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CHEMICAL MEDIATORS OF AUTONOMIC NERVE IMPULSES¹

By Professor WALTER B. CANNON

LABORATORIES OF PHYSIOLOGY, HARVARD MEDICAL SCHOOL

THE foremost physiologists of the world have given years of their professional activity to research on the contraction of skeletal muscle. Its more humble cousin, smooth muscle, which thrusts us into the world, and which for decades supports by its services our nutritive functions and our conscious existence, has had relatively little attention. The slow action of smooth muscle, its peculiar innervation, its special responsiveness to humoral agents and to certain drugs render it an especially convenient and promising agency for physiological analysis. And the results obtained by such analysis may have significant bearings on processes elsewhere in the organism—on the nature of stimulation and inhibition, for example, and on the effects of biochemical and pharmacological agents.

¹ Read at the joint meeting of the Federation of American Societies of Experimental Biology at Cincinnati, Wednesday, April 12, 1933.

The autonomic system characteristically innervates smooth muscles and glands. In this paper I propose to direct attention only to smooth and cardiac muscle, and I hope to bring before you observations which have importance for physiologists, biochemists and pharmacologists.

As preliminary to a consideration of the chemical mediators of autonomic nerve impulses it is well to learn what is known regarding autonomic nerve endings. During the past 60 years some histologists have represented nerve filaments as actually penetrating smooth muscle cells; their testimony, however, has not been accepted because of untrustworthy technique and also because other competent histologists described endings on the cell surface. To Boeke² is credited the first reliable evidence that the nerve twig enters the muscle fiber and ends there in a fine

² J. Boeke, *Verhandel. d. Koninkl. Akad. v. Wetensch.*, Amsterdam, xxiii: 1416, 1915.

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