

young when old, immunologically speaking."

Dr. Yunis is now injecting lymphoid cells and thymus glands into short-lived mice. He is also applying thymus grafts to them to explore the possibilities of engineering or reconstituting the immune response, and hence arresting or retarding secondary disease-associated aging.

Dr. Walford reported that animals who eat less are less prone to cancer, and that the same may be true of humans. When he fed just-weaned rats and mice only one-third a normal laboratory diet of calories but full doses of vitamins, minerals and other essential nutrients, they lived 50 to 100 percent longer than the normal two to three years, and developed 10 to 60 percent fewer cancers.

Dr. Walford's main interest is determining how a leaner diet, long life span and less cancer mesh with immune defense. Paradoxically, he said, a smaller diet reduces animals' immune response, although it is high immunity that is usually considered protective against cancer. □

EARTHQUAKE CORRELATIONS

The wobbling earth

As the earth spins on its axis, it wobbles slightly, so that the poles of rotation describe rough circles 20 to 30 meters in diameter around the geographic poles in a period of 14 months. This is called the Chandler wobble. The daily shift of the pole reaches a maximum every seven years. This shift, as much as six inches per day, has been measured daily by astronomers since 1900.

The cause of the wobble is unknown, but the British scientist John Milne suggested in 1893 that there may be a connection between the polar motion and major earthquakes.

Earlier this year, Dr. Charles Whitten, chief geodesist of the National Ocean Survey, who has correlated total energy released by recorded earthquakes during the past 70 years with the daily movement of the pole, pre-

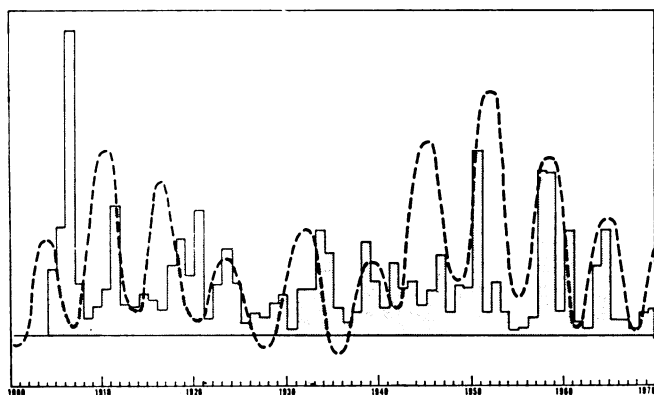
dicted that this year's earthquake activity should be a maximum because 1971 is a peak year in the seven-year cycle of polar motion.

New data released Aug. 3 by the National Oceanic and Atmospheric Administration's National Earthquake Information Center seem to confirm this prediction. According to NEIC seismologist Carl Von Hake, the amount of energy released by earthquakes this year from Jan. 1 through July 26 already exceeds that released in any one year since 1964.

Four major earthquakes have already occurred this year. These included three of Richter magnitude 8.1—one in New Guinea in January, one in the Solomon Islands and one in the New Britain Island area of the southwest Pacific in July. Also in July, there was a shock in Chile of magnitude 7.8. Three earthquakes of magnitude 8.1 have not occurred within a single year since 1950, another peak year.

Among scientists who see a correlation between wobble and earthquakes, some believe the quakes contribute to the earth's wobble, and others think the polar shift may trigger earthquakes. Dr. Whitten believes it may work both ways: The shift may trigger earthquakes which in turn increase the polar wobble. But he is not suggesting earth's wobble as the sole cause of earthquakes. "Many things undoubtedly enter into it, including the shifting of the earth as strain builds up beneath the surface and possibly even the pull exerted on the earth by the moon and sun. But when you add to this the earth's wobble as it reaches its maximum, you have another apparently tremendous force which may trigger earthquakes."

One problem in drawing correlations between polar wobble and earthquakes is that the various sources that measure wobble show discrepancies of as much as 0.1 second of arc. Part of the international Earth-Physics Satellite Observation Campaign, to begin next month, will include a 14-month effort to measure the Chandler wobble more precisely with laser observations from orbiting satellites. □



Earthquake energy (shaded area) and mean daily shift of the polar wobble: "A definite correlation."

NOAA

WATER POLLUTION

Muskie package to Congress

Sen. Edmund Muskie's subcommittee on air and water pollution reported out the expected 1971 omnibus bill on water pollution last week. It has a number of features which will appeal to environmentalists, but it also retains some criticized provisions of older laws.

Some of the new provisions:

- More money for construction grants for sewage treatment—\$20 billion in Federal funds over the next five years. The emphasis is to be on innovative techniques for recycling and reclaiming wastes.

- Incentives for states to develop control of non-point sources of water pollution, primarily agricultural runoff.

- National water quality standards, to take effect by Jan. 1, 1975, after development of implementation plans. In the meantime, less-stringent 1965 water quality standards would apply.

- A flat prohibition against discharge of toxic pollutants, unless small amounts are determined to be harmless.

- Uniform national standards for 29 new sources of water pollution, formulated on the basis of available abatement technology.

- Emphasis on regional, rather than local, treatment facilities.

The aim of the bill is "the maintenance of the chemical, physical and biological integrity of all waters, including lakes, streams, rivers, estuaries and the oceans." This goal is to be accomplished by Jan. 1, 1980.

The permit and penalty provisions of the 1889 Refuse Act are retained in the new bill, although they would be under the administration of the Environmental Protection Agency instead of, as currently, the Army Corps of Engineers. Environmentalists have criticized the refuse act as providing "licenses to pollute," although its workability as an antipollution statute has not yet been fully tested.

The bill also retains criminal penalty provisions for polluters and makes the provisions even more stringent. Such provisions have been attacked as essentially vengeful and moralistic; instead, say critics such as Sen. William Proxmire (D-Wis.), fees realistically tailored to actual abatement costs—and earmarked to pay such costs—might work a lot better than arbitrary fines or jail sentences.

Scientists at Michigan State University and elsewhere have suggested, however, that charging industries fees for wastes put into municipal sewage systems—in the manner envisioned in the new bill—is the wrong approach (SN: 4/24/71, p. 286). Instead, they say, industries should clean up wastes before dumping effluents into the systems. □