U.S. science: Signs of sluggishness

How fare science and technology in the United States? Still strong in comparison with other nations but showing many signs of weakening in the last few years. This is the conclusion one draws from a detailed compilation of statistical indicators of the strengths and weaknesses of U.S. science and technology published in the seventh annual report of the National Science Board. The report, *Science Indicators 1974*, marks the second time in four years the Board has devoted its annual report to science indicators. The 26-member Board, currently headed by Norman Hackerman, President of Rice University, is charged by Congress with providing an annual report on the status of science in the United States.

The Board itself draws no general conclusions, instead summarizing dozens of statistical indicators. Some highlights:

- The proportion of the gross national product spent for research and development has declined steadily over the last decade in the United States (to 2.4 percent) while growing substantially in the Soviet Union, West Germany and Japan.
- The United States was the largest producer of the scientific literature sampled from 1965 to 1973 in all fields except mathematics and chemistry, where it was second to the Soviet Union. But U.S. research publications in physics, engineering and chemistry have declined.
- A majority of a sample of major technological innovations of the past 20 years were produced by the United States. But the proportion of innovations of U.S. origin declined from a high of 80 percent in the late 1950s to some 55 to 60 percent since the mid-1960s. Japan and West Germany showed noted increases.
- The United States had a favorable but declining "patent balance" between 1966 and 1973. The decline of 30 percent was due primarily to increases in the number of patents awarded by the United States to West Germany and Japan and the decreasing number of patents granted to the United States by Canada and the United Kingdom.
- The United States had an increasingly positive balance of payments from technical "know-how" over the 1960-73 period. Four to five times more patents, licenses and manufacturing rights were sold to other nations than purchased.
- The interval between invention and innovation (market introduction) is shortest in Japan (3.6 years), followed by West Germany (5.6 years), the United States (6.4 years) and France (7.3 years).

As in the 1972 report, the Board also attempted to measure public attitudes toward science and technology. It again commissioned the Opinion Research Corp. of Princeton to repeat its survey. The survey provides little support for the idea that Americans are hostile to science and technology. Seventy-five percent of the public believe science and technology have changed life for the better, up five percentage points from 1972. In a ranking of nine professions, scientists and engineers ranked second and third in both 1972 and 1974 (physicians were first). Some 78 percent (up from 72 percent in 1972) described their general reaction to science and technology as one of "satisfaction or hope" or "excitement or wonder," with only 5 percent as "fear or alarm." □

MS virus: Cause maybe, cure no

Werner and Gertrude Henle, virus researchers at Childrens' Hospital in Philadelphia, are still trying to recover from their latest piece of successful research. They and several colleagues have been studying the cause of the degenerative disease multiple sclerosis and have made some significant progress in recent weeks. But somehow, during press coverage of their work, "a viral *candidate* for the cause of multiple sclerosis" became "the virus that *causes* multiple sclerosis," and, Henle says, calls started pouring in from the desperate relatives of multiple sclerosis victims.

"It is so disheartening," Henle told SCIENCE NEWS, "that their hopes were raised falsely. What we have found, unfortunately, has no direct effect on patients. We are searching for the cause of multiple sclerosis, not the 'cure.'"

Multiple sclerosis is a slow, progressively debilitating disease of the central nervous system that occurs mainly in young adults and is characterized by paralysis, tremor and speech disturbances. The Henles and others, including George and Patricia Merz, P. C. Licursi and R. I. Carp of the Institute for Basic Research on Mental Retardation in Staten Island, have found in the past five years that the disease may be caused by a virus infection and severe autoimmune response.

The Henles followed up earlier animal studies with a study of multiple sclerosis patients in which they found a small agent (25 to 30 nanometers across) in association with tissues from most of the patients. They also found that 80 percent of the patients and about 30 percent of their families and nurses carry antibodies against the particles.

"We still have to prove that this small particle really is the virus associated with the disease, and not just a 'passenger virus' that happens to be there." But the findings do show, Henle says, that a virus may set off antibody formation and a mild form of the disease in the normal individual and that only in exceptional cases does the disease develop. "It may be an autoimmune disease," he says, "in which large numbers of antibodies are formed in some individuals, and these, in turn, attack the nervous system."

Right now, Henle says, his team is developing better techniques to find the agent and measure antibodies. But even confirming the agent as the causative virus wouldn't help patients, he says, since there is no chemical or antibiotic therapy for virus diseases. "In time, perhaps, a vaccine might be developed to *prevent* the disease, but not to treat it." □

Neutron stars may be element factories

The conventional way to try to make superheavy chemical elements (those much heavier than uranium), which no longer exist on earth if they ever did, is to use ion accelerators to bombard one heavy nucleus with another in the hope that the two will fuse and make the desired superheavy nucleus. The method has worked with elements up to atomic number 106, but so far has not gone further. Nuclear theorists expect to find an "island of stability," a group of nuclei in the range around 110 that ought to be relatively more stable than others. Some of these could prove to have practical uses as some of the lighter transuranics have (for example, plutonium in power production and explosives or californium in medicine).

Theoretically, it has been a moot question whether nature makes or ever made such superheavy elements. Some scientists think the laboratory experiments may, in fact, be trying to improve on nature. Now, in the Feb. 26 NATURE, a Russian and a Polish scientist, V. M. Chechotkin of the Institute of Applied Mathematics in Moscow and M. Kowalski of the Institute of Experimental Physics at the University of Warsaw, propose that nature does make such things. It happens in neutron stars, they calculate.

If you were looking for heavy nuclei, neutron stars might be a good place to start. They have masses up to a few times that of the sun, but the matter is squeezed down to densities like that of an atomic nucleus. In fact, some theorists regard the interior of a neutron star as a kind of pathologically supercollossal nucleus. There is a tremendous excess of neutrons in a neutron star compared to their proportion in normal nuclear matter. In 1947, Maria Goeppert-Mayer and Edward Teller recognized that in a neutron-rich nuclear fluid, extremely heavy nuclei might evolve and then produce lighter elements by spontaneous fission.