in the following manner: "Our chemists tell us, forsooth, that the composition of water was unknown until Priestley discovered oxygen in 1774. Never was there a greater mistake, for did not the prophet cry out, ages ago, 'HO! Everyone that thirsteth.'" W. W. KEEN

PHILADELPHIA, PA.,
August 20

SCIENTIFIC BOOKS

The Physical Basis of Society. By CARL KELSEY, Professor of Sociology in the University of Pennsylvania. New York. D. Appleton & Co. 1916. Pp. xvi + 406.

As its name indicates, this book deals chiefly with the physical basis of human society. The following subjects are considered in sequence: the earth and man, mutual aid and the struggle for existence, the control of nature, the evolution of man, heredity, heredity and society, race differences, sex differences, the influences of society upon population, social institutions, and the nature of progress.

In the chapter on the earth and man, the author introduces too much detail for an elementary sociological work, especially on pages 1 to 28. Moreover, the real social significance of much of the material is not clearly shown. It would have been much better if the author had developed such a topic as the size and customs of the social group as influenced by the prevailing method of food getting, which is conditioned by physical environment.[1] Pages 28 and following give a fairly satisfactory summary of geographic influences.

In the chapter on mutual aid and the struggle for existence, the author again loses himself in a mass of ill-digested detail about the chemical and bacteriological aspects of plant life, and devotes to this subject space out of all proportion to its sociological significance.

The chapter on the control of nature is done more successfully, but the chapter on the evolution of man is very unsatisfactory. In this latter chapter the author launches into a discussion of the old controversy about the evolution of man. He has reduced statements and quotations from authorities to such small compass that their real meaning and spirit are largely lost. At present, when students are generally open-minded in regard to the doctrine of evolution, it is a waste of time to revive this theological controversy in a book that is non-historical. The real subject-matter of this chapter, if the title is any indication of its aim, is treated in a few scant pages at the end.

The chapter on heredity is superior to any of the preceding and is a good treatment of the subject. The clarity of presentation might have been improved by better selection of diagrams. The chart on page 236 illustrating the inheritance of polydactylism, although taken from such a reliable source as Guyer, is not well selected to illustrate the inheritance of a dominant trait. An analysis of this chart reveals the fact that the transmission of polydactylism as a Mendelian trait in the family shown, is explicable only on the assumption that it is a recessive—and this contradicts the caption. But explanation of the chart in terms of the sex-limited hypothesis does, however, permit its interpretation in terms of dominance. Yet the author has not introduced this qualification, hence the example is not satisfactory. The remaining chapters are superior to the earlier ones.

In general, the book gives all appearances of having been too hastily written, and thus furnishes grounds for the criticism that the work of sociologists is superficial. This is all the more deplorable because the general plan and logic of arrangement of the book are excellent. F. STUART CHAPIN

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Recreations in Mathematics. By H. E. LICKS. New York, D. Van Nostrand Co. 1917. Pp. v. + 155, $1.25.

This is an amusing little book with various problems of more or less interest, particularly to the teacher of elementary mathematics. Unfortunately the historical notes are largely

[1] See Ellen Semple's "Influence of Geographic Environment," pp. 54 to 65.

incorrect. In addition to mathematical problems and random notes on elementary mathematics through the calculus there are similar notes on astronomy and the calendar, and on mechanics and physics.

LOUIS C. KARPINSKI

SPECIAL ARTICLES

THE EFFECTS OF THYROID REMOVAL UPON THE DEVELOPMENT OF THE GONADS IN THE LARVÆ OF RANA PIPIENS

IN a paper published in SCIENCE, November 24, 1916, a general account was given of my experiments performed in the spring of 1916 upon the removal of the anlagen of the anterior lobe of the hypophysis and of the thyroid gland in early tadpoles of *Rana pipiens*. It was shown that in each case this operation prevented metamorphosis. A full account of the results of the removal of the anterior lobe of the hypophysis has been published.[1]

Now the effect of thyroid removal upon the development of the gonads has been largely worked out. A full account of this latter phase of the work will be published in due time, together with papers by students of mine who have worked along correlated lines. It seems desirable in the meantime to give a brief account of the most interesting theoretical results of my investigations.

It was shown in my earlier paper that in the absence of the thyroid gland the tadpoles failed to undergo metamorphosis. Development went on normally up to the time when the hind limbs reached a length of 4–5 mm. At this stage the limbs entirely ceased to develop while the body as a whole failed to undergo further differentiation. While the tadpoles increased very greatly in size they at no time showed any further evidences of metamorphosis. This was true in spite of the fact that they eventually attained a length of body—exclusive of tail—varying from 30 to 43 mm. These figures are far in excess of any length normally attained by tadpoles of this species. From time to time specimens were killed and studied. At the date of writing, March 20, two of these tadpoles still remain alive and are in the same stage of bodily differentiation that they had reached the last of June.

This not only involves leg length, the failure of the tail to decrease in length and the failure of the mouth to change in form, but it involves the retention by the intestine of the original relative length characteristic of tadpoles. The lateral line organs became more highly developed than ever. In short a strictly larval form is maintained for months.

Now it is true that failure to metamorphose may likewise be attained by insufficient feeding if brought about at a sufficiently early stage of development. One larval tadpole with hind legs 5.5 mm. in length was kept in its larval condition by feeding very meagerly to November 15. At that time an effort was made to cause it to increase in size and to attain metamorphosis. Although it ate food it remained quite small, not showing any marked increase in size, nor did it show any strong tendency toward metamorphosis. When killed Febaruary 22 the testes were found to be quite small, they showed spermatogonia but no tendencies toward spermatogenesis. This was in strong contrast to the condition in a thyroidless tadpole with a body length of 43 mm. killed February 7. In this tadpole the testes were well developed, spermatogenesis was most active and thousands of completely formed spermatozoa were found in the testes, although the tadpole had remained in a strictly larval form with hind limbs only 5.5 mm. long and with a stomach and intestine length of 426 mm.—over 12 times the length of the corresponding organs in normal frogs at the time of metamorphosis.

The above cases are compared in order to show that although starvation may serve as one means of retarding metamorphosis, it also retards the development of the gonads and of the contained germ cells. This has been thoroughly established in an unpublished paper by Mr. Wilbur Swingle, one of my graduate students who carried out a series of experiments upon this same species. This case is cited to obviate the objection that the conditions here set forth might have been produced by starvation and not in thyroidless tadpoles

[1] *Biological Bulletin*, March, 1917.