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TAXONOMY AS A FIELD FOR RESEARCH[1]

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IT has been customary for the retiring vice-president of Section G of the American Association for the Advancement of Science to present at the expiration of his term of office a retiring address. I shall adhere to that established custom. However, realizing that we have a very full program ahead of us, and that an important symposium is to follow this address, I shall be very brief. Knowing also, that it would be expected of me to deal with some phase of taxonomy, I have chosen for my subject "Taxonomy as a Field for Research." I have done this with some degree of hesitation, but with the profound conviction that taxonomy furnishes a fertile field for the apt student, that it has much to contribute to related sciences and therefore merits a place along with other botanical subjects in the domain of pure research.

That taxonomy has made marked advances during the past three or four decades, I think few would be inclined to question. Interest in this subject in recent years has been stimulated in many ways, particularly by numerous scientific expeditions, which have been concerned either wholly with botany or in which botany has taken an important place. The results of these expeditions to various and little known parts of the world have greatly added to our knowledge of the world's flora. Extensive collections of plants from hitherto little-known regions have furnished material for floristic studies on which new floras have been based, and they have also furnished material for monographic research.

New methods of attack have been brought to bear

[1] Address of the vice-president and chairman of the section on the Botanical Sciences, American Association for the Advancement of Science, Indianapolis, December 28, 1937.

organisms without realizing that type of flagellation may occur which is essentially peritrichic, although some cultures are monotrichic. True polar flagellation includes lophotrichic and definitely monotrichic organisms. True peritrichic flagellation is best shown by forms that possess four or more flagella. A degenerate type of peritrichic flagellation, on the other hand, may show one to four flagella and, if only one, the attachment may be either polar or lateral.

It is felt that much greater progress can be made in the classification of bacteria if organisms with only one flagellum are not separated from those which have three or four peritrichic flagella. A more satisfactory plan seems to be to group them on the basis of a correlation of characters. A considerable number of organisms have been observed (*e.g.*, the violet bacteria, the legume nodule organisms, *Bacterium radiobacter*, *Alcaligenes fecalis* and numerous still unidentified soil non-spore-formers) which either show this type of flagellation or else lack all flagella. These organisms resemble each other in their physiological characteristics. Such a classification as that here suggested, therefore, does not run counter to the prevailing systems of grouping bacteria, in which much weight is laid on fermentation reactions and similar characters, as well as on morphology.

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THE MOLECULAR WEIGHT OF CRYSTALLINE CATALASE[1]

THE apparent relationship of the enzyme catalase and methemoglobin, as suggested by comparison of the absorption spectra and hematin side-chains of these two substances, makes the determination of the molecular weight of catalase of considerable interest. Recently Stern and Wyckoff[2] concentrated horse catalase of a purity of 4,000 to 9,000 *Kat.f.* by sedimentation in an air-driven high-speed centrifuge and obtained a product with a *Kat.f.* of from 8,500 to 33,400. The sedimentation constant of this material they found to be 11×10^{-13}, indicating a molecular weight of 250,000 to 300,000. They obtained a sedimentation constant of 12×10^{-13} for a nearly pure catalase preparation from beef liver, but do not tell how this catalase was prepared.

The method of Sumner and Dounce[3] for preparing crystalline catalase from beef liver has made it easy to obtain this enzyme in what is apparently pure condition. We have prepared the enzyme in this laboratory and have determined the sedimentation constant of the recrystallized material by centrifuging an approximately 1 per cent. solution at 65,000 r.p.m. The value obtained over a pH range of 6.3 to 9.6 was 12.0×10^{-13}. A complete description of the method employed will be given in a later publication. Here, it suffices to note that the catalase was found to be a homogeneous substance, very slightly contaminated by impurity. Qualitative tests after centrifuging in a separation cell[4] showed that there was no enzymatic activity found in the solution removed from the upper portion of the cell and that the activity followed the high-molecular colored substance. Determination of the diffusion constant gave a value of 4.1×10^{-7}, while the partial specific volume was found to be 0.73. From these data the molecular weight of beef liver catalase is calculated to be 263,000. This value is almost exactly 4-fold the molecular weight of horse hemoglobin.[5] Now the percentage of iron in catalase is one fourth of that of hemoglobin, and accordingly the number of iron atoms per molecule must be four in catalase as well as in hemoglobin.

In conclusion, we wish to express our thanks to Professor The Svedberg for the use of his laboratory and to the Guggenheim Foundation for generous financial assistance.

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NILS GRALÉN

[1] From the Institute of Physical Chemistry University, Upsala, Sweden.

[2] K. G. Stern and R. W. G. Wyckoff, SCIENCE, 87: 18, 1938.

[3] J. B. Sumner and A. L. Dounce, *Jour. Biol. Chem.*, 121: 417, 1937.

[4] A. Tiselius, K. O. Pedersen and T. Svedberg, *Nature*, 140: 848, 1937.

[5] T. Svedberg, *Nature*, 139: 1051, 1937.

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