BIOLOGY

Cracking the nerve code with antibodies

The color code of wires in a complex circuit helps the electrician to recognize each wire and hook it up properly. Biologists have suspected that the connections of nerve cells in an animal similarly depend on a set of markers. The code is thought to involve specific molecules on the surface of nerve cell bodies and on their long processes. Now Birgit Zipser and Ronald McKay of the Cold Spring Harbor Laboratory in Cold Spring Harbor, N.Y., have demonstrated the presence of chemical markers on individual cells and groups of cells in leeches.

Zipser and McKay detected the markers by making monoclonal antibodies to the entire isolated nervous system of the leech, they reported at the recent meeting in Cincinnati of the Society for Neuroscience. They produced 475 cell lines, each making large quantities of a specific antibody. Approximately 300 of the antibodies bound to some cell surface marker of the leech nervous system, and 41 antibodies bound, as the investigators had hoped, to restricted sets of neurons or fibers. Because individual nerve cells have been identified in the leech's relatively simple nervous system, in some cases Zipser and McKay know the function of the nerve cells tagged by a given antibody.

The leech nervous system is arranged in repeated groups of nerve cell bodies called ganglia. One antibody obtained by Zipser and McKay binds in each ganglion to the four cells that sense pain. Five different antibodies label the cells that sense pressure, as well as an assortment of other neurons. Because the antibodies stain different patterns of neurons, the scientists infer that the five antibodies attach to five different cell surface molecules. They suspect the patterns will point out the nerve cells involved in processing information from the pressure sensing cells.

One intriguing antibody binds to a pair of specialized nerve cells found only in the two ganglia that control reproductive functioning. One pair of the cells had been identified previously as the penile evertor motor neurons. The antibody also binds to a pair of neurons found in each midbody ganglion and to several cells in the specialized head and subesophageal ganglia. Zipser and McKay suggest the antibody tags a network of nerve cells controlling a sexual function. In addition to identifying groups of cells that function together in the adult, the scientists expect the antibodies to allow them to trace cells through development.

Aging may brake transport in cells

The traditional focus in research on aging has been the deterioration of vital activities. But some scientists now suggest that aging may be the result of active consolidation processes in cells. "We can consider aging as the continuation of normal development instead of a cumulative catastrophe," says Ray J. Lasek of Case Western Reserve University in Cleveland. Development involves both dynamic and stabilizing mechanisms. "The balance shifts with aging to less plasticity," he told the recent meeting in Cincinnati of the Society for Neuroscience.

Lasek studies the transport of material in the nerve cell axon, the long outgrowth that contacts other nerve cells and muscle. Five different systems in the axon carry substances away from the cell body at five different rates ranging from 0.2 to 400 millimeters per day. Lasek says that the rate of just one, the slowest transport, decreases dramatically after birth and continues to slow during an animal's life. That system carries some of the materials necessary for the axon to grow and to sprout new endings, so the slowing may be linked to the decreasing potential for nerve cell regeneration observed as an animal ages. He suggests that the brake on the transport process may be continuous addition to the axon of such stable and stabilizing structural components as neurofilaments.

EARTH SCIENCES

Tectonics-torn Italy

At a meeting in Strasbourg in early March 1979, a group of Italian and Soviet scientists presented a map of Italy, crisscrossed with lines and flecked with squares and circles, that showed what they thought were the most likely spots for future earthquakes. On Nov. 23, one of those spots, which had been labeled "most dangerous," suddenly and tragically fulfilled its promise. With the death toll at 3,000 and climbing and as many as 300,000 left homeless, the magnitude 6.8 earthquake that struck southern Italy is the strongest to hit that country since 1976 and the deadliest since 1930.

The scientists' 1979 paper is hardly a triumph for earthquake prediction, which endeavors to fix a time, place and magnitude to future quakes. But it is still much to the credit of M. Caputo of the Università degli Studi in Rome and his Soviet colleagues that they were able to identify the region just east of Naples as a seismic hot spot, for Italy is a tectonic horror, a geologic crossroads of possibly three tectonic plates, each exerting its own earth-rending force on the region.

Though far from established, the commonly accepted view of the area's tectonics is that the African plate is pushing northward and beneath the eastward-moving Eurasian plate (though exactly which plate is moving is disputed). About 30 million years ago, this motion slammed Italy into Europe and buckled the Alps skyward; currently, Africa's headlong march stokes Sicily's Mt. Etna, which has been erupting intermittently for the past year, and caused the recent Algerian quake (SN: 11/15/80, p. 317).

But Italy is also torn by other geologic forces. Though unclear, it appears that the eastern half of the Italian peninsula may have been part of an ancient plate, which also carried Yugoslavia, Greece and other Adriatic countries. This plate, whose boundaries are disputed and which has a variety of names, may still exist independently or may have become welded to the African plate, from which it extends like a thumb hitching a ride to the West. Indeed, this thumb's westward journey is what puts a seismic cinch on Italy. As the African plate moves north, the thumb moves north and west and shoves beneath the eastward-traveling Eurasian plate. And Italy, half on each of the two plates, is the victim of this tectonic squeezeplay. The seismic history of southern Italy is testimony to this geologic pressure — 13 of Italy's 21 major quakes in the past 100 years have occurred south of Naples. The most deadly recent quakes, however, occurred elsewhere in the country in 1908 and 1930.