The five members of the United States Atomic Energy Commission in session at their new offices in Washington 26 November. Robert F. Bacher, 41-year-old Cornell physicist, youngest member, and only scientist on the Commission appointed 28 October, is seated on the extreme right. (See Science 8 November.) Chairman David E. Lilienthal, who resigned as chairman of TVA to accept the new post, is seated next to Dr. Bacher. Standing from left to right are William W. Waymack, a former Pulitzer Prize winner in editorial writing; Lewis L. Strauss, partner in Kuhn, Loeb & Company, bankers; and Sumner L. Pike, former member of the Securities and Exchange Commission.

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the esterase which produces the electrical nerve impulse. These results help to explain the absence of severe symptoms in persons whose esterase is reduced to only 1 per cent of its normal value (10). In fact, Fraser (see 12) nearly 80 years ago showed that eserine does not depress nerve-trunk activity. It is possible, however, that under certain conditions eserine may block impulse transmission by the negative phase-boundary potential established in contact with lipoids (5).

The descending part of the electrical wave in the electric fish and in the ganglion (12) is prolonged by eserine because the acetylcholine phase-boundary potential persists for a longer time, but no experiments have shown modification of the descending phase of the spike potential in nerve by eserine or other anticholinesterase drugs.

The rise and fall of the spike potential in peripheral nerve can be duplicated in the oil-cell by placing the acetylcholine first on one side and then on the opposite side of the oil layer. With resin in the oil a film less than 0.1 mm. thick can be formed by pressure on the saline on one side. Under these conditions a potential of 30 mv, produced by 0.05 per cent acetylcholine, fell to zero in 4 hours, due to the penetration of the alkaid to the opposite side. With very thin films of oil the spike rose and fell too fast for measurement with the potentiometer attached to the "oil-cell."

Careful measurements of the phase-boundary potential of possible products of nerve metabolism (potassium, lactic acid, lactate, phosphate, acetate, choline, citric acid) have shown that acetylcholine has a much greater electrogenic property and is the only substance so far studied capable of producing the action current in nerve. For example, as much as 1 per cent KCl is necessary to produce 10-mv negativity on cholesterol in guaiacol, and 5 per cent lactic acid produces only 10-mv positivity in contrast to the pronounced effect of dilution of acetylcholine previously described (7). There remains the possibility that the small negative after-potential is set up by choline and the two small positive after-potentials by acetate and phosphate.

The distinction between cholinergic and adrenergic nerves receives its first explanation by the phase-boundary theory. Triglyceride oils (2, 4) establish potential with sympathomimetic but not with parasympathomimetic drugs. We have recently found that choline as well as acetylcholine is inactive on triacetin (which gives potentials with epinephrine, benzodrine, etc.). When present, the phase-boundary potentials of epinephrine and acetylcholine are both negative, which suggests that these substances may potentiate under certain conditions, which is indeed the case (11).

The study of phase-boundary potential can be applied directly to nerve. Frog sciatic nerve is immersed in isotonic glucose for 1-2 hours (to eliminate short circuits by salts). The ends are tied, and the nerve forms a loop between two watch glasses of isotonic glucose connected to our potentiometer as previously described for the oil-cell (7). Addition of 1:160,000 acetylcholine to the solution bathing the part of the nerve in one dish sets up a phase-boundary potential of 10-mv negativity (which decreases in magnitude with time). Lorente de Nó (15) did not detect electrical changes in nerve treated with acetylcholine, since he failed to use isotonic sugar as recommended by Netter (15).

The experiments reported above support the theory that the electrical nerve impulse is a phase-boundary potential produced by acetylcholine in contact with nerve lipid.

References


Scanning Science—

The American Physiological Society is holding its ninth annual meeting at Boston and Cambridge on December 29th and 30th. Headquarters will be at the Hotel Brunswick. Those who require apparatus or other necessities for making demonstrations may communicate with Dr. H. P. Bowditch. R. H. Chittenden is president of the Society and Frederic S. Lee is secretary.

The American Psychological Association will meet at the same time and Prof. G. S. Fullerton, its president, will make an address on the 29th.

The American Society of Naturalists, also meeting at the same time, will join with the Psychologists in a discussion of "Inheritance of Acquired Characteristics" in which J. M. Macfarlane, C. S. Minot, E. D. Cope and William James will take part. Prof. E. B. Wilson will lecture on "Recent Developments of the Cell Theory."

—11 December 1896