spontaneous generation, on the vinegar process, on the diseases of wine, of silkworms, and the beneficent results of his success in combating disease in man himself. Of the 20,000 persons who have taken antirabic treatment, the mortality has been less than five per thousand.

The four lectures on August Wilhelm von Hofmann occupy the most space given to any individual in the volume; Lord Playfair writes of his personal reminiscences of Hofmann and of the conditions which led to the establishment of the Royal College of Chemistry; Sir F. A. Abel narrates the history of the same College and of Hofmann's professional work therein; Dr. W. H. Perkin chronicles the contributions of Hofmann and his distinguished pupils to coal-tar color manufactures; and Professor Henry E. Armstrong contributes a very full and careful analysis of the scientific work of this great master in research.

Professor O. Petterson, of Stockholm, writes of Nilson; Sir Henry E. Roscoe in a delightful sketch of Bunsen, his intimate friend and teacher, mentions many amusing episodes of the absent-minded, genial, big-framed man who has been loved by all who came into contact with him; Dr. P. P. Bedson portrays Lothar Meyer; Professor J. M. Crafts, of Boston, writes of his warm friend, Friedel; and Dr. Thorpe, of London, writes of the brilliant Victor Meyer as well as of Hermann Kopp. With each of the twelve lectures there is an excellent portrait of the person sketched, and most of the lectures contain valuable bibliographies. A copy of this memorable volume (of which the edition is limited to 500) should be found in every good library.

HENRY CARRINGTON BOLTON.

Allgemeine Physiologie. Ein Grundriss der Lehre vom Leben. By MAX VERWORN. Third edition, revised. Jena, G. Fischer. 1900. Pp. 631; illustrations 295.

The facts that Professor Verworn's book has reached its third German edition, and that it has been translated into English, French, Russian and Italian, are evidence of its worth. That it has exerted an influence on the development of physiology during the six years of its existence is indicated by the frequency of references to it in physiological literature. The book improves with each successive edition. In its present revision it is unchanged in its fundamentals, but from the first to the last page it gives evidence of having been thoughtfully worked over. Apart from the alterations obligated by the newer researches, portions of the previous editions have been omitted, portions have been rewritten, and the language has constantly been made more precise. The quantitative result is an addition of twenty-five pages and ten figures, while qualitatively there is a betterment throughout. A few of the special features of the new edition may be here mentioned.

The use of the word *Eiweisskörper* has largely given place to that of *Eiweissverbindungen,* and stress is laid on the fact that the life process consists in the metabolism of the compounds of proteids rather than of proteids alone. The section on ferments is largely rewritten. As Emil Fischer has shown, it is now recognized that each ferment acts on one specific chemical body only, and not even on the isomers of that body. In many cases of ferment action by organisms, but not necessarily in all, the efficient substance is not the organism itself, but something secreted by the organism. Buchner proved this for alcoholic fermentation by the yeast-cell, and gave the name *zymase* to the enzyme. Another fact of interest is that no synthetic ferments have yet been discovered. Attention is called to the well-known results of Loeb and others in artificial parthenogenesis. Peter's observations that in ciliated cells the basal bodies are the place of origin of the impulse to movement are quoted. Peter's idea is supported by the work of Gurwitsch on the development of cilia.

The paragraphs on the origin of the current in a voltaic cell are rewritten and Sohncke's theory is replaced by that of Nernst. According to Nernst, metals have a great tendency to give off their molecules as cations in solutions of certain salts, the amount of loss depending on the relation of the osmotic pressure of the solution to the solution pressure

of the metal; the less the former and the greater the latter, the more cations are given off, and *vice versa*. The result of the loss is a charging of the metal with negative and of the solution with positive electricity. A second metal introduced into the solution, with a different relation of osmotic pressure and solution pressure, becomes charged positively, and the result is a difference of potential between the two metals.

In discussing the action of the galvanic current on protoplasm, the question is raised as to how the well-known effects are brought about. A possible factor is the electrolysis of the medium surrounding the living substance, in which case galvanic stimuli should be regarded as chemical stimuli. Verworn regards this possibility as doubtful, and if it occurs at all, it must be altogether subordinate. Much more important, doubtless, is the direct electrolysis of the living substance itself. A possible factor in the galvanic action is the movement of the liquids in the porous cell substance. This is suggested by the work of Carlgren, who, by the action of strong galvanic currents on dead cells, was able to obtain phenomena closely analogous to those occurring in living substance. The relative shares taken by these various factors in galvanic action must be decided by future investigation.

Molisch's work on the death of plants by freezing is noted, the general conclusion being that in such cases death is due to the abstraction of water from the protoplasm and the resulting profound alteration in the chemical structure of the compounds of the protoplasm. Regarding the action of chemical stimuli, the author takes the conservative position that in many cases, but not in all, osmotic action is associated with purely chemical action. The two factors have been only rarely distinguished sufficiently, and in most cases it remains to be decided to what extent the stimulating power of the chemical substance is due to its chemical, and to what extent to its osmotic properties.

The observations of Weil and Frank, which tend to disprove the hypothesis of the contractility of the dendrites of nerve cells, are quoted approvingly. So also is the work of Myer and of Overton, who found that the solubility of narcotics in fats and oils is a great factor in their narcotizing power. Narcosis is accomplished through the agency of the undivided molecule of the narcotic, not through its decomposition products. Narcosis appears to be a contact effect.

The author devotes a page to the discussion of the effect of the Roentgen rays on organisms, but the facts so far discovered are too few to allow conclusions of value to be drawn.

In discussing the origin of life the theory of F. J. Allen is added to those heretofore given. This author believes the beginnings of life to date, not as Pflüger assumes, from the time of the earth's incandescence, but from the period when water first appeared on the earth's surface. The powerful shocks of lightning which must have occurred continually in the damp, warm atmosphere then existing, led to the production of ammonia and the oxides of nitrogen, as happens to-day. These substances were carried down in solution by the rains, and on the surface of the earth met solutions of carbonic acid and the chlorides, sulphates and phosphates of the alkalies and metals. Thus the opportunity was given for the most varied nitrogenous combinations, and the first living substance then came into being.

The chapter on the mechanism of life is not greatly altered. The 'biogen hypothesis,' as the author now terms it, is considered somewhat more fully than before, in the light of the work of Detmer, Loew and F. J. Allen, but it is not essentially changed. Attention is called to Jennings's careful work on the mechanism of tactic movements, and to Rhumbler's interesting physical analyses of cell phenomena.

In the preface Professor Verworn speaks of the present great activity of investigators in all fields of general physiology, and laments the fact that within the narrow confines of one book so many of the important contributions must be mentioned without discussion or be omitted altogether. Notwithstanding this fact, his book still remains by far the best

existing treatise on the varied subjects included under its comprehensive title.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE February number (Vol. VIII., No. 5) of the *Bulletin of the American Mathematical Society* contains a report of the eighth annual meeting of the Society, by the secretary; a report of the January meeting of the Chicago Section, by T. F. Holgate; a review of Wilson's Vector Analysis, by Alexander Ziwet; a review of books by M. Simon and J. M. Hill on Euclid, by J. S. Coolidge; 'Notes' and 'New Publications.' The March number of the *Bulletin* contains the following articles: 'The Application of the Fundamental Laws of Algebra to the Multiplication of Infinite Series,' by Florian Cajori; 'Concerning the Class of a Group of Order p^m that Contains an Operator of Order p^{m-2} or p^{m-3}. p being a Prime,' by W. B. Fite; 'Proof that the Group of an Irreducible Linear Differential Equation is Transitive,' by Saul Epsteen; 'Lines of Length Zero on Surfaces,' by L. P. Eisenhart; 'Some Properties of Potential Surfaces,' by Edward Kasner; a review of Gibson's Calculus, by W. F. Osgood; 'Shorter Notices' of Cohen's Theory of Numbers and Beman's translation of Dedekind's Essay on the Theory of Numbers, by L. E. Dickson, and of the Annuaire des Bureau des Longitudes, by E. W. Brown; 'Notes' and 'New Publications.'

The American Naturalist for February opens with an article by W. M. Wheeler on 'A New Agricultural Ant from Texas, with remarks on the known North American Species,' the new ant being *Pogonomyrmex imberbiculus*, while the notes include a key for the identification of the species. Under the caption '*Phyllospadix* as a Beach-builder,' R. E. Gibbs presents some new information regarding its life-history and shows how its spreading tufts hold the sand and produce sand-bars. G. H. Shull gives 'A Quantitative Study of Variation in the Bracts, Rays, and Disk Florets of *Aster Shorti* Hook., *A. Novæ-angliæ* L., *A. puniceus* L. and *A. prenanthoides* Muhl., from Yellow Springs, Ohio.' The number contains the 'Quarterly Record of Gifts, Appointments, Retirements and Deaths,' and it is noted that hereafter these will appear in the numbers for February, May, August and November. The gifts for the past year to schools, colleges, libraries and museums amounted to $43,233,635, and this does not include Mrs. Stanford's transfer of securities to Stanford University nor any appropriations made by national, state or local governments.

The Popular Science Monthly for March contains a long and well-illustrated article by J. C. Branner on 'The Palm Trees of Brazil,' describing the appearance and uses of many species. Alexander F. Chamberlain treats of 'Work and Rest: Genius and Stupidity,' drawing the inference that brief periods of intense work and long periods of rest produce better results than long periods of steady application. 'Science in 1901' is a résumé of progress along various lines from wireless telegraphy to the better understanding of yellow fever, reprinted from the London *Times*. Ellis P. Oberholtzer describes 'Franklin's Philosophical Society,' the oldest scientific society in the country, and W. H. Dall contributes an appreciative biographical sketch, with portrait, of the late Alpheus Hyatt. W. G. Sumner tells of the comparatively recent extraordinary outbreak of 'Suicidal Fanaticism in Russia,' and Lindley M. Keasbey discusses 'The Differentiation of the Human Species,' believing that mankind was homogeneous prior to the glacial period. E. B. Titchener, after considering the problem 'Were the Earliest Organic Movements Conscious or Unconscious,' decides in favor of the necessity of mind at the first appearance of life. Finally we have the full text of the 'Trust Deed by Andrew Carnegie creating a Trust for the benefit of the Carnegie Institution.'

SOCIETIES AND ACADEMIES.

AMERICAN PHYSICAL SOCIETY.

THE regular bimonthly meeting of the Physical Society was held at Columbia