National Rock Garden

Celebrating the Geological Heritage of Australia

Newsletter No. 14
May 2017

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Young minds intrigued by the Federation Rocks

Geoscience education in Canada

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The National Rock Garden is proudly supported by the Geological Society of Australia and the Australian National University

Australian National University

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National Rock Garden gets a mention in Parliament House

Brad Pillans, NRG Director

Recently, I had the opportunity to participate in *Science meets Parliament* (SmP) - an annual event that provides a couple of hundred scientists, from around the country, with the opportunity to meet with Federal politicians in Canberra. The event is organised by Science & Technology Australia (STA), which is Australia's peak body representing more than 60,000 scientists and technologists across all scientific disciplines. Membership of STA is through the various scientific organisations, rather than as individuals. Geological Society of Australia (GSA) members are represented through STA by the Australian Geoscience Council (AGC), of which the GSA is a member organisation.

As in previous years, I took the opportunity to tell people – including both other scientists and politicians - about the National Rock Garden. This year, at SmP, I was fortunate to meet (again) with Pat Conroy MP, Labor member for the electorate of Shortland in the Hunter region of NSW. I also met with Pat, at SmP, in 2015 and when I entered his parliamentary office this year, he immediately recognised me – "You're the rock garden man", he said cheerily. At which point I smiled and replied that when we last met he had undertaken to put me in touch with one of the coal mining companies in the Hunter. "Let's do that now", he said, and promptly handed me the name and contact details that I was looking for.

Coal from the Hunter Valley was Australia's first export, way back in 1799, when a ship load went to India, so I believe that Hunter coal should be suitably celebrated in the NRG. Of course, locating and displaying a 10 tonne block of coal might be a bit of a challenge – will the coal be able to withstand being exposed to years of rain, hail and shine, or will it crumble away? I don't know the answer just yet, but I am confident we will find a way. I will be following up with the mining company that Pat Conroy has identified and hope to provide a favourable progress report in a future newsletter.

I shared an enjoyable and informative 30 minutes with Pat, and two other scientists, and each of us had an opportunity to spruik our science. Not surprisingly, given the location of his electorate, Pat is very interested in, and well informed on, energy issues, which formed a core part of our discussion. Pat has also agreed to join the Friends of the NRG and receive our twice-yearly newsletter – which is terrific.

From left to right: Brett Rosolen (AARNet), Regina Sander (CSIRO), Brad Pillans and Pat Conroy MP, after a productive meeting during Science meets Parliament. Photo courtesy of the office of Pat Conroy.

School children visit the Federation Rocks

Brad Pillans, Chair NRG Steering Committee

In November, last year, I was contacted by Jess Hallahan, a teacher at St. John the Apostle Primary School, here in Canberra. She wanted to know if she could bring a class of 48 year 4 (primary school) students to the NRG and whether someone from the NRG would be able to meet them there. Needless to say, I readily agreed to do so. Jess explained that she would like the students to think about why the rocks look different according to where they come from in Australia and to consider how they might have been formed. They also planned to visit the National Arboretum as part of their excursion.

Young minds are wonderful! When I met the group of students and their teachers at the NRG, we began with a bit of Q&A about rocks in general. They asked questions and I asked questions, and I am delighted to say that some of their questions (and answers) showed an amazing breadth of geological knowledge. One pupil, on mention of volcanoes, was quick to tell me that the giant eruption of Tambora, in Indonesia in 1815, was followed by the year without summer in 1816 [Tambora was one of the world's largest eruptions in historical times and it injected so much ash into the atmosphere that global temperatures were lowered and accompanied by worldwide harvest failures]. Their collective enthusiasm would have allowed us to talk for hours, if time had been available. To finish the Q&A, I handed out geological timescale bookmarks and small, labelled specimens of high grade iron ore from Mt Tom Price, both of which were enthusiastically received. Then, with the same enthusiasm, they examined the NRG specimens, armed with a short list of questions provided by the teachers. In less than an hour it was over and we said our goodbyes. The following week, Jess Hallahan sent me a thank-you email – "the children had a fabulous time and can't stop talking about the rock garden and all the questions you answered. It was a wonderful experience", she wrote. Not only the children, I thought – I had a fabulous time too!

Year 4 pupils from St John the Apostle Primary School, in Canberra, enjoy getting up close and personal with rock specimens at the NRG. Photo courtesy Brad Pillans, used here with the permission of the school.

Geoscience education in Canada: The Johnson Geo Centre in St Johns, Newfoundland, Canada

Mike Smith, NRG Director

The Johnson Geo Centre is a magnificent educational facility, located within one of Newfoundland's major tourist attractions, a high rocky lookout over the Atlantic Ocean called Signal Hill, which is close to the downtown area of the city of St Johns. The Geo Centre is directly associated with a popular area for families and visitors due to the many historical aspects of the location including:

- It is the site of the final battle of the Seven Years' War in North America in 1762 - known as the Battle of Signal Hill, in which the French surrendered St. John's to a British force under the command of Lt. Colonel William Amherst. Communication between land and sea took place here using flags from the 17th century until 1960.
- On 12 December, 1901, the first transatlantic wireless transmission by Morse code was received here by Guglielmo Marconi in an abandoned hospital, the transmission originating from Marconi's Poldhu Wireless Station, Cornwall, UK.
- The headland has defensive installations related to U-Boat detection in World War 2. A professional group performs a Military Tattoo featuring early English soldiers, and then First World War soldiers (Newfoundland was then a British colony). A cannon, some old rifles and a machine gun were fired towards the end.

Location of the Johnson Geo Centre at St Johns, Newfoundland.

The Geo Centre is essentially an Earth Science museum, comprising:

- Multiple theatres showing both technical and nature programs
- A very complete display of rock and mineral specimens (mostly 5 to 50 kg in size, with several approaching 1 tonne in size
- Numerous poster displays on a wide range of topics, and
- An external display of larger half to 2 tonne rock specimens.

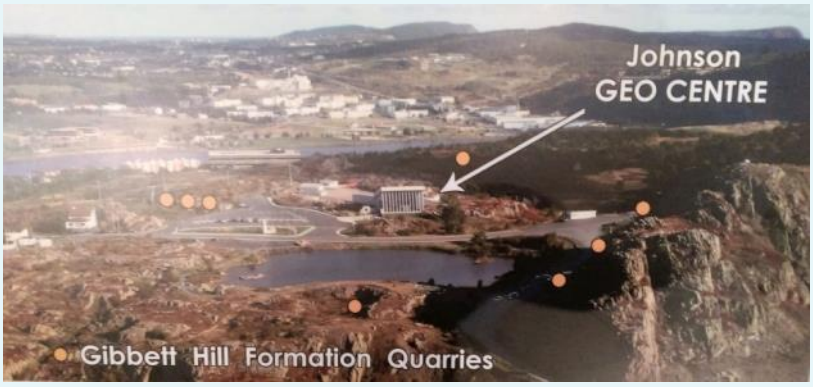
The essential makeup of the Geo Centre is quite different to Australia's National Rock Garden, but we can learn from its methodologies in earth science education. It is highly recommended as a tourist attraction for anyone travelling around the eastern coast of Canada,

All aspects of Earth Science are covered - from basic rock classification and rock evolution (equivalent to a "GEOLOGY 101" university course), through to advanced rock structure, earth processes, planetary geology, natural hazards, as well as commercial uses of both minerals and hydrocarbons. The economic aspects of the geosciences are presented with a very positive perspective, balanced by realistic discussion of potential environmental damage.

The building is quite a striking angular structure, as shown below, with easy driving access from the downtown area and with plenty of parking.

Outside view of the Johnson Geo Centre in St Johns, Newfoundland, Canada. (All photos courtesy Mike Smith)

During the establishment of St Johns, this area was the site of numerous quarries, providing monumental stone from the Gibbett Hill Sandstone for many of the city's major buildings.



Aerial view of the location of the Johnson Geo Centre indicating the position of former quarries

Every visitor is immediately met by a staff member providing advice on the overall layout of the displays and news of the day's activities. There is a specific display area for the oil and gas industry in Canada, which is sponsored by Exxon-Mobil. Another display room provides a highly convincing visual explanation of the disaster of the sinking of the Titanic. The facility contains a café and a souvenir shop. For the entertainment of small children, a small side room provides a separate play area, which has just a few geological themes incorporated.

The majority of the scientific displays are located underground, so the facility is operational in all weather conditions. At St Johns, maximum temperatures average from minus 1 in January to 20 degrees in July & August, with the corresponding average minima being -8 to 12 degrees. Significant snowfalls occur each month from November to April, but Canadians are masters of managing their severe winters.

Throughout the day, three options were available for watching movies, some very geological, some more oriented to family engagement. There are also two choices of guided tours throughout each day, provided by Geo Centre staff on particular geological topics.

The Geo Centre occupies the former site of a small glacial lake which had filled in and become a swamp. The mud and gravel was excavated to expose a long steep rock cliff which forms the eastern wall of the main display area. The surface of this wall of Ediacaran age (dated at 545-550 MY) shows many characteristics of the sedimentary rock including dipping strata, ripple marks, quartz veining (with rusting pyrite), faulting and of course glacial striations. One of the guided tours focuses totally on this wall.

The informative geological wall of the lower floor of the Johnson Geo Centre.

The labelling of all the displays is very clear (bilingual, of course) and simple enough for the general public, yet technically precise. There are several lecture theatres of various size, used either for talks, or for continuously rolling movies.

One of the many wide-ranging geological presentations features the intermittent materialisation of a crusty old "virtual geologist" as shown in the adjacent figure.

When a specific tour is announced over the speaker system, visitors are asked to gather beneath the planets in the main entry area.

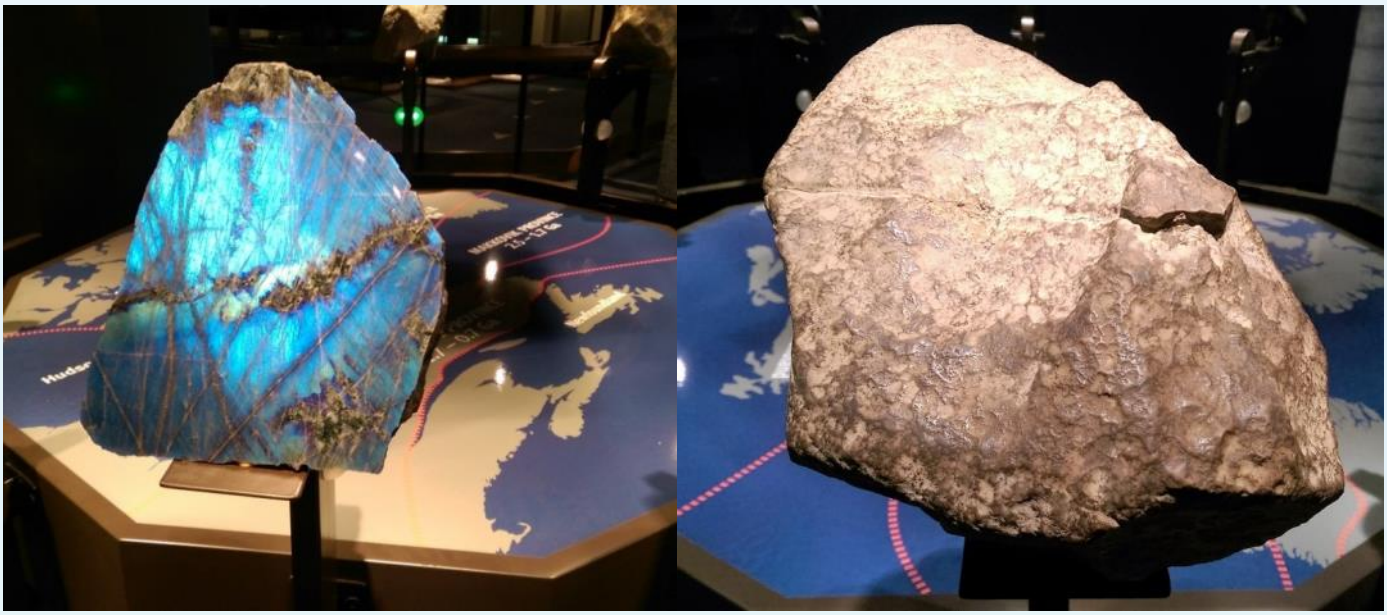
Effective use of virtual projector (far left); and overhead display of planets in meeting area (left)

Examples of well-labelled rock displays

The construction of the Geo Centre was funded entirely through the philanthropy of one local resident, Paul J Johnson (1928- 2014). He was a highly successful businessman, who headed up an insurance company that started with one office in St Johns and grew to 40 offices across Canada. Johnson was not involved in mining or any other resource-related activity – it seems he wished to promote his home province of Newfoundland so he supported many projects.

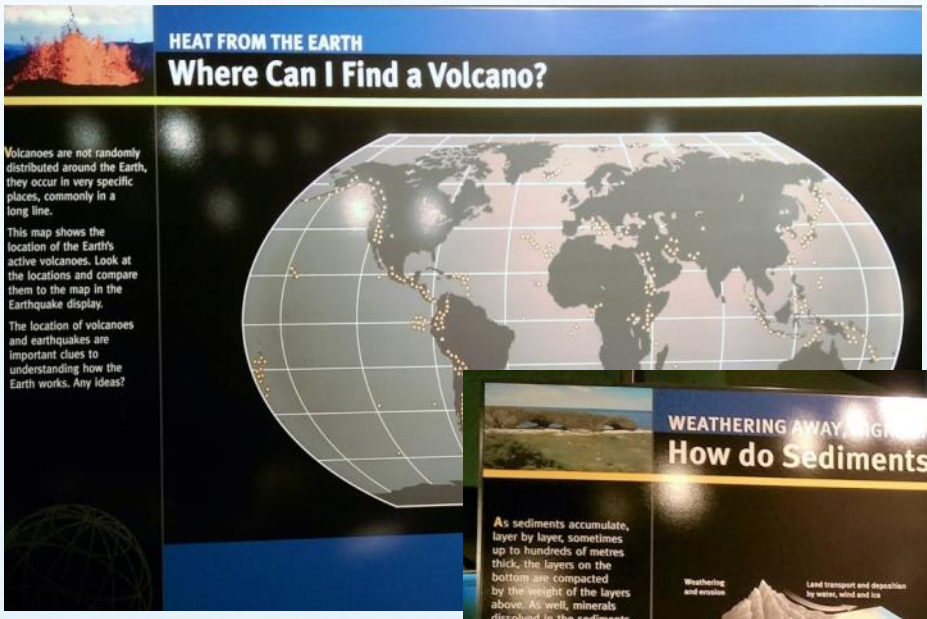
Operational funding for the Geo Centre was not provided by the Johnson family, so it is critical for income to be derived from everyday activities, as for our National Rock Garden. There are three main sources of funds:

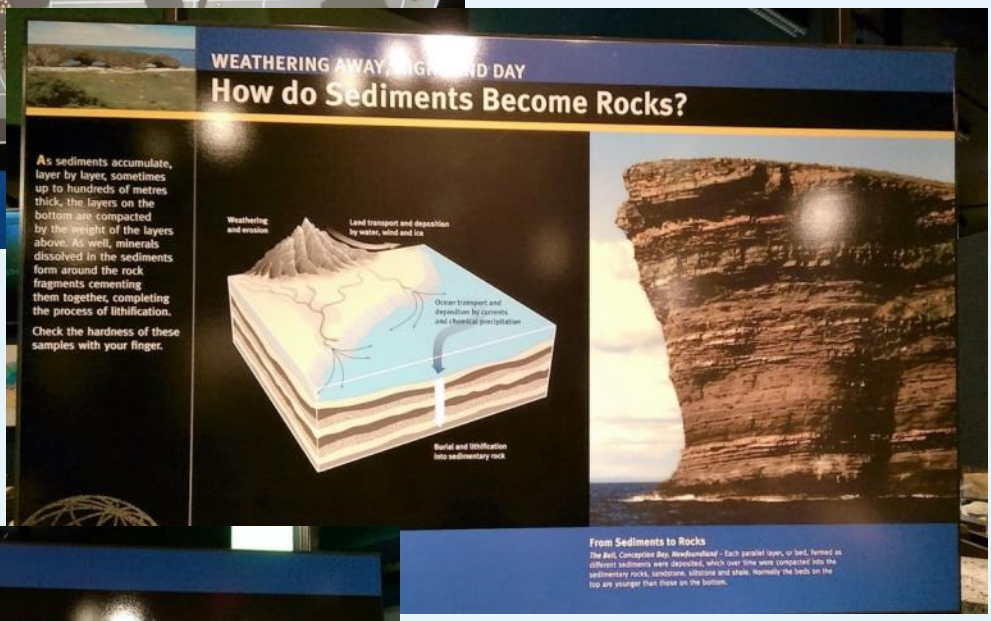
- Entry fees, which are very modest and would not deter any visitors
- Public events, most notably weddings, using an open area adjoining the centre
- Overnights stays, which may be educational or just fun



A selection of rock displays in the Johnson Geo Centre.

A few of the many poster displays in the Johnson Geo Centre





Another effective display labelled “Travelling Continents” explained the principles of plate tectonics and distribution of the lithospheric plates of the Earth.

The devastating impacts of geohazards (such as the 1929 Burin Peninsula tsunami disaster) were dramatically portrayed in posters. Designed for young children, the opportunity to create your own earthquake and observe “real-time seismic activity” proved tempting for adults as well.

An especially informative topic for an Australian visitor concerns “Ice Age Migration” – this explains how the first people arrived in the northern-most parts of the North American continent after the last massive ice age some 18,000 years ago. Before the rising oceans made the migrations impossible, humans crossed over the submerging land that connected Siberian with North America and travelled south across the Canadian shield, across central America and ultimately into South America. The display reports that “DNA analyses have confirmed the very close relationship between American Aboriginals and the Chukchi of Siberia”. One poster detailed the specific characteristics of the first settlers in Labrador and Newfoundland, and their use of a range of rock types for hunting and various domestic purposes.

A portion of the outdoor display of rock specimens at the Johnson Geo Centre. The descriptive labels on each rock are very effective in delivering information to the observer.

Rock of the month – Tarana Granite

Mike Smith and Colin Bembrick

The Carboniferous age Tarana Granite is a pink, medium grained granite, composed largely of quartz and feldspar with minor biotite, which has been employed as an important monumental stone in NSW including use in the Sydney Opera House and the ANZAC Memorial in Hyde Park in Sydney.

Blocks of granite in quarry, Image courtesy of C. Bembrick.

The geological characteristics of this rock are described in the Evans Crown Nature Reserve Plan of Management available at http://www.environment.nsw.gov.au/resources/parks/09140EvansCrown.pdf. This reserve lies on the Evans Crown Granite and Tarana Granite units of the middle to late Carboniferous Bathurst Batholith. The Evans Crown Granite is the youngest unit of the Bathurst Batholith and has been dated at 312 million years old. Evans Crown Granite underlies all but the north-western corner and a 200m wide strip along the eastern boundary of the reserve and comprises pink, medium to coarse grained, equigranular leucogranite, owing its colouration to a high proportion of K-feldspar. Quartz, minor biotite and traces of plagioclase are also visible. The Evans Crown Granite intrudes the older Tarana Granite which underlies the remainder of the reserve and comprises (at this location) pink and grey coarse-grained biotite hornblende granite (Pogson and Watkins, 1998).

Details of Tarana Granite. Images courtesy of C Bembrick.

The economic significance of this rock derives from the use of Tarana granite as a monumental building stone in NSW. For many decades, Tarana granite was quarried and crushed from a quarry owned by NSW railways, adjacent to the main western railway near Tarana. It was used as the platform surface for all stations in NSW which did not have an asphalt seal. This original quarry is now worked out and abandoned and there are now no granite blocks of any size remaining.

Google Earth image showing the location of the quarry from which Tarana Granite was mined.

The quarry location (Latitude S33˚34.98 Longitude E149˚52.26) is on the Tarana 1:25 000 topographic sheet, 8830-1-N. and is a few hundred metres from the nearest road (Carlwood Road) and is readily visible in Google Earth (left).

The access road to the quarry would need to be dry to enable access by heavy machinery.

The stratigraphic index reference is http://dbforms.ga.gov.au/pls/www/geodx.strat_units.sch_full?-wher=stratno=17834. It is a strong durable rock with specimens located in a disused quarry – there are no transportation or preservation issues.

Pink Tarana Granite contrasts with white Swedish roof tiles at the Sydney Opera House. Photo courtesy Mike Smith.

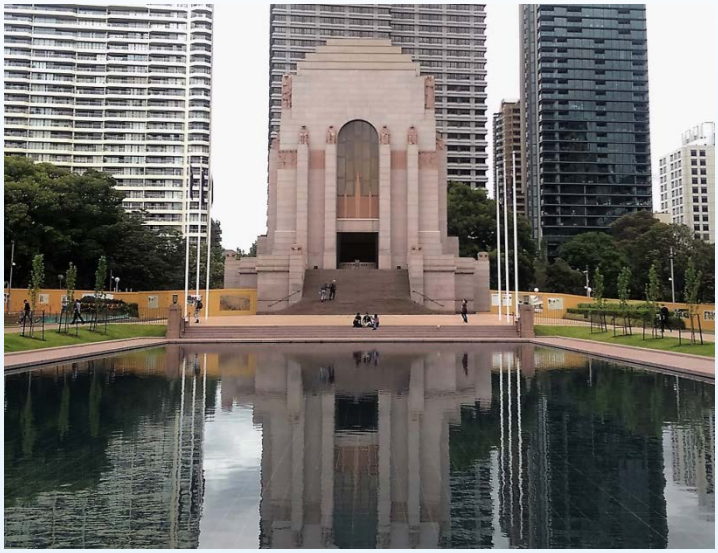
The cultural significance of the rock is reflected in its extensive use in the Sydney Opera House, which is characterised by the two coloured rocks used in the roof and the walls and floors. The roof of the

Sydney Opera House is constructed of 1,056,000 glazed white granite tiles imported from Sweden (https://en.wikipedia.org/wiki/Sydney_Opera_House). Apart from the tile of the shells and the glass curtain walls of the foyer spaces, the exterior of the Opera House is largely clad with aggregate panels composed of pink granite quarried at Tarana in NSW.

Tarana Granite and Sienna Granite (from Black Hills) used in the courtyard of the Sydney Opera House. Photo courtesy Chris Linning, Building Information Manager at Sydney Opera House.

Two Australian rocks have been used in the courtyards, steps and vertical walls of the Sydney Opera House. These are Tarana Granite from the Bathurst area of NSW and Sienna Granite from Black Hills in South Australia. When observing the Sydney Opera House from a distance, it is the pinkish red colour of the vertical panelling made using Tarana Granite which contrasts so brilliantly with the imported Swedish roof tiles.

Detail of the huge polished aggregate slabs used in the walls of the Sydney Opera House, comprising abundant fragments of pink Tarana Granite. Photo courtesy Mike Smith.



ANZAC Memorial in Hyde Park. Image courtesy of Mike Smith.

Waterfall (1977) by Anne Ferguson. Photo courtesy UNSW Art Collection website (URL below)

The exterior cladding of the ANZAC Memorial in Hyde Park, Sydney, is granite from Tarana. The stone reveals a range of dark browns, yellows and reds when polished. The quarry is now closed and the granite is reportedly no longer available for extraction.

A two-tonne block of pink Tarana Granite from a quarry near Orange in NSW was carved in situ at the northern side of the UNSW ANZAC Parade Gate during 1976 and 1977. The artist Anne Ferguson created Waterfall, kindly donating her time and skills. In Australia at this time, it was rare for women sculptors to work in stone. By keeping to University session times, Ferguson gave staff and students the opportunity to see an artist at work and to witness the emergence of Waterfall over 6 months. Carving vertical lines around the granite column she created places for rainwater to flow, in the same way "the wind and the rain carves grooves into the rocks in the bush. The artist then presented the sculpture to the university. It was relocated in 1998, 2010 and 2012. (Text from UNSW Art Collection website: www.artcollection.unsw.edu.au/sculpturewalk.html).

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The Federation Rocks display at the National Rock Garden

National Rock Garden

Celebrating the Geological Heritage of Australia

Although work by committee members and friends of the National Rock Garden is voluntary, we nevertheless incur the regular costs of an incorporated entity. There are also costs for transport and delivery of rock specimens, preparation of specimens for display, creation of descriptive plaques for the rocks, and maintenance of the NRG site.

The acquisition and display of the Moruya granite in October 2016 was a great success, with good local, regional and national publicity. We are currently documenting proposed new rock garden display specimens and planning a major fund-raising campaign to construct an education pavilion and outdoor rock display gallery. We are also building our contacts with the ACT and Federal Governments for critical co-funding opportunities.

While the committee pursues major funding from corporate and government sources, the ongoing costs must be met. We therefore seek donations from individual geoscientists who recognise the importance of geoscience and geoscience education to the future of Australia.

WE WOULD REALLY APPRECIATE YOUR FINANCIAL SUPPORT

Please Make a Donation (tax deductible):

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SIGNATURE: ……

Please mail/email this information to National Rock Garden Trust Inc. c/- Geological Society of Australia, Level 2, 141 Peats Ferry Road, Hornsby, NSW 2077 Email: nationalrockgarden@gsa.org.au

A cheque made out to the National Rock Garden Trust would also be fine.

Feedback and further information

We welcome feedback and suggestions on the development of the National Rock Garden. See the feedback boxes on the National Rock Garden website: 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.

Join our mailing list

The newsletter is circulated twice a year, ordinarily March and September. New "friends" are welcome and can be added to the email circulation list by contacting the editor.

Keep up with the latest NRG news, rock movements, rocks of the month and a whole lot more. Like us on Facebook:
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Newsletter compiled by Michelle Cooper. Edited by Brad Pillans and Mike Smith.