

Evolutionary hot start, followed by cold shock

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Red Sea Sponge. Credit: Gert Wörheide

The initial phases of animal evolution proceeded faster than hitherto supposed: New analyses suggest that the first animal phyla emerged in rapid succession – prior to the global Ice Age that set in around 700 million years ago.

The fossil record reveals that almost all of the animal phyla known today

had come into existence by the beginning of the Cambrian Period some 540 million years ago. The earliest known animal fossils already exhibit complex morphologies, which implies that animals must have originated long before the onset of the Cambrian. However, taxonomically assignable fossils that can be confidently dated to pre-Cambrian times are very rare. In order to determine what the root of their family tree looked like, biologists need reliable dating information for the most ancient animal subgroups – the sponges, cnidarians, comb jellies and placozoans. Dr. Martin Dohrmann and Professor Gert Wörheide of the Division of Palaeontology and Geobiology in the Department of Earth and Environmental Sciences at LMU Munich have now used a new strategy based on the so-called molecular-clock to investigate the chronology of early [animal evolution](#) and produce a new estimate for the ages of the oldest animal groups. Their findings appear in the journal *Scientific Reports*.

The molecular clock approach is based on the principle that mutations accumulate in the genomes of all organisms over the course of time. The extent of the genetic difference between two lineages should therefore depend on the time elapsed since they diverged from their last common ancestor. "Our study is based on a combination of genetic data from contemporary animals and information derived from well dated fossils, which we analyzed with the help of complex computer algorithms," Dohrmann explains. For the study, the researchers used an unusually large dataset made up of the sequences of 128 proteins from 55 species, including representatives of all the major animal groups, focusing in particular on those that diverged very early.

The analysis confirms the conclusion reached in an earlier study, which dated the origin of animals to the Neoproterozoic Era, which lasted from 1000 to 540 million years ago. However, much to their surprise, the results also suggested that the earliest phyla, and the ancestors of all bilateral animal species (the so-called Bilateria), originated within the –

geologically speaking – short time-span of 50 million years. "In addition, this early phase of evolutionary divergence appears to have preceded the extreme climate changes that led to Snowball Earth, a period marked by severe long-term global glaciation that lasted from about 720 to 635 million years ago," Dohrmann says. In order to assess the plausibility of the new findings, the researchers plan to carry out further analyses using more extensive datasets and improved statistical methods." To arrive at well-founded conclusions with respect to the morphology and ecology of the earliest [animals](#), we also need to know more about the environmental conditions that prevailed during the Neoproterozoic, and we need more fossils that can be confidently assigned to specific taxonomic groups", Wörheide says.

More information: Martin Dohrmann et al. Dating early animal evolution using phylogenomic data, *Scientific Reports* (2017). [DOI: 10.1038/s41598-017-03791-w](https://doi.org/10.1038/s41598-017-03791-w)

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