
Soil in Australia has received considerable attention for many years, mainly because of the widely held view that Australian landforms are very old and the soils are extremely fragile—agricultural practices imported from Europe and North America have not been well suited to this landscape and the soils have suffered widespread degradation. Thus, Young and Young’s book on Australian soils joins a number of others, some of which refer specifically to Australian soils, such as A Manual of Australian Soils by Stephens (1962), A Handbook of Australian Soils by Stace et al. (1968), or Soils: An Australian Viewpoint (CSIRO, 1983), and some of which discuss soil properties and management with particular emphasis on the Australian environment, such as Rural Land Degradation in Australia by Conacher and Conacher (1995) and Soils: Their Properties and Management by Charman and Murphy (2000). Although there is plenty of competition in the field, this book brings a fresh perspective to the study of Australian soils and contains some novel insights.

The book starts with a discussion of soil formation on the Australian land mass in the context of continental drift—the break-up of the supercontinent Gondwana and Australia’s steady drift northward—and climate change, both globally over many millions of years and change as a consequence of the new continent’s drift to lower latitudes and the opening of the circum-polar ocean circulation. The long time period is broken down into the classical geological periods, which are punctuated by episodes of mountain building, erosion and deposition, and vulcanism. This introduction finishes with a discussion of the effects of Pleistocene glaciations and long-term denudation rates of ancient land surfaces. The topic of erosion is taken up again in a later chapter where the message about the effects of erosion under the influence of European occupation of the land is somewhat confused, in that a quotation refers to “the volumes of sediment moved and changes of channel over the past 200 years [being] of much lower magnitude than the changes before settlement”, but overall, evidence is adduced that erosion has accelerated due to human activities, as has been found elsewhere in the world.

Jenny’s factors of soil formation are briskly dealt with in Chapters 2, before the reader is introduced to soil description, using the soil profile and horizons, color, texture, structure, pH, and other features such as evidence of biological activity, shrink–swell characteristics, nodules, and pans. The naming of soils and soil classifications past and present are also discussed. A brief section introduces “clay minerals, sesquioxides and cation exchange”, topics that are referred to again in later sections on “dispersion and sodicity”, “cracking clays and gibbsite”, and “salinity and sodicity”. However, the book is not strong on mineralogy of the clay fraction and consequent soil physicochemical properties. For example, in Fig. 4.3 on p. 68, Na+ is drawn as an unhydrated exchangeable cation that is larger than Ca2+ (also adsorbed as an unhydrated cation). In suspension, water molecules are said to be able to penetrate between linked clay particles to surround the Na+ ion and force the particles apart, whereas water cannot penetrate between the particles of Ca2+ clay and “break the Ca–clay bonds”. This is at odds with the concept of inner- and outer-sphere complexes involving exchangeable, hydrated Na+ and Ca2+ cations at clay mineral surfaces, and the changes in basal spacing due to the osmotic swelling of clay crystals saturated with Na+ or Ca2+ ions (Sposito, 1989). Further, ionic potential should be defined as the ion charge/radius ratio, not the “ratio of size to charge” (p. 71).

The characteristic features of Australian soils are discussed in Chapter 3, and a brief overview is presented of the distribution of soil orders, the highest category of the Australian Soil Classification. Later in Chapter 7, there is more detailed discussion of several of these characteristics, such as the influence of wind-deposited material (“parna” in Australia, synonymous with loess), cycles of erosion and redeposition (K cycles), kaolinitic weathering and lateritization (a term not so widely used now), and the more general formation of hard crusts, or duricrusts (ferricrete, silcrete, and calcrete). One comment worth further investigation is that the sea salt content of air blowing onto the southern shores of the continent is up to 10 times higher than the level in air from the Pacific Ocean. Overall, this is an excellent exposition of the unusual factors that have influenced the formation of Australian soils, with enduring challenge to pedologists to remember that a soil profile may reflect “up-built” as well as “top-down” processes.

Between Chapters 5 and 7 are chapters dealing with Water and Soil, Organisms and Soil, and Soil Erosion and Mass Movement. The chapter on Water and Soil is the weakest, with a number of errors and misconceptions. For example, on p. 62 field capacity is set at a water potential of −1/3 atmospheres, whereas in Table 4.1 on the next page, it is put at −10 kPa (−0.1 bars). The diameter of pores just holding water at the wilting point (~1500 KPa) is quoted as 2 μm instead of 0.2 μm, and hydraulic conductivity is said to be proportional to the fourth power of the pore radius, instead of the square of the pore radius. In the section on salinity, the surprising statement is made that “plants take up water and dissolved nutrients by the process of osmosis”. There is a nice blend of concepts and detailed supporting information in Chapter 5, Organisms and Soil, although nitrification should be presented as a step in overall “nitrogen mineralization”, not as the process of mineralization itself. Erosion by water and wind is discussed not only in the agricultural context, but also in the context of landscape formation, which is informative.

The book concludes with chapters on Soils of High Agricultural Value, Soils of the Forests and Rangelands, and Soils in and around Cities. Naturally, in a book of this size the choice of which soils, regions, and topics are discussed must be selective. But for most of the combinations selected the treatment has depth and is informative. The adverse effects that can occur with cropping, irrigation, and the use of fertilizers and pesticides are identified, but I was surprised no mention was made of the “ecosystem service” function of a healthy and biodiverse soil–plant community. I also felt that the topic of trace elements in soil (or micronutrients) could have received more attention than the one page allocated under “soils and human health”.

The book has a helpful glossary of terms, a short guide to soil assessment in the field, valuable references, and suggestions where to look for further information—in books, on the internet, or on CD-ROMs. The text is also well supported by a set of 32 excellent color plates. I enjoyed reading this book and would certainly recommend it to students for the information it contains on soils and geomorphic processes, land forms, geological processes, weathering, and soil distribution on a truly ancient land mass.

Robert E. White  
Institute of Land and Food Resources  
The University of Melbourne  
Parkville, Victoria 3010, Australia  
(robertew@unimelb.edu.au)

REFERENCES