

sandstones, and shales, were deposited. Later erosion removed nearly the whole covering and exposed the surface of Precambrian rocks. A few patches of the younger capping rocks still remain, as for example, the Palæozoic outliers at lake Timiskaming and lake St. John.

Since the beginning of the Cambrian, the Canadian Shield has been a stable mass. It has suffered vertical movement, but has been unaffected by any folding or mountain-building revolutions. The Precambrian history is, however, complicated. Precambrian time was very long, probably longer than all the time since the beginning of the Cambrian, which according to the latest estimations began about 500,000,000 years ago. During the long Precambrian era, volcanism and sedimentation on vast scales took place, and during at least two periods mountain ranges were built, which were subsequently eroded away to plains of low relief. The mountain-building periods were also characterized by the intrusion of igneous rocks, and these were responsible for the formation of many varieties of ore deposits.

Precambrian time can conveniently be divided into two major divisions which may be termed early Precambrian and late Precambrian. The former has been also described under such names as Archæan, Laurentian, and Archæozoic, and the latter under the terms Algonkian, Huronian, and Proterozoic.

Early Precambrian time is divisible into two periods. In the earlier period volcanism took place on a vast scale and lavas, commonly called Keewatin, accumulated in thicknesses measured in thousands of feet. Contemporaneous sedimentation also took place, so that with the lavas are interbedded tuffs and sediments, which, in places, have been altered to garnet-bearing gneisses and mica-schists. In Rainy River district of western Ontario, a thick series of such rocks, known as the Couchiching, underlies the Keewatin volcanics. In northern Manitoba and Saskatchewan similar altered sediments lie both beneath and interbedded with volcanic rocks.

In eastern Ontario and southwestern Quebec a thick series of sediments in which limestone is an important member may have been deposited in this period. This series is known as the Grenville and consists of limestone, quartzite, and sedimentary gneisses commonly carrying garnet and sillimanite.

This early period of volcanism and sedimentation was followed by widespread but gentle folding accompanied by the intrusion of granite. Succeeding this a series of sediments, known in different districts under various names, such as the Timiskaming, the Windegokan, and the Pontiac, accumulated. This period of sedimentation was succeeded in turn by a mountain-building revolution which was accompanied by widespread and general intrusion of granite, forming one of the great metallogenetic epochs of the Precambrian. A long period of quiescence succeeded, in which long-continued erosion reduced the mountainous region to low relief.

Late Precambrian time included the long period during which the Huronian and Keweenawan rocks accumulated on this eroded complex of igneous rocks. North of lake Huron the Huronian rocks consist of an older series known as the Bruce, consisting of from 10,000 to 15,000 feet of quartzites with, however, a limestone member and in places a basal conglomerate, and a younger series called the Cobalt, consisting of conglomerate, greywacke-conglomerate, slate, and quartzite, in places 10,000 feet thick. Part of the lower portion of the Cobalt series is made up of materials believed to have been derived by continental glaciation.