field. Botanical investigations, however, will always play a more or less important part in all matters pertaining to the subject, especially systematic studies of the tree floras and the application of these studies to questions having to do with reforestation and the protection of existing forest areas. The applied botanical work, in connection with future problems in pharmacology, will be considerable. Systematic studies of plants used in pharmacy, the introduction and cultivation of such plants with a view to increasing their usefulness, all come within this scope of applied botanical research. The study of tropical plants, which has already been referred to, is also bound to play an important part in the near future in the matter of the development of our insular possessions. As yet, we have very little satisfactory information as to the possibilities of tropical agriculture, especially as concerns our own country; and it would seem that some of the first problems will have to do with systematic studies of the field to determine existing possibilities, with a view to applying them in the near future in a practical way. There are numerous practical questions having an important bearing on all tropical work, which must receive attention before any final conclusions can be reached in regard to the successful growing of crops in these regions. These questions have to do with the interrelation of the plants themselves to the development of the existing system of tropical agriculture, so that really a systematic study of our tropical floras would seem one of the first requisites offering a key to the future solution of other and more general problems.

Bacteriology, in its relation to surgery and sanitation, has passed out of the field of applied botany, but problems will still arise. Systematic studies of the bacteria may be essential to the successful prosecution of certain phases of this work. It is hardly necessary to refer to these questions in detail, and I may therefore conclude this somewhat hasty and general sketch of the possibilities of applied botanical work, as we see them, by again calling attention to a fact which becomes more and more evident as we look into work of this nature, and that is, how thoroughly we are all dependent on others for aid, not only in our own field of science, but other fields as well. Like our social fabric, science for science's sake and applied science are becoming more and more a delicately complicated system, capable of endless harmonious expansion if viewed aright, but leading to possible endless discord if handled wrong. How essential, therefore, that the broadest spirit of tolerance should be cultivated, for no matter how small or how humble a piece of real work is, somewhere and some time it may be made to form a part of an harmonious whole. While this is a practical age, and while the demand is heavy for practical results, we should not forget that there are ages to come after us—ages that may demand something different from what the majority of us are producing now; and for this reason the laborer in some obscure field should not be forgotten, for it perhaps may be that his work, now little known or understood, may in the future take its place in the building up of mankind.

B. T. GALLOWAY.

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SCIENTIFIC BOOKS.

Histoire de l'Observatoire de Paris de sa Fondation à 1793. Par C. WOLF. Paris, Gauthier-Villars. 1902. Pp. xii+392; 16 plates.

If there had come down to us from the author of the Almagest a detailed account of the home of the Alexandrian school, the dimensions and cost of its buildings, their arrange-

ment and government, the official correspondence concerning the purchase and repair of equipment, if, in short, the temple of Serapis were presented to us as Mr. Wolf has presented the Paris Observatory during the first century of its existence, the mere remoteness of Ptolemy's epoch and our comparative dearth of information concerning it, would command for his narrative of commonplace incidents an interest that is in great part lacking from the corresponding events of an epoch so much nearer to our own time.

It must be confessed that we find Mr. Wolf's chronicle somewhat dry reading, and that neither the dimensions and cost of walls and windows nor the tale of petty squabbles as to who should have the right to grow beans and onions within and beneath them, is long able to keep the reviewer's thoughts from wandering to other topics. Yet is it well that some one having access to the original sources of information should gather and arrange the data here preserved, relative to the growth of a great scientific institution, and this work Mr. Wolf appears to have done, with a praiseworthy diligence whose dry-as-dust characteristics are from time to time relieved by an entertaining digression or a touch of zeal for the house of Cassini that might well become a descendant of the three generations of astronomers so intimately connected with the early history of the Paris Observatory.

An often-quoted paragraph in Flamsteed's warrant as the first Astronomer Royal of Great Britain, charges him with definite duties and a definite program in the administration of the Royal Observatory, and serves Mr. Wolf as a text with whose singleness of purpose he contrasts the lack of plan that characterized the foundation of the French observatory. We read in substance rather than in exact translation, "In creating this institution Colbert sought to erect to astronomy and the other sciences, but chiefly to the glory of his king, a magnificent palace, whose splendor should be worthy of the prince who built it and in which the members of the newly created Academy, without being subject to any prescribed duties, should by their labors vie with each other for the royal approbation, each following his own preferences according to the inspiration of the moment. Within it laboratories were provided for the chemists and physicists, a museum of anatomy for the naturalists, etc., but the observatory was too far from the center of Parisian life, and chemists, physicists and physicians alike soon forgot the way thither, if indeed they ever learned it. For a time the astronomers responded to the munificence with which the king and his minister had provided instruments of observation for their use, but, alas, the instruments belonged to the Academy and no one in particular had charge over or responsibility for them, and like their fellow academicians of a different cloth, the astronomers in time learned that the road to the observatory was long and that their convenience was best served by deporting the instruments and doing their work at home. After a few years there were left to the observatory only the four or five *savants* who lodged within its walls, and these worked independently of each other without supervision or direction. While Paris in the sixteenth and seventeenth centuries had no lack of brilliant astronomers, down to the concluding years of the eighteenth century there was in truth no Paris Observatory in the sense that we now attach to this word, and that in England has been attached to it from the beginning, viz., a body of observers working under a common direction for a well-defined purpose. They ignore these conditions of the observatory who reproach its astronomers for not having produced and published those well-planned and long-continued labors that constitute the foundations of astronomy, but which are possible only in an observatory properly organized." The American astronomer is perforce reminded by these lines of analogies with another scientific institution much nearer home.

In the early years of the observatory the chief authority exercised within it seems to have been vested in the concierge, whose office was one of considerable dignity and eagerly sought by members of the Academy. The first real director was not appointed until 1771, when the third Cassini (de Thury) came into office. Serving through the dark days of the Revolution, he protested manfully against out-

rage and indignity, but was helpless to prevent the ransacking and plunder of the observatory by armed miscreants, and his downfall, directly due to political conditions and attended by the insults and petty persecutions of his former subordinates, marks the close of the present volume, although Mr. Wolf's significant paragraph, 'He retired to his estate at Thury, where we shall encounter him in the sequel of this history,' suggests a volume still to follow.

Scattered throughout the present work are to be found interesting glimpses of scientific life and work in bygone generations: *e. g.*, the first Cassini seeking to introduce into France, from his native Italy, the arts of glass making and telescope building as prerequisites to the growth of astronomy; and a casual account of the very long telescopes then in vogue, with a welcome explanation of the manner in which observations were conducted with an objective and ocular placed a hundred, or more, feet apart with no intervening tube. Turning to matters of a more personal character, we catch glimpses of Academicians quarreling over rights of domicile in chambers hung with tapestry but devoid of beds and tables. With more of mirth than surprise do we find one of the Cassinis protesting in vain, that the observatory windows should be glazed before he is required to store within it unwelcome instruments thrust upon him by administrative decree; and with very different emotions we read the pathetic account of Picard, close to the discovery of the aberration of light a century before Bradley's time, but dying just before completion of the instruments that had been ordered expressly for investigation of the suspicious phenomena.

In mechanical execution the volume worthily maintains the traditions of the house of Gauthier-Villars, but its usefulness is impaired by lack of an index.

GEORGE C. COMSTOCK.

MADISON, WIS.

The Grasses of Iowa. By L. H. PAMMEL, Ph.D., J. B. WEEMS, Ph.D., of Iowa State College of Agriculture and the Mechanic Arts, and F. LAMSON-SCRIBNER, Agrostologist, U. S. Department of Agriculture, Des Moines, Iowa. F. R. Conway, State Printer, 1901. Bulletin No. I, of the Iowa Geological Survey. Pp. 525; with 11 plates and 514 engravings.

This is a great credit to the author and to the State Geologist who had the good sense to secure its preparation. The work treats of anatomy of the grasses, the roots, stems, leaves, flowers, grain, hybrids; purity and vitality of grass seed, cereals, fungus diseases of grasses, bacterial diseases, pastures and meadows of Iowa, weeds of meadows and pastures, chemistry of foods and feeding, lawns and lawn making in Iowa. The plates and figures are excellent and the whole work seems to be up-to-date, excepting some of the names of plants. Nearly all of the grasses of the state are illustrated, some legumes and weeds.

The authors must have devoted much time in making investigations, reading the best modern works on the subjects treated, including reports of scientific societies, bulletins of the U. S. Department of Agriculture, and of the numerous State Experiment Stations. There are many instances given showing that numerous wild grasses are superior for cultivation to those introduced from Europe. The following are the most important grasses for the State of Iowa: *Poa pratensis, Phleum pratense, Bromus inermis, B. breviaristatus, Dactylis glomerata, Agropyron spicatum, Andropogon provincialis, A. nutans, Agrostis alba, Calamagrostis Canadensis, Panicum virgatum.* For general cultivation *Poa pratensis, Phleum pratense,* and *Bromus inermis* are the most valuable; for shaded ground *Dactylis glomerata* and *Agrostis alba;* for low grounds *Agrostis alba, Poa serotina, P. pratensis, Calamagrostis Canadensis;* for dry hills *Bouteloua oligostachya, B. racemosa;* for alluvial bottoms *Andropogon provincialis,* and *Spartina cynosuroides;* for the loess of western Iowa *Agropyron spicatum, Andropogon scoparius.*

Large numbers of chemical analyses were made in grasses in their natural condition and when free from water, indicating the per cent. of fat, protein, albuminoids, crude fiber, ash and nitrogen-free extract.