

Birth rates sharply divide the world

A demographic polarization is dividing the world's nations into two distinct groups: the roughly half who have limited their population growth rates to about 0.8 percent annually, and the other half whose average population growth is triple that, according to a new report by the Washington, D.C.-based Worldwatch Institute. Nations in the second group tend to be experiencing grave economic and ecological trouble. And they will likely continue to do so, the report says, until they put a brake on their population growth.

The problem, explains Worldwatch President Lester R. Brown, one of the study's authors, is that the high-growth group — now doubling its population every 20 to 28 years — is beginning to outstrip its environment's capacity to provide food, energy and jobs. Ironically, this is partly a result of modernized health care, which has dramatically cut the death rate from disease. Unlike the low-population-growth group (especially industrial nations), high-growth nations have not compensated for their declining death rates by reducing birth rates. Now many such nations, especially in Africa and Central America, are caught "in a downward spiral in living standards," the report says, because their rapid population growth and environmental deterioration are feeding on one another.

In recent years, several developing countries — most notably China (SN: 8/11/84, p. 89), but also Cuba and Thailand — have moved from the high-growth group to the low-growth group. Though each solution was different, all relied on making birth control technologies widely available. They also tended to include social and political incentives, like tax advantages for one- or two-child families, the report notes. While such strategies can be economically costly, Brown says these nations recognized that the alternative would be even more costly — declining living standards for the entire society as a fixed or dwindling resource base was shared by an ever larger number of people (SN: 2/23/85, p. 118).

Each of these recent population growth declines was achieved while local economic conditions were improving — a situation in sharp contrast to that facing most high-growth countries today. What the high-growth nations must learn, the report says, is how to slow population increases in the face of declining conditions.

While he generally agrees with the Worldwatch assessment, Joseph Speidel, vice-president of the Washington, D.C.-based Population Crisis Committee and former deputy director of the U.S. Agency for International Development's population program, believes there is also reason for optimism. Dramatically declining economic and environmental conditions in many of the high-growth societies provide a potent motivator both for changing attitudes and policies about birth control, he says. However, he adds, without increased international aid for family planning, even a highly motivated country will have a hard time reducing its population growth.

News updates

- "Passive" exposure to cigarette smoke is clearly harmful, according to a report issued by the U.S. Surgeon General last month. Saying exposure to ambient cigarette smoke can cause disease, including lung cancer, in nonsmokers and harm the lungs of smokers' children, the report echoes a message issued earlier by the National Research Council (SN: 11/22/86, p. 325).

- The Energy Department has shut down its plutonium-producing N reactor in Hanford, Wash., while safety modifications are made. The changes, including an upgraded emergency cooling system and hydrogen-gas relief system, were recommended by an independent review committee (SN: 8/16/86, p. 101). This reactor shares several major design features with the Soviet Chernobyl plant.

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Completing an automation laboratory

A modest machine shop at the National Bureau of Standards (NBS) in Gaithersburg, Md., now offers a glimpse of the factory of the future. Under construction since 1983 (SN: 11/26/83, p.341) and completed last month, the Automated Manufacturing Research Facility has six work stations at which various combinations of robots and metalworking tools, supervised by inspection machinery, cut and shape metal. A sophisticated, automated control system involving dozens of different computers links the work stations. The system permits the machinery to fashion a variety of parts on command from a control room without requiring reprogramming of the robots or machines on the shop floor.

The facility is designed as a research laboratory for studying and testing methods of linking computer-controlled machines. Results from this research have already helped establish standards that allow equipment made by different manufacturers to pass information from one machine to another more easily. Research at the facility also provides efficient and reliable methods for monitoring the performance of automated machinery. The U.S. Navy is now working with NBS to develop an automated shipyard unit for producing submarine parts.

Speeding to a gallium arsenide record

In microelectronics, no record seems safe. Researchers keep pushing their chips to higher and higher speeds, so the title of "world's fastest" seems to change about as often as the world heavyweight boxing title. Moreover, all kinds of variations on the title are available. Last month, scientists at the Hughes Research Laboratories in Malibu, Calif., reported the highest "clock rate" for a digital integrated circuit. This particular gallium arsenide chip operates at 18 gigahertz. That's not to be confused with the much higher rates at which individual transistors built into such chips can switch from one state to another (SN: 10/18/86, p.247).

The Hughes chip, a divider circuit, operates at a frequency five times higher than that of currently available gallium arsenide integrated circuits and 10 times faster than commercial silicon circuits. The chip doesn't have to be cooled to liquid-nitrogen temperatures to achieve this speed because its design features a conventional, simple structure — the metal-semiconductor field-effect transistor. Fabrication refinements like the use of suspended "airbridges" (as seen in the photo) to link logic gates also helped researchers reach the record.



Hughes Aircraft Co.

Salt with a pinch of water

Natural deposits of rock salt are attractive as sites for radioactive waste disposal. At great depths, the salt tends to be impermeable, and mining is relatively easy because the stuff can be dissolved away to create the necessary underground cavities (SN: 1/2/82, p.9). However, according to the results of some recent experiments, traces of water trapped within the salt may have a strong effect on the flow properties of salt bodies under pressure. Under those conditions, the salt may be weakened, say Janos L. Urai and his colleagues at the University of Utrecht in the Netherlands.

"Natural rock salt invariably contains small amounts of brine," the researchers report in the Dec. 11 NATURE. Because their experiments were done in a relatively dry salt, they conclude that "weakening by water should occur in a wide range of salt rocks during natural deformation." That includes conditions that would be expected in radioactive waste repositories and storage caverns buried deep within salt beds.

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