

VII.—TRIASSIC (?) ROCKS OF DIGBY BASIN.—BY PROF. L. W.
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In the course of a geological survey of the south-western counties of Nova Scotia, of which the results form the substance of a report soon to be issued by the Geological Department at Ottawa, several interesting questions in connection with the rocks of the Annapolis Valley were brought to notice, but as to which the data obtainable at the time were not sufficiently complete to warrant definite conclusions. It was hoped that opportunities for further study would be available, but as this, so far as concerns the writer, does not now seem probable, he has thought it well, in the following notes, to make brief reference to the nature of these questions, that others interested in the geology of this part of the Province, and more favorably situated than he, may be able to give them further attention.

It has been usual to regard all the rocks of the Annapolis Valley, other than those which form its southern wall, as being of Triassic age, and, further, as embracing a sedimentary and a volcanic series of which the latter was altogether the more recent and overlaid the former. A close examination of some sections in the vicinity of Digby tend to modify the second at least of these conclusions.

The first section to which reference is made is to be found in the parish of Granville, on the eastern side of Digby Gut. From the point where the latter suddenly expands to form Annapolis Basin, the shore, for nearly half a mile to the northward, shows a series of low bluffs of a bright red colour, in connection with which at some places may be seen ledges of very soft red shales. In going northward along the Gut shore and approaching the high trappean hill whose face has been laid bare by an extensive land slide, similar red beds continue to show, but become some-

what pebbly. They are nearly horizontal, but with the frequent occurrence of what appears to be false bedding. Still farther north they become, within a few yards, quite coarse, while the colour changes from red to chocolate brown, more or less mottled with light grey. The paste is soft and clayey, but imbedded in the latter, in addition to masses of red sandstone, are numerous *columnar blocks of trap*. These blocks are markedly prismatic and of considerable size, one of them, as shown in the accompanying sketch, projecting from the face of the bluff for over two feet. What is the age of these beds?

Evidently they are newer than the trap of which they contain imbedded columns. But how much newer? Possibly Quaternary. Regarded solely by themselves, there would seem to be no great objection to this conclusion, and it is favored by the occurrence in the vicinity of beds filled with trappean blocks which bear every evidence of being of this age, but the latter are of a different colour, and do not show that intimate association with the Triassic beds which characterizes the former. This association is well exhibited in the accompanying sketch, made upon the ground. (See Plate X, Fig. 2.)

The lowest beds exposed at this point are brownish red sandstones, horizontally stratified, and no doubt a continuation of those seen along the Granville shore. Resting upon them, but somewhat irregularly, are beds of purplish red conglomerate, which are also obscurely stratified, but seem to pass upwards into the very coarse conglomerate in which are contained the large blocks of trap. Between the two there is no clear line of separation as regards either colour or texture. The coarse beds are, however, exposed only for a few yards, while beyond them the finer beds, somewhat mottled, show at intervals for nearly a furlong. In this latter direction they form the shore beneath the high hill of columnar trap to which reference has been made, but owing to the land-slide which has affected the face of the latter, the relations of the one to the other are not easily to be made out. The purplish grey beds along the shore would seem, from their position, to extend beneath the trappean hill, but in

following the former along the shore for a short distance they are found, after becoming gradually harder and somewhat vesicular, to terminate abruptly along a vertical line, which would appear to be a line of fault, the only rocks seen beyond it, but in loose blocks, being composed of trap.

From a review of the above conditions it would seem to be at least possible that the red and purple beds, which are undoubtedly a part of the group usually referred to the Trias, are more recent than the neighboring traps, unless indeed there were several periods of eruption, between or during which the stratified rocks were deposited, and then received their burden of trappean fragments.

We have now to notice another section in which facts of a similar character are still more clearly exhibited.

This second section is found in the town of Digby, just below the point where the track of the Dominion Atlantic Railway, in taking the direction of Bear River, runs along the top of a series of low bluffs overlooking the Annapolis Basin. One of them, about twenty feet high, is nearly vertical and almost wholly composed of rock, exhibiting the arrangement reproduced in the accompanying diagram. (*See Plate X, Fig. 1.*)

At the summit are about two feet of soil, consisting of a reddish sandy loam. This rests upon a bed which in texture resembles a coarse gravel, but with the pebbles contained in a matrix which, while sandy, is compact, and bleached to a light grey colour by the action of humus acids from above. The pebbles in this bed include traps similar to those of the North Mountains, both crystalline and amygdaloidal, besides granite and slate; and, as in the case of some of the beds on the Granville shore, they suggest a Quaternary origin. But directly beneath is a bed of reddish grey sandstone, several feet in thickness, which as clearly belongs to a much earlier formation, and in one particular only differs from the ordinary red sandstones of the Annapolis valley. *It also contains, but not uniformly, blocks of North Mountain trap.* Further, below this red sandstone bed, but at the northern end of the section, and merging into it,

is another coarse pebble-bed, in which the trappean blocks are very abundant and of large size. Finally, the base of the section, at its southern end (the whole section being about 30 feet in length) shows another bed of red sandstone, about two feet thick, and quite free from pebbles, while at the other extremity repeated alternations of beds with and without the trappean blocks may be seen. The lower part of the section is here obscured by a talus.

It seems very certain, from what is here exhibited, that while the trappean overflows along the Bay of Fundy trough were in part and perhaps largely subsequent to the accumulation of the Triassic red sandstones, as so clearly seen at Blomidon, they must also in part have antedated or else been contemporaneous with the deposition of red sandy sediments usually regarded as of the same age with the former.

As having, perhaps, some bearing upon this interesting question, reference may here be made to a curious section to be seen near the south-western end of the island of Grand Manan, of which, as is well known, so large a part consists of Triassic traps. The more exact location of the section is in the settlement of Red Head, at the south-west extremity of the relatively low tract of old (Huronian ?) rocks underlying the inhabited portions of the island, and to the south of the trappean ridge extending thence to the Southern Head. The older rocks referred to are hard, rubbly, dark grey slates, which are often greenish or chloritic, and much stained, sometimes ribbanded with oxide of iron. They are greatly contorted, but have a general north-west dip at a high angle. Resting on these slates, but without any distinct bedding, is a quantity of breccia or conglomerate, filled with blocks, both rounded and angular, of trap and slate. Then follows a mass of more solid trap, which is partly columnar, and into this the conglomerate or breccia seems to graduate.

About fifty feet to the north of the above exposures, a second and much more conspicuous bed (?) of breccia is seen, (Plate X, Fig. 3), *flanked on either side by solid columnar trap*, the conglomerate being about 10 feet wide and rising almost

perpendicularly, making a very marked appearance in the face of the cliff, and having much of the aspect of a dyke. It is, however, wholly made up of detached blocks,—some of them two or three feet long,—of the same nature, and some of them exhibiting the prismatic shape of the trap columns near by. In some instances, however, they are rounded. No trace of the ordinary red sandstones or of any beds resembling those about Digby is to be seen.

It seems hardly possible that the material of this agglomerate should have received its present position except through introduction from above into a previously opened fissure; but whether introduced contemporaneously with the lava flows and ash accumulations represented in the neighboring dolerites and amygdaloids, *i. e.*, in the Trias-Jura epoch, or later and possibly in the Quaternary, is a question which the writer is at present unable to answer.

Reviewing the entire subject, it is evident that there are still some unsolved problems in connection with the supposed Mesozoic rocks of the Bay of Fundy trough (including in the latter the Annapolis Basin); and if the observations here given prove the means of originating any further enquiries in this direction, the purpose of this paper will have been served.

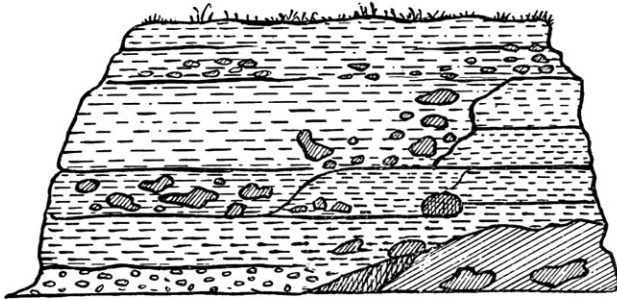


Fig. 1.

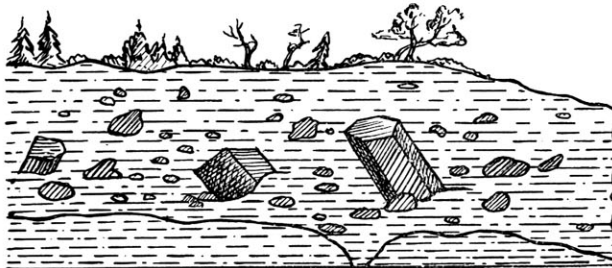


Fig. 2.

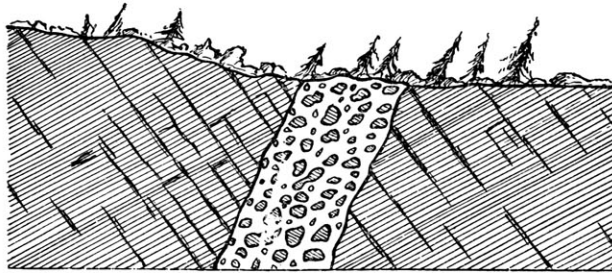


Fig. 3.

Illustrating Prof. Bailey's paper on "*Triassic Rocks of Digby Basin.*" Fig. 1, Red sandstone bluff, Digby, N. S., holding fragments of Triassic trap. Fig. 2, Bluff of red sandstone, overlaid by conglomerate, holding blocks and columns of trap, East side of Digby Gut. Fig. 3, Fissure in Triassic trap, filled with trap debris, Red Head, Grand Manan.