we think Professor Storer's book does. While, in the words of the preface, 'it makes no special appeal to chemists or students of chemistry,' it is nevertheless a thoroughly scientific book in the truest sense of the term. While it is strikingly free from the technicalities of science, its statements and discussions are based on so thorough a knowledge of science in its relations to agriculture, and so pervaded by the scientific spirit, as to render the book most valuable to all students of agricultural science.

It is, however, in its felicitous union of science with practice that the book is pre-eminent. Many otherwise good agricultural books suffer from a certain impracticability, arising from a deficient acquaintance, on the part of their writers, with the conditions of practice; while of others exactly the converse is true. Neither of these faults, however, can be attributed to the present work. While its scientific merits commend it to the student of science, its practical common sense as well as the lucidity and suggestiveness of its discussions will commend it no less to the thinking farmer. Indeed, we anticipate that one of the most valuable features of the book will prove to be that it will, on the one hand, help to remove the prejudice against science which is still too prevalent among farmers, and, on the other hand, tend to inspire in the minds of students of science a greater respect for, and a more earnest study of, the practices and maxims of successful practical agriculture.

GEOLOGY OF MINNESOTA.

THE annual reports of state surveys are, for the most part, dull reading, especially for non-residents; since they are necessarily of a detailed and fragmentary character, showing the progress of investigation in many different directions, with very little completed work. Both the reports before us, however, embody material of more than local interest, and it is desired to call attention here to those portions, without attempting to notice the entire contents of the volumes.

The notes on the section from Duluth north to the iron-mines about Vermilion Lake give Professor Winchell's latest views concerning the stratigraphy of the crystalline rocks of north-eastern Minnesota, between Lake Superior and the international boundary. The height of land between Lakes Superior and Vermilion is marked by two distinct ranges, — the high and broad Mesabi Range, composed of eruptive gabbro and red metamorphic granite; and, north of this, the lower and narrower Giant's Range, consisting of gray and red syenites, which have been referred to the Laurentian, and mark an important anticlinal axis. North of this axis, and dipping north at high angles, is a broad belt of the green and red jaspery and magnesian schists and conglomerates referred to the Huronian. South of the axis, the Huronian series appears to be concealed by a fault; but we have above it, dipping to the south in conformable succession, the Animikie slates and quartzites, the gabbro and granite of the Mesabi Range, and the greenish trap of the cupriferous series, extending from the Mesabi Range to Lake Superior.

The gabbro, Animikie, and Huronian series are each characterized by important deposits of iron ore; and this district is, with almost phenomenal rapidity, assuming a position of the first importance as regards the products of its mines. The iron of the gabbro belt is, as usually with rocks of that class, titanic. It furnishes the iron-sand of the Lake Superior beach, and, so far as known, has no parallel in Michigan and Wisconsin. The iron ore of the Animikie slates is hard hematite and magnetite, and probably parallel to the Commonwealth mines of Wisconsin, but without any known equivalent in Michigan; while the Huronian deposits, occurring chiefly about the south end of Lake Vermilion, consist almost wholly of hematite, and seem to agree closely in character and position with the Marquette and Menominee deposits of Michigan and Wisconsin.

The Vermilion Lake mines are being rapidly exploited, and the discovery of these ore-bodies is regarded as marking an epoch in the economic history of Minnesota and the north-west.

The salt-wells of north-western Minnesota and the adjacent portions of Dakota and Manitoba are believed to give promise of important developments; and various facts are cited tending to show, that, although the occurrence of carboniferous strata in this region has not been heretofore definitely known, these brines, like those of Michigan, really have their source in that formation.

Minnesota, it is well known, is, for the most part, deeply drift-covered, and the solid rocks are rarely exposed, except along the principal streams. For this reason, great geological interest attaches to the numerous deep wells which are being drilled in different parts of the state. They not only show what would be the surface rock if the drift were removed, but also establish the order, thickness, and continuity of the different horizons down to the crystalline foundations of the state, at points far removed from their outcrops.

In the deep wells of central and south-eastern

Thirteenth and fourteenth annual reports of the geological and natural history survey of Minnesota, for the years 1884 and 1885. By N. H. WINCHELL. St. Paul, State. 8°.

Minnesota, there has been found, beneath the St. Croix sandstone, which has for a long time been regarded as the equivalent of the Potsdam sandstone of New York, some four hundred feet of red and green shales, associated with some red sandstone, and succeeded below by a hard red quartzite. This has been uniformly supposed to be the red quartzite that outcrops in south-western Minnesota and the adjacent parts of Iowa and Dakota, and, in Pipestone county, contains the celebrated red clay, otherwise known as pipestone and Catlinite.

The isolation of the outcrops and the supposed absence of fossils have heretofore left the age of this interesting formation in doubt; but it has usually, in recent years, been referred to the Potsdam, although that reference has appeared very unsatisfactory, in view of the records of the deep borings already noticed. Geologists must therefore regard with great satisfaction the discovery in the Catlinite of characteristic fossils, which is here announced. Two forms have been described and figured under the names Lingula Calumet and Paradoxides Barberi, which are believed to indicate the lowest primordial zone, i.e., the Acadian, which embraces the Paradoxides beds of St. John, N.B., and Braintree, Mass.

The discovery of Acadian fossils in the pipestone establishes an important datum for determining the true horizons of other rocks of the north-west. Thus Professor Winchell has referred the overlying red shales, observed in the artesian wells, with much probability to the Georgia slates of Vermont; and the red sandstones connected with them, which appear to expand toward Lake Superior so as to become the red sandstones called Potsdam by the Wisconsin geologists, really become, in that case, the equivalent of the true Potsdam of New York. This makes it necessary to refer the St. Croix sandstones and associated magnesian limestones to the *calciferous* of New York, with which they are more closely allied paleontologically.

Passing to the other extreme of the geological scale, we find two contributions, by Dr. G. M. Dawson and Messrs. A. Woodward and B. W. Thomas, to the paleontology of the bowlder-clay, or drift. The microscopic examination of the bowlder-clays of Minnesota and adjacent regions shows that various species of Foraminifera and other microscopic forms are very generally present, with fragments of larger organisms.

The more important of the Foraminifera are described and figured. Concerning the real origin and age of these fossils, Dr. Dawson says, "that, of all the organic bodies met with, none can be assigned with certainty to the glacial period or era of deposition of the bowlder-clay itself. The origin of most can be traced unequivocally to the older rocks, from which they have been derived, and incorporated with the bowlder-clays." In Illinois the Foraminifera seem to have been derived chiefly from Devonian shales, but farther west they are characteristic cretaceous forms. Dr. Dawson further points out that while the examination of these drift-fossils will serve to throw additional light on the direction of glacial movement, — a point of particular value over the wide area of the plains, where the soft character of the rock precludes the test of direction of striation, — they have so far failed to afford any certain information as to the actual condition prevailing during that period. But the negative evidence, re-enforced by the fact that the derived fossils have been so perfectly preserved, leads to a belief in the great scarcity of life during the ice age.

The principal feature of the report for 1885 is the bibliography of recent and fossil Foraminifera, prepared by Mr. A. Woodward as an introduction to a contemplated work on the Foraminifera and other microscopic organisms of the cretaceous of Minnesota. The completeness of this work may be judged by the fact that one hundred and thirty-three titles are given for eozoon alone.

BORNEMANN, in the *Deutsche medicinal-zeitung*, states that the victim of morphine looks to cocaine for help, and, mistaking its effects for those of morphine abstinence, seeks to remove them by more cocaine, until, unless he becomes enlightened, he finally becomes an inmate of an insane-asylum. In three out of six cases known to him, this was the result. He evidently agrees with those members of the medical profession who are endeavoring to restrict its use, by saying, "More urgently than ever in the case of any other drug, are legal regulations and limitations needed for the sale of cocaine, which now, unfortunately, is too easily accessible to every layman."

— There has been of late considerable discussion among physicians in the west as to the nature of mountain-fever, — a fever which occurs in the Rocky Mountain region, and which has by some been supposed to be peculiar to that locality. Dr. Curtin, who has recently been engaged in an investigation of the subject, finds that almost any disease which occurs in the mountains is liable to be called mountain-fever. He regards that disease which is more commonly known by this name as true typhoid, modified by the peculiar conditions of elevation, etc.