a place on the list, at the age of 18 years. The editor, on the other hand, fixes the age at 40 years. Professor Jastrow in SCIENCE, volume 8, fixes the age in question at 37 years. We have thus three opinions as to the data and, naturally, three results. After examining these three opinions I venture to add a fourth—namely, that the age fixed by Lancaster is too low; that the editor's is much too high and that Professor Jastrow's is somewhat too high. Jastrow's conclusion is: "Men of thought live 69.5 years, or 3.5 years longer than ordinary men, while the lives of men of feeling [poets, musicians, artists, etc.] are three years, those of men of action five years shorter than those of average men." These statements show 'that the kind of psychical and physical activity influences the life period.' Quantitative results in this matter are only to be reached after a critical study of the data. Neither Lancaster nor the editor have made such a study. The assumption of Professor Jastrow is so based, but the details of his processes are not given. I am inclined to think that for astronomers his figures are too low.

EDWARD S. HOLDEN.

MARCH 20, 1898.

TO THE EDITOR OF SCIENCE: In the matter of the longevity of scientific men, I should like to direct the attention of your readers to an article which I published in SCIENCE of October 1, 1886 (reprinted in *Nature* November 4, 1886). I there considered the erroneous conclusions as to the longevity of astronomers and mathematicians, which Professor Holden has recently revived. Inasmuch as I had available in the case of a considerable number of great men the approximate date at which they accomplished work, which would presumably entitle them to a place on this list, I was able to compare more exactly the average longevity of these great men with the average longevity of ordinary men who had reached a similar age. This age I found to be about 37 years, which, with the expectation of life at that age, namely 29 years, would make the age at death 66 years, which was precisely the age at death of the great men selected for this comparison. It is quite possible that men of science live longer than other great men; but, if so, it would, of course, be only a very modest increase of years consistent with the known laws of variation.

JOSEPH JASTROW.

UNIVERSITY OF WISCONSIN,
March 20, 1898.

SCIENTIFIC LITERATURE.

A NEW EDITION OF ECKER'S FROG.*

THERE is probably no single animal, man excepted, which is more studied than the frog. It can be had in quantities; it presents the characters of the vertebrates in a comparatively simple condition, and hence it is used in every zoological course, while the vitality of its tissues renders it of extreme value to the physiologist. Naturally, such a useful animal has been the subject of considerable literature, and outlines of its structure will be found in almost every laboratory manual. Most of these, however, present only outlines, but in 1864 Alexander Ecker, then professor of anatomy in the University of Freiburg, began the publication of what was intended to be an exhaustive account of the anatomy of the common frog of Europe. Ill health, and finally death, prevented his completion of the work, but it was taken up and carried through by Wiedersheim, who succeeded Ecker in the anatomical chair, the final part appearing in 1882. Later (1889) an English edition of the work appeared, but this was more than a translation, for its editor, Dr. George Haslam, left his impress on every chapter, his changes in some instances amounting to a complete revision of certain sections.

Now a new German edition is in process of publication, and it is interesting to note that the new editor, like his predecessors, is connected with the anatomical institute of the University of Freiburg. Professor Gaupp began his studies of the frog in 1892, and since that time most of his publications have related to that animal, its skeleton and its muscles; especially noteworthy

*A. Ecker's und R. Wiedersheim's Anatomie des Frosches auf grund Untersuchung durchaus neu bearbeitet von Dr. Ernst Gaupp. Erste Abtheilung, dritte Auflage. Braunschweig, Vieweg und Sohn. 1896. Pp. x+229. Zweite Abtheilung, erste Hälfte, zweite Auflage. Brunschweig. 1897. Pp. ii+234. 22 Marks.

being his contributions to our knowledge of its cartilaginous skull. Two parts of the new edition have been published so far, one dealing with the skeleton and the muscles, the second with the nervous system.

In dealing with the bony frame-work of the frog one would naturally expect but few changes; since the time of Dugès these parts have been pretty accurately known. In certain places, as in the treatment of the wrist and ankle, the matter in this edition is much changed, while here and there minor changes are noticeable. Thus the name of the anterior end of the sternal structures has been changed from omosternum to episternum, but without (in spite of what appears on pages 31 and 32) sufficient justification. It has yet to be shown that the element in question is homologous with the episternum of Stegocephali, Reptilia, etc. Again we do not like the substitution of 'parabasal' for the well-known term parasphenoid (p. 50), or that of quadrato-maxillaria (p. 55) for the quadrato-jugul. Bardeleben will be pleased with Gaupp's acceptance of the prehallux as a veritable sixth toe.

More noticeable than these points in this section on the skeleton is the space given to the chondrocranium,* a subject which Gaupp has made peculiarly his own. Descriptions are given of these parts in the young and in the adult.

In the section on the muscles the changes are more numerous, names being altered in many instances so as to show more clearly the homologies with the musculature of man. In many places, noticeably with regard to the muscles of the abdomen and of the feet, the changes are more marked, as in these regions Dr. Gaupp has differentiated the muscles to a greater extent than has ever been done before.

The part upon the nervous system, embracing no less than 234 large octavo pages, over half of them in fine print, shows the greatest change. In fact, it is hardly possible to compare this portion of the work in the two editions. This change was certainly to be expected when it is recalled that no discoveries in the last fifteen years equal those in relation to the structure of the brain and nerves. The Golgi and methylene blue methods have let no little light into this most complicated part of vertebrate anatomy.

Dr. Gaupp adopts throughout the neural terminology of the German Anatomical Society, which, backed as it is by some of the best anatomists of the world, will probably have wide acceptance, although some of its features seem needless. Dr. Gaupp has given us not only an account of those features in the nervous system which can be made out by ordinary dissecting methods, but one of the clearest summaries of the internal structures with which we are acquainted. The student who has been troubled in trying to understand the complicated relations of fibre-tracts, ganglia, 'nuclei,' fasciculi, commissures, deeper origin of cranial nerves and other like questions should follow through the matter detailed in these pages, where he will find summed up not only the studies of Burckhardt, Edinger, Köppen, Ramón y Cajal, Sala, Studnička, etc., but the investigations of the author himself. The peripheral and sympathetic systems are treated with equal thoroughness and their distribution traced with a detail far beyond that in any previous work on the frog; and the chief point on which we could desire more information not given in this work is a study of the nerve components such as Dr. Strong has given us for the tadpole. On almost every page we find a feature lacking in the previous editions—comments on the morphological bearings of the facts presented. Where there is so much and where all is so well treated it is difficult to select any one part for special mention. We can hardly hope that the whole work will be translated into English, but we wish that these pages on the nervous system could be put into available shape for the American student, for they form a most admirable introduction to neurological studies, and for many years no work upon the nervous system of the Ichthyopsida can be undertaken without extended use of Dr. Gaupp's summary.

In its mechanical make-up the work is attractive. The typography is good and the subordi-

*Gaupp, like most Germans, calls this the primordial cranium. It is better to restrict this term to the membranous envelope of the brain which precedes the cartilaginous skull.

nation of headlines, etc., is consistent throughout. The illustrations have been largely redrawn, and the frequent use of color in them render them more intelligible. Why is it that American publishers insist in using a thick and heavy paper in their publications? Certainly thin paper like this (the 460 pages are but three-quarters of an inch in thickness) has numerous advantages. A final word, which may interest some, is that the German is clear and simple and does not require extensive linguistic attainments and capacity for unravelling involved sentences for its perfect comprehension. The section on the circulatory system is promised for this year. We await its appearance with the highest anticipations.

J. S. KINGSLEY.

A Laboratory Manual in Practical Botany. By CHARLES H. CLARK, A.M., D. Sc., Principal of Windsor High School. New York, American Book Company. 1898. Small 8vo. Pp. 271.

It is significant of the change which has come over the teaching of elementary botany in this country that the publishing house which has for many years issued the text-books which perpetuated the old method of presenting the subject has at length found it desirable to bring out a book written along modern lines. The author has been known for some time as the writer of a handy book of practical methods in microscopy, but has not been known as a worker in botany. He has adopted that laboratory method which has commended itself to many teachers—namely, of first presenting a summary statement including the principal features of the plant in hand, and following it by a series of 'practical studies' in which the pupil is not told too much, but is led to make independent observations.

After a rather long and quite needless preliminary chapter there follow chapters on 'Slime Molds' (Myxomycetes), Diatoms, Fission Plants, Algæ, Fungi, Bryophytes, Pteridophytes and 'Spermaphytes.' The general sequence is therefore quite good, since it is in accord with that usually adopted in modern works. In a general way, we may say that the presentation is good, also, the plants selected as examples being those commonly regarded as fairly representing the larger groups. It is unfortunate, therefore, that in the compilation of this book the author could not have had the aid of a botanist well acquainted with the various groups of plants treated. The failure to do this has led to many errors of statement, doubtless due to a misunderstanding of the subject in the labor of compiling from various texts.

In order that this book may be a safe guide, there are numerous errors and slips which will need correction. When we add to the direct errors a looseness of statement which too often mars the pages we have ample reason for asking for a revision before too much harm has been done. Thus it is inexcusable to call the ear of corn with its husks a fruit (p. 30), and to say that Spirogyra is one-celled, the cells being held together by a gelatinous coating (p. 41). We all once said that the Siphoneæ were one-celled, as the author still does (p. 72), but we know better now, and the same may be said regarding the fusion of the 'sporidia' of Ustilagineæ (p. 122), not now regarded as a sexual act. So, too, it is an error to say that stomata first appear in Pteridophytes (p. 184), good ones occurring on the moss sporophytes, and that the macrospores of Spermatophytes are borne in embryo-sacs (p. 205). The directions for the sectioning of the youngest pine cone (p. 209) are radically wrong, since at this time there is neither 'embryo-sac' nor 'endosperm' present, while fertilization does not occur until a year later.

A few examples of loose and inexact statement will suffice to show how seriously the book offends in this direction. Thus, on pp. 9, 10, "Another fact which distinguishes the Thallophytes is that the female gamete is never an archegonium, while in all other groups it is essentially an archegonium;" p. 12, "The terms *group*, *branch*, *class*, *order* and *family* are variously and arbitrarily used by writers;" also (p. 40), "different varieties may be found," where the author means 'different species;' still, again (p. 79), 'is the best known plant of its *class*,' here evidently intended to refer to its *order* or *family*. There is no excuse for a description of a fern prothallium as 'a small thalloid leaf' (p. 185), nor for the description

of gymnosperms (p. 206), which is based entirely upon the structure of the pines alone.

A few blunders of another kind mar the book, as 'protonemæ' (p. 10 et seq.), 'barbarous Latin and Greek names' (p. 8), 'female macrospores and male microspores' (p. 186), 'botanies' (p. 208). It is quite unpleasant also to see chlorophyl for chlorophyll and spermaphytes for spermatophytes.

There are many excellent features about this book, and both author and publishers owe it to themselves to see that the grave defects of the kind indicated above are speedily corrected.

CHARLES E. BESSEY.

Elementary Botany. By PERCY GROOM, M. A. (Cantab. et Oxon.) F. L. S. London, Geo. Bell & Sons. 1898. With 275 illustrations.

This concise and attractive volume of 252 pages is designed by the author to meet the requirements of secondary schools in England. As suggested in the preface, "though by no means a 'cram-book' for elementary examinations, a thorough knowledge of the contents of this book will enable a candidate to pass with distinction." Perhaps such a sentence will indicate a certain difference in educational conditions between England and America, for here it would not be easy to select any two hundred and fifty pages of botanical exposition and guarantee, upon its proper assimilation, a 'pass with honor.' The reason probably lies in the greater conservatism of the English school curriculum and the firm adherence of the English teacher of botany to the traditions of earlier days, when the systematic study of flowering plants filled a larger horizon than it does at present. When one understands the clientèle for which Groom's Elementary Botany was written it must be acknowledged to be an extremely good book. It is clear, crisp, accurate, not technical enough to be dry, nor untechnical to the point of looseness. It comprises in astonishingly small compass an adequate account of general organography, metaspermic taxonomy and elementary physiology. The figures, many of them original, are nearly all distinctly good and are far above the average of those presented in most books of similar purpose. The original figures are some of them real additions to botanical iconography, as, for example, figs. 49–52, illustrating the yearly history of the common crocus.

One is impressed by the thorough modernness of the writer of this little text-book in many small bits of detail scattered through the work, some of which might easily escape the reader. The definition and classification of fruits, the account of floral morphology and even the definition of the flower are suggestive. The reviewer has always insisted upon the necessity of the most careful definition and can conscientiously congratulate Mr. Percy Groom on his success in one or two difficult points. Sometimes, however, there is a little vagueness. It would, perhaps, be too much like trifling to call attention to a sentence on the first page—"A fern seems very unlike a mushroom and yet both are alike in that neither of them possesses flowers." This seemed to suggest an old riddle—"Why is a horse like an oyster?"—to which the very obvious answer is, "Because neither can climb a tree." Such absurd collocation of ideas would naturally not occur to the English users of this work, and the author cannot be blamed for not protecting himself against manifestations of a well-known American failing.

Some reviewers will doubtless object to the multiplicity of definitions in the Elementary Botany, but in so doing will scarcely do more than indicate their ignorance of the English school system. Where examination has been reduced to a science, as in England, and where secondary education has so thoroughly crystallized in well-marked grooves, this type of text has a place of its own and in the belief of the reviewer fills it admirably.

CONWAY MACMILLAN.

An Introductory Course in Quantitative Chemical Analysis. By PERCY NORTON EVANS, PH.D., Associate Professor of Chemistry, Purdue University. Ginn & Company. 1897.

The number of guides or manuals to qualitative analysis is very great, as nearly every teacher of that subject publishes a book arranged according to his ideas, although the material is practically identical. The field of quantitative analysis has not been so well covered. The student is generally directed to

make certain analyses, and is referred to one of the large text-books for details. A beginner is bewildered by the complexity of the work, and ends by becoming a mechanical agent, following detailed directions without knowing or inquiring why certain courses of procedure are necessary. The author has arranged a course which will serve as an introduction to the subject and give the student an excellent working basis for more advanced work in this line. He has selected typical methods in both gravimetric and volumetric analyses. In a section devoted to miscellaneous analyses he gives general directions for the analysis of such things as silver coins and rocks, and refers the student to larger works for details. The directions are clear and logical, and the reactions which take place in each case are given; but the author has purposely omitted some details, as methods of filtering and other manipulations, as he considers that these should be learned by the student from demonstration by the instructor. This book will no doubt prove valuable to those beginning work of this kind, and especially for those who are desirous of obtaining a general idea of the methods used in quantitative analytical work.

J. E. G.

A Laboratory Guide to the Study of Qualitative Analysis. By E. H. S. BAILEY, PH.D., Professor of Chemistry in the University of Kansas. Hudson-Kimberly Publishing Company. 1896.

The author states in his preface that he cannot hope to offer anything especially new or original, but his aim has been to present the subject in as concise a form as possible. The general arrangement is similar to that of many other works on this subject, and the author acknowledges the assistance he received from them. Each group is studied in detail, the principal soluble and insoluble compounds being described and the methods given for the separation of the members of the group.

J. E. G.

Repetitorium der Chemie, mit besonderer Berücksichtigung der für die Medizin wichtigen Verbindungen, sowie des 'Arzneibuches für das Deutsche Reich' und anderer Pharmakopöen, namentlich zum Gebrauche für Mediziner und Pharmazenten. Bearbeitit von CARL ARNOLD, Professor der Chemie an der Königlichen Tierärztlichen Hochschule zu Hannover. Achte verbesserte und ergäntze Auflage. Hamburg und Leipzig, Verlag von Leopold Voss. 1898.

The author, in his preface, says that this book is chiefly intended to prepare medical students for the government examination in chemistry. The first edition was published in 1884. Eight editions in thirteen years seem to indicate that the book fulfills its purpose. A careful examination fails to show why it is popular. The crude facts of methods of preparation of chemical substances, and the properties of the elements and compounds, are carefully separated from the chemistry which would make these facts intelligible and interesting. Under the title 'Allgemeine Chemie' the author gives forty-two pages of bald, concise statement. He gives in the next 230 pages dry facts concerning elements and inorganic compounds, with scarcely an illustration or illuminating thought. The last and longest section, 275 pages, is devoted to organic chemistry; the nature of the subject compels the author to treat it more intelligibly than the inorganic part, but light is admitted sparingly and under protest.

It is only fair to say that as a compend of facts the book is both full and concise. The student who could memorize it all, with some explanation from a competent coach, would have a mass of information which would be of excellent service to him when he should begin the study of chemistry.

The popularity of this book suggests speculation as to the nature of the German government chemical examination for medical students. To the lay mind it would seem that when with at least one well-known and excellent Repetitorium—Pinner's—written for the same purpose, for sale everywhere in Germany, this present compilation finds favor, the government examiners must demand crude statements of facts—not chemistry. Many of the well-known English quiz compends on chemistry are just as heavy and wooden; but we know that the universal cramming for government examinations in England is nowhere more condemned and deplored than by English chem-

ists, who refer to the study of chemistry in Germany as the model to be copied.

It would be an interesting occupation for a retired chemist, of statistical mind, to make a collection of government chemical examination papers in all countries, and of the compends used in cramming for the examinations; then to see whether the dryness of the systems is local or general. E. Renouf.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON—289TH MEETING, MARCH 12.

Dr. C. W. Stiles presented some 'Practical Suggestions in Regard to Trichinosis,' briefly reviewing the methods of pork inspection in vogue in Germany.

Dr. Erwin F. Smith spoke on 'Migula's System der Bakterien,' stating that Migula was the first to classify bacteria on morphological instead of physiological characters. He briefly outlined the groups and genera adopted, giving the characters on which they were based.

Dr. F. C. Kenyon, under the title 'Some Recent Advances in our Knowledge of the Nervous System,' briefly reviewed the general structure of the nervous system of arthropods. The fact was brought out that the so-called nerve cell is situated on the outside of the system, thus resulting in the formation of a nerve element comparable with the spinal ganglia of mammals. This so-called nerve cell was given the name of cytosomite, and the process leading from it into the nervous system was denominated the caulite, the remaining portions of the element being considered as neurite and dendrite. The distinctions between these was based upon function and the nerve element compared to a Leyden jar, of which the neurite was held to be the recipient part, and the dendrite the discharging part, for all neural impulses. In the case of the dendrite, however, this distinction may be faulty, since dendrites occur whose relations seem to indicate that they must function both as recipient and discharging parts. It was thought that the arthropod cytosomite and caulite do not function in the transfer of neural impulses, since they lie to one side of what seems to be the most direct route. The neurocyte, or nerve element, was briefly defined and the different types of neurocytes to be found in the nervous system of arthropods briefly described and commented on. The paper will be published in full later on. F. A. Lucas,

Secretary.

AMERICAN CHEMICAL SOCIETY, JANUARY 13.

The fourth annual meeting of the Washington Section of the American Chemical Society was held on January 13th. The following officers were elected for the ensuing year: H. N. Stokes, President; Peter Fireman and H. Carrington Bolton, Vice-Presidents; William H. Krug, Secretary; W. P. Cutter, Treasurer, and C. E. Munroe, E. A. de Schweinitz, Wirt Tassin and W. F. Hillebrand, additional members of the Executive Committee.

The regular February meeting was held on Thursday evening, February 10th. Mr. Tassin presented a paper on 'The Origin of Crystals and Crystalline Growth,' which contained a *résumé* of theories concerning the origin of crystals and the processes of crystal-growth, and consisted of a discussion of the results of the researches of Vogelsang, Behrens, Knop, Sadebeck and Lehmann.

Dr. H. Carrington Bolton read a paper entitled 'Iatro-Chemistry in 1897,' which was published in full in last week's issue of Science.

Dr. H. W. Wiley addressed the Society on the subject of pure food legislation, and discussed the benefits which would undoubtedly result from the deliberations of the Pure Food Congress, which will assemble in Washington on March 2d. William H. Krug,

Secretary.

NEW BOOKS.

Quantitative Chemical Analysis by Electrolysis. Alexander Classen, in cooperation with Dr. Walter Löb; authorized translation by W. H. Herrick and B. B. Boltwood. New York, John Wiley & Sons; London, Chapman & Hall. 1898. Pp. 301. $3.00.

Reform of Chemical and Physical Calculations. C. J. T. Hanssen. London and New York, Spon & Chamberlain. 1897. Pp. 72.

Einfühlung und Association in der neueren Aesthetik. Paul Stern. Hamburg und Leipzig, Leopold Voss. 1898. Pp. viii+81. M. 2.