detected such a change. The abrupt slow-down of spreading in the Pacific 10 million years ago was accompanied by a shift in direction. Prior to that time the motion was almost due west; then it shifted to the northwest, possibly as a consequence of uneven bottoming-out.

The evidence for this shift came from cores drilled on either side of the zone of biological productivity along the equator (SN: 12/27, p. 590). Small sea organisms thrive on nutrients brought to the surface in this zone by strong equatorial currents. For geophysical reasons these currents must remain at the equator. The organic sediments that accumulate beneath the zone then act as a good marker of the past positions of the equator.

The pattern of accumulation of organic sediments brought to the surface in Leg 9 showed that points on the sea floor south of the zone moved beneath the zone about 10 million years ago; those that had been beneath it moved out from under it to the north. □

TECTONICS

Continent building

Whatever the mechanisms are for the world-wide movements of the crustal plates, the major role they have played in earth history is becoming increasingly clear. In the Feb. 7 NATURE, the University of Cambridge geologist John F. Dewey and co-worker Brenda Horsfield suggest that the plate motions have been responsible for the growth and evolution of continents for at least three billion years.

Early in the Precambrian, they suggest, numerous thin plates of oceanic lithosphere controlled the growth of continental crust by eruption of basalts and other rocks to form island arc complexes. Continents gradually grew around such nuclei. They believe this continent-building process is today going on in the southwest Pacific at the New Hebrides-Fiji-Tongo island system.

The British investigators classify major mountain units into four types and explain how each may be the product of plate interactions. One type, for example, is represented by the Andes and the mountains of the western United States, where a deformation, caused by underthrusting of a plate near the foot of a continental rise, moves toward the continent, thrusting sediments onto the land.

The scientists also believe that the oceans have undoubtedly contracted and expanded numerous times in the last three billion-plus years, each time dividing the continents in a slightly different way. □

MANPOWER

Job cuts at the national laboratories

The Atomic Energy Commission, like other Government agencies, has in recent years been faced with stationary or declining budgets for scientific research. This has meant an especially increasing pinch for the branches of physics that are the particular responsibility of the commission: nuclear or medium-energy physics, high-energy or particle physics and controlled thermonuclear fusion.

These studies are outgrowths of the wartime Manhattan District Project which the AEC inherited along with the weapons technology it spawned. Over the years the commission has built them up generously, and it houses them in national laboratories from Massachusetts to California. They represent the heart of the nation's physics establishment and are being particularly hard hit by the current cutback.

Translating dollars into jobs, the decline in support embodied in the AEC's budget request for fiscal year 1971 will mean the disappearance of about 1,400 jobs in the national laboratories, the commission figures. Its managers are now reviewing their operations and giving layoff notices in preparation for the beginning of the fiscal year on July 1. The cuts seem to be hitting high-energy physics particularly hard.

Although the total AEC research budget for fiscal 1971 (which begins July 1, 1970) is down by about $5.5 million, medium-energy physics shows an increase of $350,000, and controlled fusion is in for an increase of almost $2 million. High-energy is down by slightly more than $1 million, a figure that fails to reflect the hard cuts being made in some programs to make room for others.

The trimming of effort will not be exactly across the board: One aspect of high-energy physics, the construction of a 200-billion-electron-volt accelerator at the National Accelerator Laboratory, continues to grow. This, says Dr. Paul McDaniel, director of the AEC's division of research, requires more than proportionate readjustments elsewhere.

The cuts range from about five percent in some places to the closing of an entire accelerator laboratory, the Princeton-Pennsylvania Accelerator at Princeton, N.J., which may limp along into 1972 on maintenance money; its operating funds will entirely run out by the end of fiscal 1971.

The body count among scientists and support personnel will range from the entire staff at the Princeton-Pennsylvania Accelerator, 120 persons, to figures like 300 out of 5,800 at the Lawrence Radiation Laboratory at Livermore, Calif., or 400 out of 8,100 at Sandia Corp. of Albuquerque, N.M., and Livermore, a major AEC contractor.

Most laboratory directors will apply the same proportion of loss to all categories of jobs from custodial employes to Ph.D.'s. At LRL in Livermore 100 professionals and 200 nonprofessionals are being dropped. The professionals are about one-third physicists, one-third chemists and one-third engineers. Sandia expects to apply a five-percent reduction roughly in all categories; the corporation employs 241 physicists.

Other figures include:

- Los Alamos Scientific Laboratory —loss of 100 to 150 positions.
- Argonne National Laboratory—87 positions lost, more expected.
- Oak Ridge National Laboratory—350 positions lost, though many have been transferred to other operations of Union Carbide Corp., which manages the laboratory.
- Cambridge Electron Accelerator—about 60 positions lost.
- National Accelerator Laboratory —none lost, for the moment, but no increases.

The major alternative for physicists released by these cuts, especially for high-energy physicists, is the universities. But the universities aren't hiring either; their Government money is down too.

For example, the AEC has about 500 university research contracts. According to Dr. McDaniel, the commission will probably not be able to replace the 50 or so of these that will end for one reason or another in fiscal 1971.

"It looks very grim," says Dr. William W. Havens, executive secretary of the American Physical Society. The APS, he says, is discussing with other professional societies what might be done to help, but the organized concern is only a few weeks old, and no program has yet been worked out.

Dr. Havens feels that Ph.D. physicists will be taking jobs such as junior college or high school teaching, in which very few Ph.D.'s have been found recently, or in industrial research. Another out is computers: "Some high-energy physicists are outstanding systems programmers," he says.

The money for jobs of this kind has been rising in recent years so that the financial impact for individuals is not likely to be dramatic, but the changes will take people from the research they like to do. "They won't be happy," says Dr. Havens. □