Under photographic telescopes both reflectors and refractors are discussed, with emphasis on the Schmidt camera. It is a striking fact that as late as 1930 a really new form of telescope could be invented by Bernhard Schmidt, of Bergedorf, Germany. This telescope or camera consists simply of a spherical mirror and a thin correcting plate of glass placed at the center of curvature of this mirror, the combination fulfilling the contradictory requirements of both speed and wide field. Whereas the great reflectors have focal ratios of about f/5, the new Schmidt telescopes are as fast as f/2.5 or, in the smaller sizes, down to f/1. It appears that these instruments are springing up like mushrooms in the United States, with projected sizes up to a 72-inch mirror at Palomar and a 60-inch at Harvard. After the war we may expect that all the striking pictures of the star fields of the Milky Way, taken with five to ten-inch lenses, will have to be done over again with Schmidt cameras and red-sensitive plates.

The different attachments that go with telescopes, such as spectrographs and photometers, are well described, but the tyro will not always be able to distinguish between a currently active and an obsolete instrument, nor between the precision obtained, for instance, of radial velocities with the slit spectrograph and the objective prism.

In the elaborate instruments for solar research we come, strange to say, to the field of the amateur. The late Dr. George Ellery Hale once defined an amateur as one who works at astronomy because he can not help it. In his life-long study of the sun Hale himself remained true to this definition, always contriving new and more powerful apparatus, and toward the end he brought out the spectrohelioscope, a device within the means of amateurs and used all over the world. The McMath-Hulbert Observatory near Pontiac, Michigan, is another case where the amateurs have outdone the professionals. Here the first moving pictures of solar phenomena were taken, and various instrumental innovations such as the electrical driving of a telescope are copied to advantage by observatories elsewhere.

The large telescopes of the world are listed in the order of their size; sometime we may hope to have such a list in the order of their contributions to science. The late Professor Edward C. Pickering, when once asked if they had the largest telescope in the world at Harvard, replied: "No, but we probably have the smallest one that is doing useful work." It was in about 1900 that James E. Keeler with the Crossley reflector at the Lick Observatory demonstrated the possibilities of the reflecting telescope in a good climate. There are now in various countries some twenty-five telescopes larger than the 36-inch Crossley, but, measured by the product, not more than half a dozen are equal to it in efficiency and power. That more than mere size is involved is well stated by the authors:

> A telescope is more than a machine; it is an enterprise around which clusters the life of an institution. It is in a sense a never-ending development, born of the vision of the scientist who conceives it and the engineer who designs it; it assumes form in the hands of the builders, the mechanics, whose ability and skill contribute to the construction; and finally it is nursed by the observer, not altogether without affection, through many nights and years of service, continuously altered or improved as the years bring new technical developments or as new ways are found of using it more efficiently.

The book is well printed with many good illustrations, and the few errors inherent in a first printing do not detract from its value. It is a worthy member of the Harvard series, and, like the others, if a person has a copy, somebody else will soon be asking to borrow it.

JOEL STEBBINS

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AQUATIC PLANTS

Aquatic Plants of the United States. By WALTER CONRAD MUENSCHER. 374 pp. 154 figs. 400 maps. Comstock Publishing Company. 1944. $5.00.

AS Volume 4 of the series of handbooks of natural history issued under the editorial supervision of A. H. Wright, this book maintains the high standards of previously issued numbers. The author has the same difficulty experienced by Fassett in selecting material for his "Manual of Aquatic Plants" (McGraw-Hill, 1940). In range Muenscher is more catholic by covering the entire United States, though he excludes Canada. This wide coverage is a valuable feature of the book, since many visitors to Florida are interested and puzzled by the abundant aquatics there.

In the application of his definition of aquatic plants, Muenscher omits many (33) genera included by Fassett, and also fails to include conspicuous algae and bryophytes, as well as woody plants. In both books species are omitted (*e.g., Helonias bullata, Rhexia virginica, Rynchospora* spp., *Caltha natans*) which other botanists would have included. Muenscher with good reason avoids the trinomials and quadrinomials which cluster around the numerous named forms and varieties of such variable genera as Potamogeton. His failure to include synonyms is not so happy.

Families and genera are well defined. The excellent keys effectively replace the detailed descriptions of species usual in manuals.

The numerous illustrations are well drawn and reproduced, and with the keys make identification fairly

simple. Flavor is given the book by the wide field experience of the author, whose notes on habitats and distribution are especially good. A map gives at a glance the distribution of each species.

Those interested in aquatic plants, after feeling for a long time the need of a good manual, are now handsomely served by two authoritative and useful texts.

IVEY F. LEWIS

REPORTS

THE HARVARD COLLEGE OBSERVATORY[1]

TO THE PRESIDENT OF THE UNIVERSITY:

SIR,—I regret to record a disaster at sea—the loss of the S.S. *Robin Goodfellow* with its crew and its cargo of important materials for war industries. Apparently there had been engine trouble before the ship left port, and possibly a subsequent dropping-out of convoy. A relatively small item in the *Robin Goodfellow's* cargo, but large in the eyes of the Harvard Observatory, was a shipment of astronomical photographs on the way to Cambridge from the Observatory station at Bloemfontein, South Africa. The loss was totally unexpected. The insurance rates on transatlantic shipments had dropped to a very low figure, and our shipping advisers in South Africa and in America had assured us of the relatively high safety of shipments by sea. During the past several years we have made shipments once or twice annually from America to South Africa—shipments of photographic plates and of other materials necessary for the operation of the station; we have had very high insurance costs, but no losses whatsoever. For the past two years we had attempted no return shipments from South Africa. Large quantities of photographic negatives are accumulating in our southern storehouse. Only twice have we had to ration our plate-hungry telescopes for a few weeks or months while awaiting the replenishment of raw materials from England or the United States.

In number of photographic plates our loss by the sinking of the *Robin Goodfellow* is something less than 20 per cent. of a year's work. Notwithstanding the presumably low risk, we did, nevertheless, deliberately avoid shipping home the plates made with the patrol cameras. Photographs made with the Rockefeller reflector or the Bruce refractor can be replaced; but the essence of the patrol plates is their continuous coverage of the sky throughout the year, and time can not be replaced.

In looking over recent Annual Reports from the Observatory, one is struck by the failure to finish off jobs as pledged in the reports. This merely reflects our commendable optimism, when in full pursuit of a scientific project, and also the continually increasing drain by war projects on the personnel of the Observatory staff. The investigators are largely absent, and we do not have computers and other assistants to help carry through the routine researches in the Observatory's programs. For example, the Memorial Volume for Miss Annie J. Cannon, although essentially completed, remains unpublished. The Jewett telescope at Oak Ridge can not yet be put into regular operation. The discussion of the Milton Bureau's variable stars progresses slowly.

Although much delayed, because its authors are deeply involved in war work, the volume in the series of Harvard Books on Astronomy, entitled "Telescopes and Accessories," by Dr. George Z. Dimitroff and Dr. James G. Baker, is completed and within a few weeks of publication. The six earlier volumes in the series have continued to find new readers; four of them have required a second printing. An eighth volume in the series, not heretofore announced, will be entitled "The Relativistic Universe." It will be written by Dr. Phillipp Frank and an associate. The preparation of Dr. Menzel's volume on the Sun and solar problems must be postponed until the end of the war.

A text for courses in navigation was completed during the past year by Dr. Bart J. Bok and Miss Frances W. Wright. The volume, with the title of "Basic Marine Navigation," has been adopted by a large number of colleges and universities for their wartime courses in navigation. One of the important responsibilities of the Department of Astronomy during the past three years has been the giving of heavily attended courses in navigation for both the civilian and navy students in Harvard College.

During the past year, the Wyeth reflector at Oak Ridge has not been used, and there is little likelihood that it will be put into operation again until the return of the observing staff. The same is true of the Jewett reflector, which is of the Schmidt design. It has been tested mechanically and optically, and to the extent that we find it possible, further improvements in the guiding mechanism, the electric drive, and the plate-holder ensemble will be carried on during the coming year. Test photographs by Dr. Bok, with exposures extending up to two hours, demonstrate that the correcting plate, mirror and mounting are all highly satisfactory. The instrument will be able to add importantly to our studies of nebulae, variable stars, Milky Way structure and galaxies when regular

[1] Report of Dr. Harlow Shapley, Director of the Astronomical Observatory of Harvard College, for the year ending September 30, 1944. Cambridge, Mass., 1945.