were differentiated from the rest by means of a star attached to their names and designated the "leading men of science." It is now proposed to continue this class distinction in a new edition of the directory.

I do not know of any useful purpose that has been served by the formation of a superior class of scientists, but I do know that it has created no end of ill feeling among those who have been excluded. Moreover, if it is useful to "star" one thousand and designate them the "leading men of science," why would it not be useful to "double star" five hundred of these as super leaders and "triple star" one hundred as super, super leaders, etc.?

It seems to me that in a democracy class distinction should everywhere be discouraged as much as possible and that there should be no fixed differentiation into classes in any group of individuals without the sanction of the group. I therefore suggest that the continuation of "starring" of scientists in the directory be put to a vote of those involved.

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SCIENTIFIC BOOKS

LIGHT

Chemical Aspects of Light. By E. J. BOWEN. 191 pages. New York: Oxford University Press. January, 1943. $4.00.

THIS little book covers a wide range of subject-matter and is "intended only for the student who, whether by youth, age or other cause, is not equipped to participate freely in the mathematical struggles by which formal and quantitative solutions of problems are obtained." It is addressed therefore to those who, not equipped to make new advances themselves, "wish to know something of a branch of contemporary science." Even with mathematics at a minimum, both youth and age will find the book hard reading in places, probably by reason of the great compression of material in the text. The first chapter on waves and matter, 32 pages long, has paragraphs on linearly, circularly and elliptically polarized waves, the electromagnetic theory of Maxwell, the electronic theory of matter, interference, diffraction, resolving power of optical instruments, the electron microscope, lenses, double refraction or birefringence, fluorescence, optical activity, strains in materials, liquid crystals, streaming double refraction in colloidal systems, Tyndall light scattering, depolarization, reflection, absorption and transmission, dispersion and refraction, the photo-electric effect, Rayleigh scattering, glossy and matt surfaces, color of pigments and nephelometry. It makes a concentrated diet for any reader.

Ten chapters follow the first and expand some of the topics. Chapter 3, with 47 pages on the absorption and emission of light, is a good summary of atomic and molecular spectra. Succeeding chapters treat fluorescence, luminescence of solids, photochemical reactions, photosynthesis (perhaps the evidence from radioactive carbon should have been included in this), the photographic process (a brief, compact survey of the essentials in 8 pages), the reactions of the retina, photo-cells and chemiluminescence. There are 17 pages of appendices on light filters, photochemical technique and phosphors. There are three pages of bibliography and a Table of Constants. In this latter the value for the velocity of light in vacuo $= 2.99796 \times 10^{10}$ cm per sec, should be, according to Birge, 2.99776. If youth and age find the book difficult reading the trained chemist, not specialist in this field, can find here a trustworthy summary of the present state of the science. The format, printing, paper and binding of the book are a tribute to the Clarendon Press in the third year of total war.

HUGH S. TAYLOR

EMBRYOLOGY

The Embryological Treatises of Hieronymus Fabricius of Aquadependente. The Formation of the Egg and of the Chick (De Formatione Ovi et Pulli). The Formed Fetus (De Formato Foetu). A facsimile edition, with an introduction, a translation and a commentary. By HOWARD B. ADELMANN. Ithaca, N. Y.: Cornell University Press. xxiv + 883 pp. 46 plates. 1942. $12.50.

JEROME FABRIZIO, born at Aquadependente, was professor of anatomy at Padua from 1565 to 1613. In this chair he was the third of the distinguished successors of Andreas Vesalius. His importance as a teacher is sufficiently attested by the fact that his greatest pupil, William Harvey, not only obtained one of the most important clues for his discovery of the circulation of the blood from Fabricius's description of the valves of the veins, but also founded his lifelong studies of embryology upon those of his master.

Fabricius himself was the first since the time of Aristotle to study embryology from a comparative point of view. Through his lectures and his two books on animal development he raised embryology to the rank of an independent science. The first of these books, that on the formed fetus, appeared in 1604; the second, which deals with the embryology of the chick, was published after his death, in 1621. In spite of their importance, neither was ever translated into any modern language, and it is now more than

two hundred years since they were last published in Latin. Through the devoted labor of Professor Adelmann these books, the foundation stones of modern embryology, are now set before us in a noble volume which contains the two Latin texts in facsimile, with English translations which are both readable and scholarly, entertaining biographical notes and instructive commentaries, copious annotations and cross-references and a detailed bibliography.

The studies of Fabricius were of course made without the microscope. They concern the structure of the reproductive organs of the hen, the structure of the egg and the way in which the embryo is laid down. The observations on the mammalian fetus concern almost exclusively the placenta, membranes and fetal blood vessels. As Professor Adelmann points out, the ultimate goal of Fabricius, as of Aristotle and Galen, was "to explain causes, and particularly to elucidate the final cause, the end or purpose served by each part." Structure and function were studied primarily for their aid in the comprehension of the end or useful purpose. These two books therefore are couched in a tone of scholastic inquiry which requires (and receives) a good deal of explanation by the translator in order to make them clear to the present-day reader. In his introductory chapters, Adelmann traces the previous history of embryology from Aristotle through Galen and the sixteenth century writers, including Vesalius and Coiter. Then, in a careful analysis of the text of Fabricius, he shows us how the latter began his work saturated with the spirit and point of view of Aristotle and Galen and how he had to adjust his observations of fact to the doctrinal patterns of his times.

There has been a tendency to over-emphasize the traditionalism and the factual errors of Fabricius. He made several striking mistakes, such as deriving the chick from the chalazae of the egg; but these are completely outweighed by a host of careful and (for the time) accurate descriptions of the egg and the chick, of the mammalian placenta and membranes and of the umbilical and fetal vessels. He studied a very wide range of species, and was the first to describe and illustrate in print the diffuse placenta of the pig and horse and the human decidua. The illustrations which accompany his texts are remarkably clear and instructive, and many of them could still be used for teaching. They are well reproduced in this volume.

The reviewer has perhaps said enough to indicate that Dr. Adelmann has provided much more than reprints and translations of these books. He has shown us their proper place in the history of embryology and has made it possible for students in our day to understand the achievement of their author.

Students of Harvey will find here a careful study of the relations between his work and that of Fabricius. In the translations, all the more important passages which Harvey quoted from Fabricius are specially indicated.

This work, from its touching Latin dedication to the memory of Dr. Adelmann's mother and sister, through to its excellent index, is a monument of scholarship—learned, thorough and withal interesting, and satisfyingly complete. Students of embryology and of the history of science, now and in the future, will be grateful not only to the author, but also to Cornell University, the Council of Learned Societies and the Carnegie Corporation, for making its publication possible. Special mention should be made of the handsome format, and of the typography designed by Robert Josephy, which combines beauty and legibility with a clever suggestion of seventeenth century style, making the English translations and the commentaries appear fully compatible with the dignified Paduan printing of the Latin texts.

GEORGE W. CORNER

SPECIAL ARTICLES

CURARE ALKALOIDS FROM CHONDODENDRON TOMENTOSUM

CURARE is the generic name for a group of highly effective arrow poisons of plant origin used by the South American Indians. Recent clinical work has given encouraging indications that this drug, with its powerful lissive action on the voluntary musculature, might become a valuable therapeutic agent in the treatment of spastic paralysis, for moderating the convulsions in the shock-therapy of certain psychoses, and as an adjunct to anesthesia in surgery. So far, the chief obstacle to the therapeutic use of curare has been the widely varying potency and the uncertain origin and composition of the available preparations.

The isolation of a physiologically active, crystalline alkaloid from curare proved to be a difficult task. After numerous unsuccessful attempts by other workers, H. King, in 1935, finally announced the isolation of a crystalline, highly active quaternary base chloride, designated by him d-tubocurarine chloride, from a specimen of tube curare.[1] The earlier work of M. Scholtz, of E. Spaeth and of F. Faltis on the inactive tertiary base, l-curine from curare, and the related alkaloids bebeerine and isobebeerine (isochondodendrine) found in the drug *pareira brava,* enabled King to establish the structure of d-tubocurarine chloride as that of a bisbenzylisoquinoline alkaloid in which the nitrogen atoms are quaternary (formula I). On the

[1] H. King, *Jour. Chem. Soc.* (London) 1381, 1935.