convert it into "meadow land." It was here that the buffalo last lingered in Kentucky, a few of them having been seen here as late as 1818.

With the settlement of the country and the extermination of the large wild game, the trees, which still lingered along the major streams, and possibly, also, on the tops of the sandstone knobs which are scattered over the region, began in their turn to reclaim the ground from which they had been driven, until now it is so well wooded that a person traversing the region who was unacquainted with its history would naturally conclude that each farm he sees is but the expansion of a clearing won from virgin forest by the axe of the sturdy pioneer, as elsewhere in Kentucky and Tennessee.

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SCIENTIFIC BOOKS

Bodenablagerungen und Entwicklungstypen der Seen. By G. LUNDQVIST. Bd. II of Thienemann's Die Binnengewässer, 1927, 124 pp. 14 pl. Published by E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.

FOR a number of years Swedish investigators have been studying the bottom deposits of lakes in southern Sweden and much interesting and valuable information has been obtained in these studies. The present volume deals primarily with these investigations. The first part treats of the methods of obtaining samples, including descriptions and figures of the apparatus, with the chemical and microscopical methods of studying the material, and with the system of representing the results by diagrams.

These lacustrine sediments are deposited in thin strata and the annual deposit of pollen makes it possible to trace the history of the beds; in this way it has been ascertained that the period of time covered by them ranges from a few hundred years in some instances to a few thousand years in others.

The relative proportions of the component materials serve to characterize the different types of sediments and a key for their identification is given, together with a series of thirteen microphotographs illustrating them.

The sediments are deposited in the form of beds and there is usually a succession of these beds whose sequence is dependent upon the solubility of the chief constituent of the deposit. In some instances the deposits seem to be homogeneous throughout, but through age determinations and by microfossil analyses it can be readily shown that they consist of a series of beds. Several types of bed sequences are shown by means of diagrams. In addition to chemical and biological factors, the character of the beds is affected by certain dynamic factors, such as wind, currents and exposure to wave-action. The final section deals with the regional distribution of lake types in southern Sweden. A bibliography of sixty-nine titles is given.

Die Tierwelt der Unterirdischen Gewässer. By P. A. CHAPPUIS. Bd. III of Thienemann's Die Binnengewässer, 1927, 175 pp. 70 figs.

This volume deals with the animal population of subterranean waters, such as are found in springs and caves. There are three chief sections which consist of (1) general, (2) faunistic, and (3) biological parts. The general part treats of methods of collecting the fauna, the character of subterranean waters and the characteristic environmental conditions existing therein. The subterranean fauna is divided into three ecological groups, namely, (a) Troglobionte, (b) troglophile, and (c) troglozene forms.

The second part consists of a list of the fauna of subterranean waters together with notes regarding the various forms and their geographical distribution. Mollusca and crustacea furnish the largest variety of forms.

The third part, consisting of fifty pages, treats the morphological adaptations of this fauna and the influence of subterranean life on the various organisms; the effect on the eyes and other sense organs, on the color, size and breeding habits are discussed, together with the origin and age of this fauna and the effect of the glacial period upon it. The bibliography includes 194 titles.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE SPIRALS WITHIN THE TERMITE GUT FOR CLASS USE

INSTRUCTORS in bacteriology often realize that it is not easy on many occasions to find a satisfactory source of spiral-shaped microorganisms for class use. The proper varieties of bivalves are not always available and when one has a sufficient number of these at hand, one can not be certain that one will find satisfactory spiral material within them. Many also have made it a habit to look over students in an endeavor to find a marginal gingivitis since this condition yields most beautiful fields for direct smear or for the dark field. Young people, however, show this disease in rather limited numbers.

One of us (S. F. L.) while making a study of the

protozoan fauna of the termite gut[1] some years ago was impressed by the fact that the intestinal contents of these forms contain immense numbers of spiral organisms. It then occurred to us that these insects might offer a satisfactory source of supply of spirilla for class use in bacteriology. Repeated dissections according to technique which follows showed that material both for smear preparation and for dark field was rendered abundant immediately and with spectacular results. The wide distribution of termites over the United States renders them readily available to laboratory instructors in many parts of the country and careful search will discover them in practically all regions.

The termites of the United States which are favorable for this use and which are common enough to furnish laboratory material over any considerable area belong to three genera: *Termopsis* Hagen, the commonest west coast termite; *Kalotermes,* several species of which are found in the southwestern, southern and southeastern states; and *Reticulitermes,* with numerous species, which has an extensive range including the whole of the United States with the possible exception of certain of the northernmost central states. In the Bay Region of California all three genera are present. Of these genera, *Termopsis* and *Kalotermes* live entirely in wood, the former in decaying wood, the latter in sound, but dead wood, such as stumps or dead parts of living trees, in telephone poles and, further south, in house beams. *Reticulitermes* lives in the earth from which it attacks sound wood. It is the cause of considerable economic loss due to its attacks on wood of buildings, etc.

The genera have been named in the order of decreasing size and increasing difficulty of laboratory culture. The difficulties encountered in laboratory culture of the termites arise from the necessity of considerable humidity together with the susceptibility of the organisms to fungus attack. *Termopsis,* the largest of these termites, is also the hardiest. Living as it does in fungus infested wood it seems to have developed a resistance to fungus attack. The simplest method of keeping laboratory cultures of *Termopsis* is by placing double cones of filter paper in finger bowls set in battery jars or museum jars. The larger jar should contain half an inch of water and must be covered with a glass plate. After some time on the filter-paper diet the wood particles disappear from the intestinal contents, which makes it easier to make smears. A more satisfactory arrangement for long periods or for the other genera is a series of mason jars with rubber stoppers pierced each with two glass tubes connecting by rubber tubes with the other jars, one of which contains water. Here filter-paper cone may be used or, better still for long cultures, pieces of the wood taken with the colony.

The whitish-headed individuals (nymphs of *Termopsis* and *Kalotermes,* workers of *Reticulitermes*) contain the most luxuriant flora. When material is needed the termite may be placed on a surface and held quiet by a probe pressed gently on the thorax. The extreme tip of the abdomen is then seized in fine-pointed forceps and by a gentle continuous pull the intestine may be removed. When teased the contents escape, including wood or paper fragments, great numbers of Protozoa, and the microorganisms. The lumen is lined with a close coat of spirals. Teased pieces of it mounted in Locke's or physiological saline present a beautiful picture. The material thus obtained may be mixed with two or three drops of sterile physiological saline upon a microscope slide and from this smears may be made immediately. Following air drying, they may be fixed by heat and then distributed to the students. Ordinarily Ziehl-Nielsen carbol fuchsin diluted six to ten times with water gives a satisfactory stain. The finest results, however, are to be obtained with the dark field condenser using the fresh gut contents diluted somewhat with sterile physiological saline.

Beginning with Leidy the students of the Protozoa of the termite have noted the spiral organisms which abound in the gut. Leidy, in his first paper,[2] spoke of the "spirillum" and later[3] named it *Vibrio termitis.* Grassi and Sandias[4] speak of spirilla in European termites. Dobell[5] describes *Spirochaeta termitis* from Ceylon termites, which he identifies with Leidy's species. More recently they have been discussed both by Cleveland[6] and by Damon.[7] Thus, we make no claim that these observations are original with us. We do desire to call the attention of laboratory workers and instructors to the fact that there is a source of spiral material which is easily available here in the United States.

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