

EASY SCIENCE

SOUTH AFRICANS CELEBRATE ANTARCTICA MONTH

The Department of Science and Technology (DST) has declared June as Antarctica Month to make South Africans more aware of the unique and exciting research done by our scientists on this frozen continent and the sub-Antarctic islands.

Taking a LOOK at the POLAR WILDERNESS

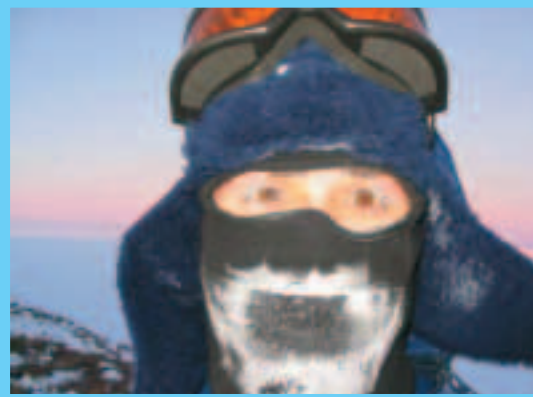
Antarctica, the continent that surrounds the South Pole, remains the most mysterious continent on Earth. It is less than 200 years since the first person set foot on Antarctica. Since then, small numbers of explorers and scientists have been visiting the world's coldest continent. No-one lives there permanently.

Among the visitors have been several thousand South Africans, working on and studying the continent and the surrounding Southern Ocean islands. The mission of the South African National Antarctic Programme (SANAP) is to increase our understanding of the natural environment and life in the area through appropriate research, science and technology.

The Antarctic continent does not belong to any state or government. South Africa and 44 other member nations belong to the Antarctic Treaty, which determines how the area is managed. Countries who sign this treaty undertake to ensure that the Antarctic region will only be used for peaceful and scientific purposes and to protect and preserve the environment.

CLIMATE

- ❖ Antarctica is the coldest, windiest and driest place on Earth. It is almost entirely covered in ice. The lowest temperature measured was -88 degrees Celsius. In the interior, wind speeds reach up to 350 km/h. The annual rainfall is about 50mm inland and 35 mm along the coast (South Africa's average annual rainfall is 464 mm, and the world average is 857 mm).
- ❖ During summer, Antarctica has 24-hour days and no nights. During winter, Antarctica has 24-hour nights when it is continually dark for about one month.



In Antarctica, scientist, Pieter Wolmarans from Gauteng found out the real meaning of cold. Photo: Struan Cockcroft.

SOUTH AFRICA IN ANTARCTICA

In 1959, the first South African National Antarctic Expedition (SANAE) was undertaken. The expedition established a permanent presence for South Africa on Antarctica that is still there today. The South Africans took over an abandoned Norwegian base on the edge of the ice shelf. This base was replaced several times, because a base built on the ice shelf drifts out to sea with the ice with time and is eventually covered with snow.

The South African base was then moved 170 km inland. The current SANAE IV was built on a rocky outcrop peeping out of the white snow. The new base was completed in 1997.

The living quarters are heated by heat exchangers that are run off a generator. Fresh water is obtained by melting snow.

GETTING THERE

Antarctica is 4 000 km away from South Africa. It takes 40 days to travel there by ship. It can only be reached between November/December and April/May.

The SA Agulhas is the South African government's research and supply ship which is used to transport people and cargo to its three bases in Antarctica and on Marion and Gough Islands.



Slowly making headway against the ice continent, Antarctica. The SA Agulhas is ready to load.

Research is conducted, weather observations are made and weather buoys released from the ship. The Agulhas uses satellite navigation to plot its way from South Africa to the three bases. The ship has a large hanger that houses helicopters used for air support when people and cargo are offloaded at all three stations.

SCIENTISTS IN ANTARCTICA

The South African National Antarctic Programme plays a big role to conserve Antarctica, which is considered a living laboratory. Studies done in Antarctica help us to understand the entire Earth system. Signals that researchers pick up in Antarctica tell us more about global changes in the past, as well as possible future changes.

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

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.

CELEBRATING WINTER SOLSTICE

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.

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.

DID YOU KNOW?

- ❖ Antarctica, together with Africa, Arabia, Australia-New Guinea, India, Madagascar, South America and New Zealand; once formed the southern super-continent known as Gondwana.
- ❖ Antarctica was first sighted in 1820 and the South Pole was first reached by a Norwegian explorer in 1911.
- ❖ JJ la Grange led the first South African Antarctic Expedition (SANAE 1). They left Cape Town in 1959 and reached Antarctica early in 1960, to take over the former Norwegian base.
- ❖ 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.
- ❖ There are no longer any sledge dogs on the continent. All dogs were withdrawn as an environmental safeguard in the early 1990s.

SEE FOR YOURSELF ICE EXPANDS

Water molecules act in a very special way when water freezes. When most liquids freeze, their molecules get closer together and the substance shrinks or contracts. But when water freezes, water molecules get farther apart and the water expands. After water has expanded to form ice, the ice can float on liquid water. This is very helpful in nature. When dams or lakes freeze, ice forms on the surface and the water underneath stays liquid. This helps living things in the water survive during winter and also under the ice around the Arctic and Antarctica.

To demonstrate that water expands when frozen, try the following:

You will need:

- ❖ Clay (play-dough), about the size of a marble
- ❖ A small baby-food bottle
- ❖ Tap water

- ❖ Blue food colouring
 - ❖ A spoon
 - ❖ A straw
 - ❖ Permanent marking pen
- Press the clay against the inside bottom of the jar, and fill the jar with water. Add 10 drops of food colouring and stir.

Slowly lower the straw into the coloured water and push it into the clay. The straw should now stand vertically in the bottle and stick out above it.

Carefully pour all the water out of the jar. Use the pen to mark the height of the water in the straw. Place the bottle in the freezer for a few hours, and then check the height of the water in the straw again. What happened? The height of the frozen water should be above the mark you made on the straw, because water expands when it freezes.

AN ICY TRICK

The sea water temperature near Antarctica is -2°C, but the water is not frozen at that temperature. Why? Because it is salty!

People who live in areas where it snows in



Locals in Antarctica: the Adelie penguin shares the continent with the Emperor penguin. The Adelie lands on its feet when coming out from the water. Photo: Beneke de Wet.



The Aurora Australis or southern lights light up the Antarctic sky. The SANAE (South African National Antarctic Expedition) IV base is in the foreground. Photo: Beneke de Wet.

the winter will know the concept of melting ice with salt. It is sprinkled on sidewalks and snowplows spread it on roads to melt the ice. As salt is added to ice, the freezing point of the ice is lowered.

The freezing temperature of water depends on the amount of dissolved salts (salinity). Water will normally freeze at 0°C and normal ocean water begins to freeze when temperatures reach about -1.9°C.

Source: www.ipy.org

Use this information to play an icy trick on your friends. Tell them you can use a string to remove an ice cube from a glass of water without getting your hands wet. Let them try a few times. They may not be able to do it, but you can!

You will need:

- ❖ A glass of water
- ❖ An ice cube
- ❖ A piece of string
- ❖ Salt

Let the ice cube float on the glass of water. Put one end of the string on the ice cube and hang the other end over the edge of the glass. Sprinkle salt on the ice cube and let it stand for about five minutes. Now you can remove the ice from the water by just lifting the string!

Try this a few times at home before you demonstrate it to friends, so that you know exactly how much salt to use and how long to wait before you pull on the string.

How is this possible? Salt lowers the freezing point of the water to below the usual 0°C, so where the salt falls, the ice melts a little. Then the ice freezes again and traps the string.

SCIENCE IN ANTARCTICA

