other distributions that would give very different results. But this is not an imaginary case. We know that, while the forms and positions of the great continents have been fixed from a very early date, they have experienced many great submergences and re-elevations, and that these have occurred in somewhat regular sequence, as evidenced by the cyclical alternations of organic limestones and earthy sediments in successive geological formations.

An example bearing on our present subject may serve to illustrate this. In the latter part of the Upper Silurian period (the Lower Helderberg age), vast areas of the American continent* were covered with an ocean in which were deposited organic limestones whose fossils show that this great interior sea was pervaded by equatorial waters bringing food and warmth, while the incipient ranges of the Appalachians on the east, and the Cordilleras on the west, and the Laurentian axis on the north, fenced off from it the colder arctic waters. How different must the climate of America and of the region north of it have been in these circumstances from that which prevails at present, or from that which prevailed in certain other periods, when it was open to the incursions of the arctic ice-laden currents, bearing loads of fine sediment!† It was in these circumstances, and in the similar circumstances in which the great Corniferous limestone of the Devonian was deposited—a limestone showing in its rich coral fauna even warmer waters than those of the Lower Helderberg—that the Devonian flora

* See a memoir and map by Prof. Hall, "Reports of the Regents of New York," 1874–'75.

† It seems certain that the faunæ of the old limestones, like the Trenton, Niagara, Lower Helderberg, and Corniferous, belong to warm and sheltered sea areas, and that those rich in graptolites and trilobites, enclosed in muddy sediments, belong to the colder arctic waters. Such arctic faunæ are those of the Quebec group and of the Utica shale, and to some extent that of the Hamilton group.