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FUNDAMENTAL UNITS IN BIOLOGY[1]

By Professor H. S. JENNINGS

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BIOLOGY has long sought to follow the example of physics by finding fundamental units, through the properties and combinations of which the phenomena of biology are produced, as the phenomena of physics are produced through the properties and combinations of its fundamental units. The history of biology yields long lists of the names and properties attributed to these supposed units. But till the recent rise of biological genetics, all these units remained hypothetical. Their existence and their properties were assumed, in order to explain the phenomena observed; they themselves were not observed.

But with the investigations of genetics in the last three decades, materials that have been claimed as the fundamental units of biology, and that at least in part fill the rôle of such, have emerged into the class of things that are observational. They are seen, at least as groups, under the microscope. Their location in the organism has been precisely determined, their arrangement and order discovered. Their properties and behavior have been to a great extent concretely investigated, their rôle in the life of organisms in large measure brought to light, though their physico-chemical nature remains as yet uncertain.

These are the materials known to biological science as *genes*. They yield in interest perhaps to no other units known to science, since a group of these develops into a living organism; into a human being, with all its powers; its consciousness and its intelligence.

Though these materials fulfil the conception of fundamental units as nearly as anything that is likely to be found in biology, they differ in many and important ways from the hypothetical units earlier postulated. The application to them of the phrase "fundamental units," with its connotation of fixity and simplicity and uniformity, brings with it the possibility of serious misconception. I should like to present a picture of their concrete properties and behavior such as may dispel these misconceptions. Whether, in view of the picture that emerges, it is to be held that biology has

[1] Address at the Mark Hopkins Centenary, Williams College, October 10, 1936.