earth sciences

Spotting future earthquakes

One of the consequences of plate tectonics is that the seismic history of a given fault can lead to certain inferrences about future earthquakes.

Using past seismic records, Lynn Sykes of Lamont-Doherty Geological Observatory located the aftershocks of earthquakes greater than magnitude 7 in the Aleutians, Alaska and western Canada from 1920 to 1970. He found three areas, one in southeast Alaska, one in southern Alaska and one in the far western Aleutians, where there have been no large earthquakes recently. These areas are likely candidates for future large quakes, he believes.

Sykes also found that large earthquakes are much more regular than small ones in their distributions with respect to space, time and size. Aftershock zones of quakes over magnitude 7.8 are longer than 250 kilometers and those of quakes less than 7.5 are shorter than 125 kilometers, he reports in the Nov. 10 JOURNAL OF GEOPHYSICAL RESEARCH. Large earthquakes seldom, if ever, reoccur along the same part of a fault zone in less than several tens of years.

Mapping fault zones with infrared

The surface traces of major faults can often be spotted from the air. But in some places, such as California's Imperial Valley, agricultural activity has eliminated small topographic effects of faulting.

Within the irrigated valley and its desert margins, says Elkanah A. Babcock of the University of Alberta, there may be differences in soil moisture on opposite sides of a fault, creating differences in the vigor of vegetation. These subtle variations of plant vigor could be recorded on infrared film.

Infrared aerial photographs revealed two previously unmapped zones of active faulting along the eastern side of the Imperial Valley. Babcock concludes, in the November GEOLOGICAL SOCIETY of AMERICA BULLETIN, that infrared aerial photography, when confirmed by ground observations, effectively located fault traces in the Imperial Valley and should be useful in other vegetation-covered areas, such as alluvial plains and prairies.

Chemical composition of aerosols

Most measurements of aerosols in the troposphere—the lower four or five miles of the atmosphere—have been made near the ground in urban areas. There is relatively little information on the chemical composition of aerosols throughout the troposphere.

Dale A. Gillette and Irving H. Blifford Jr. of the National Center for Atmospheric Research collected aerosol samples at altitudes up to 10 kilometers over Nebraska, Death Valley, Calif., the Pacific Ocean about 250 kilometers west of Santa Barbara, the central Pacific, Venezuela and Chicago.

They report in the October JOURNAL OF THE ATMOSPHERIC SCIENCES that the average concentrations of chlorine, sulfur, potassium, calcium and titanium decrease rapidly up to a height of one kilometer and then remain fairly constant. The scientists believe the rapid decrease with altitude of concentrations of titanium, silicon, calcium and potassium suggests a source in the soil. Particles containing sulfur probably came from sea salt, soil and pollution, they conclude.

medical sciences

Apparent cure for rabies

The painful and always fatal virus disease rabies may at last be licked—not with the traditional series of rabies vaccine shots that sometimes ward off the disease after a person has been bitten by a rabid animal but by the timely use of relatively simple medical techniques.

In the autumn of 1970, a six-year-old boy from Lima, Ohio, Matthew Winkler, was bitten by a rabid bat. Vaccine shots did not ward off the disease. At this time Michael Hattwick of the National Center for Disease Control in Atlanta, inserted a tube in the boy's throat to keep him from suffocating, drained off cranial fluid to keep pressure from building up, monitored his heart to forestall cardiac arrhythmias and gave him Dilantin to prevent convulsions, and oxygen. As a result Matthew is the world's only known survivor of rabies.

Hattwick believes such a technique can be applied by any competent physician and avows that if it is properly timed, it should constitute a cure for rabies.

Hormones and homosexuality

Homosexual behavior has traditionally been regarded as a result of social and psychological influences during infancy and childhood. But with the increasing understanding of hormones and more refined laboratory assays, research linking biology with homosexuality has been rewarding.

Recently low urinary secretion of the male hormone testosterone was noted in two homosexual men, and elevated testosterone levels in four homosexual women. These findings prompted Robert C. Kolodny of the New England Deaconess Hospital in Boston and his colleagues, to study sperm production and levels of testosterone in the blood of 30 homosexual men and in 50 heterosexual men.

As they report in the Nov. 18 NEW ENGLAND JOURNAL of MEDICINE, the homosexual subjects indeed showed significantly lower testosterone levels as well as fewer sperm counts than their heterosexual counterparts.

These findings, the researchers believe, strongly suggest that hormones may play, if not a major, at least a secondary role in human sexuality.

Nerve synapse and memory

Science fiction no longer has an exclusive on learning or memory molecules (SN: 11/6/71, p. 308). However evidence for the implication of nerves, as well as of individual cells, in learning is also mounting.

On the basis of ample evidence that drugs used to block or to aid memory alter to some degree the synaptic conductance of cholinergic nerves, J. Anthony Deutsch, psychologist at the University of California at San Diego, hypothesized that learning might correlate with heightened sensitivity of the postsynaptic membrane—perhaps by stepping up its sensitivity to acetylcholine, a chemical transmitter. To test this idea he injected a drug into the postsynaptic cholinergic nerves of rats that had been trained in a specific task. He found that the particular dosage blocked learning acquired seven days before, but not three days before. This differential, which Deutsch reports in the Nov. 19 SCIENCE, shows that the postsynaptic membrane of cholinergic nerves is indeed involved in learning, although its exact role remains to be elucidated.