Antarctica Month Did you Knows

Antarctica, together with Africa, Arabia, Australia-New Guinea, India, Madagascar, South America and New Zealand; once formed the southern super-continent known as Gondwana.

Ironically, because Africa and Antarctica used to be one continent, South Africa's current Antarctic base (SANAE IV) is perched on top of a gigantic outcrop of Karoo rock – nearly 5000 kilometres from home.

It takes 40 days to travel to Antarctica by ship and Antarctica can only be reached between November & December and between April & May.

Antarctica was first sighted in 1820 and the South Pole was first reached by a Norwegian explorer in 1911.

A South African meteorologist or weather expert, took the South African flag to the South Pole in 1958 as part of Sir Edmund Hillary's team to cross the continent overland – a journey that took 99 days.

JJ la Grange led the first South African Antarctic Expedition (SANAE 1), which left Cape Town in 1959 and reached Antarctica early in 1960, to take over the former Norwegian base.
South Africa is one of the 12 original signatories to the Antarctic Treaty System adopted in 1959 and a founder member of the Scientific Committee on Antarctic Research (SCAR).

The Antarctic Treaty was drafted to ensure that no dispute arises over the ownership of Antarctica.

1. The international Protocol on Environmental Protection has established Antarctica as a “natural reserve devoted to peace and science.” Hence, any military activities are prohibited and scientific investigation and cooperation encouraged.

2. Dr Aithne Rowse was the first woman to over-winter in Antarctica as a member of the fourth South African Antarctic Expedition (SANAE IV) team. This was the first team to over-winter in the SANEA IV base, from February 1997 to the following year.

3. For most South Africans, the winter solstice on 21 June passes unnoticed as the shortest period of daylight during the year. For the nine South Africans based in Antarctica this marks the mid-point of a three month period without any sun at all.

4. Every year in June the South African Antarctic Expedition (SANAE) and the other bases on Antarctica celebrate the winter solstice when the sun is the furthest from the equator. Scientists working on Antarctica then experiences three sunless months and celebrates the mid-point – June – with festivities and even variety concerts.

5. Scientists on Antarctica studies natural phenomena that happens in space, in the earth’s atmosphere and in the crust of the earth. Aurora Australis, or southern lights, is a ‘curtain’ of spectacular dancing lights in the sky. They are caused by the collision of the solar wind with the Earth’s atmosphere.

6. By studying the weather and the oceans from Antarctica, scientists are able to find clues to the process of global climate change.

7. Antarctica is the fifth largest continent on earth but has no permanent population.

8. Around 80 % of the world’s fresh water lies frozen in the ice sheet covering the continent. Were it to melt, global sea levels would rise by about 75 metres.

9. Antarctica is the continent with the highest average altitude above sea level: 2 500m.

10. Average winter temperatures are around -40ºC, although the coldest temperature ever recorded was -89ºC at Vostok Base.

11. Antarctica is technically speaking a desert, having very little precipitation, even in the form of snowfall. The continent also has the world’s lowest average humidity.

12. Static electricity on Antarctica poses a major hazard as far as sensitive electronic equipment used by scientists is concerned.

13. Appropriately enough considering its name, there are no polar bears in Antartica (*arktos* being the Greek for bear)

14. There are no longer any sledge dogs on the continent. All dogs were withdrawn as an environmental safeguard in the early 1990s.

15. South Africa is also very active on the sub-Antarctic islands: Marion Island and Gough Island.

16. South Africa maintains a base on Marion Island in the Southern Ocean just over 2 000km south-east of Cape Town. Marion Island and Prince Edward Island, twin peaks of a volcano, form the Prince Edward Islands group.

17. During 1996, Gough Island and its surrounding waters were given World Heritage Site status.

18. In the past 40 years, Marion Island's average temperature has increased by almost two degrees Celsius. Sub-Antarctic temperatures are rising faster than anywhere else in the world.

19. Marion Island's rainfall has dropped some 600mm to 1900mm per year, following the idea that the Island is becoming warmer and drier. Gough Island has in the region of 3120mm rain per year. The average wind speed is about 60% higher than that of Cape Town.

20. Marion Island is home to about 45 different species of insects.

21. Some of the things that scientists on Gough Island study include the impact of fisheries on the indigenous seabirds and the impact of invasive species, such as mice, on birds nesting on the islands.

22. Meteorologists, or weather scientists, help to predict the weather in South Africa by making observations and measurements in Antarctica. Low pressure cells move around the Antarctic continent and sometimes these result in a cold front in South Africa.

Ends.

Antarctic history: facts and fiction

- A measure of controversy surrounds who actually "discovered" the Antarctic Continent. The Russian Admiral Thaddeus von Bellingshausen sighted part of the coastline of the continent on the 27th of January 1820 without actually realising what he had seen – he described it in his log as being an ice-field 'which seemed to be covered in small hillocks'. Three days later, on the 30th of January, a small sailing ship chartered by the British Admiralty and under the command of Edward Bransfield sighted land at latitude 64 degrees South. Today we know this to be the Antarctic Peninsula.

- The first expedition to reach the South Pole was led by the Norwegian explorer Roald Amundsen. They achieved their goal on the 14th of December 1911 and returned safely to their base a few weeks later. A British expedition under Captain Robert Falcon Scott arrived at the Pole on the 18th of January 1912, but all five members of the party perished on the return journey. The US base at the South Pole is named Amundsen-Scott in honour of the two rivals.

- The first team to fly to the South Pole was led by Richard Byrd of the United States. The flight took place in November 1929. Byrd was also responsible for the development of two-way radio communication and tracked vehicles as tools of exploration on the continent. The first person to fly across the continent was another American, Lincoln Ellsworth, in 1935. He covered some 3 700 kilometres during his flight.

- The first woman to land on the Antarctic Continent was Mrs Mikkelsen, the wife of a Norwegian whaling captain, in February 1935. She went ashore at the Vestfold Hills on the east coast of the continent.

- The first successful overland crossing of the continent was completed by the Commonwealth Trans-Antarctic Expedition in 1958. Two parties, one under the leadership of Sir Edmund Hillary (of Mount Everest fame) and the other led by Sir Vivian Fuchs, departed from bases on the Ross and Weddell Sea coastlines respectively. Hillary reached the South Pole first, having established a line of depots, which Fuchs then used to complete the crossing – a journey of 99 days. A South African meteorologist, J J (Hannes) la Grange was a member of Hillary's party, and took the South African flag to the Pole.

- J J la Grange led the first South African Antarctic Expedition (SANAE 1), which left Cape Town in 1959. Having reached the Fimbulisen ice-shelf early in 1960, the team took over the former Norwegian Base ("Norway Station") in Dronning Maudland (Queen Maud Land) after the Norwegian Antarctic Expedition had vacated it.

- The first woman to over-winter in Antarctica as a member of a SANAE team was Dr Aithne Rowse. She reached the continent in February 1997as the doctor of SANAE 36, returning to South Africa the following year. This was the first team to over-winter in the SANAE IV base. (SANAE bases are identified by Roman numerals. SANAE I was the former Norwegian base, while SANAE II and III were constructed by members of the Department of Public Works in 1971 and 1979 respectively.)

Antarctica Month – Science Fact Sheet

- What is **SCAR**?
- In broad terms, international scientific activity in Antarctica is initiated, promoted and co-ordinated by the Scientific Committee on Antarctic Research. This body was set up by the International Council of Scientific Unions (ICSU) in September 1957. South Africa is one of the founding members of SCAR.

- What is the role of the Department of Science and Technology?
- The Department of Science and Technology co-ordinates, evaluates and funds SANAP's Antarctic research projects.

- What does South Africa's Antarctic research focus on?
- South Africa's Antarctic research focuses on five main themes covering the geosciences, physical sciences, life sciences, the impact of the human presence in Antarctica and the history, sociology and politics of our long term presence in the region.

- Why does Antarctica offer such a favourable location for the study of the geospace environment and why is this research important?
    1. Also known as the solar terrestrial environment, 'geospace' refers to earth and its interaction with the sun by means of various forms of particles, fields and radiation. The earth is surrounded by a magnetic field, also called the magnetosphere, which is shaped something like an enormous ring donut with the earth at its centre. The magnetic field converges in two cones, intersecting with the earth's surface at the North and South Poles. Antarctica, being a continent, offers a superior platform for research facilities located in these cones (the Arctic has a floating ice-cap, which varies considerably in area and thickness according to the seasons). Turning our attention to the sun, years of research have shown that the sun radiates light, electromagnetic waves and various charged particles. The intensity of this radiation and the quantity of particles

varies according to the activity on the sun. This is known as ‘solar weather’ and follows 11 and 22-year cycles. Most places on earth are shielded from solar activity (other than light) by the magnetosphere but the ‘gaps’ at the poles result in plasma (ionised gas) being guided by the magnetic field lines into the upper atmosphere. Here they release some of their energy, which

becomes visible as light – in a manner analogous to that in which an image is formed on a television screen. This is known as the aurora (aurora borealis in the Northern Hemisphere, aurora australis in the South). By studying this and related phenomena, we can gain a better understanding of the sun, the magnetosphere and the upper atmosphere, as well as effects on earth. Satellites play a major role in communications, navigation, oceanography, meteorology and other earth sciences – and solar weather can seriously affect our space-based technology. Similarly, the earth's ozone layer shields life on the surface from harmful ultra-violet radiation. 'Holes' in the ozone layer allow this radiation through. The first evidence of significant changes in the ozone layer was detected in Antarctica. Having a window on geospace can thus have very down-to-earth benefits!

- Why study Antarctic geology?

- Thanks to Antarctica's geological formation, it offers an excellent insight into the evolution of the earth's crust over a period spanning almost 3 billion years. Geological studies can reveal a wealth of information concerning climate fluctuations during this period – which in turn can be used to understand and benchmark present and future climate variability.

- What about biodiversity?

2. Biodiversity (the presence of a greater or lesser variety of life forms in a particular environment) can be a significant indicator of the state of health of the environment. Many factors can influence biodiversity, including natural cycles and changes, the introduction of invader species and the impact of human presence and activity. These factors can also interact with one another. By carefully integrating the work of oceanographers, biologists and geoscientists in Antarctica, the Southern Ocean and sub-Antarctic islands (such as Marion and Gough), a more complete picture of biodiversity in these regions can be developed, which in turn can offer indications of the effects of global climate change.

- What are some of the current research programmes?

3. The **SHARE** (Southern Hemisphere Auroral Radar Experiment) at SANAE IV forms part of the international Super DARN programme. This programme has conducted valuable research on the magnetosphere and ionosphere, providing data for space weather forecasting. In 1998 the SuperDARN programme received a NASA award in recognition of its work in the field of geospace research.
4. The **AMIGO** (Antarctic Magnetospheric and Ionospheric Ground-based Observations) programme is operated at SANAE IV by the North-West University and the University of KwaZulu-Natal.

5. **ANOKS** (Antarktiese Navorsing oor Kosmiese Strale = Antarctic Research about Cosmic Radiation) studies the energy spectrum of cosmic rays using a neutron monitor at SANAE IV.

- What biological research is conducted at the Prince Edward Islands?
- There are four key themes:
    1. The interactions between marine (sea) and terrestrial (land) systems
    2. The life histories of seals, birds and orcas (Killer Whales)
    3. The structure and functioning of terrestrial ecosystems
    4. The structure and functioning of the near-shore ecosystems.

    This research has led to an unparalleled knowledge of the biodiversity of the Prince Edward Islands.

- What biological research is conducted at Gough Island?
- Key fields of study at Gough Island include:
    1. The impact of fisheries on the seabirds that are indigenous and endemic to the islands
    2. The impact of invasive species (mainly mice) on birds nesting on the islands.

    An investigation into the terrestrial biodiversity of the island revealed that there are 71 species of introduced insects but only a third as many indigenous ones.

Antarctica Month - Solstice fact sheet

'Blame it on geometry'

A solstice can be defined in a number of ways but few really explain the mechanics of the phenomenon. Firstly, a solstice can be said to be either of the times each year when the sun is furthest from the equator. It is also the time when the sun is vertically above the Tropic of Cancer in the northern hemisphere or the Tropic of Capricorn in the southern hemisphere. When the northern hemisphere experiences its summer solstice (nominally on the 21st of June), this results in that hemisphere experiencing its longest day of the year while the southern has its longest night. The situation is reversed at the time of the second annual solstice, nominally on the 22nd of December.

While these definitions are correct, they are also a little misleading because they create the impression that the sun moves in the heavens, whereas as we all know that the earth moves around the sun. To understand why the solstices occur, it is best to begin with the movement of the earth. The earth revolves around its own axis once every 24 hours, resulting in the cycle of night and day. At the same time, it is orbiting around the sun, with each orbit taking one year or 365,25 days.

Now comes the tricky bit. Imagine that the earth's orbital plane is something like an elliptical (slightly oval) disc with the sun stationary at its centre. The earth's own axis of rotation is not at right angles to the orbital plane, but actually tilts over at 23,5º. This tilt remains constant as the earth orbits the sun, resulting in the angle at which the sun's rays strike the various parts of the earth's surface constantly changing throughout the year. Because the earth is tilted as it orbits the sun, to an observer on earth the sun appears to move between north and south as the seasons change, just as it seems to travel from east to west during the course of a day. When the sun appears to be directly above either the Tropic of Cancer (23,5º North) or the Tropic of Capricorn (23,5º South), a solstice occurs. (The latitude of the tropics is a direct result of the angle of the tilt.)

The northern hemisphere's winter solstice is the southern hemisphere's summer solstice, and vice versa. The tilt of the earth also results in the sun disappearing below the horizon during winter in the Arctic and Antarctic and remaining above the horizon during the summer (the so-called "midnight sun"). Antarctica experiences around three almost sunless months during winter, with the winter solstice marking the mid-point of this period.

Generally “midwinter” in Antarctica, the solstice is celebrated at all bases with over-wintering personnel. This has been a tradition since the early days of exploration at the turn of the 20th Century. A festive lunch or dinner is prepared, attended by everyone at the base. Fancy-dress costumes are a popular feature of the festivities, while many bases also hold variety concerts and publish commemorative journals, featuring the talents of the team members.

Antarctica Month – Treaty Fact Sheet

- Although not linked directly, the origins of the Antarctic Treaty can be traced to the International Geophysical Year (IGY), which actually spanned an 18-month period from 1 July 1957 to 31 December 1958. This period of international scientific co-operation involved scientists from 67 countries and focused on the exploration of space and Antarctica. The success of the IGY coupled with the dramatic increase in activity in Antarctica highlighted the need for some form of political framework to promote international harmony in the region. By this time, seven nations (Argentina, Australia, Chile, Ecuador, France, New Zealand, Norway and the United Kingdom) had made territorial claims on the continent and its surrounding seas. These claims were not recognised by all the parties – and clearly some form of international agreement was needed.

- A Chilean proposal, known as the 1948 Escudero Declaration, was used as a staring point for discussion. This proposed a five-year moratorium on sovereignty disputes, the political neutrality of expeditions and the principle of free access to the region to allow scientific research to continue.

- Representatives of 12 nations met regularly in Washington from mid-1958 until early 1959 to discuss the proposals and draft a treaty. On the 1st of December, 1959, the Antarctic Treaty was signed by government representatives of Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the then USSR, the UK and the USA. The treaty actually came into effect on the 23rd of June 1961 and the signatory states became known as the 12 consultative nations.

- The Antarctic Treaty contains 14 articles, which enshrine the following principles:

    - Antarctica (meaning the entire region south of latitude 60º South) is to be used for peaceful purposes only and military bases, manoeuvres and weapons testing are prohibited. The prohibition also extends to nuclear explosions and the disposal of nuclear waste.
    - The promotion of scientific investigation and co-operation, with the exchange of information, plans, results and personnel to be actively encouraged. This also includes freedom of access for the purpose of scientific investigation.
    - Territorial claims are not recognised, disputed or established by the Treaty, and no new claims are to be asserted.

- The original treaty has been amended and extended, creating the Antarctic Treaty System, which includes the conventions and recommendations made at the regular meetings.

- One of the most important parts of the Antarctic Treaty System is the Protocol on Environmental Protection (also known as the Madrid Protocol). This established Antarctica as a “natural reserve devoted to peace and science” and all consultative members agreed to take responsibility for the environmental management of their Antarctic actvities.

- By May 2000, 15 additional nations (Brazil, Bulgaria, China, Ecuador, Finland, Germany, India, Italy, the Netherlands, Poland, Peru, the Republic of Korea, Sweden, Spain and Uruguay) had achieved consultative status. Russia took over the privileges and responsibilities of the USSR.

- A further 17 nations (Austria, Canada, Colombia, Cuba, the Czech Republic, the Democratic People’s republic of Korea, Denmark, Greece, Guatemala, Hungary, Papua New Guinea, Romania, the Slovak Republic, Switzerland, Turkey, Ukraine, and Venezuela) have acceded to the Treaty. They are granted observer status at the consultative meetings.

- The 44 Antarctic Treaty nations together represent about two-thirds of the world population.

- South Africa is at present the African continent’s sole representative.

- The 28th International Conference on the Antarctic was held in Stockholm from the 6th to the 17th of June this year. Items on the agenda included the effect of global warming and tourism on Antarctica.