Technology

Solid electrolytes

Electrolytes are substances that carry electric current through the migration of ions rather than just through the movement of electrons, as in a wire. They form the working material of fuel cells and electric batteries by transporting ions from chemical reactions taking place at one electrode to those at another. Generally, electrolytes are either liquid solutions (such as the acid in a car battery) or molten salts, and their fluid state is often inconvenient because it tends to promote corrosion, leakage and instability. Miniaturization is difficult in devices that contain liquids. Also, in fuel cells, the operating temperature of what solid electrolytes do exist is quite high, which limits their applicability to everyday use.

Many of the problems associated with present electrolytic devices could be solved if new solid electrolytes could be produced, and a report in the May COLUMBIA ENGINEERING RESEARCH tells of progress being made in this endeavor. Columbia University professor A. S. Nowick and some of his students have succeeded in creating a solid electrolyte with ion conductivity an order of magnitude better than its most common predecessor and with a substantially lower operating temperature. The new material is crystalline cerium dioxide into which a small amount of calcium oxide or other impurity has been added. The sites of the impurity in the crystal lattice provides pathways for the movement of ions, which jump from site to site "like the movement of marbles in a game of Chinese checkers." A full account of the research is being submitted to the JOURNAL OF THE ELECTROCHEMICAL SOCIETY.

More minority engineers

The National Academy of Engineering has teamed up with 16 major American industries to help attract more minority students into technological fields. The goal of the National Advisory Council on Minorities in Engineering, which includes representatives of minority organizations as well as business leaders, is to raise the number of minority college engineering graduates from current levels of 500 a year to 6,000 a year by the mid-1980's.

A first step in bringing this message to minority students, while they are still young enough to respond, is a traveling exhibit put together by the General Electric Co. It has been touring junior-high schools in the Philadelphia area this spring and will go to Washington, D.C., and Cleveland this summer and fall.

Called "Expo-Tech," the exhibit features a multimedia junket through the development of engineering from man's first tools through complex modern achievements in electronics, chemistry and space. The sponsors report high interest among the minority students who have had a chance to see it.

Son of Super Slurper

A new family of super-absorbent materials, whimsically called "Son of Super Slurper" by their inventor, William M. Doane, a chemist with the U.S. Department of Agriculture, can soak up some 1,300 times their weight of distilled water. Technically called hydrolyzed starch-polyacrylonitrile graft copolymers (H-SPAN), the new materials are more than 30 times as effective in sopping up liquids as cellulose fibers, now the most common absorbent material used in disposable products. The H-SPAN's should find immediate use in bandages, diapers, soil conditioners and erosion-control agents.

Ecology

Genes in evolution and extinction

So enamored have most evolution biologists been of the importance of natural selection in determining the progress of a species that relatively little empirical work has been done on the accumulative effect of random changes in inherited traits—the so-called "genetic drift." Though a mathematical theory of such changes was worked out several decades ago, experimental confirmation was hard to come by since trait changes due to random events are hard to distinguish from those fostered by selection pressures. In addition, most random changes are slight and thus escape notice.

Now, several experiments have been launched using the tools of biochemistry to detect small changes in protein structure of animals, and one recent study, published in the May 24 SCIENCE by Michael L. Bonnell of the University of California at Santa Cruz and Robert K. Selander of the University of Texas at Austin, illuminates the existence and nature of genetic drift, and also dramatically demonstrates its importance to species survival.

In the mid-19th century, the northern elephant seal almost became extinct through overhunting; the total population dwindled to approximately 20 individuals. This small group likely did not have in its gene pool the entire reservoir of genetic variability once possessed by the species—a reservoir that presumably had helped the animals to survive environmental changes, since at least some individuals would possess an ability to adapt. As time passed, random drift in this small group could have reduced this reservoir even further, by causing various traits to be lost through chance genetic change.

Bonnell and Selander thus have found no structural variation in the proteins they studied among individuals of northern elephant seals. Five variable proteins, however, were found among southern elephant seals, which never underwent such a drastic population reduction. Groups with no genetic variation "can't have much of a future" Selander told SCIENCE NEWS; and as a result, the northern elephant seal lies in greater danger of extinction from changes in the environment than its southern cousins.

The flightless ibis of Hawaii

The partially fossilized remains of a recently extinct flightless ibis—long-legged wading birds related to herons—have been found in a lava cave on the island of Maui. The discoverers claim this is the first record of an ibis outside the tropical continental mainland and also the first recorded flightless ibis anywhere.

The discovery was made by Wayne Gagne and Frank Howarth of the Hawaii International Biological Program at the Bishop Museum of Honolulu and Betsy Harrison of the Hana Rain Forest Project at the University of Hawaii—the NSF-sponsored Student Originated Studies Program project which last year discovered a new bird genus in Hawaii (SN: 1/12/74, p. 22).

Like other flightless birds, the ibis probably evolved away from its mainland relatives because of the lack of natural predators on the remote islands. The bird's discoverers hypothesize that the population was decimated by colonizing Polynesians and the animals they introduced, probably reaching final extinction in the early 19th century with the coming of Western man. The bones of two flightless rails were also found with the ibis, the first record of this bird on Maui.