and will serve as controls for future survey work performed by cities in the state. This will enable such surveys to be in accordance with the precise first-order system and make them of greater importance for future reference and record.

STEPS have been taken at the University of Leeds to secure a research fellow to investigate the cause and cure of chronic rheumatism and allied conditions, in order that he may enter on his duties early in 1934. This is the outcome of a deputation, headed by the Earl of Harewood, visiting the university and proposing a scheme of cooperation between the university and the Royal Bath Hospital, Harrogate. An advisory committee of the university has been set up to take general supervision of the work.

DISCUSSION

PALEOZOIC AGE OF THE ROCKS OF CENTRAL NEW HAMPSHIRE

ON the new geological map of the United States issued during the past summer by the U. S. Geological Survey, most of central New Hampshire is shown as "pre-Cambrian, some early Paleozoic rocks may be included." The representation of the geology of this state was based in large part upon a map which I submitted in January, 1932, to Mr. George W. Stose, editor of geological maps for the U. S. Geological Survey. Field work during the summers of 1932 and 1933 has shown that my assignment of the rocks of central New Hampshire to the pre-Cambrian is erroneous. Many of the schists are definitely metamorphosed Silurian and Devonian. Others are pre-Silurian, probably Ordovician but possibly older. Most of the intrusive rocks are younger than the Lower Devonian, but a few are Late Ordovician or older. It is very probable that there are no pre-Cambrian rocks in central New Hampshire, and perhaps in the whole state.

I assigned the rocks of central New Hampshire to the pre-Cambrian on the basis of field work in the North Conway quadrangle during the summers of 1925 and 1926 and the Littleton and Moosilauke quadrangles in 1931. There are no fossiliferous strata within thirty-five miles of the North Conway quadrangle, and the conclusion that many of the schists and orthogneisses are pre-Cambrian was based on long-range correlation. The writer stated that "the evidence as a whole is admittedly inconclusive, but it favors an early paleozoic or pre-Cambrian age of the Montalban schists."[1]

A pre-Cambrian age was also suggested by field work in the Littleton and Moosilauke quadrangles in 1931. The fossiliferous Silurian and Devonian are underlain by a great thickness of slates and volcanics, the metamorphism of which is low-grade. These rocks were believed to be Cambrian and Ordovician. To the southeast of the Silurian and Devonian and the supposed Cambrian and Ordovician are metamorphic rocks of intermediate grade and high grade. Because of their higher metamorphism and an apparent stratigraphic position beneath the supposed Cambrian and Ordovician, they were believed to be older than any of the other rocks and thus pre-Cambrian.

I fully realized, however, that the data were not conclusive and that more field work would be necessary before a definite decision could be reached. Unfortunately, my manuscript of the map had to be prepared in 1932 during this period of uncertainty. On the basis of the data available I assigned the rocks of central New Hampshire to the pre-Cambrian.

As field work progressed during the summer of 1932 and the stratigraphy and structure of the metamorphic rocks of intermediate grade were unraveled, it became clear that they were merely the more heavily metamorphosed equivalents of the Devonian, Silurian and older rocks. Moreover, it was established that most of the intrusive rocks, originally assigned to the pre-Cambrian, are actually younger than the lower Devonian. Finally, in the summer of 1933, with the extension of the field work, it became apparent that even the high-grade metamorphic rocks are Paleozoic.

The conclusion that most of the schists and igneous rocks of New Hampshire are Paleozoic is not a new idea. In the early part of the present century Hitchcock reached a similar conclusion[2] and in a sense the writer is merely substantiating a suggestion put forth thirty years ago.

Table I shows the stratigraphic units established during the past three summers in west-central New Hampshire between the Connecticut and Ammonoosuc Rivers. The age of the Fitch and Littleton formations is based upon paleontological data which will be presented in detail in a forthcoming paper by Arthur B. Cleaves and the writer. The Clough is either Lower or Middle Silurian. The age of the Albee, Ammonoosuc and Partridge formations is not known, other than pre-Silurian. Reconnaissance work strongly sug-

[1] Marland Billings, "The Petrology of the North Conway Quadrangle in the White Mountains of New Hampshire," *Proc. Am. Acad. Arts and Sci.*, Vol. 63, p. 79, 1928.

[2] C. H. Hitchcock, "New Studies in the Ammonoosuc District of New Hampshire," *Bull. Geol. Soc. Am.*, Vol. 15, pp. 461–482, 1904.

TABLE I

Lower Devonian	Littleton formation	Slate, sandstone and volcanics. 5,000 feet
Middle Silurian	Fitch formation	Calcareous shale, calcareous sandstone, arenaceous dolomite, arkose, quartz conglomerate. 700 feet
Lower (?) Silurian	Clough conglomerate	Quartz conglomerate and quartzite. 0–200 feet
	—— Unconformity ——	
Upper Ordovician (?)	Partridge slate	Black slate 0–2,000 feet
	Ammonoosuc volcanics	Chlorite and sericite schists of volcanic origin. 2,500 feet
	Albee quartzite	Quartzite and slate. 4,000 feet

gests that they are younger than the fossiliferous Middle Ordovician of eastern Vermont and therefore Upper Ordovician.

The paraschists between the Ammonoosuc and Pemigewasset Rivers, which in 1931 were believed to be pre-Cambrian, are now known to belong to these same six stratigraphic units, but in a higher stage of metamorphism. The slates and sandstones of the Littleton formation have become mica schists, garnet schists, staurolite schists, and, further to the southeast, sillimanite schists. The volcanics of the Littleton and Ammonoosuc formations, which are chlorite schists and sericite schists northwest of the Ammonoosuc River, are amphibolites and fine-grained biotite gneisses to the southeast. In the Fitch formation the calcareous shales have become biotite-calcite schists and the arenaceous dolomites now consist of actinolite, pyroxene, plagioclase and quartz. Similar changes occur in the other formations, except the Clough conglomerate, which is merely more coarsely crystalline.

Our mapping of the Moosilauke quadrangle demonstrates that the mica schists, garnet schists and sillimanite schists of Mt. Moosilauke are metamorphosed Devonian rocks. Reconnaissance work indicates that the sillimanite schists of the Presidental Range and elsewhere are likewise metamorphosed Devonian. It is very probable that most of the metamorphosed sedimentary rocks between the Pemigewasset River and the Maine border are Silurian and Devonian.

Four major periods of intrusive igneous activity have been recognized in central New Hampshire—the Highlandcroft, Oliverian, New Hampshire and White Mountain petrogenic cycles. The rocks of the Highlandcroft cycle include diorite, quartz diorite, granodiorite and granite. They are younger than the Partridge slate, but older than the Clough conglomerate. They are thus definitely pre-Silurian, and if the tentative assignment of the Partridge slate to the Upper Ordovician is correct, the Highlandcroft petrogenic cycle is Late Ordovician. The Oliverian rocks consist largely of biotite granite and are younger than the Lower Devonian but older than the major period of orogeny. The rocks of the New Hampshire magma series consist of diorite, quartz diorite, granodiorite, trondhjemite and granite. They are younger than the Lower Devonian and essentially contemporaneous with the great period of folding. Youngest of all are the rocks of the White Mountain ("alkaline") magma series, which are younger than the Lower Devonian and also later than the period of orogeny.

Thus three of the igneous series are younger than the Lower Devonian. To these three groups belong 90 per cent. of the igneous rocks of central New Hampshire. The other 10 per cent., the Highlandcroft group, is pre-Silurian and probably Late Ordovician, although the possibility of a greater age can not be definitely eliminated on the basis of the present data. On the recent geologic map of the United States only the rocks of the White Mountain magma series are shown as Paleozoic. All others were included under the symbol for the pre-Cambrian. In other words, Paleozoic intrusives are much more abundant than the map shows.

It is quite impossible to prepare a satisfactory geologic map of New Hampshire at the present time. No complete survey of the state has been made since the Hitchcock survey in the seventies. Although an excellent piece of work for its time, it can not be used as an adequate basis for a modern map. Fortunately the state is now completely mapped topographically and the geologic mapping of five quadrangles is now well advanced, and publication of the memoirs now in preparation should give definition to our present picture of Paleozoic history in this area.

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GLOSSARY OF TERMS USED IN DESCRIBING WOODS

THE December issue of *Tropical Woods,* published by the Yale School of Forestry, New Haven, Conn., contains a report by the Committee on Nomenclature of the International Association of Wood Anatomists on the standardization of terms used in describing woods. It is in the form of a glossary in which 126 terms are enumerated and succinctly defined.

The members of the committee are Professor Arthur J. Eames, Cornell University; Professors Irving W. Bailey, Ralph H. Wetmore and Robert H.