and exert power over NCI funds that way. But at least, critics admit, the legislation might have been worse—squelching what progress NCI had made in the past, and severing a reasonably workable relationship among NCI and the various National Institutes of Health.

What boost a refurbished and glorified NCI might give to cancer research is too early to tell. All the legislative controversy over cancer research during the past months, however, has prompted the NCI to bring together some of the top medical researchers in the United States, from various disciplines, to confer on what directions cancer research should take. The scientists have been meeting in closed conferences since the end of October; they will conclude in January. Their decisions could well have a greater impact on American cancer research than the cancer legislation per se. □

When the Pacific crustal plate reversed itself

Whalers and fishermen have known for years that there is a narrow belt straddling the equator where plankton and fish are especially abundant. The fertile zone, only about 100 to 200 miles wide, is caused by upwelling in the boundary zone where the oceanic currents from the Northern and Southern Hemispheres meet. The upwelling brings nutrient-rich deep waters to the surface.

The rich life in this narrow equatorial belt deposits vast quantities of lime and silica shell material on the sea floor, creating a thick layer of chalk (SN: 12/27/69, p. 590). As the Pacific Ocean floor moves northwestward sediments deposited at the equator become covered with increasing thicknesses of non-equatorial sediments—mostly a red clay.

Scientists on Leg 20 of the United States' Deep Sea Drilling Project this fall traced the movement of the Pacific crustal plate by drilling into this chalky layer. In results announced last week, they found that during the past 125 million years the Pacific sea floor has moved northwestward more than 2,000 miles. Parts of the Pacific that were once under the equator are now just south of the Aleutian Islands.

The general magnitude of this motion was not too much of a surprise; previous drilling had shown movement of 600 to 900 miles over the past 50 million years (SN: 10/23/71, p. 279). A more significant find was that between about 70 million and 55 million years ago, the northwestward motion of the Pacific crustal plate was reversed and the Pacific floor moved southward for a while before resuming its northwestward drift. Drilling at a point east of the Mariana Islands, the earth scientists, led by Bruce C. Heezen of Lamont-Doherty Geological Observatory and Ian D. MacGregor of the University of California at Davis, found a 70-million-year-old layer of chalk below another chalk layer only 50 million years old. The two layers were separated by a layer of red clay.

Though evidence of radical shifts in the direction of plate motion has been discovered elsewhere, says Heezen, this is the first definite indication of a complete reversal in plate motion. Magnetic anomaly patterns in the Pacific had given some clue. Some of these patterns, which normally parallel the direction of sea-floor spreading, run north-south and others run east-west. This indicates that at some time there was at least a 90-degree turn in the direction of plate motion. These anomalies are roughly the same age as the reversal in plate motion discovered by the Leg 20 scientists. Heezen also suggests that the reversal might have been related to the rupture between Australia and Antarctica, which occurred about 65 million years ago.

The scientists also measured the rate at which the Pacific crust is being thrust under the Asian continent at the deep-sea trenches lying along the western margin of the Pacific. By mapping the deposits of volcanic dust cast over the Pacific floor by Asiatic volcanoes and determining how rapidly the deposit moved toward Asia, they estimate that the Pacific crust has been consumed beneath Asia at a rate of about four inches per year over the past 10 million years.

In the course of the voyage, in which nine holes were drilled, two records were set. At a spot about 800 miles southeast of Tokyo the Glomar Challenger's drill bit descended through 20,321 feet of water, and then drilled through 1,237 feet of rock. This was the deepest drilling—both in water depth and rock penetration—yet accomplished. The samples brought up were the oldest yet found in the Pacific, more than 135 million years old. □

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Leg 20's MacGregor and Heezen.

Quasars, galaxies and superlight velocities

In the decade that quasars have been studied, their cosmological importance has frequently been stressed. Quasars look like stars but radiate energy at rates suitable to galaxies. Some of them appear to be among the most distant objects known. This combination of qualities ensures them a special place in the history and evolution of the cosmos, but as yet there is no general agreement what it is.

In the Dec. 1 ASTROPHYSICAL JOURNAL a theoretical model that links quasars, galaxies and radio galaxies in an evolutionary sequence is presented; possible physical links between some quasars and some galaxies are noted, and more evidence regarding the internal structure of quasars including motions that are apparently faster than light is recorded.

The theoretical model is by Alfonso Cavalieri of American Science and Engineering and Philip Morrison and Kent Wood of Massachusetts Institute of Technology. It is based on a suggestion that Morrison made some time ago that quasars, the nuclei of certain galaxies and pulsars might all be similar objects: condensed spinning magnetic bodies.

In the present work an evolutionary scheme for bodies of this sort is presented. At some point early in the history of the universe galactic cores with masses between 10^7 and 10^{10} that of the sun detach themselves from the more or less amorphous background. It is possible that some of these cores could form without being surrounded by normal galaxies. These galaxyless cores would collapse to form quasars. Quasars do most of their radiating in the visible and infrared portions of the spectrum, but in the course of their evolution to that state some of them could give rise to the radio galaxies—galaxies that are dark or nearly so in the visible, but radiate strongly in the radio range.

The model gives a mathematical expression for the total luminosity of the quasar population at different stages of its evolution. The farther away a quasar is, the earlier in its career did it emit the radiation we now record. Thus the history of quasars can be compiled by going to successively greater distances. When that is done, the total quasar