

these rocks are so many and so difficult that comparatively little progress has been made in the endeavor to group them into formations or systems comparable with those of the fossiliferous series, and to ascertain the stages of geological history of which they are the memorials. The obstacles to increase of knowledge on this subject arise from the complication and obscurity of the geotectonic relations of the rocks. We have as yet no satisfactory clew to their chronological sequence. They have undergone so many disturbances of their mass, and so many and serious alterations of their internal structure, that it is often quite impossible to be certain of their true sequence. Nothing in the least degree analogous to the evidence of fossils among the sedimentary rocks is here available. Whether eventually a determinable order of appearance among the minerals of these ancient rocks may be ascertained remains still uncertain. If it could be shown that certain minerals, or groups of minerals, came into existence at particular stages in the formation of the crystalline schists, a key might be found to some of the most difficult parts of this branch of geological inquiry. But though such a sequence has often been claimed to exist, no satisfactory proof has yet been adduced that it has been asserted on more than mere local observation. Certainly no general law of mineral sequence in geological times has hitherto been established.¹

Thus while it is often difficult or impossible to ascertain

¹ The late T. S. Hunt was one of the main exponents of the view that the crystalline pre-Cambrian rocks were deposited as chemical sediments in a certain definite order, and that the rocks could be recognized by their mineral characters, and be thereby grouped in their proper order all over the world. See, for example, his essays on "The Taconic Question in Geology," and on "The Origin of the Crystalline Rocks" in vols. i. and ii. of the *Trans. Roy. Soc. Canada*. How completely this artificial system breaks down when tested by an appeal to the rocks in the field has been well shown by R. D. Irving, 7th Ann. Rep. U. S. Geol. Survey, 1888, p. 383.