Quaternary Landscapes in Iowa


One of the objectives of this well-written book is to bring knowledge of the Quaternary for Iowa up-to-date in that it has been more than 20 years since the last summary was published. This objective has been accomplished by bringing together three elements: the substratum, the soil, and the land surface.

The book has two parts—the Briefing, and Memoranda. The first 112 pages of part 1 discuss the substratum—the foundation upon which the present landscape of Iowa is built. Only the Cary and Tazewell glacial episodes of the Wisconsin glaciation still are recognized in Iowa; the Mankato was dropped about 1960 and the Iowan in 1965. Although the name Cary is retained, the author states that it has been changed in many places outside of Iowa including the type area near Chicago. He admits to being old-fashioned and stubborn in retaining its use in Iowa.

Land surface and soil are considered in the next section covering 55 pages. The material is organized under the headings of hill summits, hillslopes and valleys. Two provinces are discussed under hill summits—loess and till. This section is useful for understanding the relationships among substrata, the landscape and the occurrence of specific kinds of soils. The loess province especially is well handled. For example, "As the loess thins, the particle size decreases, the summits broaden, the local relief decreases... Soil development increases..." Models are developed explaining soil formation for the provinces discussed. The section on land surface closes with two premises on relative dating. The first is that the soil is younger than the material in which it forms, and the second, that the soil is younger than the surface on which it forms. Although these premises seem obvious, they are not, especially the second one, since, for example, many soil scientists still do not utilize landscape age as an aid in soil classification and mapping.

The remaining section of part 1 discusses paleosols, glaciation and palynontology under a general heading of environment. Part 2 begins with a useful catalog of 123 radio carbon dates in Iowa. Other sections deal with contamination of radio carbon samples and "relations" in which the author’s views on statistical procedures and curve fitting are presented. The book has 121 references, a number of photographs, well-executed figures, and a foldout color plate showing the Quaternary Geology of Iowa. Quotations of Mark Twain are encountered throughout the book and they are a delight.

This volume covers a subject matter area often neglected—that between soils and geology. Reading this book should compel those who study and work with the land to look more critically at landscapes. Throughout the book an effort has been made to define terms so that it should be readily understandable by any reader interested in earth science. Although the focus of the book is Iowa, many principles are developed which have application beyond Iowa’s borders. Fred C. Westin, Agronomy Department, South Dakota State University, Brookings.

Soil Mechanics—Selected Topics


This book consists of nine chapters, each giving an up-to-date and detailed treatment of a particular topic. The authors are Australian specialists in soil mechanics. The topics discussed are:

1) Soil chemistry relevant to engineering behavior of soil by O. G. Ingles.

2) Pore pressures in soils and rocks by I. K. Lee and I. B. Donald.

3) Flow of water in saturated soil and rockfill by I. K. Lee and J. D. Lawson.

4) Strength and deformation of soils and rocks by I. K. Lee and O. G. Ingles.

5) Experimental techniques by J. R. Morgan and P. J. Moore.

6) Theories of plasticity and failure by E. H. Davis.

7) Stability analyses application to slopes, rigid and flexible retaining structures by I. K. Lee and P. J. Moore.

8) Application of soil dynamics to foundation design by J. R. Morgan and P. J. Moore.


Soil scientists without some previous knowledge of soil mechanics will not be able to assimilate many sections of the book, but for those already familiar with standard texts, the book is a source of recent work in the above listed topics.

In the preface Dr. Lee states, "Engineers have realized that there is a wealth of geotechnical knowledge available from other disciplines such as soil and agricultural, soil physics and geology." The work of soil scientists which apparently has most interested engineers concerns the physico-chemical properties of soils and clays discussed in Chapter 1. In many soils such important engineering behavior as volume stability, strength and permeability is controlled by "dissolved salts associated with clay surfaces." Although soil chemists may find the treatment of ion exchange very cursory (lyotropic effects are not mentioned) the discussion of soil structure and fabric attempts to fill the gap between the atomic scale of clay electric double-layers and macroscopic units more adequately than the soil physics texts with which I am familiar. Ingles helps to remove some of the confusion experienced by soil scientists in reading engineering literature by clearly defining flocculation, dispersion and coagulation.

Among other sections of the book soil physicists may find of interest is the discussion of the effective stress law extended to unsaturated soil in Chapter 2. This is an area of common interest to the highway engineer and the soil physicist who most frequently deal with soil in an unsaturated state. Unfortunately, the effective stress concept, which is of such great utility in many engineering applications in saturated soil, is more complex and less useful in unsaturated soils. However, there is continuing study of this subject both in soil physics and engineering.

The latter half of Chapter 4, which analyzes the brittle failure of unsaturated soils and rocks, will interest those who deal with problems of tilth, cultivation and soil structure. Several existing theories of failure are examined and compared with experiments. The author concludes that the Griffith-Brace theory is more adequate in lower stress regions than is the Mohr Theory, although the latter is better in regions of high compressive stress.

Chapter 5 gives some detail on the use of transducers in pore pressure, soil pressure and displacement measurements, improvements in triaxial testing and earth pressure measurements. The chapter on saturated flow (3) treats non-Darcy flow through rock fill, several transient flow conditions in soil, including storage and drainage, and gives a complete discussion of consolidation.

Chapter 6 demonstrates the use of limit theories which apply to materials more general than those of classical plasticity, i.e., to materials which are cohesive, frictional and change volume during deformation. The final three chapters deal with specific engineering problems.

It is difficult to evaluate the potential value of this book to readers of SSSA Proceedings. Only parts of it will be of interest to any one reader. Because of its detailed treatment of restricted subjects, it is not recommended as a soil scientist's introduction to soil mechanics. Moreover, the high price ($31.50) will tend to limit potential buyers to libraries and those with a special interest in several of the selected topics. L. J. Waldron, Department of Soils & Plant Nutrition, University of California, Berkeley.