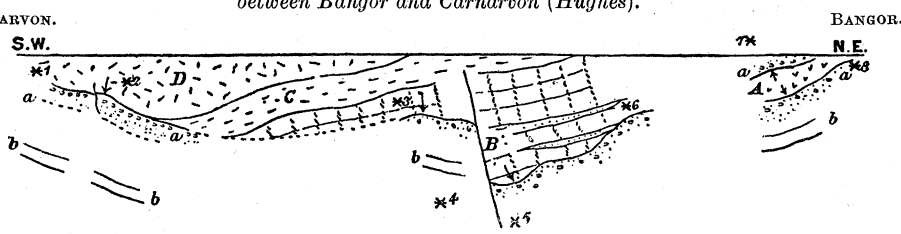
1. — Diagram plan showing how the Cambrian basement beds creep over the various divisions of the archean between Bangor and Carnarvon (Hughes).



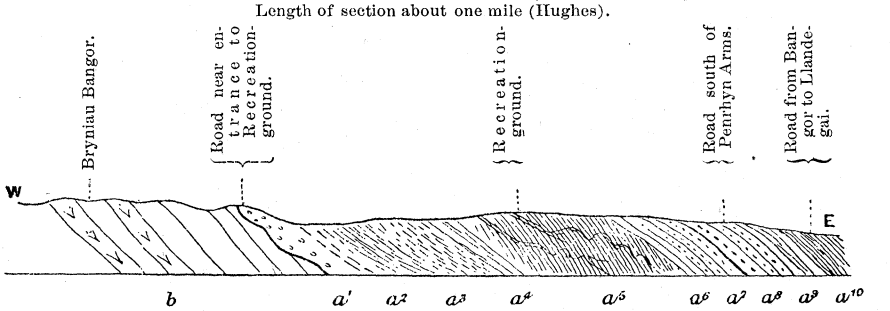
Cambrian.
b, Sandstone and shale of Cambrian.
a, Conglomerate and grit of Cambrian basement beds.

Archean.
A, Bryniau beds } Bangor group (= Pebidian, etc.).
B, Dinorwig beds }
C, Crug beds } Carnarvon group (= Dimetian).
D, Twt beds }

*1, Twt Hill; *2, Yscyborwen; *3, Careggoch; *4, Llandeiniolen; *5, Tymawr; *6, Brithdir; *7, Hendrewen; *8, Bryniau Bangor.

2. — Diagram section east and west across Bryniau Bangor.

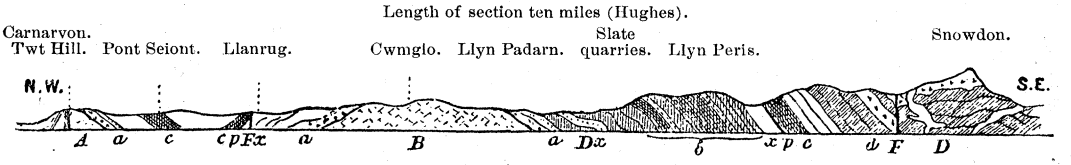
Length of section about one mile (Hughes).



b, Bangor beds (upper Pebidian); a^1, Conglomerate and sandstone (basement bed of Cambrian); a^2, Sandy mudstone; a^3, Finer felspathic mudstone; a^4, Pale green felspathic mudstone; a^5, Cleaved and contorted felspathic mudstone; a^6, Purple and green fine mudstone and slate; a^7, Fine sandy flags, like the Bray beds, purple, and here and there green, passing up into brown; a^8, Even-bedded thin gray sandstones; a^9, Banded flags, passing up into a^{10}, Black slates.

3. — Diagram section showing the sequence of rocks from Carnarvon to Snowdon.

Length of section ten miles (Hughes).



Archean.
A, Carnarvon group (Dimetian); *B*, Dinorwig group.

a, Conglomerate and sandstone (basement bed of Cambrian); *b*, Lower and middle portions of Cambrian, not subdivided, but probably including Harlech, Menevian, Lingula flags, and Tremadoc beds; *c*, Arenig; *p*, Pisolitic iron ore; *d*, Bala group, with subordinate volcanic beds; *F*, Faults; *x*, Broken ground; *D*, Dikes.

are merely intrusive masses or altered beds of Silurian and Cambrian age. The basal conglomerate in this area consists in places almost entirely of quartz-felsites, at other points of a mixture of granitoid (true Dimetian) and felsite rocks, and in some cases of schists. I may further mention with regard to the crystalline schists in Anglesey and in Scotland, supposed by the Geological survey also to be of Cambrian and Silurian age, that the recent researches of Bonney, Callaway, Lapworth, and myself, tend to make it certain that they are all, like the similar rocks in America described by Dr. Sterry Hunt and others, of pre-Cambrian age. HENRY HICKS.

Hendon, N. W., London,
July 5, 1883.

Silurian strata near Winnipeg.

Presuming that it may be of interest to some readers of SCIENCE to read something on the geology of a locality near Winnipeg, I take pleasure in furnishing information, hitherto unpublished, concerning an outcrop of Silurian strata in this part of the north-west. This interesting exposure occurs a short distance from Selkirk, situated some twenty-one miles north of Winnipeg on the Canadian Pacific railway, and near the Red River.

At this place a quarry was opened about a year ago, which, on examination, affords many attractions to a student of science. Fossils belonging to some sixteen species are readily obtained, not only in the

solid rock, but also in the innumerable chippings that lie scattered about the quarry.

The rock is magnesian limestone, dresses readily, and, when burnt, supplies excellent lime. Stone from this place is shipped by rail to Winnipeg, where it is used for ordinary and ornamental building-purposes. Many of the fossils being in the form of casts, they frequently interfere with the successful dressing of the stone. About four feet of drift material overlies the rock; but at another quarry lately opened, nearer the river and a short distance farther north, the drift material attains a thickness of twenty feet. The rock is much the same, but apparently not so fossiliferous.

In the quarry first referred to, the remains of corals belonging to the genera Alveolaria, Halysites, and Zaphrentis, are very numerous. Some specimens obtained bear a close resemblance to the genus Favosites. Another group of very common fossils are representatives of the genera Orthoceras, Endoceras, Ormoceras, and Cyrtoceras.

An excellent specimen measuring eight inches in diameter, with three whorls, was found. The specific characters are much obliterated, but in general outline and appearance it bears a close resemblance to Trocholites ammonius of the Trenton.

Several imperfect specimens of Trilobites were found. One appears to be a member of the genus Illaenus. Fragments of Stromatopora are common, showing in all cases distinct lamination, and, in several, well-defined oscula; while in a few, conical elevations can be observed. The specimens obtained were found among the fragments of rock scattered about the quarry; but the characters of all are exceedingly uniform. The largest obtained measures 7 inches across, 5 in depth, and 2 in thickness. The laminae are well marked, numbering four to the line. They present a wave-like appearance, there being three crests in the section under examination. At the summit of each crest a large aperture is observed. Viewing the specimen from the top, six of these oscula are seen, all about the same distance apart. As yet, I have discovered no rods or pillars present; but there is no question regarding the presence of well-marked laminae and oscula.

I have read carefully the description of the species S. tuberculata, S. perforata, S. granulata, S. mammillata, and S. ostiolata, of Nicholson, and S. concentrica of Goldfuss, and none seem to embrace the species from this quarry. If any reader of SCIENCE can suggest the species to which this interesting fossil from Selkirk belongs, he will confer a great favor upon the writer. J. HOYES PANTON.

Pre-Bonneville climate.

In a critical notice of my preliminary report on Lake Bonneville (SCIENCE, no. 20), Mr. Davis points out that a certain conclusion as to the history of the basin is not sustained by the phenomena described. Since reading his comment, I have not been able to consult my text; but, if memory serves, his restriction is fully warranted. Still, the conclusion is not of necessity overthrown; for it is based in part on omitted data, the report aiming to present only an outline of the subject. Now that the matter is up for discussion, it may be well to indicate these.

The facts set forth are as follows. Above the Bonneville shore-line the topographic forms are those produced by sub-aerial agencies. Below the shore-line the details are of sub-aqueous origin, but the larger features are sub-aerial in type. Especially are the great alluvial cones constituting the pediments of some of the mountains continued beneath the old water-margin, their surfaces being lightly etched and embossed by lake agencies. Evidently these alluvial cones are of pre-Bonneville date; and evidently, too, the goal of drainage — 'the base level of erosion' — was lower when they were built than during the Bonneville epoch.

The questioned conclusion is, that the emptiness of the basin during the long pre-Bonneville, alluvial-cone epoch was due to aridity. Mr. Davis acutely perceives, that the adduced phenomena comport equally well with the alternative hypothesis that the pre-Bonneville condition of the basin was one of free drainage to the ocean, the present continuity of the basin's rim having been instituted either at or just before the beginning of the Bonneville epoch.

On this hypothesis, the place at which the drainage of the basin was discharged must have acquired the peculiar configuration of a river-channel; and since, as our observations show, alluvial accumulation has not been great in the region during Bonneville and post-Bonneville time, vestiges of this channel should remain. The fact that they have not been found goes far to show that they are not visible; for intelligent search has been made for them, our eyes having been trained for their recognition by the discovery of pre-Bonneville channels *within* the basin. All the low passes of the enclosing rim have been scrutinized. At whatever points, then, earlier drainage systems have intersected this rim, the channels appear to have been obliterated by the erosive and constructive agencies of land sculpture.

Again: the principal plain of the Bonneville basin is at heart mountainous. Its surface is level only because the alluvial mountain bases are deeply buried by later deposits. Of the nature of these deposits we know little more than that the uppermost is lacustrine, the Bonneville layer concealing all else. The deposit representing the pre-Bonneville or alluvial-cone epoch must be relatively heavy, and may be assumed to dominate in the determination of the general configuration of the plain. With the basin closed, a certain system of slopes would arise: with the basin open, there would arise a certain other system, definitely related to the point of discharge. The actual system of slopes is adjusted to the existing status, — a closed basin, with lacustral sedimentation.

Assuming that there was at some remote date a channel of outflow, and that the configuration of the plain was adjusted thereto, the period consumed in the obliteration of the one and the remodelling of the other must have been long as compared with the Bonneville epoch. The pre-Bonneville portion of the period — when the basin was closed, but contained no lake — was presumably characterized by a climate similar to the present.

The aridity of the pre-Bonneville epoch is one of the features associating the Bonneville history with glacial history; for, if it be disproved, the Bonneville flooding no longer demonstrates a climatic episode, and the apparent homology disappears. And the Bonneville oscillations have, of course, no climatographic value if they were orographically produced. It is well, therefore, to test thoroughly every link in the chain of evidence. G. K. GILBERT.

Nevada, July 15, 1883.