

library. Some one ought to make the experiment of using it as a supplementary reader in the high schools.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

Catalogue of the Flora of Montana and the Yellowstone National Park. By PER AXEL RYDBERG, Ph.D. New York. 1900. 8vo. Pp. xii+492.

This fine volume, which is issued as the first volume of the *Memoirs of the New York Botanical Garden*, appeared early in the year, bearing date of February 15, 1900. It is the result of several seasons of work done in the field by the author as collector for the United States Department of Agriculture and the New York Botanical Garden. When he came to work up these collections he found that the flora of Montana was but little known, and accordingly he availed himself of all the accessible material of previous collectors. The final result is a list of 1976 species and varieties of Pteridophyta and Spermatophyta, of which 776 are not recorded in Coulter's 'Manual of the Rocky Mountain Region,' and 163 are new to science.

The treatment of the subject is liberal, and we have here much more than the old-fashioned list which has all but disappeared from botanical literature. The nomenclature is modern, of course, and authorities and descriptions are so freely cited that no one need have any difficulty in certainly identifying all of the species and varieties included. Habitat and locality notes are given with much fullness, and in nearly every case herbarium specimens are particularly indicated by numbers, the only exception being in those cases where the species had been authoritatively reported in standard works. The selection of type, the size of page, and quality of paper all contribute to the finish of the work for which the author supplied so well wrought a text.

The work includes 42 Pteridophytae, 21 Gymnospermae, 423 Monocotyledones, and 1490 Dicotyledones. The large families are Polypodiaceae (22 species), Pinaceae (20), Gramineae (191), Cyperaceae (105), Juncaceae (23), Liliaceae (28), Orchidaceae (22), Salicaceae (29), Chenopodiaceae (50), Amaranthaceae (27), Alsini-

aceae (34), Ranunculaceae (71), Crucifereae (76), Saxifragaceae (35), Rosaceae (84), Papilionaceae (122), Onagraceae (43), Umbellifereae (41), Primulaceae (24), Polemoniaceae (39), Boraginaceae (40), Scrophulariaceae (93), Compositeae, including Ambrosiaceae and Cichoriaceae (357).

That much work is yet to be done in this region may be seen from the author's remark in the preface that "the area east of the 108th meridian on the south side of the Missouri River, and of the 112th meridian on the north side is practically unexplored botanically," in fact it appears that it is only the mountain regions that have been fairly well explored.

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The Agricultural Experiment Stations in the United States. By A. C. TRUE and V. A. CLARK. U. S. Department of Agriculture, Office of Experiment Stations, Bulletin No. 80. Pp. 636, pls. 153.

This book was prepared as a part of the exhibit of the American Agricultural Experiment Stations at the Paris Exposition. It is an exhaustive treatise on the history, work, and present status of the experiment stations in general and of the fifty-six stations individually, profusely illustrated with half-tones showing the buildings, plats, laboratories, herds, etc., of the different stations. It opens with an account of the general agricultural conditions of the United States as related to the work of the stations, dividing the country into six general regions. The part devoted to the history of the stations includes an account of the early experimental work carried on by the agricultural colleges and other institutions prior to the establishment of experiment stations supported by State appropriation. The first of these stations was located at Middletown, Conn., in 1875, and was afterwards removed to New Haven, where it continues in operation. The movement to secure Federal aid for experiment stations, resulting in the passage of the Hatch Act in 1887, and the development of the stations under the Hatch Act are reviewed. There are now fifty-six stations in operation, including those in Alaska and Hawaii, fifty-two of which receive Federal aid.

The relations of the stations to the general government through the Department of Agriculture, their equipment, and lines of work are discussed at considerable length. Some of the more important general results of the work of the stations are briefly noted under the following headings: (1) Introduction of new agricultural methods, crops, or industries, and the development of those already existing; (2) the removal of obstacles to agricultural industries; (3) defense of the farmer against fraud; (4) aid to the passage or administration of laws for the benefit of agriculture; and (5) educational results of station work. Brief as this summary necessarily is, it brings out in a striking manner the wide range of usefulness of experiment stations to the farming community, touching nearly every phase of agricultural operation from the seeding and culture of the crop to its utilization in feeding for beef, pork, lamb or milk production, or in the arts. It points also to the great benefits which have already resulted in particular lines, as in the improvement of the dairy industry, which has been practically revolutionized, and is held by the authors to be "the most important general result of experiment station work"; the maintenance of soil fertility by the economical use of fertilizers and green manures; the introduction of new crops, as Kafir corn, rape and Manshury barley; and the prevention of the ravages of a long list of injurious insects and diseases. And finally it brings out very forcibly the influence which the stations have had in arousing widespread interest in the various forms of agricultural education—a phase of the station work which is often underestimated. This influence has been exerted through the vast amount of literature distributed by the stations in the form of bulletins and reports, which go regularly into more than half a million homes and libraries, through other writings and correspondence of the station workers, their addresses at farmers' institutes, and the intimate association of the stations with institutions for higher education. "No nation has ever attempted the free dissemination of agricultural information in so wide and thorough a way as has the United States, and it is believed that the results have justified the large expenditures which have been made

for this purpose. * * * The stations are not only giving the farmer much information which will enable him to improve his practice of agriculture, but they are also leading him to a more intelligent conception of the problem with which he has to deal, and of the methods he must pursue to successfully perform his share of the work of the community and hold his rightful place in the commonwealth." As a result of the intimate associations of the stations with institutions for higher education, "the pedagogical possibilities of instruction in the science and practice of agriculture have been more clearly revealed, and the claims of agricultural science have increasingly gained the respect and attention of scientists working in other lines. There is now in this country a much keener appreciation than heretofore of the fact that the problems of agriculture furnish adequate opportunity for the exercise of the most thorough scientific attainments and the highest ability to penetrate the mysteries of nature."

The larger part of the volume is devoted of accounts of the individual stations, and of the Office of Experiment Stations at Washington, which constitutes a part of the general system. These accounts, although condensed, are quite complete, and aside from giving the history, equipment and lines of work of the station, contain many interesting notes on its more important and successful investigations, evidences of usefulness, and reference to general results which have been of greatest benefit to the agriculture of the State.

An appendix contains an account of the inspection work of the stations (fertilizers, foods and feeding stuffs, apparatus for milk testing, nursery stock, animal diseases, etc.), with the principal features of the laws under which it is carried on; the general statistics of the American stations; a list of the publications issued by them since their organization; a list of books published by experiment station workers; and a catalogue of the experiment station exhibit at the Paris Exposition.

The chief regret in connection with this book is the small edition to which it was limited, which precludes its general distribution, even among experiment station workers. It is hoped that Congress will see fit to authorize a reprint,

so that it may be distributed to those most entitled to it, and placed on sale like other government publications.

E. W. ALLEN.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Journal of Science* for July contains the following articles:

- 'Energy of the Cathode Rays,' by W. G. Cady.
- 'Volcanic Rocks from Temisconata Lake,' Quebec, by H. E. Gregory.
- 'Interpretation of Mineral Analysis: a Criticism of recent Articles on the Constitution of Tourmaline,' by S. L. Penfield.
- 'Studies in the Cyperaceae, No. XIII,' by T. Holm.
- 'Titration of Mercury by Sodium Thiosulphate,' by J. T. Norton, Jr.
- 'Selenium Interference Rings,' by A. C. Longden.
- 'Carboniferous Bowlders from India,' by B. K. Emerson.
- 'New Bivalve from the Connecticut River Trias,' by B. K. Emerson.
- 'Statement of Rock Analyses,' by H. S. Washington.
- 'String Alternator,' by K. Honda and S. Shimizu.
- 'Action of Light on Magnetism,' by J. H. Hart.

THE June number of the *Bulletin of the American Mathematical Society* contains the following articles: 'Report of the April meeting of the Society,' by the Secretary; 'Report of the April meeting of the Chicago Section,' by T. F. Holgate, Secretary of the Section; 'On the history of the extensions of the calculus,' by J. G. Hagen; Burnside's 'Theory of groups,' by G. A. Miller; Shorter notices: D'Ocagne's 'Treatise on nomography,' by F. Morley; Barton's 'Theory of equations,' by J. Maclay; Rice's 'Theory and practice of interpolation,' by E. W. Brown; Braummühl's 'History of trigonometry,' and Boyer's 'History of mathematics,' by F. Cajori; and Frischau's 'Series in circular and spherical functions,' by W. B. Ford; 'Notes'; 'New Publications.'

The July number, concluding Vol. VI. of the *Bulletin*, contains: 'Some remarks on tetrahedral geometry,' by H. E. Timerding; 'On singular transformations in real projective groups,' by H. B. Newson; 'On groups of order $8\frac{1}{2}$, by Ida M. Schottenfels; Lobachevsky's Geometry' (second paper), by F. S. Woods; 'Burkhart's Elliptic functions,' by J. Pierpont;

'Erratum'; 'Notes'; 'New Publications'; 'Ninth annual list of papers read before the Society and subsequently published,' 'Index.'

DISCUSSION AND CORRESPONDENCE.

THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

TO THE EDITOR OF SCIENCE: The following criticism has been sent to me of the last schedule published by the Royal Society for the International Catalogue:

"Take for example, paleontology, the introduction states that the zoological subdivisions are identical with those of the zoological scheme, but so hasty is the compilation that the old scheme of three years ago has been republished quite forgetful of the fact that it was long since given up and replaced by a totally different one. Had one ever classified titles by this scheme, the complete want of accord would have at once appeared. On p. 14 of the zoological scheme is a half page of misprints, which could not have been overlooked had the scheme served for experiments, 'Fauna and Flora' stands as a division of human anatomy, evidently through some carelessness of copying; topics are wanting in abundance and the same topic recurs 3 or even 4 times. Indeed in spite of all the good counsel given and the two years that have been taken, these last schemes simply swarm with errors, from fundamental ones to mere careless misprints * * *."

It hardly seems possible that this schedule, so regardless of the best principles of bibliographical work, and so illogical in its classification can receive the general support which is necessary to make it a financial success. We all welcome the idea of international co-operation as the only means out of the *impasse* of over crowded literature, but before we can combine we must have put before us a scheme which is practicable.

HENRY F. OSBORN.

THE CALLOSITIES UPON HORSES' LEGS.

TO THE EDITOR OF SCIENCE: I shall feel very much obliged to any of your readers who will furnish me with any hypotheses concerning the origin of the callosities upon the legs of horses and mules, and upon the fore-legs of