PALAEONTOLOGY AND THE FOSSIL GALLERIES

SOUTH AUSTRALIAN MUSEUM

Teacher background notes

Overview

The Museum fossil galleries are a fantastic window into the remarkable fossil record of South Australia which covers development of life on Earth across a vast geological time scale. From the very first evidence of complex life in the Ediacaran period, through to the dog-eat-dog (or rather Anomalocaris-eat-Trilobite) world of the Cambrian explosion, then into the era of the giant marine reptiles of the Eromanga Sea and more recently the Megafauna, incredible giant animals sometimes found preserved in limestone caves, our world-class palaeontology galleries and collections offer engaging and varied topics for students which align with the Australian Curriculum. Learn about how scientists use fossil evidence to understand evolution and biodiversity as well as changes to the Earth's surface and climate over time.

Key curriculum content

Science as a Human Endeavour

- Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available

Year 4
Earth and space sciences

Earth's surface changes over time as a result of natural processes and human activity

- Collecting evidence of change from local landforms, rocks or fossils

Year 5
Biological Sciences

- Living things have structural features and adaptations that help them to survive in their environment

Year 6
Biological Sciences

- The growth and survival of living things are affected by physical conditions of their environment

Summary of galleries

Ediacaran Fossils

In 1946, a geologist, Reg Sprigg visited the Ediacara Hills in the Flinders Ranges. On the bases of sandstone slabs, he found disc-like impressions that looked like jellyfish. Further investigation led him to believe that these fossils were evidence of the oldest animal life on Earth. He published his findings in two papers in 1947 and 1949. Ediacaran animals show evidence of feeding, movement and reproduction, making them the first known complex life on Earth.

The processes by which Ediacaran fossils were preserved are of great curiosity to scientists because soft-bodied organisms would not normally fossilise. In the Flinders Ranges, the Ediacaran fossils are found on sandy seafloor beds that were deposited by storm action and strong ocean currents. The fossils are found in bands of quartzite which form the prominent ridges of the Flinders Ranges and date from between 635 to 542 million years ago.

Cambrian Fossils

The Cambrian Period, between 541 and 485 million years ago, is one of the most important intervals on the timeline of life on this planet. South Australia is very fortunate of having some of the greatest fossilised examples of this time and the South Australian Museum is at the forefront of research into this most important period in evolution: the amazing first steps of animals happened right in our backyard!

Cambrian animals lived in a world with oxygen levels less than half of what they are today, at a time when life on the planet was confined to aquatic environments: the continents were totally barren, and no plants or animals would successfully inhabit them for many tens of millions of years to come.

The early Cambrian fossils found in South Australia, from the Flinders Ranges through the Yorke and Fleurieu peninsulas and down to Kangaroo Island, represent the next chapter in the rapid evolution of marine animals following the Ediacaran.

Opal Fossils

The Opal Fossils Gallery displays spectacular opalised fossils from Coober Pedy and Andamooka in the State's north that date from the Cretaceous period between 145 and 66 million years ago. Exhibits include a piece of ancient seabed with several hundred opalised shells, fossils from the Moon Plain north of Coober Pedy, and the largest ammonite ever found in Australia, which was originally mistaken for a truck tyre. The centrepiece of the gallery is literally a jewel: the opalised skeleton of a 6m long Addyman Plesiosaur. This priceless specimen was found in an opal mine in Andamooka in 1968. It is the finest known opalised skeleton on Earth.

Pleistocene Gallery

South Australia has a wealth of vertebrate fossil localities that span the Quaternary Period (2.6 million years to present). Two of the most significant sites are Lake Callabonna and the Naracoorte Caves World Heritage Area. Many of the fossils you see on display at the museum were excavated from these sites. They provide insight into past faunas from arid and temperate environments.

During the Pleistocene Epoch (2.6 million to 11,700 years) giant marsupials, reptiles and birds roamed Australia. These animals are called megafauna and include animals such as the 2,500 kg herbivore *Diprotodon optatum* and the giant bird *Genyornis newtoni*. Skeleton reconstructions and real fossils of these and other megafauna are on display in the gallery.

Year 10
Biological Sciences

- The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence

Senior Secondary

Biological Sciences

- Contemporary evidence for evolution comes from five main lines of evidence: paleontology, biogeography, developmental biology, morphology and genetics

Earth and Environmental Science

Fossil evidence indicates that life first appeared on Earth approximately 4 billion years ago

- The characteristics of past environments and communities (for example, presence of water, nature of the substrate, organism assemblages) can be inferred from the sequence and internal textures of sedimentary rocks and enclosed fossils
- Geological, prehistorical and historical records provide evidence (for example, fossils, pollen grains, ice core data, isotopic ratios, indigenous art sites) that climate change has affected different regions and species differently over time

School visit information and resources

Resources

Google Arts and Culture Ediacaran Fossils

https://artsandculture.google.com/exhibit/MQKy3v3KW85QKQ

Ediacaran Fossils of the Flinders Ranges ebook

Addresses the Australian Curriculum outcomes for year 11 and 12 SACE Geology.

http://www.outreacheducation.sa.edu.au/programs/ediacaran-fossils-of-the-flinders-ranges/

Updated version 2022: Currently available as a pdf under Fossils.

https://www.samuseum.sa.gov.au/visit/families-educators/EducationResources

Prehistoric Mammals of Australia and New Guinea: One Hundred Million Years of Evolution.
Archer, M., Long, J. A. (2002).
Australia: UNSW Press.

Rehistoric Giants:
The Megafauna of Australia
Clode, D. (2009)
Museum Victoria
https://danielleclode.com.au/megafauna

https://projectdig.qm.qld.gov.au/learning/Digital%20learning%20and%20experiences

Downsized Dinosaurs:
The Evolutionary Transition to Modern Birds

https://link.springer.com/article/10.1007/s12052-009-0133-4

The Rise of Animals
Mikhail A. Fedonkin (2007).
JHU Press

South Australian Museum affiliated researchers

Naracoorte, where half a million years of biodiversity and climate history are trapped in caves

https://theconversation.com/naracoorte-where-half-a-million-years-of-biodiversity-and-climate-history-are-trapped-in-caves-78603

Where the wild things were - Research Tuesdays University of Adelaide February 2018

https://www.youtube.com/watch?v=PTUnR7Rnu2c&list=PLrj2iJKdUdbwQleoFrMCh-Hw1tXUQboHi&index=40

A giant species of trilobite inhabited Australian waters half a billion years ago

https://theconversation.com/a-giant-species-oftrilobite-inhabited-australian-waters-half-a-billion-years ago-118452

Mike Lee Professor in Evolutionary Biology Contributions to 'The Conversation'
https://theconversation.com/profiles/mike-lee-8293/articles

Feathered Dinosaurs -The Origin of Birds
Long, J.A. and Schouten, P. (2008).
Melbourne, VIC: CSIRO Publishing.
https://www.researchgate.net/publication/257938967_The_Evolution_Revolution-Design_without_Intelligence

The Dinosaurs of Australia and New Zealand, and other animals of the Mesozoic Era.
J. A LONG (1998)
University of New South Wales Press, Sydney; Harvard University Press, MA. USA. 182pp. ISBN 13: 978-0-674-20767-7 ISBN 10:0-674-20767-X

The Evolution Revolution:
Design without intelligence.
McNamara, K.J. and Long, J.A. (2007).
Melbourne, SA: Melbourne University Press.
https://www.mup.com.au/books/the-evolution-revolution-paperback-softback

If you have questions or feedback or would like to be included on our mailing list please contact: education@samuseum.sa.gov.au

Education programs at the South Australian Museum are supported by the Department for Education.

Updated May 2022

Above image: *Diprotodon optatum*, Peter Trusler
Cover image: *Dickinsonia*, South Australian Museum

Supported by
Government of South Australia
Department for Education

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