

# SCIENCE

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## PHYSICS AND VITAL PROCESSES<sup>1</sup>

NEVER before have I attempted to give a lecture on a subject about which I know as little as I do about the physics of vital processes. Those who did me the honor of inviting me to speak should, however, be better acquainted even than I am with the probable extent of my ignorance, so that I hope you will follow the custom of a certain English college which, when one of its members invited a guest to its dining halls, recorded to the credit of the host any offenses committed by his guest, and fined him accordingly.

I should indeed hesitate to attempt any critical discussion of special fields of biophysics in the presence of an audience many of whose members are far more competent to discuss these matters than I am. Nevertheless, when a physicist turns his attention to the mechanism of things which pertain to life he is apt to be impressed by certain aspects of a general nature which may have seemed of secondary importance to the biologist, but which, nevertheless, in his own eyes play a very fundamental rôle. This is particularly the case in these days when the physicist has become humbled in the matter of materialistic dogma by his endeavors to understand the actions of the most capricious thing in all nature, not excepting the things which live, nor even the female sex thereof, by his endeavor to understand the atom.

We may divide the activities of living things into three classes as regards their relation to physics. First, we have the class which is understandable to us in terms of physics or chemistry, without the invocation of laws other than those which have become familiar to us in the laboratory. Thus, when I expand my chest, I require no further knowledge than the fact that the pressure in a space decreases when the volume increases to explain why my lungs fill with air. When I observe that the boundary of the protoplasmic interior of the cell allows certain things to pass through and stops others—when I find that the cell can build up within itself a hydrostatic pressure greater than that in the medium in which it is placed, I am not surprised, because I can duplicate such phenomena with various membranes in the laboratory. Even though I may be unfamiliar with the complete theory of osmosis in its molecular aspects, I am ready to accept the facts as understandable in

<sup>1</sup> Presented at the American Chemical Society Institute, Northwestern University, Evanston, Illinois, August 11, 1928.

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