centers of reduction to the two higher planes, and thence by interpolation to points over the station; the second, from the station pressure to the pressures on the two other planes directly. This agreement, therefore, unites the entire data in a homogeneous system, and it becomes the basis for future substantial scientific discussions in many meteorological problems. We can now deal quite confidently with hundredths of an inch of pressure.

A full report on this subject will appear in the Annual Report, Chief of Weather Bureau, Vol. II., 1900–1901, and will contain the following sets of charts for each month and for the year, $B_m . t_0 . e_0 .$ and the relative humidity on the sea level plane, $B_1 . t_1 . e_1$ on the 3,500-foot plane, $B_2 . t_2 . e_2$ on the 10,000-foot plane, 130 in all; also charts of gradients in latitude, in longitude and in altitude, as well as charts for reducing selected hours of observation to the mean of twenty-four hourly observations. With these data a newly opened station can by a little computation be put on a better basis regarding its normals than would be given by at least ten years of regular observations. A summary table contains the above list of normals for 265 stations besides the original data for the station $B_n . t . e.$, and will be a valuable source of reference for numerous questions in meteorology.

The reduction tables for pressure consist of three different sets: (1) The general logarithmic tables computed for every 100 feet up to 10,000 and for every 10 degrees from $-40°$ to $+100°$; (2) the station tables for publication, containing the following corrections for each of our three planes of reference, sea-level, 3,500-foot and 10,000-foot, namely, the Laplacean free dry air correction, the humidity correction, the correction for the plateau effect and the occasional residual correction, also the two arguments t surface temperature and θ the mean column temperature. Diagrams have been constructed to show the relations between t and θ, and they form a most instructive analysis of the plateau temperature problem, showing that each district has local characteristics of its own; (3) the station tables are compiled from the forms (2), and they are expanded for the arguments surface t and surface B, so that there shall be no interpolation along the temperature argument in order to obtain the nearest hundredth of an inch, 0.010. The body of the table gives the reduced pressure on its plane, and not the correction to the actual pressure, which must be added to it to produce the reduced pressure, as is customary in such tables. There remains only a very simple interpolation for the intervals of a tenth of an inch of pressure to the required hundredth of an inch. It is thus an easy matter to enter the three tables in succession with the same arguments, surface $(B . t)$, and find $B_0 . B_1 . B_2$. These data will enable us to construct three sets of isobars at each hour of observation, showing three plane sections through the atmosphere, and these will probably prove to be of value in the forecasts of the weather conditions. The sea-level reductions went into operation on January 1, 1902, as stated, but some more work is required to furnish the stations the necessary tables of group (3), the two preceding groups being completed.

FRANK H. BIGELOW.
WEATHER BUREAU.

SCIENTIFIC BOOKS.

Memorial Lectures delivered before the Chemical Society of London, 1893–1900. London, Gurney and Jackson, Paternoster Row. 1901. 8vo.

This volume contains the lectures commemorating deceased honorary and foreign members of the Chemical Society of London, delivered during the eight years designated in

the title, and if we take into consideration the historic eminence of the subjects of the lectures, as well as the fitness of the lecturers for their biographical tasks and their success in preparing them, it is safe to say that no more important or fascinating contribution to the history of chemistry has been issued within the decade. In each case care was taken to select as the lecturer one who had been personally intimate with the deceased chemist, or who was especially well qualified to write of his researches with the sympathy born of studies analogous to his; the result forms an illustration of the international character of science, for the native of Belgium is portrayed as to his life and labors by an American, the native of Switzerland by a Swede, the Germans by Englishmen, a Frenchman by another American, and only one lecture, on a Swede, is by a compatriot.

The methods followed by the lecturers in dealing with the individuals assigned them vary considerably, but the majority depict the personality of the chemist, his domestic life, his official duties, his positions of honor, and after these his labors and discoveries in the field of chemistry; in several instances the biographer introduces valuable disquisitions bearing on the theories which the person portrayed founded or helped to establish. Professor J. W. Mallet, of the University of Virginia, writing of Jean Servais Stas, precedes his account of the life-work of the Belgian in the determination of atomic weights, with a careful summary of the fundamental ideas that gradually led up to the question, 'What is the mass (or weight) of an atom of a particular element?'; and he presents a clear statement of investigations as to the atomic weight of the elements from the time of Berzelius to that of Stas. At the beginning of his painstaking researches Stas had an almost absolute confidence in the accuracy of Prout's hypothesis, but at their conclusion he said, 'The theory of Prout must be considered as a pure illusion.' Mallet himself, however, seems inclined to believe that there may be still something in it.

In passing, let me say that the biographer of Stas falls into the error of assigning to Wenzel a share in the discovery of the law of neutrality, an error originating with Berzelius, and often repeated, but corrected by J. S. C. Schweigger, Angus Smith, Ladenburg and by others.

In his lecture on Marignac, the Upsala professor, Cleve, introduces a skilful survey of the complicated history of the rare earths, including a table giving the characters of the elements of the yttrium-cerium groups that was highly esteemed at the date of its publication (1895).

Dr. W. H. Perkin, in his sketch of the labors of Hofmann, introduces an authoritative account of the origin of the coal-tar color industry, and both Drs. Japp and Thorpe in their lectures on Kekulé and on Victor Meyer, respectively, insert most praiseworthy contributions to the history of those branches of organic chemistry in which each was laboring so successfully.

These disquisitions do not partake of padding, but are among the most valuable features of this very valuable volume.

One of the most difficult men to treat, on account of his gigantic intellectual position, Helmholtz, is presented in a masterful way, notable for its vigor and brevity, by Dr. Geo. F. Fitzgerald.

Dr. Percy Frankland's biography of Pasteur is very readable and appreciative; he points out that the French chemist long ago 'completely foreshadowed and grasped that important branch of our science which we now call stereo-chemistry' as shown by the philosophical reflections made by Pasteur after his discoveries in connection with racemic acid. Some bold experiments conducted by Pasteur were designed to accomplish 'the task of turning the Creator's world upside down'; one of these was carried on at Lille in 1854. He had a clock arranged with heliostat and reflector, to reverse the natural movement of the solar rays striking a plant from its origin to its death, so as to ascertain whether in such an artificial world, in which the sun rose in the west and set in the east, the optically active bodies could be obtained in enantiomorphic forms. Dr. Frankland reviews Pasteur's studies on fermentation, his researches on

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