

GENERAL SCIENCE

Royal Society, 1660-1960

Founded by King Charles II, the Royal Society celebrated its tercentenary with a nine-day meeting in London attended by scientists from all over the world.

Reports by Tove Neville from London

BIOCHEMISTRY

Energy-Rich Booster Chemicals Recharge Tired Nerves, Help Them Recover

NORMAL NERVE FIBERS, which operate somewhat like the transmission system in an automobile and can run down like a tired battery, are kept going by a built-in recharger, scientists attending the tercentenary celebration of the Royal Society in London were told.

Dr. A. L. Hodgkin, research professor of the Royal Society and fellow of Trinity College at Cambridge University, said it has recently been possible to obtain evidence about the source of energy for the "ionic pump," which starts a tired nerve fiber on its way to recovery.

Most of the research has been done on the whopper-sized nerve fibers of the squid, a ten-armed relative of the octopus. In a fully grown Atlantic squid, *Loligo forbesi*, the fibers are four to eight inches long and one twenty-fifth of an inch in diameter.

For some time physicists and physiologists working on the problem of nervous transmission have known that the inside of the nerve fiber usually has a high concentration of potassium ion. Outside the thin fiber membrane is a high concentration of sodium ion.

When an electrical, or nerve, impulse

comes along, some of these ions trade places through the membrane. Each exchange takes place in one millisecond, but the time required for the ions to return to their proper places after the impulse passes is relatively long. If too many impulses must be transmitted before the ions are back in their resting places, the nerve would become tired.

Without help the fiber cannot get the ions back where they belong. In poisoned or fatigued isolated squid nerve, Dr. Hodgkin said, the needed recharge comes in the form of energy-rich, phosphate chemicals—arginine phosphate and ATP, adenosine triphosphate. Either of these will bring temporary recovery to a fiber that has been poisoned, or essentially worn out, with cyanide. A large dose of arginine phosphate makes the fiber almost normal.

What happens is that the booster chemicals push the sodium ions back outside the fiber membrane and the fiber recovers. Tracer studies have shown that it takes one or two molecules of arginine phosphate to eject a single sodium ion, Dr. Hodgkin reported.

• Science News Letter, 78:67 July 30, 1960

PHYSICS

Studies of the Tracks of Cosmic Rays Will Provide Valuable Information

PREPARATIONS are now being made to capture tracks of cosmic rays with energies up to a million billion electron volts at 100,000-foot altitudes, Prof. C. F. Powell, Nobel Prize winner of the University of Bristol, told scientists at the tercentenary meeting of the Royal Society.

He said an expedition, supported by the Research Council of NATO, will send an emulsion "sandwiched" with layers of tungsten up for 40 hours' study of cosmic ray particles from a balloon in 1961. The presence of the tungsten causes the production of large numbers of electrons that appear as bundles of tracks visible to the unaided eye. The studies of the tracks give valuable information about neutral particles that could not be got by any other means.

Prof. Powell said that most elementary particles have been discovered by experiments with cosmic radiation. Later, the properties of particles and their behavior were investigated by beaming particles at a target in large atom smashers.

A second way of studying the particles is to make use of the protons and other nuclei of great energy that enter the earth's atmosphere as cosmic radiation.

The great advantage of sending detecting apparatus to high altitudes is that the particles have not been modified by passage through the atmosphere, said Prof. Powell.

For such experiments photographic emulsions are used to record the tracks of particles with great advantages. The emulsion stays sensitive and no extra apparatus is needed to make exposures. The observations allow very detailed study of individual nuclear collisions by the protons.

Several international balloon flights carrying "stacks" of emulsion to high altitudes have been undertaken, the first two from Sardinia in 1953 and 1955, Prof. Powell reported. He said many European scientists participated in these expeditions.

The latest experiment in this field was a result of international collaboration. A stack of pure emulsion was recently

launched by balloon from the United States aircraft carrier, *Valley Forge*, in the Caribbean.

The balloon rose 115,000 feet and was recovered after about 14 hours flight. A second flight is being attempted in Texas, he said.

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TECHNOLOGY

Nuclear Power Necessary In Britain by 1970's

THE COST OF ELECTRICITY from the atom must be cut to help Britain meet fuel shortages expected by the early 1970's, Sir Christopher Hinton, chairman of the country's Central Electricity Generating Board, told the Royal Society at its tercentenary celebration in London.

Nuclear power will be cheaper when higher temperatures can be achieved, Sir Christopher said. Advances in technology are still bringing down the cost of conventional power. Therefore, nuclear power will have to compete with falling costs to break even and then go below cost of currently used fuels, he said.

That nuclear power is not already as cheap as conventional power is due to problems within the nuclear generators.

The development of magnesium alloys (magnox) made nuclear power generation possible, Sir Christopher said. However, further advance cannot be expected until a new material can be found. Use of stainless steel or beryllium is not promising because the cost of fuel elements would exceed that of magnox.

Sir Christopher said one engineering problem in nuclear generator design deals with the large pressure shells, made from plates of thicknesses so great that possibilities for rolling and cross-rolling of the material are minimized. There is a danger of casting defects and coarse grain in the steel for this reason.

Besides, welding of these thick plates is not easy and brittle fracture, increased by neutron irradiation, makes the problems even greater.

Past experience of reactor development has led the British Atomic Energy Authority to design the advanced graphite reactor (A.G.R.), Sir Christopher said.

It is estimated that the capital cost of the first industrial reactors of the A.G.R. type will run at about \$250 per kilowatt hour.

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GENERAL SCIENCE

Faith in Science Urged Despite Dangers

DO NOT DISRUPT YOUR WORK by worry over a devastating nuclear war or over world starvation from the population explosion. Have faith in science.

This is the advice given scientists by Sir Cyril Hinshelwood in his address as president of the Royal Society at its tercentenary meeting.

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