Letters

World Population Problem

The article by Dorn on world population [*Science* **135**, 283 (1962)] expresses excellently the current thinking and conclusions of demographers. They do not seem to have taken account of some basic features of the situation.

The idea that breeding has come under control only in this century and not in all countries is unsound. Varied means of control have been known and practised through the ages, and not merely the simple and obvious one of partial or total celibacy (*1*). The degree of control that some persons or countries exert may indeed not be what others approve. And differences in the degree of control may result in strikingly different amounts of resources per person, leading to demands for social justice in the removal of the discrepancy. But even the pygmies of the Congo, who in their forest environment are practically free from famine, disease, war, and aggression, control their numbers and have no population problem (*2*). The complexity of breeding and an ambivalent attitude toward births tend to make the motivation in control most uncertain. Society restricts breeding in various ways and yet makes control a serious crime after some arbitrary stage in the process has been reached. The process is made shameful; the parts involved are named *pudenda* and have to be hidden, and the pregnant woman undergoes "confinement." But the result, when suitably limited, is highly lauded. Even the person responsible never knows how many offspring he or she might have had—that is, how much control has been exercised. When demographic studies were first made it was calculated that the particular population then studied showed only a quarter as many births as there might well have been (*3*). So far as can be known, this or a greater degree of control is quite general and should be taken into account in an appraisal of world population.

The data presented by Dorn do show a striking decline in mortality but do not show that this is "the major cause of the recent spurt in population increase." Such an interpretation of a complex and confusing dynamic picture seems to have come from the symposium on "World Population in Transition" (*4*). Davis, viewing increase as dependent upon excess of births over deaths and failing to find any correlation between the recent spurt and increase in birth rates, concluded that it "must, by elimination, be attributed to the decline in mortality." This idea ignores the fact that increase of population in the long run is wholly dependent upon births, since all men die. Decline in mortality merely defers death. *As distinct from births*, any effect of deferment of death on population is definite and precise, merely a pro rata increase in numbers. With number of births unchanged, doubling the length of life doubles the population, and through this halves both birth rate and death rate.

With uncontrolled breeding, the environment, not the parents, prevents the population explosion that multiplication in breeding involves. Individuals die when they fail to have effective room, which varies with human wants. Multiplication quickly fills available effective room. With that room unchanged, the higher the breeding rate, the higher the rate of premature death. For example, with room for only a certain number of adults, if each adult pair produces four young, half the young must die prematurely or there will be too many adults. If each adult pair produces 20 young, 90 percent of the young must die prematurely.

Even with room for many young it is rare for a couple to ignore tradition, community mores, and the effect on the standard of living in starting early to breed freely. Under favorable circumstances many pioneers on this continent did have large families. With the approval of the church and with the group aim of getting "the revenge of the cradle" by outbreeding the English-speaking majority, French Canadian couples in Quebec have not infrequently had as many as 20 children each. In Toronto, as the result of a bequest from a former mayor, there has been a series of "stork derbies" in successive decades. The substantial prizes seem to have made some women breed freely even in urban communities. The winner of the third breeding competition, it was recently announced, had nine children in the 10-year period; the five runners-up had eight children each.

In man's controlled breeding, the potentiality of geometric increase at the rate of 20 young or more per adult pair permits quick action to offset any decrease in the population resulting from temporarily unfavorable conditions such as famine, pestilence, or war. It might well be that, on the average, only four young per adult pair, or even only three, would be required to offset unavoided premature mortality. Control prevents the premature mortality that results from strain on the resources required by adults. It makes these resources available for extending the life of the individual through old age, through years of declining vigor. It also enables people to live better. With control, the ratio of population to resources can be kept within whatever limit is desirable for the best standard of living.

With either environmental or parental control of breeding, the curve of population change, as advantage is taken of an increase in effective room, is sigmoid, as was shown in the peopling of this continent. That the curve of change in world population in Dorn's Fig. 1 is not yet of this character—that is, that the curve continues to rise more rapidly—merely shows that the effective room (not the physical space) has not yet begun to be exhausted. Davis (*4*) was doubtless right in attributing "the first real burst of world population" to the Industrial Revolution. It may well be that the unprecedented spread of the technological progress made by Northwestern civilization to Eastern and Southern countries of the world is responsible for the present spurt in world population, which is taking place in those countries.

There does not seem to be any sound basis for Dorn's contention that "the inexorable effect of the biological laws that govern all living organisms" poses a new problem for man in population control because he has "gained

sufficient control of [pestilence and famine] so that they no longer effectively govern his increase in number." It is really absurd to think that man, with all his ability, cannot govern his breeding if he wishes, that "biological law" makes him multiply. He has for long ages been quite able to control his numbers, though without certain refinements now discovered. At a recent meeting in the Toronto General Hospital that was devoted to "new concepts in fertility and dysfertility," I asked how many children a couple might have. The physician who undertook to answer the question said that they might perhaps have a thousand children. This is vastly short of the 200,000 ova and about 200 million spermatozoa (per ejaculation) that Dorn states are seemingly available. But even this number will not be easily achieved; it should not be considered to pose a threat of overpopulation!

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References

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3. E. Halley, *Phil. Trans. Roy. Soc. London* **A17**, 596, 654 (1693).
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Studies on the Metric System Proposal

I read with interest the editorial "Weights and measures" in a recent issue of *Science* [**136**, 1085 (1962)]. As one who made a 2-year professional study of the subject some decades back, with a large staff of assistants, I appreciate the objectivity in the pros and cons you list. More could hardly be gotten into a short editorial, and I do not propose to pursue the pros and cons much further here. I should like to make some comments in the interest of perspective, however, on the preamble, rebuttal, and conclusion.

I feel sure it is just a slip (though it may leave a wrong impression) when you say "the question of *adopting* the metric system in the United States is again being debated" (italics mine). Nearly 100 years ago (in 1866) the metric system was legally adopted in this country. The question today is rather one of penalizing the use of our thoroughly standardized English system, thus destroying it, and substituting the metric system as the *sole* system for the United States.

In my study (in 1921) it was found that, after nearly 60 years of legal right, not more than one-tenth of 1 percent of the American people used the metric units. Of the rest, relatively few had even heard of this system, and yet the 99.9 percent would be the people to suffer and to be much more than inconvenienced by a compulsory change, whether it took 33 or 333 years. (The latter period is the more likely if the experience of France is to be used as a criterion.)

This is the other side of the "rebuttal"; and there is another question one should raise in view of the fact that the metric system is neither scientific nor convenient except for fine-instrument making and foreign trade: By what kind of effrontery does one-tenth of 1 percent of our population keep on insisting that it should benefit at the expense of 99.9 percent of the people? In *Forbes* magazine, beginning with the issue of 19 January 1924, five articles were published (three by proponents of the proposal that the metric system be made mandatory and two by me). The following statement, in the 12 April 1924 issue, closed the series: "It is just about as sensible to attempt to substitute the metric for the English system in the United States as it would be to attempt to substitute in this country the French for the English language."

As for the conclusion, I should like to point out that a *very* considerable and objective study of the "facts" has already been made on at least two occasions, including the fact that there is nothing *scientific* about the existing metric system. The first study was made in 1821 by John Quincy Adams. It was this thoroughgoing analysis which Congress had before it in adopting the English rather than the metric units for the United States at that time. The second study was made 100 years later, by me. It was sponsored and financed by the National Industrial Conference Board, was published by the Century Company, went into every conceivable aspect of the subject, and was guided by an able committee of five outstanding American scientists, engineers, and businessmen. Two favored the metric system, two favored the English system, and one (the chairman) was uncommitted. The report (261 pages) had the unanimous approval of this committee, which was composed of E. M. Herr, president of the Westinghouse