
SCIENCE & TECHNOLOGY

increases can be traced to several other factors, notably the shift toward replacement technology. "New generations of processes and devices—new energy sources, new transportation systems, new pollution controls—are usually far more complex and costly than those they replaced." They take longer to plan, develop, and construct, and thus their financing becomes increasingly more difficult for private industry.

Moreover, U.S. government policies (e.g., patent policies) often do not encourage industry to take advantage of new technology arising out of federally sponsored research and development. Government attempts to bar potential health hazards often impede the development and marketing of certain products, particularly pharmaceuticals and agricultural chemicals.

Withdrawal of Pentagon financing of basic research in 1970 damaged both basic and applied research, says Wiesner; major research universities that perform most of the fundamental and exploratory work leading to technological innovation now suffer from both reduced government subsidies and the pressures of inflation.

"The United States," Wiesner concludes, "has moved in recent years from a situation in which all our forces, commercial and public, encouraged the innovation which created our spectacular scientific and industrial capabilities to a situation in which there are ever-increasing deterrents to creative change."

Genetic Research And Social Ills

"XYY: The Dangers of Regulating Research by Adverse Publicity" by Bernard D. Davis; and, "The XYY Male: The Making of a Myth" by Jon Beckwith and Larry Miller, in *Harvard Magazine* (Oct. 1976), P.O. Box 301, Uxbridge, Mass. 01569.

Last May, after a year of bad publicity and harassment, scientists abandoned a long-term research project at Harvard Medical School on genetic abnormality and behavior. Dr. Davis, professor of bacterial physiology at the medical school, defends the genetic project; Beckwith, professor of microbiology and molecular genetics at Harvard, and Miller, a third-year medical student, deplore it.

The research centered on the extremely small number of children born with three sex-determining chromosomes instead of the normal two. Investigators in several countries have found that the extra male chromosome pattern, shown as XYY, was 10 to 20 times more frequent in inmates of institutions for the criminally insane than in the general male population. This discovery prompted press accounts erroneously reporting that an extra male chromosome invariably causes excessive aggressiveness and "criminality."

The aborted Harvard study, which entailed the identification of XYY infants and then follow-up observation and therapy, was "in the

SCIENCE & TECHNOLOGY

clinical tradition of trying to detect, observe, and ameliorate a potential health problem," Davis argues. Critics of the program, he contends, waged a "crusade against evil" which distorted the issues and impaired free intellectual exchange chiefly because of a conviction that any attention to genetic factors in behavior will have unhappy social consequences.

Beckwith and Miller argue that previous studies showing XYY males to be anti-social were tainted with error and bias; they cite other research revealing no significant correlation between the genetic abnormality and aggressive behavior. Because of sensational publicity accorded "criminality genes," the Harvard study "may have created serious problems in the lives of the observed children that would not have occurred otherwise." In addition, Beckwith and Miller say, any conclusions reached by the study might be invalid because there was no "control group" of "normal" children, studied alongside the XYY children, to rule out any possibility of bias.

Experiments of this sort, they argue, reinforce the notion that genetics, rather than "social and economic deprivation," are to blame for social problems. Noting hasty proposals by criminal-justice specialists for the identification and preventive detention of XYY males, Beckwith and Miller urge greater public participation in decisions to conduct scientific research.

Triumph Over Pestilence

"The Eradication of Smallpox" by Donald A. Henderson, in *Scientific American* (Oct. 1976), 415 Madison Ave., New York, N.Y. 10017.

For the first time in medical history, doctors, epidemiologists, and roving health workers may have eradicated a deadly, pestilential disease—smallpox. The last known case was reported on Aug. 9, 1976, in Ethiopia. If no new cases are reported during 1977 and 1978, and if a World Health Organization commission is satisfied with the reporting, smallpox will be declared to have been eradicated from the earth.

Henderson, chief medical officer in charge of smallpox eradication at the WHO in Geneva, explains that when the campaign began in 1967, smallpox was considered endemic in 33 countries, with 11 others reporting imported cases. As successive centers of infection were eliminated, epidemiologists evolved increasingly effective methods of reporting, quarantine, and mass vaccination. WHO's efforts have now narrowed to two remote areas of Ethiopia.

To achieve success, health workers visited rural schools and market places to collect rumors of unreported smallpox cases, and as incidence declined they offered progressively greater rewards for fresh information. Special rosters listed every person living within a one-mile radius of an infected village. Guards were hired to cordon off the homes of smallpox patients and to ensure that all visitors were inoculated; meticulous records were maintained.