crust than the material of our old gneisses. As to its bedded character, this may have arisen in part from the addition of cooling layers below, in part from the action of heated water above, and in part from pressure or tension; while, wherever it cracked or became broken, its interstices would be injected with molten matter from beneath. All this may be conjecture, but it is based on known facts, and is the only probable conjecture. If correct, it would account for the fact that the gneissic rocks are the lowest and oldest that we reach in every part of the earth.

In short, the fundamental gneiss of the Lower Laurentian may have been the first rock ever formed; and in any case it is a rock formed under conditions which have not since recurred, except locally. It constitutes the first and best example of those chemico-physical, aqueous or aqueo-igneous rocks, so characteristic of the earliest period of the earth's history. Viewed in this way the Lower Laurentian gneiss is probably the oldest kind of rock we shall ever know—the limit to our backward progress, beyond which there remains nothing to the geologist except physical hypotheses respecting a cooling incandescent globe. For the chemical conditions of these primitive rocks, and what is known as to their probable origin, I may refer to the writings of my friends, the late Dr. Sterry Hunt and Dr. J. G. Bonney, to whom we owe so much of what is known of the older crystalline rocks[1] as well as of their literature, and the questions which they raise. My purpose here is to sketch the remarkable difference which we meet as we ascend into the Middle and Upper Laurentian.

In the next succeeding formation, the middle part of the Laurentian of Logan, the Grenville series of Canada, we meet with a great and significant change. It is true we have still a predominance of gneisses which may have been formed in the

[1] Hunt, "Essays on Chemical Geology"; Bonney, "Addresses to British Association and Geological Society of London."