PHYSIOLOGY

Radio Tubes Amplify And Measure Nerve Messages

Using Electrical Connection With Nerve Fibers Scientists Are Learning More About Effects of Different Stimuli

RADIO TUBES and the general mechanism used in modern radio for the amplification of very weak electrical impulses have been exceedingly useful to the physiologist in his laboratory. They have enabled him to learn more about the nature of messages sent along nerve fibers to and from the brain, and thus to push out a little farther the frontier of man's knowledge about himself.

This point was developed in a radio talk by Prof. D. W. Bronk of the University of Pennsylvania, given under the auspices of Science Service over the network of the Columbia Broadcasting System.

Nerve impulses travel at rates from three to three hundred feet a second, and appear to be electrical in their nature. By an exceedingly delicate operative technique, it is possible to separate out a single nerve fiber from the hundreds with which it is usually trunked, and attach to it a wire leading to an electrical recording instrument. But single nerve impulses are so weak that for a long time it was exceedingly difficult to detect them. It was at this point that the development of radio amplification proved of benefit to physiologists. By magnifying these weak impulses more than a hundred thousand times, they can be made to register themselves on automatic recording mechanisms.

No matter where a nerve impulse originates, whether in eye or ear or touch organ, it seems to be the same thing as it travels back along the nerve fiber toward the brain or other nerve center. Why this is so is one of the still unsolved riddles of science.

Weak Stimulus, Few Reports

But one of the riddles that has been at least partially solved is that of nerve action under stimuli of differing intensities. A weak stimulus will cause only a few reports to be sent in from the sense organs that look out upon the outside world. It is as though only a few of a hundred outposts on a battle front were telephoning the appearance of a new body of troops. But a strong stimulus rouses all the sentries, and every nerve fiber carries its message to the brain.

The nerve messages have a range in frequency as well as in number of sending stations. A weak stimulus may cause only a few impulses a second, a strong one will speed the frequency up to more than a hundred—as it were the difference between the same telegrapher lazing along in slack time and piling dots and dashes onto the wire at top speed when crowded with work.

Composed of Simple Elements

In these two ways the central nervous system is informed of the quantitative differences in the outside world. And in the same ways—by differences in number of fibers used and in frequency of impulses along each fiber—are the orders from headquarters transmitted to the acting muscles. If the situation calls for little response, only a few impulses a second along a few outgoing fibers cause a few twitches of muscle fibers. If vigorous action is called for, thousands of fibers carry hundreds of impulses each per second, and the twitches blend into a powerful contraction of a whole series of muscles. The results may be quite complicated, but they are made up of these relatively simple single elements.

Science News Letter, October 29, 1932

ENGINEERING

New Swiss Lake Will Run Three Power Plants

THERE is a new lake in Switzerland to attract tourists.

Though its builders created a thing of beauty, electricity was what they really wanted when Grimsel glen at an altitude of 6,155 feet was dammed. From this height water of the lake will fall thorugh three power plants of 282,000 horsepower generating capacity before its usefulness is spent. One of these plants, at Handeck, has been completed.

The lake contains 300 million cubic feet of water and is three and one-half miles long. Its dam is 300 feet high and 110 feet long.

Science News Letter, October 29, 1932

METEOROLOGY

Heated Anemometer to Take Mt. Washington Wind Record

ACTIVITIES of scientists who will occupy a station on the summit of Mt. Washington this winter have been expanded by cooperation of Polar Year authorities.

Observations of aurora will be made with a special apparatus, the la Cour star box, that renders this work more useful. Joseph B. Dodge, who is making arrangements for the station, announced that a box has been received from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. This apparatus is essentially a diagram of the stars over which the observer pencils the aurora in the proper position.

A heated anemometer, the first to be tried in the United States, will also be used on Mt. Washington. A small electric stove heating element radiates to a copper dish inverted over it.

The dish has eight curved blades to catch the wind and is free to rotate. When clouds at subfreezing temperatures course over the summit the liquid droplets of which even these cold clouds are composed freeze onto all obstructions and grow into the wind like great horizontal icicles of rough white ice. The anemometers, or wind velocity indicators, quickly become so covered with ice that their rotation is greatly reduced. Frequent attention with torch or hot water is necessary if the wind record is to be maintained, unless some continuous source of heat can be made available.

Science News Letter, October 29, 1932