

j21 Silurian (416-444 Ma) < Niagra Falls cap rock >

Over six weeks, in a series of lectures, [Gideon Mantell] delineated an entire history of the earth. Starting with the human epoch, each week he ventured further back in time, revealing the geological evidence for a succession of different eras. ... Several hundred people flocked to the town hall to hear his last talk, on Saturday 21 October 1837. ... The tickets, at two shillings and sixpence each, were sold out. This time, Mantell delved even further into the past, describing the discoveries made by Murchison in the Silurian rocks of the Transition era: the strange trilobites, crinoids, echinoids and corals ‘found in very early formations of the earth’.

—Deborah Cadbury, 2000.¹

The Silurian was a tectonically quite time for Laurentia and its Piedmont, Gander, Dunnage southeastern seaboard. At the time, an island adrift in the Iapetus ocean was the paleoterrane Avalonia (**Figure j21.1**). The part of Avalonia, which is now Wales, UK, accumulated the type-area sediments of the Silurian System that Murchison erected. In these sediments, fossils most useful for world correlation are graptolites. These were first described in detail by Lapworth. Lineages of planktonic graptolites characteristic of the Silurian Period have one stipe (*Monograptus*), whereas earlier have multiple.² Parallel evolution in several species of *Monograptus* was open-spiral coiling of the stipe. However, best for worldwide correlations are dendroid graptolites that atypical of these usually benthonic forms were planktonic (had a float or attached to floating seaweed).³

In Laurentia, a Silurian inundation by the Tutelo sub-sea of the Tappanoe epeiric sea is recorded by extensive shelly facies. Tabulate and rugose corals (extinct at Paleozoic’s end)⁴ debuted in the Silurian and famously built, along with stromatoporoids and bryozoans, the great boundary reefs of the Michigan and Illinois geologic basins.⁵ The mid-Silurian Clinton Formation, or correlative rocks of the east-central U.S., is a red, fossiliferous, sedimentary iron ore containing oolitic hematite (called *flaxseed ore* when the oolites are lenticular due to subsequent Appalachian-orogenic flattening).⁶

The Silurian was a time when world climate was warmer and more stable (no evidence anywhere of extensive glacial ice, and attendant climatic instability) than before. Silurian epeiric-sea floodings were extensive and are partly explained by a eustatic rise of sealevel due to melted prior-continental ice sheets. The Silurian witnessed the spread of jawless fish, and the first appearance of freshwater fish and of jawed fish. Pentamerid brachiopods, which grew to sizes of over 10 cm, were one of the largest of the dwellers within Silurian reefs. They also occurred abundantly, as clumps of individuals, on the reef flanks.⁷ Without fixed attachment, these brachiopods had a thickened beak area that, in wave-agitated water, served as a weight to stabilize the shell resting on shallow-seafloor sands. The, strange to us, top predators of the Silurian were species of marine and freshwater eurypterids (the New York State fossil). Life on land (then restricted to freshwater riparian and swamps) is recorded by fossils of earliest vascular plants.⁸ Among these lived primitive relatives of spiders and centipedes. Mike Newman in 2000 found a first-land-creature—millipede-like, with microscopic air holes (identified by Heather Wilson) that allowed appropriately named *Pneumodesmus newmani* to breathe on mossy mudflats dated 420 million years old and now in outcrop, east coast of Scotland.⁹ □

Figure j21.1¹⁰ Laurentia (with the geographic outline of North America on it for reference) was across the equator. Separate, to the south, is Avalonia (now part of the eastern margin of North America, England, Irish Republic, Spain, and a block through central Europe from France to Bulgaria). Silurian shoaling carbonate reefs known locations are shown by black dots. Similar to those of today is the latitudinal restriction of these first coralline reefs to what would have been warm, shallow, seawater.

