

BIOLOGY

Healing neuron short-circuits damage

Severed nerve cells in the leech central nervous system have an amazing ability to reconnect with their normal contacts, even if they have to pick them out from hundreds of alternative cells. Biologists are searching for the clues that guide cells in selecting connections, first in development and later in repair. Salvatore Carbonetto and Kenneth J. Muller of the Carnegie Institution of Washington are examining regeneration in nerve cells that connect by electrical synapses, where current flows directly between the cells. The researchers suggest that, as a step in the repair of normal cell communication, the regenerating nerve cell forms a temporary electrical synapse with the severed piece of its own axon. That axon segment is still connected to the original synapse.

Carbonetto and Muller examined cut neurons with an electron microscope and also recorded flow of current through the cells at various times after injury. In two to three weeks, electrical impulses are again able to pass from the cut neuron through the severed segment to its target cell, although about a month is required before the regenerating nerve process reaches the location of the original synapse. "The segment seems to be an imperfect target for the regenerating neuron, however, for the neuron continues growing along the axon segment to the normal site of synapse, where growth ceases," Carbonetto and Muller conclude in the June 2 *NATURE*.

Jellyfish beat planes in efficiency

Jellyfish and aircraft differ significantly in their modes of jet propulsion. A scientist at Technion—Israel Institute of Technology—has been examining the jellyfish movement to see if aircraft designers made the wrong choice.

Aircraft are propelled by a continuous jet emission, while many marine animals produce pulses of jet propulsion. "From a purely anatomical standpoint, development of continuous jet propulsion [in animals] seems feasible, so there may have been some evolutionary incentive for pulsing," Daniel Weihs says. His study of marine animals shows that significant gains in thrust can result from the pulsing movement. "By moving in bursts and glides it is possible to work at your most efficient power or just glide. Therefore, on the average, you save energy and make the best use of that produced," Weihs explains.

Pores made for artificial membranes

The holes in biological membranes are often their most important feature. They determine what ions can get in and out of cells and are an intricate part of specialized functions, such as conduction of nerve signals. To understand the detailed functioning of natural cell surfaces, scientists are attempting to duplicate their characteristics in artificial layers made of lipids. Researchers at Indiana University School of Medicine have now synthesized molecules that can create pores in artificial membranes, they report in the June 17 *SCIENCE*.

The molecules that Stephen J. Kennedy, Henry R. Besch Jr. and colleagues inserted are polypeptides of a repeating sequence of four amino acids. The polypeptide chain is coiled into a structure called a beta helix. The polypeptide spans the membrane with lipid-soluble portions of the amino acids facing outward and water-soluble groups lining the interior of the channel. Adding the polypeptides to an artificial membrane caused a thousandfold increase in its permeability. As in certain biological membranes, potassium ions passed more easily than sodium or lithium. However its conductance was much greater than that of natural membranes. Further work using a slightly different sequence of amino acids has produced a channel more like those of natural membranes, Besch says.

TECHNOLOGY

Scientific equipment: More demand?

According to a market study, the sale of scientific instruments—one measure of scientific activity—will increase by about 92 percent between 1976 and 1981. This will represent a dramatic departure from the decreases of the recent past.

The report, published by Creative Strategies, Inc., in San Jose, Calif., attributes the incremental demand, in part, to the additional instrumentation required to comply with more stringent government safety regulations. This revitalization, however, is also consistent with recent industry figures that reveal a general rejuvenation in R&D spending (SN: 6/18/77, p. 392).

The report indicates that the sale of analytical instruments worldwide will increase from \$1.131 billion in 1976 to \$2.132 billion in 1981. In the United States alone, the change is expected to be greater—an increase from \$425 million to \$1,195 million in the same time period. This represents an annual increase of 23 percent.

New solar cell is stable, efficient

Several scientists at Bell Laboratories have achieved significant improvements in semiconductor liquid junction solar cells. Besides converting solar illumination to electrical energy with a notable 9 percent efficiency, their device is also remarkably stable and resistant to corrosion. These kinds of cells have attracted recent attention because they are cheaper than the conventional all-solid ones.

K.C. Chang, A. Heller, B. Schwartz, S. Menezes and B. Miller report in *SCIENCE* (196:1097) that their cell has a useful lifetime of several years, under nominal insolation (about 70 milliwatts per cm²). This is an improvement over past achievements.

Their experimental apparatus consists of two electrodes (gallium arsenide and carbon) fully immersed in an aqueous chemical solution. When the cell is illuminated, electrical current flows from one electrode to the other via the solution, much like in an ordinary battery.

In order to obtain the highest efficiency (currently, 21.9 percent) in an all-solid solar cell, it must be made with a single crystal of semiconductor material. Single crystals are expensive to make. The liquid cells, however, can be made to function well even using cheaper polycrystalline components.

Industry briefs

- Rolls-Royce plans to place into production a new jet engine that will burn 40 percent less fuel than previous models. The so-called RB.401 engine is designed primarily for small business jets, but has been made tough enough to be suitable for such military applications as remotely piloted vehicles. The small engine has proven so successful that Rolls-Royce is now considering how to modify the design for larger engines, such as those used in commercial passenger planes.

- A new model for efficient handling of technical information has been developed at the Xerox Corporation and may have important implications for communication between major laboratories or large university libraries. The company discovered simply that it is now more efficient to send microfiche copies of a new technical document to all libraries in a system than to store the documents in a central location and send out printed copies on request. Each library in the company's widespread divisions thus has a complete microfiche file of all technical documents produced at the other branches, which can be reproduced into "hard copy" by the Xerox 970 microfiche printing machine. Titles are catalogued and retrieved by computer.

- The General Electric Research and Development Center in Schenectady, N.Y., has announced development of a technique that reduces the time for "doping" the semiconductor wafers used in manufacturing electronic components from a week down to only a few minutes.