



National Rock Garden

Celebrating the Geological
Heritage of Australia

Newsletter No. 9
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The National Rock Garden is proudly
supported by the Geological Society of
Australia and the Australian National University



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www.nationalrockgarden.org.au



Recent Developments

Brad Pillans, Chair of the NRG Steering Committee

Since the last Newsletter, in March, there has been plenty of activity to report.

A major promotion of the rock garden was undertaken at the Australian Earth Sciences Convention in Newcastle, in July, with a stimulating display in the convention exhibition area. This allowed me to meet a large number of attendees and discuss various aspects of the Rock Garden. We also ran a lucky prize draw for a copy of the beautiful book, 'Shaping a Nation. A Geology of Australia', published by Geoscience Australia. Congratulations to the winner, Katarina David, a PhD student at UNSW. I also had the pleasure of delivering a keynote talk at the conference, highlighting key achievements of the steering committee and Rock Garden progress. The talk was well attended and I was able to respond to quite a few questions.

I am pleased to announce that the Rock Garden has received its first 'Rock Sponsor' donation - a substantial donation of \$20,000 to assist with the acquisition, transportation and preparation of a large granite tor from the Monaro region of southern NSW. The origin of the spectacular granite tors of the Monaro has intrigued geologists for many years – in particular, how and when were they formed? Granite tors are not, of course, only confined to the Monaro region – they are characteristic of granites in many parts of Australia. The Devil's Marbles, near Tennant Creek in the Northern Territory, are another well-known example. However, their size and wide distribution in the Monaro will make them a very worthy (and eye-catching) addition to the NRG.

Over the past few months there have also been a number of personnel changes at the NRG. Doug Finlayson, a foundation Director, and driving force behind the early stages of the project, has stepped down. In his place, we have appointed two new Directors – Mike Smith and John Bain, both existing members of the NRG Steering Committee. I thank Doug for his enormous contributions, including editorship of the Newsletter; he will be sorely missed.

Garden Design Update

Our garden masterplan has now been completed and will be available for download from the NRG website. This is the design concept for the whole NRG site – nearly 6 hectares in area – not just the Federation Rocks Display.

The masterplan, which we commissioned from landscape architects Taylor Cullity Lethlean (TCL), contains a number of design elements that will allow us to display rocks in exciting and interesting ways. Key elements include:

1. A **Rock Gallery**, about the size of a football field, in which some of our most spectacular rock specimens will be displayed as large, stand-alone specimens like the Federation Rocks. Excavated material from the gallery area will be used to construct an amphitheatre overlooking the gallery on its eastern side.
2. A **Time Wall**, about 3 m high on the western side of the gallery, on which cut and polished rocks will be displayed in a time sequence from oldest to youngest, highlighting some of the major events and rocks that shaped the Australian continent over more than 4 billion years.
3. Five **Gorges**, extending west from the Time Wall, and lined with rocks in a more naturalistic way, one for each of the 5 main intervals of geological time: Archean Eon (older than 2.5 billion years), Proterozoic Eon (2.5 billion to 540 million years), Paleozoic Era (540 to 250 million years), Mesozoic Era (250 to 65 million years) and Cenozoic Era (65 million years to present).

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4. A **Geological Walk**, with meandering paths, and large rocks displayed in a garden setting, with discrete areas presenting 5 major themes: Geological Processes, Landscapes, Lifeforms, Heritage and Resources.

5. An **Entry Structure** with information panels and rock displays that introduce visitors to the garden experience.

Of course, the masterplan will not be realised without substantial financial support from government, industry and individuals. Indeed, we estimate that it will take something in excess of \$10 million to turn the masterplan vision into reality. Please contact the NRG if you wish to make a donation or a bequest, and remember that all donations are tax deductible.

Federation Rocks Update

With the devastating theft of one of our Victorian rocks and the arrival of two wonderful blocks of bright red Banded Iron-Formation from WA, in February, the Federation Rocks Display received much publicity. Since then, I am pleased to report that the Federation Rocks have settled in quite nicely and continue to attract favourable comment from people who visit the site. During autumn, in particular, I thought the rocks looked particularly good on a clear sunny day against a backdrop of colourful autumn leaves on nearby trees.



Photo: Federation Rocks Display, in autumn, looking south, Image courtesy Brad Pillans.

On one occasion, I was at the display, with local palaeontologist, Dr Des Strusz, identifying fossils in the Canberra Limestone specimen – a few crinoids, some small corals and lots of algal material. Just as we were leaving, a couple of cyclists arrived, one of whom immediately jumped off his bike and leapt on top of the Hawkesbury Sandstone block. He then proceeded to wax lyrical about the great display, for the benefit of his friend who was obviously visiting for the first time. Terrific, I thought. Just the sort of enthusiastic response we want from members of the public! And climbing on the rocks is a fine way to do it, as many younger children have discovered.

Finally, a quick update on the theft, back in February, of one of our Victorian rocks - a one tonne quartz reef specimen from Bendigo. Sadly, despite wide publicity, the rock has not been recovered, and the police investigation has now been closed, unless further new information comes to light. In the meantime, we have been negotiating to get a replacement rock – not an easy task because, these days, there are few operating gold mines in the Bendigo area. Nevertheless, we are optimistic of being able to have a replacement rock installed at the NRG by the end of September.

Rock of the Month – Middledale Gabbroic Diorite

Lance Black, Canberra

The medium to coarse grained Middledale Gabbroic Diorite, is an igneous rock with an outcrop area of ~3 km², near Temora, NSW, where it intrudes Lower Paleozoic rocks in the Lachlan Fold Belt. Dominant primary minerals are plagioclase feldspar, hornblende, pyroxene, ilmenite and haematite. Although the rock is extremely fresh, late stage (deuteric) alteration has led to varied replacement of augite by cummingtonite, hypersthene by actinolite, and hornblende by chlorite. Secondary epidote is also common.

Selected in 1998 as a potentially useful unit for defining part of the chronology of this Palaeozoic terrane, this rock has since become the source of one of the most important world-wide reference standards for geological dating (geochronology). Now known as TEMORA 2, the potential of this standard was initially established by scientists from Geoscience Australia, the Australian National University, and the University of Toronto.

Its popularity is based on the quality (and to a lesser extent, quantity) of its zircon, a constituent trace-mineral that is widely used for determining the age of rocks. Zircon dating is based on the radioactive decay of uranium and thorium to lead – the U-Pb dating method. The strength of the TEMORA zircon is that it has essentially neither lost nor gained any of those elements since host rock crystallisation 417 million years ago (very close to the boundary between the Silurian and the Devonian Periods). This means that even different zircon grains within this rock consistently yield the same age, a vital prerequisite for a geochronological standard.

Over recent decades, micro-beam methodologies using such instruments as the versatile and widely used SHRIMP (an ion-microprobe developed and manufactured at the ANU) have become vitally important to geochronology. These instruments, however, do not immediately yield numerical ages. In order to compensate for instrumental bias, the derivation of a numerical age requires the unknown zircon to be concurrently analysed with a zircon of known age (the reference standard). It is crucial that the isotopic composition of the standard is as homogeneous as possible, because any heterogeneity will translate into extra uncertainty in the age derived for the zircon being dated. The value of the TEMORA zircon for this task is exemplified by its popularity, with it now being used in more than a hundred different U-Pb dating laboratories throughout the world. And, since becoming accepted as a preferred reference standard for this phase of geological research, the TEMORA zircon has also been proven to be a quality isotopic standard for hafnium and for oxygen isotopic research, which provide additional valuable information on a rock's history.

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Over recent years the Middledale Gabbroic Diorite outcrop has been well visited. Some overseas scientists have been particularly keen to pay homage to the site that has played a critical role in the reliability of the ages being produced in their home laboratories.

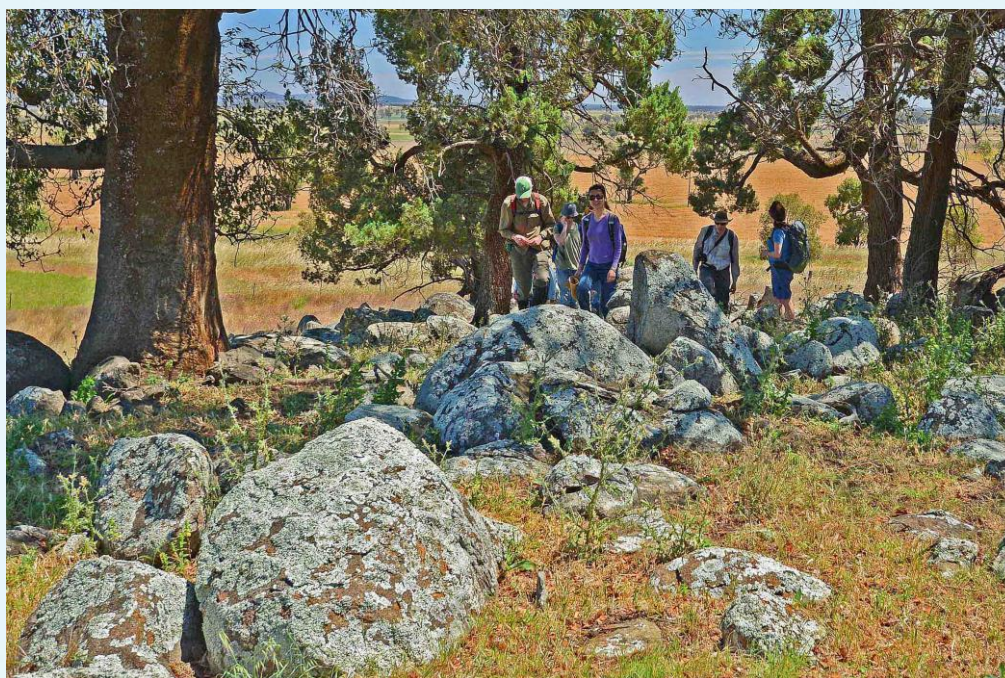
A decade and a half ago, the age of the Middledale Gabbroic Diorite was only poorly known. Now it is one of the most frequently and best dated rocks, not only in Australia, but throughout the world.

References

Black LP, Kamo SL, Allen CM, Aleinikoff JN, Davis DW, Korsch RJ and Foudoulis C, 2003a. TEMORA 1: a new zircon standard for Phanerozoic U-Pb geochronology. *Chemical Geology*, 200, 155-170

Black LP, Kamo SL, Williams IS, Mundil R, Davis DW, Korsch RJ and Foudoulis C, 2003b. The application of SHRIMP to Phanerozoic geochronology; a critical appraisal of four zircon standards. *Chemical Geology*, 200, 171-188.

Black LP, Kamo SL, Allen CM, Davis DW, Aleinikoff JN, Valley JW, Mundil R, Campbell IH, Korsch RJ, Williams IS and Foudoulis C, 2004. Improved $^{206}\text{Pb}/^{238}\text{U}$ microprobe geochronology by the monitoring of a trace-element-related matrix effect; SHRIMP, ID-TIMS, ELA-ICP-MS and oxygen isotope documentation for a series of zircon standards. *Chemical Geology* 205, 115-140.



*Photo: Surface outcrop of Middledale Gabbroic Diorite, near Temora, NSW,
image courtesy Lance Black, Canberra*

Australian Landscapes: Elachbutting Rock

Paul Askins

Elachbutting Rock, near Mukinbudin in Western Australia's wheat Belt, is a massive granite outcrop, a very popular camping sport for 4x4 wheel clubs and for locals, also a popular site for weddings.

The name Elachbutting is thought to mean 'that things standing' which is quite feasible as Elachbutting is a large granite rock, a prominent landmark standing out from the surrounding countryside. It has a spectacular colourful wave similar to Hyden's Wave Rock with the added beauty of 'Monty's Pass', a 30m tunnel caused by a rock slide. An echoing cave similar to an amphitheatre is close by.



Photo: Elachbutting Rock, near Mukinbudin, image courtesy Paul Askins

If you have an interesting landscape photo and description to share, please send it to:
rockgarden@gsa.org.au

Online

National Rock Garden Masterplan

The Masterplan was released at the Australian Earth Sciences Convention in Newcastle. Please download the Masterplan from the NRG website (note this is a large file).

<http://www.nationalrockgarden.org.au/assets/News-letters/M1310140904Rock-Garden-MP-WEB-4-small.pdf>

Stunning South Australia rock on display at the National Rock Garden

The Geological Survey of South Australia, DMITRE *MESA journal* published an article about their contribution of *Oorlano Metasomatite* to the National Rock Garden. The article includes geological information, rock selection, cutting and transport.

<https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/samref/sarig1/image/DDD/MESAJ070020-021.pdf>

Sydney Sandstone, Pyrmont: Dimensions in Stone

The following is a link to a YouTube clip about Sydney Sandstone and the building of a city. If you liked the National Rock Garden FaceBook page, you may have noticed this clip in May.

<https://www.youtube.com/watch?v=WsO3rs-hdsA&feature=youtu.be>

To Make a Bridge: Where did the granite of the Sydney Harbour Bridge come from?

<http://www.insidehistory.com.au/2014/04/tae-mak-a-brig-to-make-a-bridge-where-did-the-granite-of-the-sydney-harbour-bridge-come-from/2/>

David Attenborough: Wonderful World

While not strictly about rocks, this YouTube clip that David Attenborough was involved in, speaks volume about our planet earth. Enjoy this light-hearted clip.

<https://www.youtube.com/watch?v=B8WHKRzkCOY>

Do you have a link to a YouTube clip or online resources you think the National Rock Garden community would like to see? If you do, please post it on our FaceBook page.

Feedback and further information

The Geological Society welcomes feedback and suggestions on the development of the National Rock Garden. See the feedback boxes on the National Rock Garden web site –

www.nationalrockgarden.org.au

Tax deductible

The National Rock Garden is a registered Charity and all donations are tax deductible. Making a donation to the National Rock Garden is a great way to reduce your tax and feel good too! To make a donation, please visit the NRG website or phone (02) 9290 2194.

Sponsoring the National Rock Garden

Building the National Rock Garden will take the participation of many volunteers, involve different tiers of government, provide work for contractors, designers and builders and ultimately involve many organisations and people. As highlighted above, we need major donors and sponsors to work with us as we build this national monument in the nation's capital. If you or your organisation would like to be financially involved, please contact Prof. Brad Pillans, brad.pillans@anu.edu.au or Sue Fletcher, sue@gsa.org.au

Newsletter – compiled by: Brad Pillans and Sue Fletcher, National Rock Garden

The newsletter is circulated twice a year, ordinarily December/January and June/July. New “friends” are welcome and can be added to the email circulation list by contacting the editor. You don't have to be an earth scientist. Members of the public, students and educators with an interest in the evolution of the Australian continent are all welcome. Newsletters are also posted on the National Rock Garden web site.

www.nationalrockgarden.org.au



Keep up with the latest NRG news, rock movements, rocks of the month and a whole lot more.

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