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GEOLOGY OF AN AREA SOUTHWEST OF RANDVILLE

DICKINSON COUNTY, MICHIGAN

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By Carl A. Lamey

INTRODUCTION

A geologic and magnetic survey of secs. 5 and 7, T. 41 N., R. 30 W., a few miles southwest of Randville, Dickinson County, Mich. (see index map, pl. 1), was made during the summer of 1945, and preliminary geologic and magnetic maps were compiled from the field notes. The project is part of a cooperative program being conducted by the U. S. Geological Survey and the Geological Survey Division, Michigan Department of Conservation.

The field work was done by using dial compass, tape, and dip needle. The section boundaries were taped, markers established every eighth of a mile, and from those markers each section was covered by a pacing traverse grid. Other markers were established at eighth-mile pacing intervals along the north-south lines of the traverses, the positions of these markers noted when the east-west lines were surveyed, and the entire traverse grid adjusted when the data were plotted. Dip-needle observations were made at forty-foot intervals along all lines.

TOPOGRAPHY

The area is one of considerable relief. The outstanding topographic features are a large swamp in the northern half of sec. 5 and a ridge that extends through the southeastern parts of secs. 5

and 7 and the northwestern part of sec. 8. This ridge is conspicuous in sec. 8, where it attains a height of a few hundred feet and is characterized by a steep northern face. A lower and less continuous ridge parallels it in a general way for about three-fourths of a mile. This ridge lies about an eighth of a mile to the northwest and is separated from the larger ridge by low ground and swamp. High ground is present along the west side of sec. 7, except near the southwestern part of the section, but it extends only about an eighth of a mile eastward.

The crests of the two ridges are characterized by discontinuous rock exposures, whereas the flanks are covered by coarse glacial debris. In some places the glacial material forms well defined knob and kettle topography.

ROCKS EXPOSED

The rocks exposed in the area are iron-formation, mica-garnet-gruenerite schist, quartzite, and granite, with which are associated granite gneiss, pegmatite, and hornblende and biotite schist and gneiss. The dumps of a few test pits and shafts show the presence of slate near the surface in part of the area.

Iron-formation.—The iron-formation [1/] is generally gray, thin-

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1/ All rock descriptions are based on megascopic examination only.

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bedded, and very siliceous. It is composed chiefly of magnetite and granular quartz, but some of it contains considerable amounts of red

to purple jasper. Thin seams of gruenerite are present in some of the material. Most of the quartz is recrystallized chert and jasper; rarely some of it has the appearance of original rounded quartz grains. Before the formation was metamorphosed it probably was composed chiefly of hematite and chert or jasper.

Mica-garnet-gruenerite schist.—The mica-garnet-gruenerite schist is greenish gray to brown. In part it is thin bedded, but the bedding is conspicuous only on weathered surfaces and on some joint faces, where the garnets stand out in relief. Gruenerite, although not conspicuous, is abundant in some beds and lenses, and a dark mica, possibly biotite, is the chief constituent of others. Magnetite is present in some lenses. It is not usually visible under a hand lens but can be readily detected by a magnet when the rock is powdered.

A black massive rock containing large amounts of amphibole, probably hornblende, is associated with the schist in some outcrops. The black rock appears to have gradational and lenticular relations to the schist and to be interbedded with it.

The composition of the schist suggests that the rock from which it was derived is a slate that contains ferruginous lenses. Where the ferruginous material was siliceous carbonate, it was transformed into gruenerite; where it was hematite or limonite, it was transformed into magnetite. It is possible, although by no means established, that the black amphibole may have been formed by the metamorphism of interbedded basic volcanic material.

Quartzite.—Most of the quartzite is grayish white, but some of it is pink to red, and in places it contains greenish spots. Most of the material exposed is vitreous and shows individual quartz grains rather clearly, but a few exposures are micaceous while others are sugary and contain well-crystallized octahedrons of magnetite. The micaceous and sugary types are but poorly exposed and were noted only along the northern and western sides of the ridge extending through secs. 5, 8, and 7. Much of the quartzite is massive, but some shows distinct bedding. Both cross bedding and ripple marks are present in a few exposures in secs. 7 and 8.

Slate.—The slate is known only from the dumps of two shafts and a test pit near the iron-formation outcrops in sec. 5. The explorations are very old and it was not possible to obtain material from the ledge without extensive excavation.

The slate is dark to light gray except on weathered surfaces, where it is reddish. It is thin-bedded, micaceous, and quartzitic. Many of the alternating micaceous and quartzitic layers are but 0.05 inch thick, but some are as much as 0.20 inch thick. Well-rounded grains of dark quartz are present in the quartzitic layers and are conspicuous in some of the thicker ones.

Granite.—The granite is pink to red, and much of it is gneissic. At one exposure it is cut by reddish pegmatite. Some hornblende and biotite schist and gneiss are associated with the granite in some places, apparently interbanded with the granitic material.

DISTRIBUTION OF FORMATIONS

The distribution of formations is indicated on the geologic map (pl. 1). It differs considerably from the distribution shown by one of the early maps of this area.[2/]

2/ Van Hise, C. R., and Leith, C. K., The geology of the Lake Superior region: U. S. Geol. Survey Mon. 52, pl. 23 opposite p. 306, 1911.

MAGNETIC OBSERVATIONS

Observations on outcrops gave values of 14° to 16° for most exposures of granite and gneiss of all types and for most of the vitreous quartzite; values of 17° to 21° for the sugary quartzite that contains magnetite octahedrons; values ranging from 3° to 37°, erratically distributed, for the mica-garnet-gruenerite schist (see magnetic map, pl. 2, of the outcrop in sec. 5); and values ranging from 35° to 72° for iron-formation. The usual values to be expected from the non-magnetic formations were therefore assumed to be between 14° and 16°.

The magnetic map shows the presence of three belts of magnetic anomalies that are higher than the usual 14° to 16° range, and one that is slightly lower, the values in the low belt ranging from 11° to 13°. The values in the three belts of high anomalies, combined with the distribution of outcrops, are generally distinctive enough to indicate the presence of iron-formation, mica-garnet-gruenerite schist, and sugary quartzite where those characteristic anomalies are present. The absence of the anomalies, however, does not assure the absence of the formations in all instances, since the strength of the anomalies will

depend on the amount of overburden, the degree of metamorphism, the presence of the ferruginous lenses in two of the formations, and perhaps on other factors as well. Interpretations based on the anomalies, therefore, must take into consideration also all stratigraphic, structural, and physiographic information that is available.

The significance of the belt of low anomalies is at present obscure, as no outcrops were found showing such low values. They suggest either very thick overburden or an extensive zone of shearing or faulting, but they might represent nothing but the normal magnetic values for some type of material that is not exposed in this small area.

AGE RELATIONS AND STRUCTURE

Both the age relations and the structure are obscure at present and will probably remain so until mapping is extended considerably beyond the small area surveyed.

Age relations.—It seems probable that the quartzite is the Sturgeon quartzite, of Lower Huronian age, but in the area mapped there is no proof of this. The mica-garnet-gruenerite schist probably was derived from a ferruginous slate that contained some hematite or limonite and some unoxidized iron carbonate. From the known occurrences of such formations in the surrounding areas, it seems probable that this formation is equivalent to (1) the Middle Huronian Siamo slate of the Marquette range and vicinity, (2) the Middle Huronian ~~Bijiki~~ Brier slate member of the Vulcan iron-formation of the Menominee range, or (3) the Upper Huronian Bijiki iron-formation

member of the Michigamme slate. Both the lack of distinctive chert bands and the apparent thickness of the schist suggest to the writer the greater probability of the formation being equivalent to either the Siamo or the Brier, and the known development of similar rock from the Siamo slate favors that formation.

If the mica-gruenerite-garnet schist is equivalent to the Siamo slate and underlies the iron-formation, it appears likely that the iron-formation may be the equivalent of the Negaunee iron-formation, and of Middle Huronian age. The relation between the schist and the iron-formation would then be similar to the relation shown in some places near Republic and Champion.

The age of the slate found on dumps is wholly indefinite at present, and no attempt is made at this time to determine the age of the granite, because of the complexities and amount of regional study necessary to determine its age.

Structure.—Since the age relations of the formations are not known, only suggestions can be made regarding the structural relations. The quartzite dips in general 60° to 70° in a southeasterly and easterly direction, but cross-bedding and ripple marks show that the top of the formation is toward the north and west, and hence the formation is overturned. The magnetic and geologic maps show that the quartzite and the iron-formation diverge westward, and the iron-formation either is faulted or complexly folded between sections 5 and 7. The mica-garnet-gruenerite schist apparently ends rather abruptly northeastward in sec. 5, suggesting that it may be terminated

by a fault. Also, its continuation southwestward is indefinite. If it is deeply buried and lies close to and grades into the iron-formation, it might not be possible to separate it from the iron-formation by magnetic observations alone.

If the age of the quartzite is Lower Huronian, and that of the schist and iron-formation is Middle Huronian, the known distribution and structure of formations suggest the possibility of part of an overturned and faulted syncline from which at least one formation, notably the Lower Huronian Randville dolomite, is missing either as a result of pre-Middle Huronian erosion or later faulting. If the age of the schist is Upper Huronian, the structure is likely to be more complex unless the age of the quartzite is not Lower Huronian. Present information indicates complex structure of some type.