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Book Review: Iowa's Geological Past: Three Billion Years of Change

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REVIEWS

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Iowa's Geological Past: Three Billion Years of Change. Wayne Anderson, 1998. University of Iowa Press, Iowa City IA. xii + 424 pages. ISBN 0-87745-639-9, ISBN 0-87745-640-2 (pbk.). \$29.95 hdbd., \$19.95 pbk.

Wayne Anderson, born in geode country in southeast Iowa, earned his Bachelors, Masters, and Ph.D. at the University of Iowa (writing a thesis and dissertation on Iowa geologic topics). He will complete a 37-year career teaching geology at the University of Northern Iowa with his retirement in the Spring of 2000. His research activities and the work of his students have added greatly to our understanding of the geology of eastern Iowa. In his many years of studying and teaching, Wayne has clearly developed a thorough understanding of the geology of the Iowa, and he has drawn on this wealth of information in his newest literary effort, to produce a very complete and accurate book on Iowa's geologic history.

His discussion of *Iowa's Geologic Past* begins with a description of the geologic setting of the state, centered in the stable Midcontinent throughout the Phanerozoic (last 530 million years). Anderson uses the concept of sedimentary sequence, conceived by legendary geologist L.L. Sloss to explain how these rocks were deposited during 5 major transgressions of the seas onto the continents, bounded by periods of regression and erosion. He describes the use of Sloss's Sequences to show the general relationship of Iowa's rock record to deposition in surrounding states. With this background firmly laid, Anderson launches into a chronological description of the geological history of Iowa and Iowa's rock record.

This discussion begins with the first 2.5 billion years of Iowa's history, the Archean, and a discussion of the oldest dated rocks in the state, 2.89 billion-year-old intrusions; intruded into even older, still undiscovered rocks. Anderson continues into the younger Proterozoic (2,500–530 million years ago) with a description of some of Iowa's better known Precambrian features, including the Midcontinent Rift, Sioux Quartzite and associated pipestone deposits. He goes on to review rocks recovered in several key core drilling projects, and ends with a description of the Precambrian rocks encountered during the drilling of the central peak of the Manson Impact Structure.

Moving upward in time, into the Paleozoic (the age of "Early Life" 530–208 million years ago), *Iowa's Geologic Past* reviews the Cambrian of Iowa, its vast sheets of beach sand (now major aquifers), and the first hard-shelled life forms. Overlying the Cambrian, the Ordovician was dominated by the deposition of layers of marine limestones (later altered to dolomite) and shales in shallow inland tropical seas. These rocks were later to serve as the hosts for extensive lead and zinc mineralization in the Upper Mississippi Valley Tri-State region of Iowa, Wisconsin, and Minnesota. Anderson describes the geology and history of the lead mining industry that was active in the region for almost 200 years. Extensive sequences of carbonate mounds and intervening mud flats dominated the Silurian Period of Iowa and much of the northern Midcontinent. These dolomitized sediments produced rocks are among the most resistant cliff-formers, providing a dramatic backdrop for some of Iowa's most spectacular

State Parks (such as Palisades-Kepler, Backbone, and Wapsipinicon) and providing some of Iowa's best building stones (quarried at Stone City) and aggregate resources.

The warm Paleozoic seas that covered Iowa during much of the Devonian and Mississippian periods left spectacular, world-renowned fossil evidence of their rich and abundant marine fauna. As the seas transgressed to Iowa in the Middle Devonian, they initially encountered hot, dry evaporative conditions that led to the deposition of two widespread sheets of gypsum in the southeast (currently being mined by US Gypsum) and south central regions of the state. As the water deepened, sea life flourished with a great abundance and diversity that can be seen at the Devonian Fossil Gorge (the emergency spillway of the Coralville Dam north of Iowa City.) The Mississippian Period marked the last transgression of the vast Paleozoic carbonate seas into the Midcontinent. It produced some of Iowa's best concrete and aggregate rock and some of the world's most spectacular fossils. Discovered and prepared by a central Iowa farmer, the intricately preserved, fully articulated crinoids, starfish and sea urchin slabs collected by B.H. Beane are now on display at the State Historical Museum in Des Moines and in museums all over the world. The Iowa Mississippian also produced a trove of amphibian fossils, the earliest animals to walk on the land of North America. The youngest period of the Paleozoic present in Iowa is the Pennsylvanian, a thick series of rocks dominated by cyclic sequences of sandstones, shales, and limestones deposited by numerous short-lived marine transgressions and regressions driven by the cyclic buildup and melting of continental glaciers on the southern continent. These rocks included significant coal resources that were extensively mined in southern Iowa around the turn of the century. Anderson describes Iowa's coal mining history and the mining techniques employed in the state.

The Mesozoic (the age of dinosaurs 208–65 million years ago) in Iowa includes rocks of the Jurassic and Cretaceous periods. Jurassic rocks are limited to a very small area in and around Fort Dodge, but includes a very valuable and extensively mined gypsum deposit. Anderson describes this unit and the story of the Cardiff giant, a statue carved from the gypsum and promoted as an ancient petrified man. Cretaceous sandstones and shales constitute the bedrock of northwest Iowa. These units were deposited on the eastern margin of the Western Interior Seaway and in the rivers that flowed to it and serve as a valuable aquifer and source of aggregate in northwest Iowa. One of Iowa's most dramatic geologic features was created in the Late Cretaceous, the Manson Impact Structure, a 37 km-diameter meteorite impact crater that is one of the largest and best studied in America.

The most recent era in Iowa's geologic history, the Cenozoic, was dominated by multiple advances and retreats of continental glaciers. The thick deposits of glacial till, in some regions sculpted by torrents of sediment-laden melt-water and capped with thick, wind-borne loess deposits, form the varied landscapes of today's Iowa. Anderson describes ice age Iowa landscape and the animals that inhabited it. He explains how each of the major landscape regions was formed. He ends his book with a review of Iowa's mineral and groundwater resources and a description of the geology of selected public lands.

Iowa's Geological Past is the most complete and accurate discussion of Iowa's geology and geologic history that has been compiled in a single book. It is richly illustrated with maps, cross-sections, fossil illustrations and photographs. Short vignettes are widely used to describe important personalities in Iowa geology, significant fossils, and other highlights of the state's geological history. This book in-

cludes abundant references to more detailed studies, and is suitable for use as a text book or a general reference book. It also provides a wealth of information about many aspects of the natural history of the state, and best of all it provides a lot of enjoyable reading.—RAYMOND R. ANDERSON, *Iowa Department of Natural Resources, Iowa Geological Survey Bureau, Iowa City, IA. 52242.*

Wildflowers and Other Plants of Iowa Wetlands. Sylvan T. Runkel and Dean M. Roosa. 1999. Iowa State University Press. 372 pages. ISBN 0-8138-2174-6 pbk. \$24.95.

Runkel and Roosa have scored again with an impressive book on the plants of Iowa wetlands. The format is similar to their very successful *Wildflowers of the Tallgrass Prairie* (ISU Press, 1989) with full-page color illustrations of each species with the facing page giving nomenclatural data, range and habitat, leaf, flower and fruit characteristics. Information and interesting facts about the plant, including uses by aborigines and early settlers, follows.

The coverage is extensive with photos and descriptions of 150 species with 210 taxa listed in the index. The book is divided into sections on terrestrial flowering herbs (2/3 of the species), ferns and lower vascular plants, trees, shrubs, and vines, and emergent herbs.

Photography is impressive throughout the book. Each species illustrated is readily identified from its photograph. The range of species is very wide including several very rare plants, yet most of the common species are also included. Especially impressive is the section on sedges. Often this difficult group is ignored or given short shrift. Runkel and Roosa include 10 important sedges that should make those of us with only a rudimentary knowledge of the group more willing to wade in and give the sedges another try.

In addition to the pictures and descriptions the introductory sections give a natural history of wetland types and the species to be expected in each along with illustrations of most of the types. Runkel and Roosa's knowledge of the plants and communities of the state is evident in this section as they list locations of rare plants and give examples of outstanding sites. Adding to the usefulness of the book is an extensive bibliography and a glossary.

This book is going to make fieldwork in wetlands easier for naturalists and will serve as a vehicle by which more amateurs can be lured into the marshes and ponds.—PAUL CHRISTIANSEN, *Professor of Biology Emeritus, Cornell College, Mt. Vernon, IA 52314.*

An Illustrated Guide to Iowa Prairie Plants. Paul Christiansen and Mark Müller. 1999. University of Iowa Press, Iowa City, Iowa.

IX + 237 pages. ISBN 0-87745-660-7 hdbd., ISBN 0-87745-661-5 pbk. \$44.95 hdbd., \$22.95 pbk.

Iowans are increasingly aware of the significance of the tallgrass prairie, and efforts to preserve and protect this once-widespread ecosystem are ongoing. An obvious focus of these efforts is to conserve the native flora. When Bison and Elk disappeared from the landscape and row-crop agriculture appeared, a few of the native plants remained in old cemeteries, along roadsides, and in a few prairie remnants. Workers are now attempting to revitalize our prairies with native biodiversity by finding native plants and selectively harvesting their seeds for use in restoration projects. Efforts to locate and protect remnant native plant populations usually require the assistance of knowledgeable volunteers.

Christiansen and Müller have provided a comprehensive and accessible guide to the native prairie plants of Iowa which should be an outstanding resource for professional botanists, ecologists, and the interested layperson. Their book bridges the gap between exhaustive but highly technical botanical manuals, and "nature guides" which are aesthetic but lacking in content. The approach is to catalog all of the relevant plants (some 300 species) together with distribution information, ample illustrations, and useful characters for identification. Plants are grouped as Pteridophytes (non-flowering vascular plants), Dicots, and Monocots, and listed alphabetically by family. This presentation will be quite familiar to users of the Peterson or other popular field guides. The authors suggest other resources for "more positive identification," however this work will be quite sufficient for all but the most technical work.

The book is a good introduction to plant systematics for the uninitiated. A short Preface includes a brief discussion of the prairie biomes and the history and philosophy of restoration. The authors then present a species list, and a Family Finder and descriptions for identification of plant families (of which 47 are included in the book).

The heart of the book is the species descriptions and illustrations. The line art is excellent, dot maps indicate distribution in Iowa, and descriptions of all relevant plant parts are provided. The treatments are both complete and succinct. Similar species are also described, along with synonyms for the common or Latin names. The book concludes with a list of Iowa prairies open to the public, a glossary, references, and index.

Perhaps the book title should include the word "native," for no exotic species are included. I miss these, for knowing the prairie today also means knowing the common non-native species. Nevertheless, this book is a must for anyone interested in Iowa's native plants and their conservation.—PAUL WEIHE, *Asst. Prof. of Biology & Env. Science, Central College, Pella, IA 50219.*