published by Richards in London in 1906. Specifically the account is found in Dampier's narrative of his "First Voyage to the Bay of Campeachy" which is dated 1676. Dampier was, of all the early English ship captains and circumnavigators, by far the keenest observer. His "Voyages" fairly bristle with the most interesting and valuable natural history notes, and it seems not improbable that if they were better known they might constitute his best bid for fame. His text seems to indicate quite clearly that these "Carrion Crows" are our well-known "Turkey Buzzards," and if so it may be that this is the first and possibly the only recorded occurrence of albinos among them.

E. W. Gudger

State Normal College,
Greensboro, N. C.

AN OPEN LETTER

My dear Professor Jeffrey: In your delightful volume (excuse the word, but it expresses my feeling) on Woody Plants, you make a division of Archigymnospermæ and Metagymnospermæ on the basis of pollen chamber, fertilization by motile sperms, and presence of cryptogamic wood. In other places you show the close relationship of Cordaitales, Ginkgoales and Coniferales. Could you explain briefly, in this journal, for the benefit of many who will undoubtedly be interested, why you split the gymnosperms between the Ginkgoales and Coniferales rather than between the pithy stemmed Cycadean series and the woody Cordaites-Ginkgo-Conifer series?

Sincerely yours,

Henry S. Conard

Dear Professor Conard: Your open letter has been submitted to me by the editor of Science. My motive in dividing the Archigymnospermeæ from the Metagymnospermeæ on the basis of the presence of antherzoid fertilization and cryptogamic centripetal wood is largely one of expediency, since there are fortunately almost no gaps in the series of vascular plants outside the very considerable one which separates the Angiosperms from the Gymnosperms. The cryptogamic wood (or the *bois centripete*) has been an important criterion for the lower gymnosperms since the days of Renault and Brongniart. Zoidogamy, predicted by Hofmeister for the lower gymnosperms and discovered in the Cycads and Ginkgo by Hiarase Ikeno and Webber is a prominent character on the gametophytic side. The combination of these two accepted criteria makes the line of separation come above the Ginkgoales. The large pith and large leaves which you emphasize were also possessed by many Cordaitean forms. Some of these had leaf bases very fern-like in organization, as described by Dr. D. H. Scott and myself in remains from the lower Waverly of Kentucky. I would repeat that the term Archigymnospermeæ is one of convenience, and like most scientific terms falls short of covering the situation. I would quite agree with you that the Ginkgoales are fully as closely allied to the Coniferales as to the Cordaitales, yet convenience and the present state of our knowledge includes them with the ancient gymnosperms. I may add that your "Cycadean Series" appears to me to be a very natural one, and in fact is generally admitted. Hoping I have made my position clear I remain,

Yours sincerely,

E. C. Jeffrey

SCIENTIFIC BOOKS

Studies in the History and Method of Science. Edited by Charles Singer. Oxford, Clarendon Press, 1917. xiv + 304 p. 4°, XLI plates (many colored), 33 illustr. in text.

As Sir William Osler tells us in the introduction to these essays, they are the outcome of a quiet movement on the part of a few Oxford students to stimulate a study of the history of science. Upon the generous initiative of Dr. and Mrs. Charles Singer, a bay has been set apart in the Radcliffe Camera of the Bodleian for research work in this field. The objects pursued are: first, to place at the disposal of the general student a collection that will enable him to acquire a knowledge of the development of science; secondly, to assist the special student in research: (*a*) by placing him in relationship with investigations already undertaken, (*b*)

by collecting information on the sources and accessibility of his material, (*c*) by providing him with facilities to work up his material.

In spite of Dr. Singer's absence on military duty, the work has been carried on with conspicuous success. Ten special students have already used the room: Ramsay Wright has made a study of a Persian medical MS.; Walter Libby of Pittsburgh, during the session of 1915–16, collected material for his well-known book on the history of science; E. T. Withington is investigating the Greek medical texts for a new edition of Liddell and Scott's dictionary. Miss Mildred Westland has helped Singer with the Italian medical MSS. Reuben Levy has worked at the Arabic medical MSS. of Maimonides. Mrs. Jenkinson is engaged on a study of early medicine and magic. J. L. E. Dreyer has used the room in connection with the preparation of the "Opera Omnia" of Tycho Brahe. Miss Joan Evans is engaged upon a research on medieval lapidaries. Mrs. Singer has begun a study of the English medical MSS., with a view to a complete catalogue.

This is a splendid beginning—the right beginning—and one can not bestow too much praise on Dr. and Mrs. Singer for their enthusiastic and contagious activity.

This volume of essays is issued as a *ballon d'essai,* but we earnestly hope that a well-deserved successs will encourage its editor to publish periodically a similar one. That this first one has been issued at all, and "got up" with such admirable scholarship and taste in the fourth year of the war, is a credit to Oxford.

One half of the book is Singer's own work. He has contributed two very important studies. One on the scientific views of Saint Hildegard. The author traces the sources of her knowledge, by no means an easy task, one whose accomplishment implies a great familiarity with medieval science. It is interesting to compare this study with earlier ones devoted to the same subject: it illustrates the whole difference between historical studies of the old literary type and those permeated with the scientific spirit—a genuine understanding of scientific problems and values. The other is a study in early Renaissance anatomy with a new text: the Anothomia of Hieronymo Manfredi (1490). Both studies are very accurate, clear and complete; they are magnificently illustrated.

There is a suggestive paper on vitalism[1]—in fact the most comprehensive short statement of this question which I have read—by the much lamented John Wilfred Jenkinson, (with a portrait). Dr. Jenkinson was killed in action in 1915, at the Gallipoli peninsula. He had already produced excellent embryological work, but was still very young and his friends had placed considerable faith in him.

I must quote more briefly the other papers: Raymond Crawfurd deals with "The blessing of cramp-rings. A chapter in the history of epilepsy." E. T. Withington's essay is devoted to one of the most clear-minded men of the sixteenth century: Dr. John Weyer, the first serious opponent of the witch-mania. Any one acquainted with the history of witch-craft will at once appreciate his greatness. Most historians probably know very little about him, and yet this man was far greater than the contemporary kings and princes about whom they know and tell us so much. And do you think it was by mere coincidence that the first opponents of the witch-mania were scientists? Reuben Levy shows that the "tractatus de causis et indicis morborum" attributed to Maimonides, is most likely not his own work. Lastly there is a long essay by F. C. S. Schiller: "Scientific Discovery and Logical Proof." Interesting as it is, I think that this paper is here somewhat out of place. A book chiefly devoted to the history of science, should only harbor such philosophical and methodological studies as are based on historical information.

The publication of this book is highly gratifying. It proves that in England, as well as in Italy, France and Germany, the idea of the history of science is crystallizing and growing fast.

In America also, the year 1917 has brought to light some important contributions to this movement. I refer to the publication of two

[1] It is a revised edition of a paper published in the *Hibbert Journal,* IX., 545–559, 1911.

remarkable text-books. The first in point of date is Walter Libby's "Introduction to the History of Science" (Boston, Houghton Mifflin), a very well written and interesting account of some of the most typical conquests of science throughout the ages. The second is Sedgwick and Tyler's "Short History of Science" (New York, Macmillan), whose more ambitious purpose is to outline the whole of its development. The authors have been teaching the history of science for a great many years at the Massachusetts Institute of Technology. They have taken great pains to make their book as serviceable as possible to the student. It contains a large number of relevant quotations, and some longer extracts from Hippocrates, Roger Bacon, Copernicus, Harvey, Galileo, Newton, Jenner, Lyell; also notes on the main inventions of the last two centuries, and chronological and bibliographical summaries.

With books like these, the American teachers will have no excuse for not knowing at least something on the subject. It is not unlikely that now that such convenient text-books are provided, courses based upon them will grow like mushrooms; those giving them will gradually become acquainted with the history of science, and some of them will wish to know more of it. That is also a beginning.

The reader should not be left under the impression that no real research work has been undertaken in this country. It will be enough to remind him of the two beautiful studies contained in the eleventh volume of the Humanistic Series of the University of Michigan. The first is an admirable edition of Robert of Chester's Latin translation of the "Algebra" of Al-Khowarizmi, with an introduction, translation, and notes by Ch. L. Karpinski (1915). The second, an English version of Nicolaus Steno's "Prodromus," with notes by J. G. Winter (1916). This volume is to be completed by an essay on the "Vesuvius in Antiquity," contributed by the editor of the series, Francis W. Kelsey.

I believe that no greater service can be rendered to the history of science, at this juncture, than by relentlessly insisting upon the necessity of raising the standard of scholarship as high as possible. It will gradually dawn upon the people that inaccurate historical facts are as worthless as inaccurate scientific facts. It is true, historical errors are less obvious. At least they are not automatically detected, as is the case in the positive sciences, where most errors lead sooner or later to inconsistencies. But does the fact that there is no material check of our accuracy in historical matters not increase—rather than decrease—our duty to be accurate?

The Past can not rise up and arrest the historian, crying out: "You inconsiderate tattler, you liar, how dare you. . . . ?" The historian is a judge. Upon his shoulders rest the immense responsibilities of a judge. And those upon whom he sits in judgment have been silenced forever.

It is not always easy to appreciate the merit of a contemporary, because we can not justly estimate the value of a discovery until we have got far ahead of it, and tasted a great many of its fruits. And so it happens all the time that some people enjoy a very high reputation, which they do not deserve, while others traverse life unrewarded and unnoticed.

From the idealistic point of view, this does not matter much, because, sooner or later, justice is done. That is the historian's trust. If he be unfaithful to it—if he says for instance that the air pump was discovered by Robert Boyle instead of by Otto von Guericke—this is not a mere trifle. It is a protracted injustice; the supreme crime.

But the ultimate purpose of those who are now fighting under the banner of the history of science—only a few to-day but legion to-morrow—is even higher. To put it briefly, their purpose is to reconcile knowledge and idealism. We need both equally. I do not know which is worst, knowledge without idealism or idealism without knowledge, and yet our whole system of education is leading to their growing estrangement.

It would be foolish to imagine that scientists and literary people, the so-called humanists, will come together spontaneously. Such a miracle will not come to pass, unless we

prepare for it. Scientists are too busy to undertake historical studies, and literary people can hardly be expected to reeducate themselves along scientific lines. A bridge must be built. The task of unification must be intrusted to specialists, equally well trained as scientists and historians. There is no other way out. Complete courses on the history of science must be organized, and at least a few men must be given the material possibility of devoting themselves entirely to this work of synthesis.

The books of which I have spoken are new tokens, among many, of the irresistible movement which is leading to the organization of these studies and we must be grateful to all those who are helping—either as scholars or as vulgarizers. It remains to be seen which university will take the lead; the others will follow.

GEORGE SARTON

INVERTEBRATE PALEONTOLOGY

IN 1879 Hall described in a Report of the New York State Museum a curious fossil from the Silurian, giving it the name *Camarocrinus stellatus*. It was a large globose structure, internally divided into several chambers, attached at one end to a stem agreeing with that of the crinoids. Hall surmised that it represented the base of some crinoid species, the other end of the stem, with its calyx, being still unknown. This explanation was generally accepted, but the peculiar chambered bulbous form was supposed to represent a special adaptation for a floating mode of life, the bulb being in fact a float, from which the crinoid hung suspended in the water. In 1904 Dr. R. S. Bassler, of the U. S. National Museum, found an apparently promising locality for *Camarocrinus* a few miles north of Cape Girardeau, Mo., along the bluffs of the Mississippi River. This led Mr. Frank Springer in 1912 to send Mr. F. Braun to the locality, with the result of uncovering the most marvelous specimens of crinoids, completely solving the mystery of *Camarocrinus*, and furnishing the National Museum with a slab about 4 by 5½ feet, covered with remains of the animals. This slab, now mounted in the hall of invertebrate paleontology, will always remain one of the most striking paleontological specimens in existence, for it shows the animals as they died, probably smothered by a deposit of mud brought by a swift current from some higher level. Mr. Springer has prepared a detailed and beautifully illustrated account of the new materials, and has taken occasion to review all the congeneric species found in America.[1]

It turns out that *Camarocrinus* is the basal end of a well-known crinoid, described first from Bohemia by Zenker in 1833. Zenker called it *Scyphocrinites*, and according to the rules of nomenclature this is the proper name, but students of crinoids have chosen to shorten such names, in the present case writing *Scyphocrinus*. The Missouri slab proves to belong to Zenker's original species, *S. elegans*, the American specimens agreeing in all respects with those from Bohemia. The basal bulb was not afloat at all, but was embedded in the mud, acting as a root. In its resemblances to and differences from the calyx end it suggests some interesting reflections in connection with the researches of Professor C. M. Child, of Chicago. To what extent is it purely adaptive, and how much of its form and structure depends upon a principle of partial repetition of the fundamental structure of the animal?

Although the Missouri slab represents the Bohemian species, Mr. Springer finds that there are no less than seven other forms of *Scyphocrinites* (or, as he writes it, *Scyphocrinus*) in American rocks. *S. stellatus* is Hall's original *Camarocrinus; S. pratteni* is a very fine species from Tennessee, described under another generic name by McChesney as early as 1860; *S. ulrichi* was described by Schuchert as a *Camarocrinus;* and finally *S. spinifer, S. mutabilis, S. pyburnensis* and *S. gibbosus* are published as new by Mr. Springer.

The Carboniferous (Pennsylvanian) rocks of Maryland, Pennsylvania, West Virginia and Illinois have in recent years yielded a most interesting assemblage of fossil insects, which

[1] Frank Springer, "On the Crinoid genus *Scyphocrinus* and its Bulbous Root *Camarocrinus*, Washington, Smithsonian Institution, 1917, 74 pp. and nine plates.