more detailed preliminary studies recommended in my article would be to remove this uncertainty or, at least, reduce it as much as possible. Any attempt to discount the biological effects of a sea-level canal on the basis of currently available data would seem to be premature.

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World Population: Control or Crisis?

Two recent articles on the world population crisis presented the problems but offered no permanent solutions (*1*). Hardin said, "No technical solution can rescue us from the misery of overpopulation. Freedom to breed will bring ruin to all." Aldrich quotes W. M. Myers' estimate that "with unprecedented effort mankind can buy two or three decades before being overcome by widespread famine" but he himself concludes that "the question we leave here unresolved is how, or whether, mankind will achieve control of its population."

Man *could* achieve control of population growth, but only by drastic methods and new techniques. At the time of puberty, each girl would have a capsule containing a minute amount of progesterone inserted under the skin which would act as a chemical antifertility agent for 15 to 20 years. When a baby is wanted, the capsule would be removed. After the birth of the baby a new capsule would be inserted. Some restrictions might be required, such as denying parenthood to women under the age of 18 or 20, to unmarried women, and to those who had already produced three children.

If such proposals seem too drastic and dictatorial, consider some of the alternatives. Mexico, for example, has received extensive aid since 1943 from the Rockefeller Foundation and has made great progress in increasing food production. J. George Harrar of the Foundation has noted that food production there tripled while the population doubled. But if Mexico's present rate of population growth (3.5 percent) (*2*) should continue, her population would equal the present population of the United States in 42 years, exceed the present population of the world in less than 130 years, and increase 1000-fold in 200 years. Obviously population

growth must be controlled by high death rates or by low birth rates. The National Academy of Sciences in its report *The Growth of World Population* concluded, "Other than the search for lasting peace, no problem is more urgent" (*3*).

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References

1. G. Hardin, *Science*, **162**, 1243 (1968); D. G. Aldrich, Jr., *ibid.*, p. 1309.
2. *United Nations Demographic Yearbook 1968* (Statistical Office of the Economic and Social Affairs Dept. of the United Nations, New York).
3. National Academy of Sciences Committee on Science and Public Policy, NRC Rept. 1091 (Washington, D.C., 1963), p. 2.

Migratory Habits of the Scientific Goose

The rapidly expanding population of the once rare bird, the scientific goose, has increased the importance of attempts to study and interpret the rather exceptional geographic movement patterns of this species. Although permanent nesting areas are found in all habitable regions of the earth, they tend to be concentrated in the vicinity of the major cities. At intervals, which correlate only approximately with seasonal variations, individual birds from widely separated nesting sites simultaneously take flight. They travel, often vast distances, to flocking points where they engage in the "ritual ceremony" or "symposium" which lasts an average of 5 to 7 days, then return to their points of origin. The cycle is repeated again and again, with the only discernible difference being the location of the flocking point.

The assumption that this migratory behavior is related primarily to breeding may be rejected on the grounds that the males greatly outnumber the females; moveover, the frequency of participation appears to accelerate with age, so that the oldest birds (easily distinguishable by their bedraggled feathers and drooping tails) are in almost constant flight. Any alternative hypothesis to explain this mysterious evolutionary adaptation must account for the events of the "ritual ceremony." During this activity the individuals, one by one, take a position facing the others and cackle loudly in turn. Analysis of these sounds has demonstrated characteristic cackling patterns for each individual, the only variation being the addition of