population growth over several hundred generations, from the prehistoric past up to today. As we pointed out, the process which governed the growth rate for a couple of thousand of years and which is still acting today, exhibits a most dangerous intrinsic instability, which is now—so to say—around the corner. It is clear that this process has to be interrupted, and, as we believe we have shown, to suggest stepped-up industrialization is to propose to put out a fire with gasoline.

The real problem is that today we have to prepare each single member in a family of 3 billion to face soon a decision—namely, either to persist in enjoying his children and to pay for it by having no more than two and remaining mortal, or to reach for individual immortality and remain childless forever. In 20 years, of course, 4 billions will have to make this decision.

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**References and Notes**

1. A better approximation is of form $t_m = (1/\gamma_0) + (1/\tau\gamma_0^2)$, with $\gamma_0 = 0.034$. Compare with E. S. Deevey, Jr., *Sci. American* **203**, No. 3, 200 (1960). This, however, results in a slowly increasing birth rate.
2. H. F. Dorn, in *The Study of Populations*, P. M. Hauser and O. D. Duncan, Eds. (Univ. of Chicago Press, Chicago, 1959), p. 455.
3. A. J. Coale, in *Trans. Intern. Population Conf.* (Vienna, 1959), pp. 40–44.
4. P. H. Gebhard, W. P. Pomeroy, C. E. Martin, C. V. Christenson, *Pregnancy, Birth and Abortion* (Harper, New York, 1958), p. 219.
5. W. E. Howland, *Science* **133**, 939 (1961).
6. Official population projections for 1980 made in 1950 are now revised by adding a mere 500 million people to the old estimate. Compare *Population Bull. No. 1* (United Nations, New York, 1951), pp. 1–3, and *ECOSOC Report, Time* **77**, No. 16, 31 (1961).

## Reciprocal Disarmament

I have not as much hope today for the *advancement* of science as I have fear for its *retrogression*, or even extinction—a process in which (in my opinion) many scientists and technologists are aiding, either by their indifference to the diversion of scientific discovery to purposes of destruction or by active furtherance of such diversion. How sadly must the shades of Newton and Boyle, Thomson and Rutherford regard the great edifice they founded, threatened today by the indifference of their successors to its perversion. Today, as in Galileo's time, scientists dare not publish their results. The founders of science had to contend with the people's fear of sorcery. Not very different today is the reaction of a considerable section of a misunderstanding and revolted public. A few days ago, on television, I heard it suggested that we emulate Herod by killing all scientists at birth, but this I think would be going too far.

From a humanitarian standpoint I still believe that science is capable, if properly applied, of advancing the *real* happiness of mankind. In this matter I don't say that scientists have any particular responsibility, for actually science in its inception had to force itself, so to speak, upon the world. But now that it has grown to the point where its discoveries threaten the very existence of man, the case is very different. Scientists cannot escape responsibility for the results of their work, nor should they dare, if they have joy in discovery or if they value their own lives, to take a passive attitude toward war or to leave the control of atomic energy to politicians.

Ever since war became spatially three-dimensional, politicians have been promising to control it by traditional methods—attempting by *diplomacy* to prevent *nationalism* from asserting its prerogatives by *military force*. For half a century now these three forces have been cooperating to bring about the present crisis. A practitioner of the scientific method cannot be content to adhere to custom until the bombs begin to drop. Because one method fails, will he refuse to try another?

I believe it's time to try a new experiment. Regarding diplomacy, Henry Kissinger says: "It is not an accident that the diplomatic stalemate has become more intractable as weapons have grown more destructive . . . the increasing horror of war has made the progress of negotiations more difficult." Jerome Wiesner in *Daedalus* specifically states the difficulties and dangers of diplomatic disarmament conferences. Shall we trust our existence to such methods much longer? (Let us hope that the two conferences now arranged will produce results; nevertheless, let us be prepared for failure.)

Long experience of human affairs tells us that in all complex attempts at accomplishment there comes a time when discussion must cease and action must begin. Because of this experience all organizations have executives, one of whose qualifications must be courage to act. In the past, executive intervention in international affairs has often meant the start of a war. But since we

are assured that war today is "unthinkable," let us now think how our President could initiate the attainment of world peace.

He has the power to start a disarmament process, a necessary prelude to the establishment of world law. The reciprocal disarmament plan proposes that the President order the destruction of 2 percent of each class of our arms and then invite all nations to follow suit. If they should reciprocate, he would have another 2 percent destroyed, and so on. Midway in the process we would begin to turn over arms to a World Authority, which would thus grow in strength to become the single deterrent against any individual nation's aggression. This process would give industry time to adjust; would create a favorable climate for the organization of world law; and would continually preserve the balance of power until the World Authority attained "superpower." Furthermore, the plan promises, as a by-product, to break the deadlock on inspection procedure that has wrecked previous conferences.

Doubtless in implementing this process we would make some mistakes, but we would not be making the supreme mistake of talking until it is too late.

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## On Educating the Public

Perhaps I may add something useful to James E. McDonald's letter [*Science* **133**, 1271 (21 Apr. 1961)]. Stung by repeated references to the callousness and indifference of scientists in the face of a threat of all-out nuclear war, and alarmed by the misinformation published by people who might be expected to know better, we at this university undertook a twofold project to educate the public. The first part of the project consisted of a series of 26 lectures on radiation and fallout, given in the extension department at a popular level. We are fortunate, being situated in Ottawa, which is the scientific as well as the political capital of Canada, in being able to call on experts from many different fields, ranging from the physicists and biologists at Atomic Energy of Canada, Limited (Chalk River), to the strategical and tactical experts associated with the armed forces. The second part of the project consisted of a series of dispassionate half-hour programs on television in which as much information