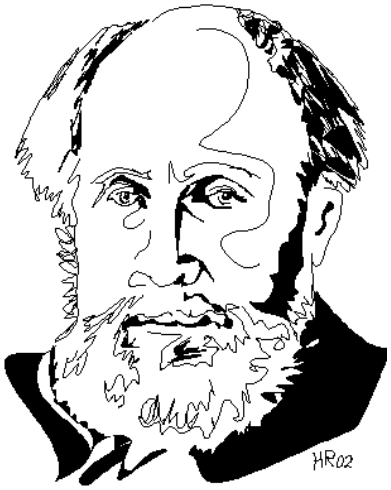
i20 The first reptiles < colylosaurs >

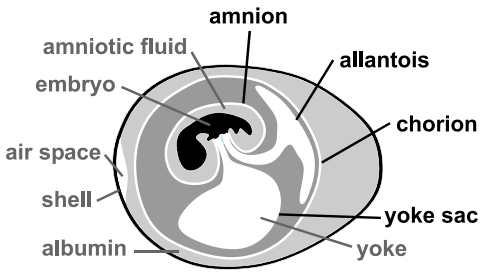


Fossils of reptiles are not unusual in Early Permian red-bed terrestrial strata. This is also the age of the coaliferous strata in Nova Scotia in which amphibians 30 cm long with lizardlike bodies are found inside the rotted-out stump holes of lycopod tree trunks in a succession of 63 buried standing forests (some) exposed in section where the giant (to 12 m) tides of the Bay of Fundy sap at the base of the Joggins Fossil Cliffs.[1] Pioneer geologist **John William Dawson** (1820-1899)[2] accompanied by Lyell in 1852 miscalled these "Carboniferous microsaurs" (tiny lizards)[3] —wrong age, not reptiles (A. Romer in 1950 reclassified these *Dendrerpeton acadianum* as amphibians),[4] and huge compared to the smallest known amniote adults such as extant island moist leaf litter dwelling geckos *Sphaerodactylus parthenopion* and *S. ariasae* that measure 1.25 cm from tip of snout to end of tail![5] Lyell, who was shown the site by Dawson, referred to these "first reptiles" (*sic*) in his *Principles of Geology*, 9th edition, 1854.[6] Dawson tells of his discovery of the tree-stump drowned (or asphyxiated while sheltering from forest fire as associated ash suggests)[7] animals in *Acadian Geology*, 1855.[8] Since found, Early Permian reptiles (their skulls high and narrow compared to the flattened skulls of amphibians well known from fossils in Permo-Carboniferous coal swamp sediments) range in adult size from about 0.7 m, for *Captorhinus* and *Labinosaurus*, to 1.5 m, for *Limnoscelis*, a possible carnivore. These early reptiles, Romer surmised had a semiaquatic life style. *Captorhinus* and *Labinosaurus* have large, long, teeth in the premaxilla and several rows of teeth in the cheek part of the jaw bone. Their diet could have included hard-shelled invertebrates. The three genera are placed in the order Cotylosauria of the class Reptalia.[9]

The diversity of Lower Permian reptiles indicates that the first reptiles evolved before. And from Lower Pennsylvanian (ca. 310 to 320 Ma) Joggins Nova Scotia strata is *Hylonomus* ("forest wanderer") *lyelli* found by Dawson in 1859 and confirmed by Robert (Bob) L. Carroll in 1964 to be the oldest known diapsid (?) reptile,[10] and from Lower Carboniferous strata in Scotland are synapsids (?) "Lizzy" (*Westlothiana*),[11] and *Casineria*.[12] To the casual observer, differences between the oldest fossils of reptiles and amphibians are not easy to see (as is to be expected of a newly emergent group).[13] Direct prove would be to find in place the *essential* reptilian feature of their class (and all evolved from them, including us) which is the amniote egg (*see* Topic *i21*).

For most experts, amniotes and amphibians differences evolved from a common ancestor. That is, they are monophyletic and together define a clade within sarcopterygians (*recall* Topic *h9*).[14] ❑

Figure i21.1 [1] Amniote egg's embryonic membranes



Illustrated is a schematic of a chicken's egg. Hens do not lay eggs all year long. What is found, is that the duration of daylight, under natural conditions, determines when a hen's ovary is roused to mature eggs within her body. In winter, when it is too cold to raise chicks, days are short. In the progression of the seasons, enough light finally trips a hormonal trigger for ovulation to occur, about six or eight hours later. Eggs are then on the way, usually one every twenty-five hours. In ovulation, a chorion covered yolk sack erupts from the ovary's constraining membranes and is drawn down the oviduct into the hen's infundibulum. There the chorion membrane is susceptible to being penetrated by the head of a sperm. One sperm fertilizes the egg and, if so, the chorion becomes impermeable to others that would. But whether fertilization occurs or not, after fifteen minutes, muscular contractions will move all into the magnum, where, as Marion Visser who in *Much Depends on Dinner*, 1986,[2] entertainingly tells, (cont. over)