

# EXTINCTIONS: PAST AND PRESENT

UNIVERSITY OF CAPE TOWN



## WEEK 2 SETTING THE STAGE FOR THE DIVERSITY OF LIFE

Hi everyone. Welcome to Extinctions: Past and Present.

The first of the big five extinction events occurred by 443 million years ago at the end of the Ordovician whilst the second of these major extinction events occurred at the end of the Devonian about 373 million years ago. The FORMER one is considered to be the second biggest extinction event that ever occurred.

The Ordovician seas were filled with a diverse array of animals such as trilobites, crinoids, nautiloids, brachiopods, snails, clams and cephalopods. It also included some early vertebrates particularly jawless fishes and the first fishes with jaws. Later this week my colleague from the University of Alberta, Tetsuto Miyashita will chat to us about the diversification of early vertebrates and the actual origin of jawed fishes, the so-called Gnathostomes. These Gnathostomes set the stage for vertebrate dominance on our planet over the next four hundred million years.

Red and green algae were abundantly present in the Ordovician seas. In fact, molecular studies of DNA and RNA suggest that green algae called charophytes gave rise to the earliest land plants about 480 million years ago. The earliest forms of land plants are known from Argentina and date to about 473 million years ago. These first colonisers of land appeared to be like modern liverworts. That is, simple plants that do not have roots or stems.

This further suggests that land plants originated on the Gondwanan subcontinent which, at that time, comprised of South America, Africa, India, Australia, Madagascar and Antarctica. Thus, around 440 million years ago towards the end of the Ordovician, although life was mostly in the aquatic environments, the first tentative

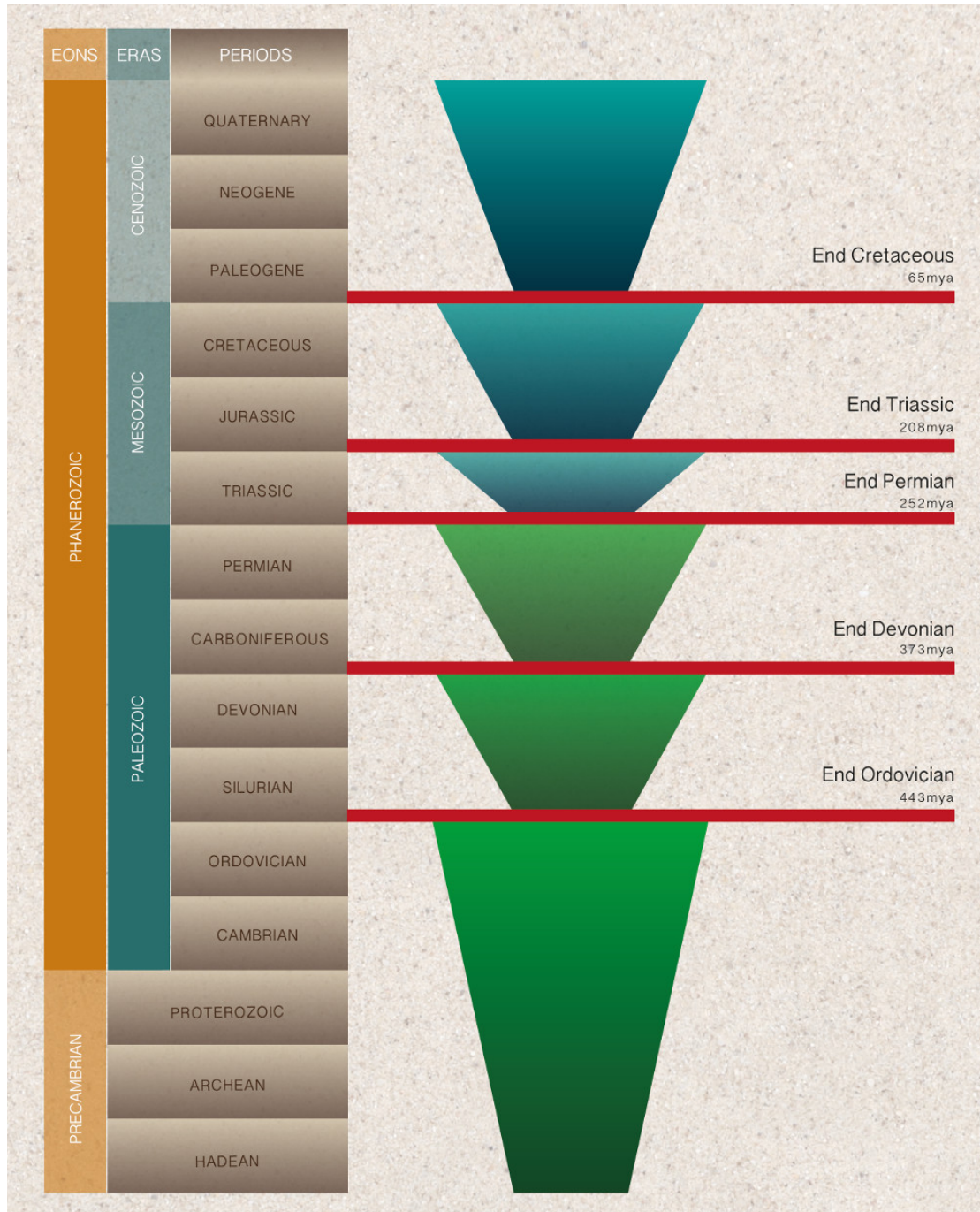
radiations onto land had begun. At about this time the southern landmass Gondwana is over the South Pole.

Recent work by scientists have suggested that the onset of glaciation may have been caused by a gamma ray burst. That is supernova events which caused nitrogen oxygen in the atmosphere to form nitrogen dioxide which would have led the build-up of smog which would have blocked out the sun's rays. This would have resulted in global cooling and acid rain. Ultimately it is thought that this would have led to widespread glaciation and major changes to the sea levels.

As you can imagine this would have been catastrophic for organisms living in aquatic environments. Indeed more than sixty percent of marine organisms become extinct at this time, resulting in over 100 families becoming extinct, including many trilobites, nautiloids, crinoids. After this extinction event there is a rise in the diversity of invertebrates and, very significantly, we see that fishes become the main component of marine and freshwater faunas. Indeed the Devonian is sometimes referred to as the Age of Fishes. During this time, we see the rise of armoured fish, the placoderms. These placoderms have thick bony plates of armour that covered most of their bodies. An example of this is *Groenlandaspis* a placoderm from the Witteberg and Bokkeveld groups of South Africa.

During the Devonian the first four-legged animals the so-called tetrapods make their appearance. Vascular plants become established on land and we see the earliest forest of *Archaeopteris* in the fossil record. Wingless insects are now very evident in ecosystems on land. In the seas life was still diverse, with a large number of trilobites, brachiopods, echinoderms, ammonites as well as a diverse array of armoured fish such as *Dunkleosteus*. *Dunkleosteus* grew to about 10 meters in length and preyed on anything it wished.

In the interview later with Rob Gess he will chat with us about the wonderful diversity of fossils present in Waterloo Farm, a locality in South Africa. The incredibly well-preserved fossils from this locality gives us an unprecedented glimpse into a Late Devonian coastal lagoon ecosystem.



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