of the Christian era, 200 to 300 million; at the beginning of the modern era (1650), 500 million; in 1950, 2.5 billion.

These four numbers constitute a measurement of one of the most dramatic aspects of man's existence on the globe, and they explain the purple language of the demographer in describing the changes in rates of population growth during the modern era as a "demographic revolution" or "population explosion" (*2*).

The basis for the demographer's emotionally surcharged language may be summarized as follows.

1) The present population of the world could be produced from an initial population of two dozen individuals increasing at the rate of 0.02 percent per year over a period of 100,000 years, and man has been on the earth for at least 200,000 to 1 million years.

2) The rate of population growth has increased enormously over the three centuries of the modern era (1650–1950), during which time it averaged about 0.5 percent per year. Over this period the rate of growth increased from about 0.3 percent per year between 1650 and 1750 to 0.9 percent per year between 1900 and 1950. World population growth averaged 1 percent per year between 1930 and 1940.

Now, a 1-percent return per year, even compounded, would by our standards represent a meager return on investment. But it constitutes a fantastically rapid rate of population increase. One hundred persons multiplying at 1 percent per year, not over the period of 200,000 to 1 million years of man's occupancy of this globe but merely for the 5000 years of human history, would have produced a contemporary population of 2.7 billion persons per square foot of land surface of the earth! Such an exercise in arithmetic, although admittedly dramatic and propagandistic, is also a conclusive way of demonstrating that a 1 percent per year increase in world population could not have taken place for very long in the past; nor can it continue for very long into the future.

The demographer's concern is not based only on considerations of the

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Table 1. Population, income, and energy consumed per capita, by continent, about 1950. Source of data, United Nations, except where otherwise indicated.

| Area | Total population | | Aggregate income | | Per capita income ($) | Energy consumed per capita (kw-hr)† |
|---|---|---|---|---|---|---|
| | No. (thousands) | (%) | Dollars* (millions) | (%) | | |
| World | 2497 | 100.0 | 556 | 100.0 | 223 | 1676 |
| Africa | 199 | 8.0 | 15 | 2.7 | 75 | 686 |
| North America | 219 | 8.8 | 241 | 43.3 | 1100 | 10,074 |
| South America | 112 | 4.5 | 19 | 3.4 | 170 | 741 |
| Asia | 1380 | 55.3 | 69 | 12.4 | 50 | 286 |
| Europe (exclusive of U.S.S.R.) | 393 | 15.7 | 149 | 26.8 | 380 | 3117 |
| U.S.S.R. | 181 | 7.2 | 56 | 10.1 | 310 | 1873 |
| Oceania | 13 | 0.5 | 7 | 1.3 | 560 | 3543 |

* See (*8*, *9*). † See (*33*).

past. It is even more justified by postwar developments in population growth.

Since the end of World War II the rate of population increase has continued to accelerate and has reached a level of about 1.7 percent per year. There is justification, indeed, for pointing to a new population explosion in the wake of World War II of a greater magnitude than that previously observed. At the rate of world population increase for the period 1800–1850, for example, the present population would double in 135 years; at the 1900–1950 rate, in 67 years; and at the postwar rate, in only 42 years.

Projection of the post-World War II rate of increase gives a population of one person per square foot of the land surface of the earth in less than 800 years. It gives a population of 50 billions (the highest estimate of the population-carrying capacity of the globe ever calculated by a responsible scholar) in less than 200 years! This estimate, by geochemist Harrison Brown (*3*), is based on the assumptions that developments in the capturing of solar or nuclear energy will produce energy at a cost so low that it would be feasible to obtain all the "things" we need from rock, sea, and air, and that mankind would be content to subsist largely on food products from "algae farms and yeast factories!"

Moreover, the United Nations estimates of future world population indicate even further acceleration in the rate of world population growth during the remainder of this century. Between 1950 and 1975 the average annual percentage of increase, according to the United Nations "medium" assumptions, may be 2.1 percent, and between 1975 and 2000, almost 2.6 percent (*4*). Such rates of increase would double the population about every 33 and 27 years, respectively.

It is considerations of this type that would make it necessary for a world government to exercise forethought and planning, which constitute rational decision making, in facing the future. This, of course, is the purpose of the projections. The figures do not show what the future population of the world will be—for the world could not support such populations. They do demonstrate that man, as a culture-building animal, has created an environment in which the rhythm of his own reproduction has been modified in such a manner as to point to crisis possibilities.

## Crisis Possibilities

The crisis possibilities are of several forms, each posing major world political problems. The first, we may note, is the ultimate crisis, which would result from the fact that the globe is finite (*5*) and that living space would be exhausted. Unless one is prepared to argue that future technological developments will enable man to colonize other globes (*6*), it is clear that present rates of population increase must come to a halt by reason of lack of space. No facts or hopes as to man's ability to increase his food production and to increase other types of goods and services can indefinitely increase man's *lebensraum* (or could do so even if we accept the absurd assumption that man, at terrific cost, could burrow into the earth, live in man-made layers above it, or live on the seas).

In the short run, let us say to 1975 or to 2000, world population will be confined to much more manageable numbers. The United Nations projects, on the basis of its medium assumptions, a world population of about 3.8 billion by 1975 and 6.3 billion by 2000 (*1*, p. 23).

In the short run there is no problem of exhausting the space on the globe, nor is there reason to fear serious decreases in world per capita food supply, as is evidenced by projections of The Food and Agricultural Organization and others concerning foodstuffs (*7*). But there is great reason to be pessimistic about the possibility of greatly increasing the average world level of living during the remainder of this century.

In 1950, world per capita income was estimated at $223 (*8*, *9*). In North America, per capita income was $1100. Had each person on the globe enjoyed the North American level of living in 1950, as measured by per capita income, the aggregate world product in 1950 would have supported only 500 million persons, as contrasted with the actual world population of 2.5 billion. For average world income to have matched income in North America, aggregate income would have had to be increased about fivefold. To bring world per capita income by 1975 to the level enjoyed in North America in 1950 would require about a 7.5-fold increase of the 1950 level in 25 years. To do the same by 2000 would require a 12-fold increase in the 1950 world income within 50 years.

Even if the more modest income level of Europe ($380 per capita in 1950) were set as the target, great increases in productivity would be necessary, because of prospective rates of population increase, to raise average world income to the required level by 1975 or 2000. To achieve this goal by 1975, world income would have to be increased 2.5-fold over the 1950 level, and to achieve it by 2000, the required increase would be greater than fourfold. A decline in the rate of world population growth to that of the period 1800 to 1850—namely, to 0.5 percent—would decrease by three-fourths and four-fifths, respectively, the projected world-income requirements for attaining this goal by 1975 or 2000.

These considerations not only show the enormous difficulty of materially increasing the world level of living on the basis of present rates of population increase but indicate, also, the weakness of the argument that a solution to the population problem is to be found in more equitable distribution of the world's food supply or of goods and services in general (*10*). The equitable distribution of world income in 1950 would, to be sure, have raised the per capita income of Latin America by 31 percent; of Africa, almost threefold,

and of Asia, four- to fivefold, but it would still have produced a per capita income per annum of $223, only one-fifth that in North America and only three-fifths that in Europe (exclusive of the U.S.S.R.). The miserably low level of living of most of the world's population is attributable not so much to maldistribution as to low aggregate product, the result of the low productivity of most of the world's peoples.

These political problems of a global character may perhaps be better understood through consideration of their international aspects, special attention being given to the plight of the two-thirds of the world's population resident in the underdeveloped areas of the world, in Asia, Africa, and Latin America.

Table 2. Estimated population and population increases, by continent, 1900 to 2000 (*4*).

| Area | Population (million) | | | | | Av. annual increase (%)* | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1900 | 1925 | 1950 | 1975 | 2000 | 1900–1925 | 1925–1950 | 1950–1975 | 1975–2000 |
| World | 1550 | 1907 | 2497 | 3828 | 6267 | 0.9 | 1.2 | 2.1 | 2.6 |
| Africa | 120 | 147 | 199 | 303 | 517 | 0.9 | 1.4 | 2.1 | 2.8 |
| Northern America | 81 | 126 | 168 | 240 | 312 | 2.2 | 1.3 | 1.7 | 1.2 |
| Latin America | 63 | 99 | 163 | 303 | 592 | 2.3 | 2.6 | 3.4 | 3.8 |
| Asia | 857 | 1020 | 1380 | 2210 | 3870 | 0.8 | 1.4 | 2.4 | 3.0 |
| Europe (including U.S.S.R.) | 423 | 505 | 574 | 751 | 947 | 0.8 | 0.6 | 1.2 | 1.0 |
| Oceania | 6 | 10 | 13 | 21 | 29 | 2.3 | 1.4 | 2.4 | 1.6 |

* Arithmetic mean of percentage of increase for 25-year periods.

## International Considerations

The short-run implications of present rates of world population growth are manifest in specific forms and in varying degrees of intensity among the various regional and national subdivisions of the globe. The distribution of the world's population and of the world's utilized resources, manifest in differentials in levels of living, is the result, of course, of millenia of human history. The demographic dimensions of international politics may best be comprehended against the background of differences among peoples in levels of living and the significance of these differences at this juncture in world history (*8, 11, 12*) (Table 1).

To note the extremes, North America in 1950, with about 16 percent of the earth's land surface, contained less than 9 percent of the world's population but about 43 percent of the world's income. Asia, in contrast, with about the same proportion of the world's land surface (18 percent), had 55 percent of the world's population but only 12 percent of the world's income. Per capita income in Asia was at a level of about $50 per year as contrasted with a level of $1100 in North America. Despite the fact that such comparisons are subject to considerable error (*13*), there is no doubt that a tremendous difference in per capita income existed, of a magnitude perhaps as great as 20 to 1.

The major factor underlying this difference is indicated by the contrast in the difference in nonhuman energy consumed in North America and Asia, respectively—over 10,000 kilowatt-hours per capita per year for the former in contrast to less than 300 for the latter. The availability of nonhuman energy for the production of goods and services is perhaps the best single measurement available of differences in capital investment, know-how, and technology which account for the great differences in productivity and, consequently, in the size of the aggregate product available for distribution.

The other relatively underdeveloped continents of the world also had relatively low shares of world income as compared with their proportions of world population. Africa, with a per capita income of about $75 per year, and South America, with $170, were also well below not only the level for North America ($1100) but also the levels for Europe (exclusive of the U.S.S.R.) ($380), the U.S.S.R. ($310), and Oceania ($560). There is a high correlation among these areas between per capita income and amount of nonhuman energy consumed (Table 1).

These differences in levels of living, as it turns out, are in general inversely related to present and prospective rates of population increase. The populations of the relatively underdeveloped continents of the world are increasing at a more rapid rate than those of the economically advanced continents (*4, 14*) (Table 2). Between 1950 and 1975, to use the medium projections of the United Nations, while the population of Northern America is increasing at an average annual rate of 1.7 percent and that of Europe, at 1.2 percent, that of Asia will be growing at an average annual rate of 2.4 percent, that of Africa at 2.1 percent, and that of Latin America at 3.4 percent. Between 1975 and 2000, while the rate of increase for Northern America will average 1.2 percent per year and that for Europe, 1.0 percent, the rate for Asia will be 3.0 percent, that for Africa 2.8 percent, and that for Latin America 3.8 percent, a rate at which the population would double about every 18 years.

As I have indicated above, rapid increase in world population imposes a severe burden on efforts to raise levels of living. It is easy to demonstrate that the burden would become an impossible one for the economically underdeveloped areas should their rates of population increase follow the trends indicated in the United Nations projections.

For example, Asia, merely to maintain her present low level of living, must increase her aggregate product by 60 percent between 1950 and 1975, and by an additional 75 percent between 1975 and 2000. To raise her per capita income to the European level for 1950 while continuing to experience her rapid population growth, Asia would have to increase her 1950 aggregate income 12-fold by 1975 and 21-fold by 2000. Africa, to do the same, must increase her aggregate income eight-fold by 1975 and 13-fold by 2000, and Latin America would have to increase her aggregate income fourfold by 1975 and eightfold by 2000 (*15*).

To achieve a per capita income equal to that of Northern America in 1950 while experiencing the projected population growth, Asia would have to increase her aggregate income 35-fold by 1975 and 62-fold by 2000. Africa, to achieve a similar goal, would require 22-fold and 38-fold increases, respectively, in aggregate income, and Latin America, 12-fold and 23-fold increases.

These considerations provide additional justification for the use by the demographer of the phrase *population explosion;* and they certainly indicate the hopeless task which confronts the underdeveloped areas in their efforts to achieve higher levels of living while experiencing rapid population growth. The control of rates of population growth would unquestionably decrease

Table 3. Summary of projections of urban population for the world and for Asia, 1975 (*18*).

| Cities (category) | Population (millions) | | | Estimate of increase in population, 1950–1975 (millions) | | Estimate of increase in population, 1950–1975 (%) | | Proportion of total population in cities | |
|---|---|---|---|---|---|---|---|---|---|
| | Projection for 1975 | | 1950 | | | | | Projection | |
| | Upper | Lower | | Upper | Lower | Upper | Lower | 1975* | 1950 |
| | | | *The world* | | | | | | |
| 100,000 and over | 745 | 488 | 314 | 431 | 174 | 138 | 55 | 19 | 13 |
| 20,000 and over | 1155 | 779 | 502 | 653 | 277 | 130 | 55 | 30 | 21 |
| | | | *Asia* | | | | | | |
| 100,000 and over | 340 | 176 | 106 | 234 | 70 | 222 | 66 | 15 | 8 |
| 20,000 and over | 544 | 283 | 170 | 374 | 113 | 220 | 66 | 25 | 13 |

* Figures are based on the "upper" projection, which assumes urbanization of an increasing proportion of the population.

the magnitude of the task of achieving higher levels of living in the underdeveloped areas, especially in those with populations that are large relative to resources (*16*).

Increasingly large proportions of the population in the underdeveloped areas of the world are becoming concentrated in urban places. The continued acceleration in the rate of world urbanization during the first half of this century was mainly attributable to urbanization in the underdeveloped areas, which proceeded at a pace considerably above that in the developed areas (*17*). I have had occasion to make projections of the urban population of the world and of Asia to 1975; these are presented in Table 3 as illustrative of what is in prospect in the underdeveloped areas of the globe (*18*). For the rate of urbanization in Latin America and Africa is, also, accelerating.

The projections for Asia indicate that in the 25 years between 1950 and 1975, in cities either of 100,000 and over or of 20,000 and over, urban population will increase by at least two-thirds and may perhaps triple. The lower projection is based on the assumption that the proportion of urban population in Asia will be the same in 1975 as it was in 1950. Under this assumption the projected increase would result from total population growth alone. But if it is assumed that the rate of urbanization in Asia will increase as it did between 1900 and 1950 while the total population continues to grow at the rate projected by the United Nations, then tripling of Asia's urban population is indicated.

Thus, while the nations of Asia are attempting to improve their miserable urban living conditions, their urban populations will continue to increase explosively—perhaps to triple within a period of less than one generation.

In the economically more advanced nations of the world, urbanization is both an antecedent and a consequent of technological advance and of a high level of living—a symbol of man's mastery over nature. In the underdeveloped nations, however, urbanization represents instead the transfer of rural poverty from an over-populated and unsettled countryside to a mass urban setting. In the economically underdeveloped areas of the world, urbanization is outpacing economic development and the city is more a symbol of mass misery and political instability than of man's conquest of nature (*17, 19*).

The prospect for individual nations, while variable, is in general the same—one of explosive growth. Between 1955 and 1975, according to the United Nations medium projections, the population of China will increase by 294 million persons and that of India, by 177 million (*4, 20*). That of Pakistan will increase by 45 million persons, and that of Indonesia, by 40 million, in these 20 years. Japan, although she has now greatly slowed down her rate of population growth, will, despite her already great population pressure, increase by an additional 27 million. To confine our attention to the Far East for the moment, smaller countries with the most explosive increases include South Korea, Taiwan, and Ceylon. Each of these nations is faced with a task of tremendous proportions merely to maintain her present level of living, let alone to greatly increase it while continuing to grow at the projected rates.

## Political Instability

What will happen if the underdeveloped areas in Asia are frustrated in their efforts to attain a higher standard of living?

Warren S. Thompson devotes his latest book to providing an answer to this question (*21*). The larger of these nations are not apt to remain hungry and frustrated without noting the relatively sparsely settled areas in their vicinities—the nations in the South-East Asian peninsula: Burma, Thailand, and the newly formed free countries of Indochina, Laos, Cambodia, and Vietnam. (Vietminh, that is North Vietnam, is already engulfed by Communist China.) Even parts of thinly settled Africa may be subject to the aggressive action of the larger and hungrier nations as feelings of population pressure mount. Moreover, Communist China, the largest nation in the world by far, faced with the greatest absolute population increases to add to her already heavy burdens in striving for economic development, may not confine her attention only to the smaller nations within her reach. Her present actions relative to her boundaries with India and possible tensions over her boundaries with the U.S.S.R. contain explosive possibilities.

It is Thompson's conclusion that the larger nations in the Far East, including Japan, India, and Pakistan as well as China, may resort to force to achieve access to additional resources under sufficient population pressure. The smaller countries may not be able to resort to force but are almost certain to require outside aid to prevent chaos. Furthermore, while neither Indonesia nor the Philippines is in a position to be aggressive or is easily accessible to aggressors, both, under mounting population pressures, are likely to continue to experience growing internal political instability.

Population pressure as a factor in political instability is not confined to the Far East. Populations of the Middle East and North Africa—the Muslim area (exclusive of Pakistan)—may increase from 119 million in 1955 to 192 million by 1975, an increase of 73 million or 61 percent in 20 years (*4*). As Irene Taeuber has noted, this is an area "where internal instabilities and conflicts of religious and ethnic groups create recurrent crises for the region and world." Taeuber observes that the immediate political instabilities in this area are attributable more to "diversities among the peoples and the nations than to population pressure or population growth" (*22*). But she points to the importance, in the decades that lie ahead, of economic advances to lessen tension in this region and to the barrier

that rapid population growth may contribute to that development.

Latin America, although in large part still a sparsely settled area of the world, is already experiencing problems associated with rapid population growth which give promise of worsening. For Latin America, as has been reported above, is faced with a population increase of 86 percent between 1950 and 1975 and of 95 percent, almost a doubling, between 1975 and 2000 (*4, 23*). Especially difficult in Latin America are the problems posed by accelerating rates of urbanization. Recent measurements of rate of urban growth in Latin America indicated that of 15 countries for which data were available, urban population in one, Venezuela, was increasing at 7 percent per year, a rate which produces a doubling about every 10 years; seven had growth rates which would double their population in less than 18 years; and only two (Chile and Bolivia) had rates of urban growth of less than 1 percent per year (*19, 24*). Growth rates (total and urban) of the magnitude which Latin America is experiencing are likely to add appreciably to the difficulty of raising living levels and are likely to worsen already existent political instabilities that threaten internal order and may affect world peace.

Finally, a fourth region of political instability to which the population factor is a contributing element, and one where it will be increasingly manifest, is sub-Saharan Africa (*22, 25*). Middle Africa is sparsely settled, but increasing knowledge about the area indicates high birth rates, decreasing death rates, and explosive growth. The United Nations projections indicate a population increase from 154 million in 1955 to about 202 million in 1975, or an increase of 31 percent. The familiar syndrome of underdeveloped areas—malnutrition, disease, and urban and rural squalor on the one hand and aspirations for independence and economic development on the other—are now emergent in this most primitive continent of the globe. And here, as in the other underdeveloped areas, rapid population growth is likely to intensify political unrest.

In southern Africa another type of population problem is also a major element in a political problem that has grave implications for world order as well as for the stability of the Union of South Africa. This is the problem arising from the conflict between the indigenous people and European settlers manifest in apartheid. Rapid and differential rates of growth of native and European populations are likely to intensify rather than to allay conflict in southern Africa.

The tensions and political instabilities generated by explosive population growth in the economically underdeveloped nations have a special significance in the contemporary world, characterized by the bipolar conflict between the Free and Communist blocs and the efforts on the part of each to win the allegiance of the uncommitted nations of the world. This conflict has several demographic dimensions of importance.

### The Free and Communist Blocs

The first of these dimensions is evident in the way in which population is distributed among the three political blocs into which the world is divided. For in 1955, each of these political groups—the free nations, the Communist nations, and the uncommitted nations—had approximately the same population. The Free and the Communist blocs, respectively, each have much to gain in the struggle to win the allegiance of the uncommitted third of the world's people. This titanic competition is focused primarily on South and Southeast Asia at the present time, because the bulk of the world's politically uncommitted population is located there.

In this war for men's minds, the competition between free-world and Communist ideologies, each of the contestants has powerful weapons. Apart from military power, which I will leave out on the assumption that a nuclear stalemate exists, the key weapons of the Communists, as is daily attested to by their propaganda, are the exploitation of the wide gap between the levels of living of the "have" and "have-not" nations and the attribution of blame for the misery of the "have-not" nations on the imperialistic and colonial practices of the "have" powers. Needless to say, the fire of this propaganda is effectively fed by the frustration of the underdeveloped areas in their efforts to advance their levels of living, or in their efforts to win independence from imperial powers, where this is not yet accomplished.

The Communist bloc, with relatively little, but with increasing, surplus product, is attempting more and more to help the uncommitted nations in economic development. The U.S.S.R. may perhaps be departing from its postwar cold-war policy of trying to persuade uncommitted nations to accept its ideology by means either of internal coups or direct external aggression.

The chief weapon of the free nations, apart from the example of their free way of life, is, undoubtedly, the provision of assistance to the underdeveloped nations to help them achieve their economic goals.

Thus, the success or failure of underdeveloped areas to raise their levels of living has the most profound world political implications. The most important immediate international political question is the question of whether the free-world approach or the Communist approach is the more effective one for achieving economic development.

It is to be emphasized that this is not a rhetorical or hypothetical question. It is being answered by the course of events, the definitive test of achievement. It is being answered by what may be regarded as the most important experiments of all time—experiments under way in each of the three blocs of nations. A great race is on among the economically underprivileged nations to attain higher living levels—some by relatively free, and some by totalitarian and Communist, methods. The contests involve nations within each of the great political blocs, for within each of them both economically advanced and underdeveloped areas are to be found (*26*).

The greatest single race under way is undoubtedly the race between the leaders of the Free and Communist blocs, respectively—that is, the United States and the U.S.S.R. The U.S.S.R. has certainly served notice that, by its methods, it hopes to surpass the level of living attained by the United States, and in the not too distant future. Overshadowed only by the direct contest between the United States and the U.S.S.R. is the race between India and Communist China (*27*), a race of special and direct immediate interest to the underdeveloped areas. For these mammoth nations, the two largest in the world, are bending every effort to achieve higher living standards—one through the Communist approach and the other by democratic methods. The outcome of this race will be of great interest not only to the underdeveloped nations in the uncommitted bloc but also to those in the Free bloc—the underdeveloped nations in Latin America as well as those committed to the Free bloc in Asia and in Africa.

The international political situation, then, as described above, gives a special significance to explosive population growth. For present and future rates of population growth may, indeed, prevent underdeveloped nations from raising their levels of living. Simon Kuznets' examination of the evidence indicates that the gap between "have" and "have-not" nations is increasing rather than decreasing (*12*). To the extent that underdeveloped nations are frustrated in their efforts to advance their living standards, they will, it may be presumed, be more open to the blandishments of the Communist bloc. Furthermore, if the underdeveloped Communist nations demonstrate that they can achieve more rapid economic progress than the underdeveloped free nations, the free way of life may well be doomed. Success or failure in this fateful contest may well hinge on the ability of the nations involved to decrease their rates of population growth (*28*).

## The Alternatives

The "why" of the population increase, in an immediate sense, is readily identifiable. It is to be found in the great increase in "natural increase"—in the gap between fertility and mortality (*1*). Quite apart from the precise timing of changes in the relations between mortality and fertility, it is clear that explosive growth can be dampened only by decreasing natural increase. This is true for the world as a whole in the ultimate sense, with differences in timing for different parts of the world. For suggested solutions to the problems of present and prospective rates of population growth in the various subdivisions of the world through migration, foreign trade, redistribution of wealth, and similar means hold forth little promise, if any, even in the short run (*21*, chap. 18).

There are only three ways to decrease natural increase: (i) by increasing the death rate; (ii) by decreasing the birth rate; and (iii) by some combination of the two.

Although it is true that decreased death rates were largely responsible for the population explosion in the past and are foreseen to be a large factor in the future, the adoption of a policy to increase mortality, or to diminish efforts to increase longevity, is unthinkable. Unless one is prepared to debate this, two of the three ways of decreasing natural increase are ruled out. For two of them involve an increase in death rates.

If longevity gains are to be retained, then, the only way to reduce explosive population growth is to decrease the birth rate. That is, the "death control" mankind has achieved can be retained only if it is accompanied by birth control. This proposition, even though it flows directly from the demographic facts of life, in view of prevalent value systems provokes heated debate of the type manifest in the press. Birth control has recently, indeed, made the front pages of the world press.

What is important about the value controversy under way is that it definitely affects global and international policy and action on matters of population and, therefore, on the crucial political problems involved. The most significant thing about all the available methods of birth control—a fact mainly obscured in the present public controversy—is that they are by no means adequate to the task of slowing down explosive world population increase, especially that in the underdeveloped areas. The great mass of mankind in the economically less advanced nations which are faced with accelerating rates of growth fail to limit their birth rates not because of the factors at issue in the controversy we are witnessing but because they do not have the desire, the know-how, or the means to do so. The desire to control fertility, arising from recognition of the problem, is, however, increasing. Japan is already well down the road to controlling its birth rate, although by methods which are not enthusiastically endorsed either by the Japanese themselves or by other peoples. China, India, Pakistan, and Egypt (*29*) have population limitation programs under way or under serious consideration, and other underdeveloped areas are showing increasing interest in this problem (*30*). The changes in value systems which will create mass motivation to adopt methods of family limitation are not easily brought about (*31*), but they are at least under way.

Birth control methods in use in the economically more advanced nations are not, in the main, well adapted for use in the underdeveloped areas. But the results of increased research and experimentation with oral contraceptives are encouraging (*32*), and there may soon be a breakthrough on obtaining adequate means for the task of limiting population growth in the underdeveloped areas.

## Conclusion

The demographer and the increasing number of his allies, in directing attention to the implications of world population growth, are in fact pointing to major global and international political problems—problems that cannot be ignored. Needless to say, the solution to the problems is not to be found in appeals to the traditions of the past, sacred or secular. The solution is to be found in the policies and actions which man himself, as a rational animal, must work out and implement. The mind of man, which has conceived remarkable methods for increasing life expectancy, is probably ingenious enough to devise methods by which the population explosion can be controlled within the framework of man's diverse value systems.

### References and Notes


1. *Determinants and Consequences of Population Trends* (United Nations, New York, 1953), chap. 2.
2. See the objection to this phrase in "Statement by Roman Catholic bishops of U.S. on birth control," New York *Times* (26 Nov. 1959).
3. H. Brown, *The Challenge of Man's Future* (Viking, New York, 1954).
4. *The Future Growth of World Population* (United Nations, New York, 1958).
5. This fact is ignored by Roman Catholic bishops [see New York *Times* (26 Nov. 1959)] and by the Pope [see "Pope denounces birth limitation," New York *Times* (15 Dec. 1959)].
6. The impracticability of colonizing other planets is considered by G. Hardin [*J. Heredity* **50**, 2 (1959)].
7. W. H. Leonard, *Sci. Monthly* **85**, 113 (1957).
8. "National and Per Capita Income of 70 Countries in 1949," *U.N. Statist. Papers, Ser. E, No. 1* (United Nations, New York, 1950).
9. The calculations were made by using United Nations per capita income figures for each continent applied to revised United Nations estimates of 1950 population of continents to obtain revised aggregate income by continent and for the world, as shown in Table 1. A new world per capita figure of $223 was obtained, as compared with the published figure of $230.
10. For the Communist position see F. Lorimer, "Population policies and politics in the Communist world," in *Population and World Politics*, P. M. Hauser, Ed. (Free Press, Glencoe, Ill., 1958); for the Catholic position see "Pope denounces birth limitation," New York *Times* (15 Dec. 1959); for the Socialist position, see J. D. Bernal, "Population growth is no threat for a free society," *Natl. Guardian* (7 Dec. 1959) (extract from J. D. Bernal, *Science in History*).
11. W. S. Woytinsky and E. S. Woytinsky, *World Population and Production* (Twentieth Century Fund, New York, 1953).
12. S. Kuznets, "Regional economic trends and levels of living," in *Population and World Politics*, P. M. Hauser, Ed. (Free Press, Glencoe, Ill., 1958).
13. *Report on International Definition and Measurement of Standards and Levels of Living* (United Nations, New York, 1954).
14. Note the different definitions of area in Tables 1 and 2. In Table 2, which gives population projections to 1975 and 2000, "Northern America" includes only North America north of the Rio Grande; "Latin America" includes South America, Central America, and North America south of the Rio Grande. For the rough comparisons made, no adjustment of the data was necessary.
15. Calculations were based on revised data, as explained in (*9*). For Latin America the

calculations were based on a comparison of estimated aggregate income for "Latin America" in 1950, per capita income for "South America" being used.
16. The "population problem" differs for areas with different ratios of population to resources; for example, see Political and Economic Planning, *World Population and Resources* (Essential Books, Fairlawn, N.J., 1955).
17. P. M. Hauser, "World and urbanization in relation to economic development and social change," in *Urbanization in Asia and Far East* (UNESCO, Calcutta, 1957), p. 57, based on work of K. Davis and H. Hertz.
18. ———, "Implications of population trends for regional and urban planning in Asia," UNESCO Working Paper No. 2, U.N. Seminar on Regional Planning, Tokyo, Japan (1958).
19. ———, Ed., "Urbanization in Latin America" (UNESCO, New York, in press).
20. "The Population of South East Asia (Including Ceylon and China: Taiwan) 1950–1980," *U.N. Rept. No. 3 on Future Population Estimates by Sex and Age* (United Nations, New York, 1958).
21. W. S. Thompson, *Population and Progress in the Far East* (Univ. of Chicago Press, Chicago, 1959).
22. I. B. Taeuber, "Population and political instabilities in underdeveloped areas," in *Population and World Politics*, P. M. Hauser, Ed. (Free Press, Glencoe, Ill., 1958).
23. "The Population of Central America (Including Mexico), 1950–1980," *U.N. Rept. No. 1 on Future Population Estimates by Sex and Age* (United Nations, New York, 1954); "The Population of South America, 1950–1980," *U.N. Rept. No. 2 on Future Population Estimates by Sex and Age* (United Nations, New York, 1955).
24. "Demographic aspects of urbanization in Latin America," UNESCO Seminar on Urbanization Problems in Latin America, Santiago, Chile (1959).
25. *Social Implications of Industrialization in Africa South of the Sahara* (UNESCO, London, 1956).
26. K. Davis, "Population and power in the free world," in *Population and World Politics*, P. M. Hauser, Ed. (Free Press, Glencoe, Ill., 1958).
27. W. Lippmann, "China is No. 1 problem," Chicago *Sun-Times* (14 Dec. 1959); "To live India must change its way of life. . . ," Chicago *Sun-Times* (15 Dec. 1959).
28. Nor is population a factor in political instability only in the underdeveloped areas. There are many other demographic dimensions of world politics which cannot be treated here because of limitations of space. The authors of a recent symposium volume which it was my privilege to edit include further considerations of population as a factor in world politics. Especially pertinent are the articles by Kingsley Davis, Frank Lorimer, Irene Taeuber, and Quincy Wright, from which I have drawn material for this discussion.
29. "Japan's population miracle," *Population Bull.* **15**, No. 7 (1959); "The race between people and resources—in the ECAFE region," pt. 1, *Population Bull.* **15**, No. 5, 89 (1959).
30. *Asia and the Far East, Seminar on Population* (United Nations, New York, 1957).
31. F. W. Notestein, "Knowledge, action, people," *University—A Princeton magazine*, No. 2 (1959); P. Streit and P. Streit, "New light on India's worry," New York *Times Magazine* (13 Mar. 1960).
32. See, for example, G. Pincus *et al.*, *Science* **130**, 81 (1959); ———, "Field Trials with Norethnyodrel as an Oral Contraceptive" (Worcester Foundation for Experimental Biology, Shrewsbury, Mass., in preparation).
33. Data are based on the following: J. J. Spengler, *Proc. Am. Phil. Soc.* **95**, 53 (1951); original data (for 1937) from "Energy Resources of the World," *U.S. Dept. State Publ.* (Government Printing Office, Washington, D.C., 1949), p. 102 ff.

# Sir Francis Simon

Knowledge of the properties of matter at temperatures near absolute zero has been increased greatly by his work.

P. W. Bridgman

Sir Frances Simon was born on 2 July 1893 in Berlin, the only son (he had two sisters) in a well-to-do family. He attended the Kaiser Friederich Reform Gymnasium and at first devoted himself to the classics, at the wish of his grandfather. The classics he did not like at all. He showed extraordinary talent for physics and mathematics, and it is said that it was under the influence of Michaelis of the Rockefeller Institute of Medicine in New York, an old friend of the family, that he decided to become a scientist, at the age of 14. Michaelis also persuaded his family, after considerable initial opposition, that this was the proper step. Simon graduated from the Gymnasium in 1912. After this he briefly attended the universities of Göttingen and Munich, until he was called into the army in the fall of 1913 for his year of military service. World War I broke out before his year was up, and he continued in the army, connected with the field artillery, for the duration of the war. He was badly affected by gas, and was twice wounded, the second time severely, two days before the armistice. He was confined to a military hospital until the summer of 1919, recovering from his injuries, and he thus lost altogether six years at the beginning of his scientific career. For his services in the war he was awarded the Iron Cross, first class, and was also made an officer—two unusual distinctions for a person of Jewish origin.

In 1919 Simon resumed his studies, now at the University of Berlin, working under Nernst on specific heats at low temperatures, a topic of great interest at the time because of its bearing on Nernst's controversial heat theorem. In 1921 he was awarded the degree of Dr. Phil. in *physics* under Nernst, the physical *chemist*. His other teachers at Berlin included Planck, von Laue, and Haber. In 1922 he was appointed Nernst's assistant at the Physikalische Chemische Institut. In this same year he married Charlotte Münchhausen, also of a well-to-do Berlin family, whom he had met socially two years before. Her tastes were artistic and musical, and she and Simon complemented each other perfectly. There can be no doubt but that his scientific effectiveness owed much to his happy family background (*1*). In 1924 Simon was appointed *Privat Dozent* in physics in Berlin, and in 1927, *Ausserordentlicher* (associate) professor in physics, a post which he held until he left for Breslau in 1931.

## Early Publications

Simon's first published paper, on specific heats at low temperatures, appeared in 1922. During the nine years of his stay in Berlin he published 50 papers altogether; these 50 papers foreshadow most of his later scientific activity, and nearly all were connected in some way with low temperatures. At first he continued the work he had done while with Nernst—namely, on specific heats at low temperatures and, in particular, on the various anomalies at the lowest temperatures. These anomalies vitiated a smooth extrapolation of results at higher temperatures and they had to be taken into account in calcu-

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