SCIENTIFIC BOOKS

SOIL SCIENCE

Fundamentals of Soil Science. By C. E. MILLAR and L. M. TURK. Pp. xi + 462. 56 tables and charts, 78 figures and a glossary of terms. New York: John Wiley and Sons. 1943. $3.75.

THE authors, professor and head of the department of soils and associate professor of soils, respectively, at Michigan State College of Agriculture, East Lansing, Michigan, announce in the preface that the book was prepared for use as "a college textbook, a reference book for farmers and owners of farm lands, and as an aid to any one desiring information on soils and their culture."

Those who have made any attempt to teach soil science well realize the particular difficulties of subject-matter organization which the field of study represents. The task is not simplified by the need, in most university departments of agriculture, for serving not only students who are later to become specialists in soils but also those who are not soils majors but who should, nevertheless, have a fair general knowledge of soil science. When to the needs of these groups are added the demands of farmers and landowners, the preparation of a single, readable and satisfying book for all is a complicated undertaking.

The authors have dealt with the subject-matter in nineteen chapters throughout which photographs, figures and tables are fairly uniformly distributed. Many of the figures are new to text-books on soils and are valuable additions. Each chapter of the book contains lists of "Objectives" and "Questions" which are subject-matter headings, and should be of use to the beginning student. Chapters I to IX inclusive, and XV, which deal mainly with development, classification, physical and chemical properties, moisture, organisms, organic matter, soils and agriculture of arid regions, contain material which may properly be regarded as contributing primarily to knowledge of the fundamental properties of soils. These chapters cover about two thirds of the text. The remaining nine chapters are concerned with plant nutrition, fertilizers and fertility maintenance in soils, irrigation, soil in relation to fruit and lawn production and soil in relation to economics (productivity ratings of soils and soil resources): all subjects which, however valuable, are more closely connected with soil manangement, crop production and land evaluation than with fundamental soil science. In the earlier chapters there is also incorporated a considerable amount of material of an applied nature, *e.g.,* several sections on kinds of tillage implements, time and depth of tillage are included in the chapter on the physical and chemical properties of soils; a chapter on lime, with sections on the agricultural sources of lime, chemical guarantees and fineness, follows the chapters on chemical properties and soil reaction; the chapter on soil moisture includes sections on tile drainage, size of tile and so forth. This method of presentation undoubtedly adds to the interest of the subject, especially to the student with farm experience. The question nevertheless persists as to whether the method allows sufficient time at this stage in his training for the fullest development of the less easily acquired background necessary to the student majoring in soils, whose great opportunity is at hand to acquire the more difficult fundamentals.

The book is directly written, although at the cost of some oversimplification, for example, in parts of the chapter on soil moisture and elsewhere, and much has been accomplished in integrating the various subject-matter divisions and making the entire book interesting and readable. It is believed that attention might advisably have been given to the more complete development of some of the fundamentals and in acquainting the reader with the need for readiness, on his part, for repeated future adjustment of his point of view in order that he may be prepared to keep pace with advances in soil physics, soil chemistry and soil microbiology. It will appear to some that more conscious recognition might advantageously have been made, also, of the limitations of our present knowledge and, on that account, of the frequently arbitrary means which are devised for the solution of some of the most urgent soils problems.

An unfortunate error has been overlooked in the discussion accompanying the development of the expression for the pH of water in Chapter IV. The denominator term in the first equation on page 100 may be regarded as constant and almost equal to the molar concentration, per liter, of water. It is not infinite, but in either case it can not be ignored.

The book is a distinctly useful one and will be well received by students and farmers desiring an introduction to soil science.

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TERMITES

Termites (Isoptera) from the Australian Region. By GERALD F. HILL. 479 pp. 24 plates. 353 figs. Australia: Council for Scientific and Industrial Research. 1942.

THOSE of us who take an interest in termites have followed the excellent work which Mr. Hill has done in Australia for many years past. In the book under review he has summarized the results of his investigation. The region is one which is particularly rich in species of termites. The Australian continent, alone, possesses no less than 140 species. As is well known,

it possesses the only living species of *Mastotermes*, the most primitive living termite and one which is responsible for a large amount of economic loss. Mr. Hill gives the means of identifying all the termites, which he recognizes from Australia, New Guinea and the islands south of the Equator, between 140° E and 170° W, a region which is of very great interest to us in this country at the present time. Although the book is primarily a description of species in technical terms, it should not be forgotten that this is ultimately one of the major bases of our knowledge of any group of animals, and where an entire fauna is redescribed so far as possible by one man on a uniform basis, the value of all separate descriptions is enhanced.

The book, however, is more than that since it includes a summary of whatever is known, all too frequently very little, of the biology of the various forms. It may, therefore, be considered as a foundation upon which much future detailed work will be laid. It is not surprising, with such a rich fauna hitherto described in fragments by many investigators, that detailed experimental work on the physiology of the species has not been widely undertaken before. We may hope to see a great increase in such work in the near future, now that the solution of the always troublesome problems of identification of material has been rendered as simple as may be.

In spite of the fact that the book is lithoprinted, its appearance is very pleasing and the illustrations are excellently drawn and well reproduced. I noticed only a few typographical errors, of no particular consequence.

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SPECIAL ARTICLES

ON THE MECHANISM OF INSULIN ACTION: OBSERVATIONS WITH RADIOACTIVE PHOSPHORUS

IN spite of the large amount of study that the subject has received, the mechanisms by which insulin brings about increased deposition of glycogen and oxidation of glucose in striated muscle are little better understood than when these effects were first observed. The participation of the phosphorus compounds in carbohydrate metabolism offers the hope that tracer studies with the radioactive isotope of this element (P^{32}) would cast some light on the matter. In this preliminary report are described some effects of insulin on phosphate metabolism in resting muscle, as determined by this technique; possible correlations of the findings on the intact animal with those obtained on cell-free extracts are discussed.

The injection of insulin into cats under pentobarbital anesthesia was found to result in an increased turnover rate of phosphocreatine P and of the two labile phosphate groups of adenosine triphosphate during glucose absorption, and no change in the rate of turnover of glucose-6-phosphate beyond that resulting from the administration of glucose alone.

Three groups of experiments were performed on 24-hour fasted animals. In each case, the muscles were analyzed 4 hours after the subcutaneous action of Na_2HPO_4 containing P^{32}. In the control group (8 animals) only the phosphate was given. A second group (4 animals) was given 50 cem per kgm of 5 per cent. glucose solution intraperitoneally half an hour after the glucose. A third group (4 animals) was given glucose in the same way as the second group, followed half an hour later by a subcutaneous injection of 5 units of insulin per kgm.

The phosphorus compounds were separated from trichloroacetic acid filtrates and measurements of radioactivity made by methods similar to those previously described.[1] The data, given in Table 1, are expressed in terms of counts per minute per mgm of P, calculated to the basis of 10^6 counts per minute injected, per kgm body weight.

TABLE 1

TURNOVER RATES OF PHOSPHORUS COMPOUNDS IN RESTING MUSCLES OF CATS, AS INFLUENCED BY GLUCOSE AND INSULIN*

	Inorganic phosphate	Phospho-creatine	Adenosine triphosphate	Glucose-6-phosphate	Plasma inorganic phosphate
Group I Phosphate only	364 (224–470)	125 (64–182)	82 (50–117)	208 (114–298)	9460 (5300–14,400)
Group II Phosphate and Glucose	308 (212–460)	115 (67–210)	77 (64–106)	522 (402–665)	9475 (7150–14,200)
Group III Phosphate, glucose and insulin	325 (225–415)	317 (205–425)	189 (133–248)	482 (374–620)	6200 (4950–8800)

* All values are expressed in terms of counts per minute per mgm P, calculated to the basis of 10^6 counts per minute injected, per kgm body weight. Figures given are averages, with the range in parentheses.

It is apparent that the injection of insulin during glucose absorption results in an acceleration of the turnover rates of phosphocreatine and adenosine triphosphate, and that this effect is not seen in the absence of an external supply of insulin. It is quite

[1] Jacob Sacks and Charles H. Altshuler, *Am. Jour. Physiol.*, 137: 750, 1942.