THE NEEDS OF THE MIMETIC THEORY

PROFESSOR SHULL, in his reply to my criticism of his views[1] objects to being "called upon to accept mimicry until it has been clearly disproved." But why not accept a theory which does give an explanation of multitudinous facts in relation to the whole subject of the coloration of insects until some other equally comprehensive theory has been adduced to compete with it?

I take exception to Professor Shull's inclusion of myself among those who "are all agreed that mimicking color, form or habit arose by one mutation": indeed, I did not know that it was possible for any one to hold that view nowadays, for it is "ancient history." My statement that "genetics are primarily concerned with the basic changes which result in *production* of a certain appearance, whereas the problem for the mimetist is not 'how or why' a habit or pattern is produced but how or why it *survives*" does not justify Professor Shull's statement that this view "implies the one-mutation origin of the imitations," nor the conclusions which he draws from this view. He does not allude to the concepts of evolution of the gene complex or to modifying factors, and I venture to quote the following by E. B. Ford from "Mimicry":[2] "It is well known that some of the most elaborate mimetic adaptations, involving varied and profound modifications, are controlled by the operation of a single gene. This must have arisen spontaneously by mutation, and consequently it has been argued that the mimetic resemblances which it controls did so too.

"Such reasoning is evidently fallacious, for it will now be apparent that we have no ground for thinking that a gene exercised the same effect at its first appearance as it does to-day; a consideration first clearly stated in its evolutionary aspect by Fisher."[3] Ford points out that certain mimetic forms differ from each other in a manner known to be due to single-factor differences. "But we are none the less entitled to regard each of them as the product of slow and continuous evolution."

Regarding experiments with animals I do not think Professor Shull is justified in saying that "I missed most of the point to this caution." I am in complete agreement as to the necessity of careful experiments.[4]

Reighard's work dealt with fishes, but I have no first-hand knowledge of the subject of coloration of marine animals and concerned myself only with insects, which I have studied in nature. McAtee's results have been so severely criticized for the manner of their presentation that I preferred not to discuss them.[5] Finally, I agree with Professor Shull that mimicry needs a deeper foundation, but I would not therefore pay no attention to its breadth.

G. D. HALE CARPENTER

SCIENTIFIC BOOKS

RECENT BOOKS ON PHYSICS

An Elementary Survey of Modern Physics. By G. F. HULL, New York, Macmillan, 1936. 457 pages. $3.50.

"MODERN physics" is pretty well established usage for that part of the science which has developed since about 1895 and which covers electrons, positive rays, x-rays, radioactivity, atomic and molecular structure. All this might well be called atomistics or corpuscular physics, for it can not go on being called modern indefinitely.

In the college curriculum it is generally found that there is no time for such topics in the traditional one-year introductory course, so more and more it has become the custom to have second-year courses covering these modern developments. It is for such a course that Professor Hull's book is intended, and for such use it seems to the reviewer to be admirably suited. The style used is quite breezy and journalistic, but apparently not at the cost of as great accuracy as is possible in an elementary account.

This book ought to be quite useful to scientists in other fields than physics who never took the second course or whose physics was taken many years ago. It seems to be the best book available at present for the biologist, chemist or astronomer, who would like to read about the new developments in physics in an elementary way while yet getting something more solid than is offered in the popular books of the book trade.

Some idea of the scope of the book is given by considering the chapter headings: (1) Molecules in swarms; (2) We discover and weigh the electron. We weigh atoms and discover isotopes; (3) Simple properties of orbits; the discovery of the nuclear atom; (4) Radiation; (5) The photo-electric effect; (6) Atomic spectra and the Bohr theory; (7) X-rays; (8) Electron tubes; (9) Electrical phenomena in gases and solids; (10) The Zeeman and Raman effects; (11) Radioactivity; spontaneous transmutation of elements; (12) The beginning of artificial transmutation; (13) Cosmic rays; (14) Transmutation of the elements. Induced or artificial radioactivity; (15)

[1] SCIENCE, 85: 496–498, 1937.

[2] Methuen's Monographs on Biological Subjects, pp. 106–107, 1933.

[3] *Trans. Ent. Soc. Lond.*, 75: 269–78, 1927. See also Fisher, *Biol. Rev.*, 6: 345–68, 1931.

[4] *Trans. Ent. Soc. Lond.*, October 8, 1921, pp. 2–7.

[5] See *Proc. Ent. Soc. Lond.*, 7: 79–105, 1932 (1933) and *ibid.*, 8: 113–126, 1934.

Waves, particles, new atom pictures; (16) Limitations imposed by nature—the uncertainty principle; (17) Modern applications of physics.

E. U. CONDON

PRINCETON UNIVERSITY

The Physics of Electron Tubes. By L. R. KOLLER. Second edition. McGraw-Hill Book Company.

THE author has presented a simple, clear survey of the principles of electronics, together with a wealth of practical information. This book will be welcomed by the engineer or student who wishes an accurate non-mathematical account of the physics involved in the electronic devices which have become so important in present-day industry. Those working in the field covered by the book will find a great deal of valuable detailed description of the technique used in the preparation of electron tubes.

A very complete account of thermionic emission is given in the first few chapters. This treatment includes not only thoriated tungsten and oxide coated emitters but also the less well-known caesium treated cathodes. The problem of electrical discharge in gases is very adequately and clearly covered. Sections dealing with photoelectric and photoconductive phenomena provide a clear practical outline of the field and include numerous tables and curves describing the properties of photoactive materials.

The book also contains a large amount of useful information on such subjects as the use of getters for producing high vacua, the measurement of temperatures inside of vacuum tubes and the general methods used in electron tube work.

In addition to the material contained in the first edition, the second edition includes a discussion of secondary emission multipliers, the ignitron, and various new devices employing electron optics. The book is well printed and illustrated with many diagrams and charts which clarify the text.

V. K. ZWORYKIN

R.C.A. MANUFACTURING COMPANY,
CAMDEN, N. J.

L'Unité de la Force et L'Unité de la Matière dans la Conception Physique Uniforme du Monde. By JAN BAŠTA. Pp. 103. Masarykova Akademie Práce, Prague, 1936.

IN this monograph the author maintains, largely by qualitative arguments, the unity of all force and the unity of all matter. The latter hypothesis leads him to the concept of a cosmic ether composed of protoatoms, which, under certain conditions, may manifest themselves as the chemical elements of ordinary matter. Rejecting the concept of action at a distance, he assumes that forces are transmitted from one protoatom to another by immediate contact. To maintain the unity of force, he supposes that elementary forces possess both a longitudinal and a transverse aspect, the first accounting for gravitational attraction and the second for electromagnetic interaction. By developing a theory of elasticity of the ether he computes a velocity of gravitational waves between 1.73 and 2.00 times the velocity of light.

The author dislikes both the special and the general theories of relativity. He prefers to explain the negative result of the Michelson-Morley experiment on the ground of ether entrainment, without, however, offering any escape from the difficulties to which that hypothesis leads.

LEIGH PAGE

YALE UNIVERSITY

Atomic Physics. By MAX BORN. New York: G. E. Stechert and Co. pp. vii + 352. 1936.

THE book is characterized by a reasonably comprehensive introduction of about three chapters dealing with phenomena from the experimental side. A brief review of the Bohr theory follows, mention is made of the matrix mechanics, and the remainder of the book deals with the wave mechanical theory. At the end there is an appendix, in which some of the mathematical expressions are developed in greater detail.

The author's prominence in the field of atomic structure, of course, insures an authoritative statement of the situation. The book deals with the relative elementary aspects of the subject; but it does not always form very easy reading. Although it is presumably written for one who has not made a study of the subject before, the nature of the language in the discussions is such that a previous knowledge of wave mechanics and of the problems which confront the theory of atomic structure would be almost essential for a proper comprehension of the contents of the book.

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SPECIAL ARTICLES

APHIS RESISTANCE IN BREEDING MOSAIC-ESCAPING RED RASPBERRIES

PREVIOUS investigation[1] has indicated that certain red raspberry varieties are either immune to red raspberry mosaic or non-infectible by its common vectors. These varieties are now either unobtainable for breeding stock or they are objectionable because of unde-

[1] W. Howard Rankin, *N. Y. (Geneva) Agr. Exp. Sta. Bul.*, 543, 1927.