

NORTH DAKOTA'S GEOLOGY

The Face of North Dakota: The Geologic Story. John P. Bluemle. 1977. North Dakota Geological Survey Educational Series 11, Grand Forks. 73 pages. \$1.00 (paper - includes *Geologic Highway Map of North Dakota*).

This publication is part of the North Dakota Geological Survey's Educational Series, a continuing series of reports directed toward the general public rather than toward professionals. The series is based upon the research and reports of the Survey but is written without the technical phraseology of the more formal publications.

Miscellaneous Map 19, which accompanies the report, is a geologic map and cross-section of the state. This map shows the surface geologic features of the state that are described in the text and, by means of the cross-section, shows how some of the buried features are distributed through the state. The major state and federal highways as well as the towns are also shown on the map, so that the interested reader can visit and identify those features.

Bluemle has been in charge of the Educational Series during the past several years. He has written six general reports about different parts of the state and has produced a road log of the geological features along Interstate 94. All of those, as well as other selected publications, are listed in the bibliography.

Bluemle begins by describing, shortly and simply, the physiographic and geologic position of North Dakota in relation to the rest of the continent. That position is important in explaining why and how the geologic features of the state developed. After this brief introduction, Bluemle describes the basic geologic materials (rock types) common in the state. Again, this is a non-technical explanation. Bluemle avoids using technical terminology as much as possible but whenever he must use scientific terms, these are explained and defined.

With the background defined, Bluemle then begins a description of the kinds and locations of the geologic features of the state. He concentrates upon the glacial features, both because of his own professional interest as well as because about two-thirds of the state is covered by glacial materials.

Bluemle completes this section by describing the relationship of the soils and vegetation of the state to these same geologic materials and features. An explanation of such relationships is not found in generalized articles on geology, at least not in the details used here.

A description of the geologic history of North Dakota is a second major part of the report. This section is introduced by a discussion of the length of geologic time and how the concept of geologic time (relative time) differs from the usual concept of time (absolute time). Bluemle then produces a short but complete description of the geologic history of the state using the modern concept of sedimentary sequences with reduced emphasis on formation names. This again is a method of orienting the report to the general reader by introducing and describing concepts rather than a number of technical terms.

A third major portion of the report is a description of the mineral resources of North Dakota. Bluemle concentrates upon petroleum and lignite, describing the beginning of utilization of those resources in the state, the changes which

development of those minerals has undergone, and present and possible future development. The status of other mineral resources such as sand and gravel and salt and potash is also described.

The major parts of the report are concluded by a short description of the ground water and surface waters of the state. Bluemle fails slightly in following his general plan as he neglects to define hydrology. Otherwise, it is a short but clear description of its subject.

Minor parts of the report are concerned with fossils (most reports on fossil collecting in North Dakota have more words than there are fossils), rock and mineral collecting (same thing), and the availability of geologic reports about North Dakota.

All of this is based upon the research conducted by members of the North Dakota Geological Survey and associated scientists. The primary data used for that research derive from two main factors: the collection, as required by state law, of data from the more than 6,000 holes drilled for petroleum and preserved by the Survey, and also the cooperative program between the Survey, State Water Commission, and the U.S. Geological Survey to investigate the water resources of this state. Basically, the oil drilling activity has produced information on the sub-surface rocks and the water resource program has produced information about the near-surface and surface deposits of the state, particularly the glacial deposits. The coal drilling programs being conducted during the present decade are producing information about the shallow subsurface rocks of the western part of the state which probably will be integrated into reports in the next few years.

In the light of all this, it is interesting to compare Bluemle's present report with similar kinds of reports written in past years. The work which Bluemle's pamphlet replaces, *The Geology of North Dakota* by John Hainer, was published in 1956. While Hainer described the same general subjects as Bluemle does, he did so in less complete but also somewhat more complex fashion. This is because more data have been collected and assimilated by the Survey in the past twenty years, as well as more effort expended by Bluemle to orient his reports to the general public than by Hainer.

The comparison of Bluemle's and Hainer's reports shows that science is a continuing study of nature. Our knowledge, or at least what we believe we know, is in continual development, based upon the information collected. It is not that previous investigators were mistaken, it is that they did not have as much information as is presently available. This is something that the general public does not understand and it is unfortunate that Bluemle did not take the opportunity to clarify it.

Bluemle also neglects to emphasize the leading role the Survey has taken both in promotion of the development of the mineral resources of the state as well as the wise management of those resources. After all, the Survey does not have a numerous and influential lobbying group as do other state agencies such as the Highway Department or the Game and Fish Department, so if the Survey won't blow its own horn, no one will.

Basically, however, *The Face of North Dakota* is a well-written, complete, and easily understood description of the basic geologic foundation of the state. Within the limits of space and budget Bluemle produces a good introduction to

the geology of the state and also lists some references for those who are interested in more detail. The book is useful not only for the general reader to gain background about the geologic make-up of the state, but also useful as general reference for junior high and high school science courses.

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