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Gnangara geomagnetic observatory—50 years young

Australian geomagnetic studies go back 167 years

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One of nine observatories in Geoscience Australia's geomagnetic network (figure 1), Gnangara, just north of Perth, is the second Australian mainland observatory to join the 'over 50s' club. Toolangi magnetic observatory north of Melbourne operated continuously for 67 years from 1919 to 1986, while Antarctic observatories at Macquarie Island and Mawson began operating in 1952 and 1955.

Mainland observatories commonly face more threats to their existence than Antarctic observatories, often because of urban expansion as buildings, transport infrastructure and powerlines encroach on the quiet zones required for optimal monitoring of the magnetic field. Geomagnetic observatories often have to relocate for these reasons, so Gnangara's longevity—so far—is all the more remarkable.

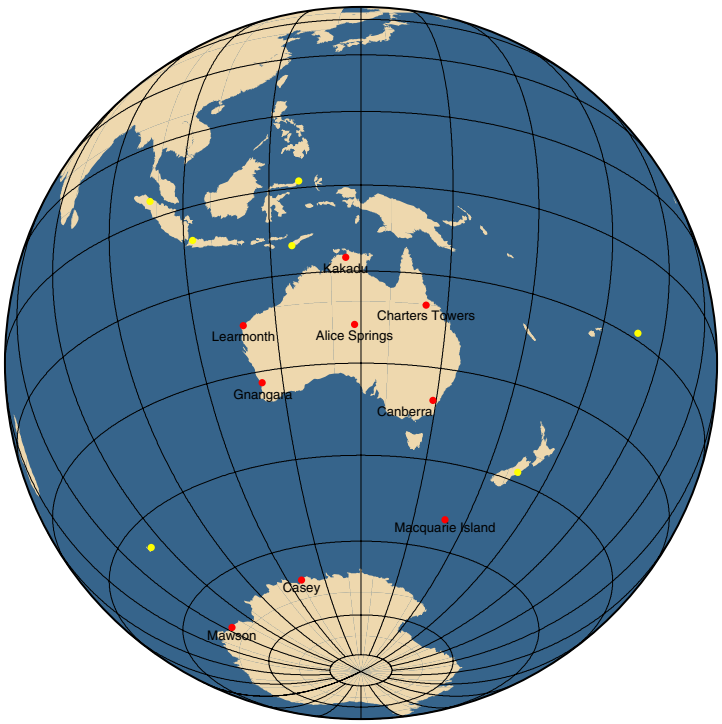

Figure 1. Geoscience Australia's geomagnetic observatory network (red dots) and other regional observatories (yellow dots).

What do geomagnetic observatories do?

Earth is one of six planets in our solar system that possess a magnetosphere or magnetic field. This allows navigation by compass, enables migratory species to find their way to and from breeding grounds, and protects the planet's atmosphere from being diminished by the solar wind.

The geomagnetic field is constantly changing. Dramatic changes because of solar activity can occur within seconds to hours, while subtle changes caused by the motion of molten fluid in Earth's outer core some 3000 kilometres below the surface operate at time scales of thousands of years. Geomagnetic observatories monitor all these changes to gather information for navigation, oil and mineral exploration, and scientific research.

Australian geomagnetic history

Geomagnetic monitoring has a proud history in Australia. Observatories established independently in the western and eastern states initiated stretches of continuous magnetic-field recording in this country comparable to some of the longest in the world.

In the early 20th century, the Carnegie Institution of Washington's Department of Terrestrial Magnetism embarked on an ambitious international program to map Earth's magnetic field. The department's visits

to Australia have left a legacy of many temporary magnetic stations throughout the country (some can still be visited today), as well as Western Australia's first geomagnetic observatory, commissioned at Watheroo on 1 January 1919. Watheroo was in continuous operation for 40 years until its closure in March 1959, after which Gnangara became the state's primary observatory.

Regular monitoring of geomagnetic variations began at Gnangara in June 1957, just in time for the start of the International Geophysical Year in July of that year. The Gnangara and Watheroo observatories ran in parallel for almost two years, so that the magnetic-field difference between the two stations could be accurately determined. Allowing for this two-year overlap, Watheroo and Gnangara observatories have together given almost 90 years of continuous magnetic-field monitoring in southwest Western Australia. This unbroken time span is a significant achievement in observatory operations the world over.

There is also a distinguished observatory history in Australia's eastern states. The very first Australian geomagnetic observatory was established by the Royal Society of London in 1840 in the Domain in Hobart, just eight years after German scientist Carl Friedrich Gauss had built the first 'absolute' observatory in Gottingen in 1832. The Hobart observatory operated from 1840 to 1854, followed in 1858 by observatories in Melbourne's Flagstaff Gardens and Royal Botanic Gardens, then Toolangi, and then Canberra (where operations continue today), giving Australia another impressively long period of almost unbroken magnetic-field monitoring.

Today

Gnangara remains an indispensable part of Geoscience Australia's geomagnetic network. However, the city of Perth has expanded in the past 50 years, causing increasing disruption to the magnetically quiet conditions required for observatory operations. Geoscience Australia is currently considering options to ensure the continuity of high-quality magnetic-field monitoring in southwest Western Australia, which may include moving the observatory to a quieter location north of Perth.

Information on the geomagnetic field, including data measured at Gnangara and Australia's other geomagnetic observatories and magnetic-field models derived from these data, is freely available via Geoscience Australia's website.

For more information

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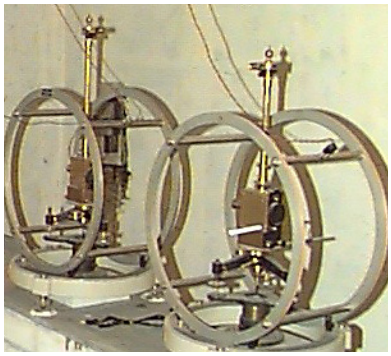

Figure 2. Gnangara's recording vault, showing the historic Eschenhagen equipment. The Eschenhagen variometer was first installed at Watheroo observatory by the Department of Terrestrial Magnetism in 1919. It was transferred to Gnangara in 1960 and operated there until 1991. This historic equipment is now on display in the Geoscience Australia building foyer.

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Information on the geomagnetic field, including data measured at Gnangara

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