considerations, and the remainder is devoted to practical suggestions and directions.

In the discussions of photometric apparatus, such types have been selected as have been shown by experience to be really useful. Among these, the Bunsen screen holds easily the first place, from actual use, convenience, and sensitiveness, though attention might well have been called to its two notable weaknesses:

1. That it violates a fundamental principle of photometric construction, namely, that the portions of the photometric screen which are used for comparison should be illuminated each by one only of the lights to be compared, and not by both. The violation of this principle renders it possible, as is shown in the analytic discussion, to make settings in any one of three ways, which may give quite different readings, so that agreement is only obtained (and not surely even so) by reversing the instrument. How many users of the Bunsen screen for industrial purposes habitually reverse their photometers?

2. That the ordinary binocular use of this instrument is attended by the possibility of a considerable constant error. This is indeed pointed out on page 210, but is of sufficient importance to deserve mention in the description of the photometer itself.

It is questionable also whether the old shadow photometer is not too hardly dealt with. The illustration on page 54, though similar to that generally given in books on the subject, affords no idea of the proper use of the instrument. When arranged in the most advantageous manner this photometer becomes convenient in use to an extent hardly approached by any other form, and sufficiently sensitive for most work.

The bolometer, as a photometer, is dismissed with a few lines, yet it is worth noting that while energy measurers—like the bolometer—which can be made to register their results mechanically, do not measure the physiological sensation of light, yet for certain purposes they may be most useful. The variation in brightness of a light, within not too large limits, takes place generally without changing materially the character of the light, and hence is proportional to the corresponding change in energy. Such questions as the steadiness of a standard can be investigated by means of a bolometer with far more precision than by any photometric arrangement. No photometric indictment against the standard candle has ever approached in severity the curves obtained by Nichols and Sharp, in the work referred to by the author.

The method is recommended in the chapter on arc light photometry, of calibrating an incandescent lamp at white heat, by comparing in succession lights of higher and higher incandescence, starting with the ordinary yellowish standard, until through a series of steps the required limit is reached. This is a questionable method in practice. As the change of color in the successive steps is always in the same direction, from yellow toward white, errors made on account of the differing colors of the lights are likely to be always in the same direction, and therefore cumulative. I have found it very difficult to make a series of measurements of this kind tally in their final results with a direct comparison between the limits of the series made with a flicker photometer.

But these are small questions and affect but little the value of a book which may be recommended to students of the subject as a safe and efficient guide.

Frank P. Whitman.

Liverpool Marine Biological Committee's Memoirs.

Numbers II. and III. of the Liverpool Marine Biological Committee's memoirs have recently come to hand. It was hardly to be expected that the standard of scientific excellence set by No. I. of the series, on *Ascidia* (see Science, January 19, 1900), written by the most experienced ascidiologist living, could be reached by all succeeding numbers. If, however, the two now under review may be accepted as establishing the quality of those that are to be prepared by specialists less distinguished than is Professor Herdman, the writer of the first number and editor of the series, a set of very valuable little books is to be the outcome of this unique undertaking.

Their usefulness will be by no means restricted to English laboratories of elementary

instruction, but will extend to the reference libraries of many professional zoologists.

Number II., by Mr. J. Johnstone, is on *Cardium;* and number III., by H. C. Chadwick, is on *Echinus*. The former contains 84 pp. and 7 pls.; the latter 28 pp. and 5 pls.

In *Cardium* the sections, 'General Organization, Mantle and Foot,' 'Shell,' 'Alimentary Canal,' 'Branchia,' 'Vascular System,' and 'Course of the Circulation,' are particularly well done. One rarely finds in works on the lamellibranchs of the general scope and purpose of this the crystalline style and the method of extending the siphons and foot better treated than here. The renal, nervous and reproductive systems do not fare quite so well, relatively. The histology of the nervous system, for example, is not touched upon at all, while it is entered into with some detail for all the other systems.

The treatment of the renal system is somewhat deficient in illustration, and consequently lacks to some extent in clearness. And here one wonders why the terms 'organ of Bojanus' and nephridia, so well established in lamellibranch morphology, are not even mentioned.

The absence of any reference to the cœlon, at least under that name, is strange.

A feature of this particular monograph, and one which will undoubtedly both extend and enhance its local value, is an appendix on 'The Economy of the Cockle, with special reference to the Lancashire Sea-Fisheries District.'

The *Echinus*, though perhaps not reaching at any point quite so high a level of descriptive excellence as does *Cardium* in a few sections, is more even. It is good throughout.

Both monographs contain much evidence that their authors have not only a large fund of first-hand knowledge of their subjects, but have also wide acquaintance with the original literature bearing upon them.

One constantly wishes that zoological treatises of this general type might contain more physiology and natural history with the morphology than they do; but here the desiderata are usually beyond the power of the authors to remedy. The three numbers of this series thus far put out are certainly less defective in this way than are many general works.

None of the numbers thus far issued have either tables of contents or indexes, and they should certainly have both; their value would be greatly enhanced thereby.

I would again express regret that the volumes cannot be more securely bound. A number of forms in the copy of *Cardium* that has come into my hands are now nearly ready to fall out, and the book has had no hard usage. The educational worth of the books certainly ought to insure them a place in many laboratories and reference libraries; and their usefulness ought not to be impaired by defective construction.

WM. E. RITTER.

SCIENTIFIC JOURNALS AND ARTICLES.

Popular Astronomy for August and September, published at Northfield, Minn., contains, as leading articles, views of some prominent astronomers, about the present opposition of the planet Eros as favorable for a study of this new planet's parallax. If its parallax can be obtained, micrometrically and photographically as accurately as is now believed, the result will help to a better knowledge of the solar parallax. Such knowledge would improve most of the constants of the solar system. S. J. Brown, Astronomical Director of the United States Naval Observatory, has prepared the first and second articles. The first is on the feasibility of obtaining the solar parallax from simultaneous micrometric observations of Eros, and the second is a translation from the French of two circulars issued by the International Astrophotographic Conference at its meetings in July and August last, giving instructions to all the astronomers of the world who are expected to co-operate in observing Eros during September and October. Director Brown gives useful comments on these circulars. Other articles are: 'Ptolemy's Theorem on the apparent Enlargement of the Sun and Moon near the Horizon,' by Dr. T. J. J. See, Washington, D. C.; 'Total Eclipse of May 28, 1900,' by Professor M. Moyé, University at Montpellier, France; an illustrated article on the same subject by the editor; 'The Propagation of the Tidal Wave,' by Dr. T. J. J. See; 'The Planet Jupiter,' by G. W. Hough, and an obituary