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David A.T. Harper, Bertrand Lefebvre and Thomas Servais

Life has diversified on Earth during the past four billion years. 19th Century savants presented models for the gradual increase in diversity and complexity of animals during the Phanerozoic, punctuated by some mass extinctions. More recently views have diverged from those espousing gradual change to those focused on sudden, rapid diversity pulses, based on the interrogation of large databases. The new generation of data capture and evaluation relies on big data and sophisticated analytical techniques. Results, however, are not consistent in all the available big databases; each database is not truly global. The origins and early diversifications of groups of animals are diachronous in both time and space, whereas large hikes in biodiversity in some groups are due to intensive study of a number of key continents, mainly North America and Europe, especially Scandinavia, with large numbers of palaeontologists involved. For example new data from China demonstrate there is no Furongian Gap in the late Cambrian, that artificially separated the Cambrian and Ordovician radiations. Instead increasing diversity segues seamlessly through the Cambrian – Ordovician boundary; high-latitude Early Ordovician biotas contain significant numbers of exceptionally-preserved faunas, some more typical of Cambrian Lagerstätten. We are far from de-colonizing our data: much data especially from the global south may continue to change our perception of biodiversity change and continue to fill in gaps in the fossil record. Interestingly, there is another approach that may be more robust. A recent compilation of the first occurrences of higher taxa such as phyla indicates that most were already present in the late Proterozoic and the early Cambrian, corresponding to the concept of the Cambrian Explosion. The cumulative arrival of orders, families, genera show a gradual and long-term increase during the entire Ordovician. As biases are mitigated and new data added, a vision emerges of a single long-term radiation of Early Paleozoic animal diversity following its initiation in the Proterozoic and earliest Phanerozoic, a view not that different from that of our 19th Century pioneers. Plus ça change.