TECHNOLOGY

Tapping a volcano

On a clear day in Portland, Ore., a person with sharp eyes can spot smoke and steam near the top of Mt. Hood, an old volcano about 60 miles to the east. Its steam may one day help power the city, if geological engineers from the University of California's Lawrence Berkeley Laboratory have their way. The engineers are tracking the circulation of hot water within the volcano's interior. Its geothermal water, at temperatures of 100°C to 150°C, could provide a cheap source of heat for ski lodges on Mt. Hood that now use oil. If hotter water is found, steam-driven turbines might provide electricity for Portland.

To map Mt. Hood's internal structure, the researchers study the earth's low-frequency electromagnetic field for signs of volcanic formations such as chambers and pipes of hot, molten rock. Also, gases shot from cracks near the volcano's summit are tested for trace elements, which tell what rock layers geothermal fluids come from and how long they pool in certain places. Since little is known about the geothermal potential of Mt. Hood, the researchers hope to reduce the exploration risk and encourage industry to drill deep wells. With luck, part of the volcanic energy potential of the United States — by one estimate about 1,000 times the annual energy consumption (SN: 6/18/77, p. 393) — may come into use.

Shirt wars: Cotton vs. polyester

A battle is brewing over how much energy it takes to make a shirt. Cotton International claims that five times more energy is used to produce polyester than cotton and that nonrenewable petrochemicals are wasted on the polyester. Not quite, says a study in the May-June AMERICAN SCIENTIST. Researchers from Yale University and Catholic University found it takes 3.5 times more energy to produce 100 pounds of polyester than 100 pounds of cotton lint. However, the researchers also say that more fiber is needed per cotton shirt due to loss during fabric production. Polyester shirts, moreover, have a longer life and take less energy to wash, dry and iron.

The study concludes that energy saved in maintaining an all-polyester or polyester/cotton blend shirt far outweighs the initial savings in the production of raw cotton fiber. "When one considers that the shirt made with polyester will last one and one-half times as long as the 100 percent cotton shirt, nearly 88 percent more total energy is consumed by all-cotton shirts as by their polyester blend equivalents," the report noted. In response, the National Cotton Council asked: "Does durability really matter, or do changes in fashion cause garments to be discarded long before they are actually worn out?" Take your pick.

Cutting back those Btu's

Efforts to conserve fuel and electricity by about 3,000 energy-hungry U.S. firms have paid off. According to a report by the Department of Energy's voluntary business energy conservation program, energy efficiency for these firms — which use 50 percent of the industrial energy in the United States — climbed one percent in the first half of 1977. The savings were equivalent to 667,000 barrels of oil per day, according to the report. Best efficiency gains of 1977 were made in the chemicals and petroleum industries. Although energy-use improvements were generally widespread, a few industries lost ground. Primary metals, textiles and foods all reported moderate declines in energy efficiency. The one percent gain in efficiency brings the total since 1972 to 9.2 percent. Although the gain was small compared with the more than four percent gain made from 1975 to 1976, the report notes that progress despite the severe winter of 1977 is encouraging.

BIOMEDICINE

Making the right connections

Hooking up the nerves of the body to the right place and at the right time during development is no easy task. Some of the secrets of this wiring wizardry have been discovered by Robert R. Ruffolo, George S. Eisenbarth, Jeffrey M. Thompson and Marshall Nirenberg of the National Heart, Lung and Blood Institute. They found that nerve cells, or neurons, from the retina and the spinal cord of chick embryos will form connections, or synapses, with muscle cells or other neurons only during a critical or "window" period during their development. If the neurons don't make connections during that period, apparently they never do. Moreover, if the neuron should make a mistake and connect with the wrong kind of cell, say a muscle cell instead of another neuron, the synapse is given short shrift.

The investigators report in the May PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES that neurons of the developing retina only form synapses with muscle or other retina neurons between the sixth and 16th day of development, while those of the developing spinal cord make connections only between the second and 16th and 17th day of development. They removed retina and spinal cord cells from chick embryos of various ages and cultured them with striated muscle formed from embryonic muscle cells of fetal or newborn rats. They found that 94 percent of the synapses ever formed by the cultured retina neurons were made on the sixth day of development, within 84 hours of the time the ability to form synapses appears.

However, while the retinal neurons readily made a multitude of synapses with the muscle cells, the synapses were short-lived: Within 21 hours after formation, half of the synapses were no longer functioning. In contrast, synapses between two retina neurons were quite stable. During normal development in the chick, neurons of the retina hook up to other retina neurons but not to striated muscle cells. In other words, retina neuron to muscle cell represents a wrong connection. Spinal cord neuron to muscle cell is the formation of a correct connection, however, and when spinal cord neurons of eight-day-old chick embryos were cultured with rat striated muscle, the synapses formed were long-lived.

The authors concluded that the time limitation put on synapse formation coupled with the failure of ill-chosen synapses to survive may be a general mechanism of the assembly of some circuits in the nervous system during development.

Lung lining leads to easy breathing

How can a mammalian fetus, whose lungs are filled with liquid as long as it remains in the womb, suddenly start breathing air a few seconds after birth? Animal studies conducted by Emile M. Scarpelli, a pediatrician at Albert Einstein College of Medicine in the Bronx, N.Y., are revealing the mechanism....

As a mammalian fetus starts breathing, a phospholipid coat lining its lungs allows the lungs to produce bubbles of air. The bubbles enable oxygen to reach the lung and then to pass quickly into the bloodstream. After that, the phospholipid film lining the lungs keeps the lungs open and filled with air. At this point, the lungs start breathing like adult lungs.

Sickle cell yes, malaria no

Sickle cell gene carriers are resistant to malaria. Milton J. Friedman of Rockefeller University in New York reports in the April PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES one way the sickle cells resist the malarial parasite. The parasites can infect the red blood cells of carriers of the sickle cell gene, but when oxygen is in short supply, the metabolism of the parasite is disrupted and it dies.