

j25 Ordovician Laurentia: Tippecanoe inundation and Taconic orogeny < Queenston delta, St. Peter sandstone >

The North American continent east of the mid-Cordilleras is comprised of the greater part of the once Laurentia paleocontinent (rotated ~ 90° counterclockwise from its Early Paleozoic orientation).

An epeiric sea, named the Tippecanoe by L. L. Sloss, flooded the Laurentian craton during the Silurian and prior Ordovician periods. Paleogeographic maps of Laurentia, which then straddled the equator, show the Tippecanoe inundation at full flood as a shallow epeiric sea unbroken across the entire Laurentian craton except for a few shoaling islands of Precambrian rock (now exposed in the Canadian shield and along the crest of the Transcontinental Arch in the United States).¹ During the time of the Tippecanoe sea, an orogeny occurred in a fossa (tectonic trench) that extended along the southern margin of Laurentia. This orogeny is called the *Taconic* because evidence of it is preserved by, what is called, the *Queenston-Juniata* delta now exposed in the Taconic mountains, New York. From what must have been seaward emergent mountains, it is comprised of detrital sediments shed north. Its furthest reach was achieved by the earliest Silurian. It had prograded north against the advance of the Tippecanoe epeiric sea onto the Laurentian craton, its sediments spilling forward whenever they had overfilled a subsiding foreland basin.²

Wedge shaped in cross section (thickening east in its present orientation), the silico-clastic Queenston-Juniata delta formation separates the Tippecanoe epeiric-sea platform sediments into two epeiric sub-sea carbonate formations: the Tutelo sub-sea (Silurian) above, and the Creek sub-sea (Upper and Middle Ordovician) below.

The brief offlap of Tippecanoe epeiric sea that ended the time of the Creek sub-sea in Laurentia was a time of end-Ordovician extinctions. This extinction event brought on by Late Ordovician glaciation was worldwide and the second largest such ever. Of species then, 73 percent vanished. Graptoloid graptolites were brought to near extinction. They had evolved from dendroid graptolites at the beginning of the Ordovician, which period of time Lapworth formally designated from his study of their diverse species in the Transition graywacke of Scotland and Wales.³ The graptolite facies there have their counterpart in Laurentia in the flysch that accumulated in the Taconic mountains forebasin.⁴ Coeval are the shelly facies of the Creek sub-sea that record an almost complete submergence of the Laurentian craton. These Upper Ordovician shelly facies are composed of as much as 80 to 90 percent of calcareous fossils of brachiopods, bryozoans, nautiloids, gastropods, rugose corals, and algae. These are extensively preserved from Ohio and Indiana to north of Hudson Bay as platform sediments, and in western North America as shallow-water sediments (with cumulative thicknesses of thousands of feet) in Laurasia's passive northern-margin miogeocline.⁵

The Tippecanoe transgression onto the craton of Laurentia is recorded by a basal quartz-sandstone of extreme maturity, called the *St. Peter sandstone* fm. Its purity makes it important for glass and for moldings making, and as an ingredient in polishes and abrasives, paints, plasters, pottery, porcelain, and tile. Its porosity makes it important for filters and, in situ, as an aquifer. Evidently the sand was derived from an interior free of mountains where erosion cut no deeper than to recycle quartz sand from preexisting platform sediments to the shore of the Tippecanoe sea.⁶

Laurentia was emergent late in the Early Ordovician. An epeiric sea that preceded this time, is called the *Sauk*. In Laurentia, the Ordovician began during the height of the Sauk inundation.

The lower boundary of the Ordovician, in retrospect, was poorly defined by Lapworth who placed it by when floating graptoloid graptolites diverged from sessile dendroid graptolites. However, when a group of organisms comes into being is less sharp in its record than when a group goes extinct. Earlier than graptoloid graptolite first appearances by some 1.5 million years was the extinction of previously abundant and diverse tropical trilobite species. This more easily recognized widespread event in the shelly facies, in which graptolites are rarely preserved, is universally used today. □