

SANAE 51

THE NEWSLETTER OF THE 51st SOUTH AFRICAN NATIONAL ANTARCTIC OVERWINTERING EXPEDITION



AURORA AUSTRALIS!

In this edition we tell you more about our first experience with aurora, the SANAE water cycle, winter effects, and more..

OUR FIRST PEEK AT THE SOUTHERN LIGHTS

Braam Beukes

Aurora, a word that inspires curiosity in most people. You read articles and hear stories told, but never quite seem to grasp what it is all about. This is one of the reasons why some of us come to Antarctica. As a South African you look at people funny when they mention 'Aurora Australis' or 'Southern Lights'.

This is because it is an unknown phenomenon to most South Africans like myself. Here at SANAE our first Auroras were very faint. They looked like distant fuzzy



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white clouds in the night sky. It was only when a picture with a camera was taken that you could see that it was indeed an Aurora in the distance. We started asking ourselves 'Is this what everyone was on about?'. Luckily our question would be answered in a spectacular fashion.



swirl. The shapes continued to move and change intensity. I ran around smiling on the ice almost falling on my face a couple of times. I truly felt like a five year old in a candy store. I could not believe my eyes! I wish everyone could have seen what we saw.

On the evening of the 23rd of April we saw something that was completely beyond our comprehension. Just amazing! The sky was filled with moving colour.

Mostly white-green with a little red here and there. Different shapes filled the skies. Here was a ribbon moving, there a veil and there a rain like pattern or



THROWING SMELLY

Jon Ward

Water is everywhere in Antarctica. In fact, 98% of the continent is covered by ice, enough to raise the sea level by 60 metres, if it were to all melt. This accounts for over 70% of the world's fresh water supply. Despite this, Antarctica is

classified as a desert - the coldest, windiest and driest

place on Earth. Annual precipitation can be as low as 2

centimetres per year, but due to the cold temperatures, the water remains frozen as snow and ice is moved around the continent by the wind.

As we all know, water is essential to our survival; not only for drinking and cooking purposes, but also for the base's heating system,



sewage and showers. Fortunately, we have an ample supply; unfortunately, it is not in a useful form. In order to produce and store liquid water, the snow and ice must first be melted in the snow smelter or so-called “smelly” and then pumped up to the base into tanks. The smelly is



located about 200 metres away from the base so that the prevailing winds can regularly replenish the area with fresh snow. This is also designated a “clean” area so that the snow is not contaminated in any way, because whatever goes in the smelly, ultimately comes out of the tap. There is no automated way to get the snow into the smelly to make water, so one has to physically be there to shovel the snow into it, an act dubbed “throwing smelly”. This is quite a demanding exercise that is best done in small teams at frequent intervals. But less than half the volume of snow that you throw into the smelly is actually converted into water, so one really learns to

appreciate the elbow-grease that goes into every drop.

Once the smelter has produced enough water, the tanks have to be emptied by pumping the water up to the base. The smelter is connected to the base’s water tanks via the “smelly-line”,

a pipe with a special heating tape inside it to prevent the water from freezing and causing a blockage. Once inside the tanks in the base, the water is distributed to the various essential systems, followed by the toilets, laundry room and showers.

If you do not throw smelly, then there is no water, simple. The laundry facilities and the showers are the first systems to be shut down, if there is a water shortage. This is usually not due to any laziness on the part of the team, but due to the weather. White-out conditions can prevent anybody from going outside and making the trip to the smelly. It is potentially very dangerous to go out in

SMELLY SPECS

Vincent Rademeyer

The main smelly system consists of two water tanks, two pumps, and a heated, insulated pipeline connecting the smelly to the base. To melt the ice or snow, the two tanks are fitted with electrical elements. Each tank has 6 elements which are switched by a programmable logic controller (PLC) to try and maintain the water temperature between 20°C and 30°C.

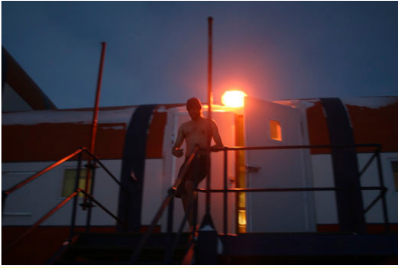
The cold water tank is where the snow is added to be melted. The hot water tank holds warm water which assists in the melting of the ice. Each tank can hold about 2,150 litres of water.

The two tanks are linked to each other so they stay at the same level - this is where the second (circulating) pump comes into play. The hot water tank has water level sensors to indicate the water level in the tanks. The PLC will automatically pump water to the base when the tanks are full.

complete white-out conditions, as there is no contrast or reference for you to follow, so you can easily get lost but when the weather does retreat for a time, one has to seize the opportunity to throw a little smelly! 🐾



VINCE CHARGING OUT IN THE DARK WINTER NIGHT TO FEND OF THE BIRTHDAY FIENDS, BARE-CHESTED!



TWO BIRTHDAYS ARE BETTER THAN ONE

Jako Bester

The month of May saw a very unique event that very seldom occurs... where a individual team member has the rare privilege to experience their second birthday on the 'ICE' and with it the traditional 'SNOW BATH!'. Our stoic deputy leader, Vincent, celebrated his

second overwintering birthday at SANAE on the 30th of May and did nothing less but the expected duty of charging out to meet the cold head on! Although a few chest hairs may have suffered a less fortunate fate, he weathered the 'storm' with his regular grin and happily returned for some coffee, cake and presents with the rest of the team! Happy Birthday Vince! May it be a great year ahead! 🎂



At least he still had enough breath to blow out all those candles!



HARNES UP!!

Stefanie Strachan

Since the threat of falling down a crevasse is ever present here in Antarctica, we need to keep our knowledge of how to react if something like that does happen fresh in our minds. Some



Wednesday afternoons are allocated to rope training where we all meet in the hangar, get geared up, and practice the key elements of a crevasse rescue. As you would recall from Newsletter 1, we were all trained in the basics of rope work back in Cape Town, so these sessions are just to keep

our rope skills in shape.



We started by watching an educational DVD by the British Antarctic Survey (BAS) that recapped how to rope up when

traveling on ice and what to do when you or your travel buddy falls down a crevasse. The following weeks were spent practicing the roping up techniques (which included tying yourself to a rope in the correct manner



and then being pulled around by a guy pretending to fall down - this falling procedure could also be

mistaken for trying to pull you off your feet), ascending a rope with jumars, and abseiling. Some of the team members that were more comfortable with the techniques also practiced switching over from an ascending system to a descending system and vice versa. A bit of healthy competition arose, and since safety is the main feature, 30second penalties were readily

handed out by spectators if any safety feature was neglected or forgotten.



The plans for the following sessions include more switching practice, pulley systems and maybe even a trip to Kleinkoppie in the summer for some ice arrest lessons. 🧊

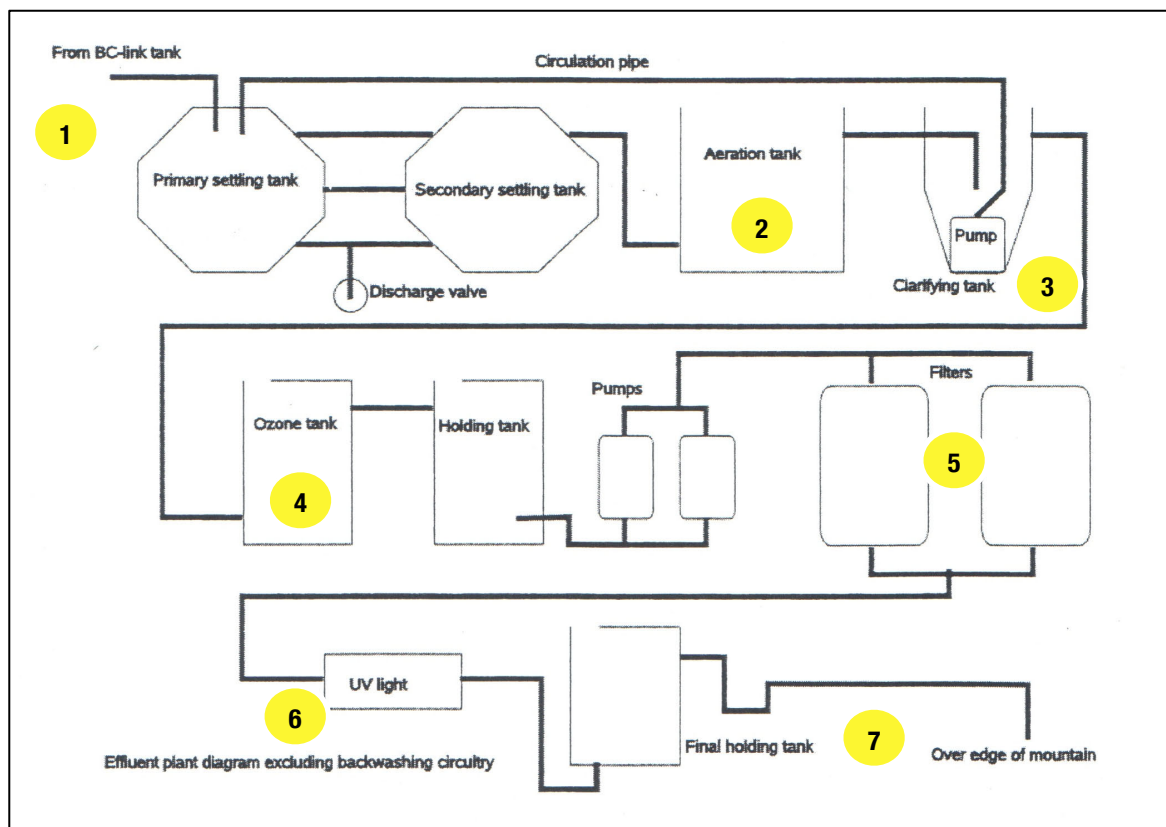
WATER PURIFICATION AT SANAE

Johan du Plessis

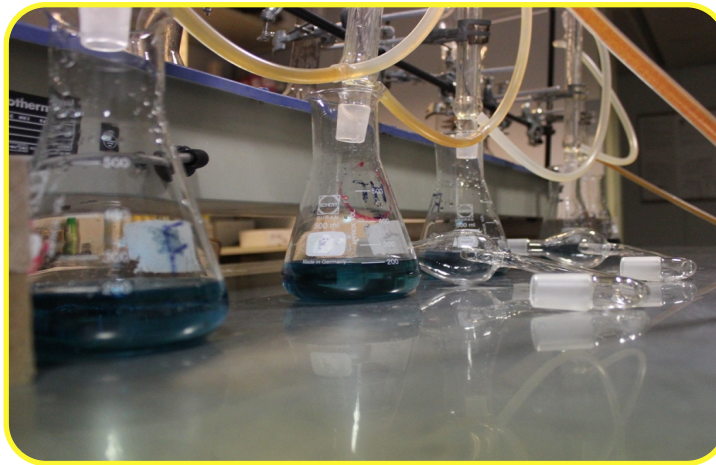
Seeing that SANAE is a self-sustained unit and seeing that South Africa, as signee of the Madrid protocol, is committed in keeping Antarctica pristine, we need to treat any effluent and ensure any run-off water is within acceptable standards.

All water from sinks, showers and toilets is gravity fed to a number of holding tanks in the base. The holding tank for the medical facility and the holding tank for the kitchen are pumped to the AB Link holding tank. From the AB Link holding tank the water is pumped to the BC Link holding tank. From this holding tank the water is pumped into the water treatment plant.

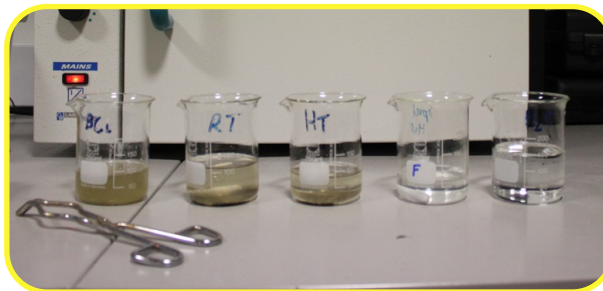
The water treatment plant is laid out as per the following schematic:



1. The water is firstly pumped into the two settling tanks where anaerobic digestion takes place.
2. The water is then fed by gravity into the aeration tank where the bio-filter is situated. A blower supplies this tank with air to ensure the aerobic organisms can multiply and digest the organic material.
3. This tank's overflow feeds into the clarifying tank where the activated sludge is settled and the partially treated water can flow to the next process. The settled activated sludge is returned to the settling tanks. This sludge



4. The water now flows to the ozone tank, where ozone is introduced into the water, which disinfects the water.



5. From a holding tank water is pumped through two sand filters, which keeps any remaining solids behind. When the filters are backwashed, these solids are reintroduced into the system for further



- breakdown.
 6. The water is then passed through a UV light chamber where further disinfection takes place.
 7. The water is pumped to a holding tank in the hanger from where it is pumped over the cliff edge. This line is affectionately nicknamed the "Lolly".
- Although most of the breakdown process is natural thanks to microorganisms living in the bio-filter, there are some routine tasks needed for the process to run

optimally. Special enzymes are introduced to the kitchen sink to help with the breakdown of fats. We also add different enzymes to the holding tanks and drains to aid the process. Also seeing that the organic process in the reactor tank (Aeration tank) causes a drop in pH, we add lime to

keep the environment pleasant for our beloved bio-organisms.

Lastly, we also do monthly tests on samples taken from various points in the above-mentioned process. This is done to verify that the process is healthy and that the run-off water is within set specifications. For this a day or two in the wet lab is needed. ☺



WHEN THE SUN SETS FOR THE LAST TIME

Jako Bester

Watching the last sunset at SANAE was as much an exhilarating experience as it was a daunting one... How would living in total darkness for the next two months

feel like? Would I be able to go without sunlight for so long? Well the total darkness is a bit of an overstatement... the sun still manages to remind us that it still is around with a few golden and pink

rays shimmering in a twilight on the horizon for about an hour or two each day almost as if it wants to say "I haven't forgotten about you!" There are however a few challenges that loomed. What would await us when we go out to fill the smelly in the dark... Will my headlamps batteries last?...

But most of all what would the effects on my body be ... Well, that is probably one of the things that makes overwintering in the Antarctic so challenging. You see there are a few things that occur when you are luminously challenged. Under normal circumstances the normal exposure to sunlight will give our bodies visual cues or so-called light zeitgebers. This in turn stimulates photoreceptors in the periphery of the retina called melanopsin receptors. The function of these receptors are basically to recognise the intensity or changing levels of light. I.e. when it gets brighter, melanopsin becomes very active and in turn stimulates a neural pathway from the retina to a part of the brain called the hypothalamus. In the hypothalamus there is a region called the suprachiasmatic nucleus (SCN) that acts as the body's so-called 'clock' which in turn regulates things like body temperature and the secretion of cortisol, and it also inhibits a hormone called melatonin which is responsible for inducing sleep. When the lights start to dim the 'Pineal gland' is activated by the SCN which in turn releases melatonin which reduces alertness and makes us more sleepy.

Now even with normal indoor lighting this hormone can be prevented from being released. Now I suppose everyone can make the natural assumption that without our normal sequence of visual cues from regular sunlight/daylight our sleep patterns can become quite disorganized and in severe circumstances severe insomnia

and even sleep deprivation can occur each with their own set of consequences. Furthermore it also influences the levels of serotonin in the brain which in turn can have depression as a after effect. These are however not the only consequences of lack of sunlight. Exposure to UVB light is responsible for maintaining our endogenous production of Vitamin D3 which in turn is responsible for the maintenance of normal blood levels of calcium phosphate. Abnormalities with these levels can cause quite a few problems with general cellular function, bone mineralisation, normal muscle contraction and nerve conduction. So how much sunlight do we actually need? Well it is generally accepted that the daily requirements of Vit D3 are about 1000 IU per day although some experts advocate up to 4000 IU per day. We receive approximately 200 IU from food and we can add approximately 400 IU per day with supplements and the rest we need to obtain from natural sunlight... which is exactly what we do not have. For us to obtain the daily recommended dose of sunlight experts say we need to expose at least 40% of our skin to natural

sunlight for 10 - 15 minutes per day. Now here in Antarctica even that modest amount of exposure for such a short period of time per day during the summer months may prove difficult as we spend most of our time wrapped up in thick jackets and gloves to ward off the cold. Furthermore the few areas that may be exposed to sunlight is so thickly covered with sunscreen to avoid sunburn from the reflection off the ice that it practically reduces the amount of sunlight we absorb to sufficiently produce Vitamin D3, down to zero as the sunscreen impairs the absorption of sunlight required for the formation of Vitamin D3. Most of the effects of overwintering in Antarctica are still unknown and in the research phase. It also makes Antarctica the ideal place to do research on the effects that might prevail during longterm space travel. But to our loved ones at home, do not worry, these effects are all temporary and some research articles even suggest that all overwinterers return in even better health than before! ☺



VLF ANTENNA WOES

Braam Beukes

Here at SANAE we do VLF (Very Low Frequency) radio wave recordings so the scientists can study the effects of space weather on these radio waves. We have two antennae to enable us to perform these recordings. The main antenna used for most of the VLF systems consists of basically an antenna mast with two antenna loops. This is a story of what happened to this antenna in the month of April.

One of your greatest fears when arriving in this hostile environment is that something might go terribly wrong. This fear, for me, was realised on the 26th of April of this year. We had terribly strong winds in excess of 70 knots with gusts of up to 120 knots. The base was reacting to the wind by vibrating and even swaying at times which would put anybody's senses, and nerves, on alert.

As I was looking out the window I could see the main VLF antenna in the distance. With a shock I realised that the antenna mast was not as it should be – it was leaning over badly! My heart began to race and my stress levels hit the roof. Unfortunately you are powerless to do anything and can only watch as the instruments in the laboratory started to convey what was happening to the antenna outside. After a while I had to switch off some of the equipment as I could see that the storm had savagely ripped the antenna loops apart. I felt so powerless.

That afternoon the wind subsided a little. I informed my team of my great predicament and of what needed to be done. But who would help to fix a damaged VLF antenna in sub-zero temperatures and freezing wind? Furthermore, because of the late hour, the sun was setting and soon it would become dark. Nevertheless, I made an announcement (or rather a call for help) over the PA in the base for assistance to go and repair the antenna. I gathered my equipment and the willing people I could find and headed out.



Arriving at what in my mind looked like an accident scene or disaster area was the ripped apart antenna loops and bent over mast. To my surprise more people arrived from the base. I then tried to communicate to the team what was to happen. This meant screaming through layers of clothing, put on to ward off the cold, where after we started work. The mast was lowered and repairs on the antenna loops and mast began. The cause of the disaster was that one of the anchor points for the mast failed in the high winds. During the repairs this was replaced with a new piece of cable.



Time seemed to go by quickly as it got darker and colder. With everyone mustering all the strength they had we hoisted the mast back in an upright position with the new antenna loops attached. It took a while to fasten all the ropes and make sure everything was secure. Some of the people had to return to the base, only to return later as their hands could no longer endure the harsh cold.

It was completely dark by the time we returned to base. This made finding tools and cleaning up a little bit of a challenge but we managed to get everything together. I was completely amazed at the team and what they had put in to help repair the broken VLF antenna. I was so proud of our team who really came through when it mattered. Thank you guys!

Well, after a late dinner we could all sleep soundly knowing that the VLF equipment was running normally again and that I had a team which would be there when needed. 🙏

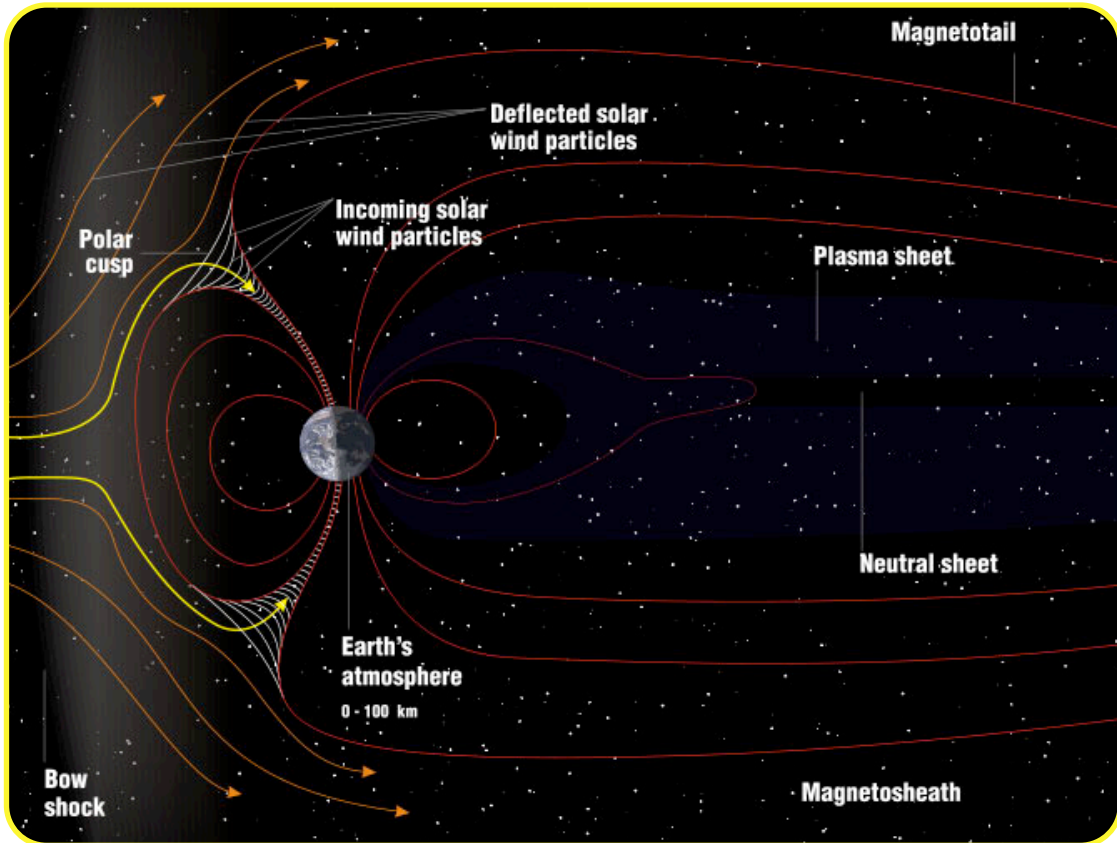
AURORA : ALIEN INVASION OR A PEEK INTO A PARALLEL UNIVERSE?

Stefanie Strachan

Numerous naturally occurring celestial phenomena have been observed and admired since the dawn of human history, but few have stirred the human imagination, curiosity and fear as much as the aurora. The aurora (also called the polar lights) is certainly one of the most spectacular of nature's phenomena.

term "aurora borealis" after Aurora, the Roman goddess of morning. He

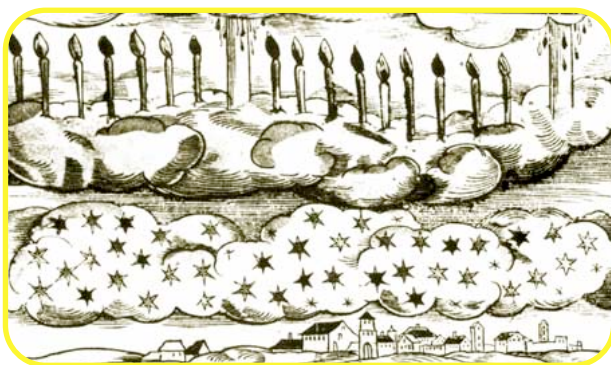
Like the origin of so many good things, aurora starts with the sun. The Earth is constantly immersed in the solar wind - a rarefied flow of hot plasma (gas of free electrons and positive ions) emitted by the sun in all directions, a result of the two-million-degree temperature of



In earliest historical times, inhabitants of Greenland and the Nordic countries

had the misconception that the auroras he saw were due to sunlight reflecting from the atmosphere.

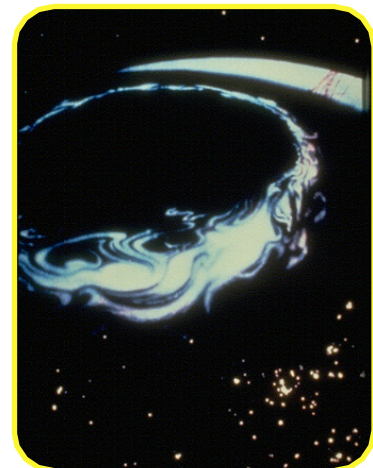
the sun's outermost layer. The solar wind usually reaches the Earth with a velocity of around 400km/s - in other words, seriously fast!



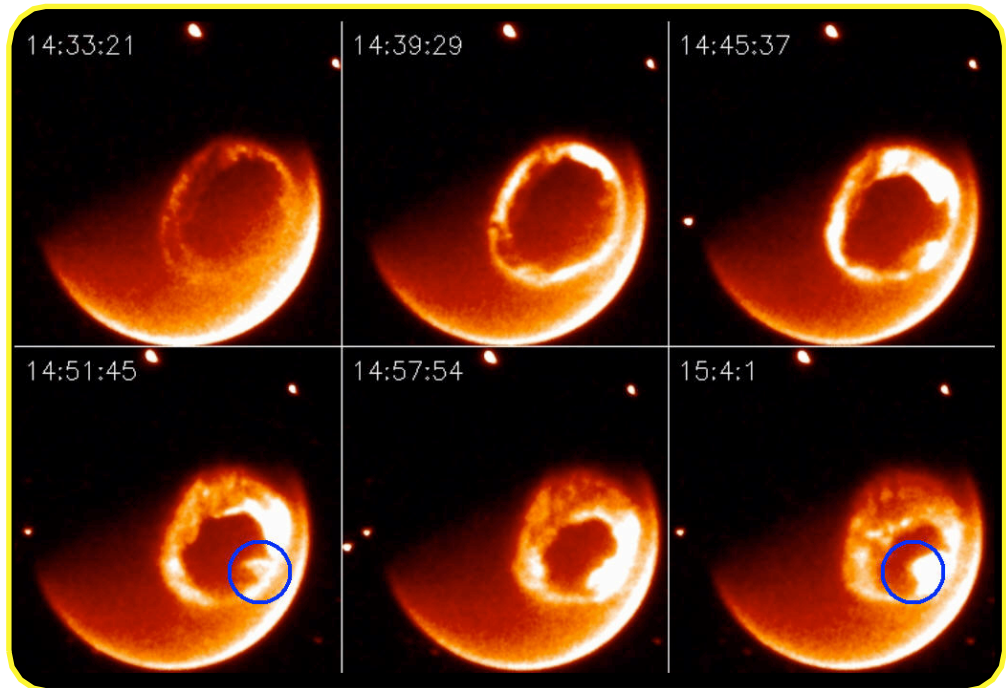
As science and technology progressed over the centuries, our understanding of aurora moved away from the supernatural when the questions of how and why were answered. So what

interpreted the polar lights as omens from the gods portending disaster, as signs from deceased relatives, as signs of a battle among the gods, or as weather signs. In 1619 A.D., Galileo Galilei coined the

exactly are these pretty lights in the sky, and why do we only see it at the Earth's poles?



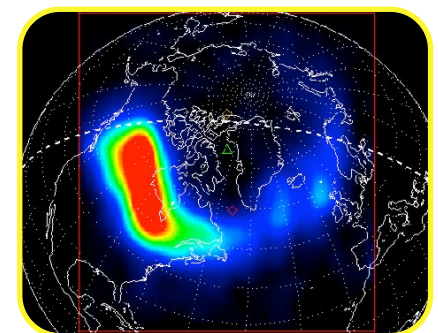
An aurora is caused by a complex interaction between the sun's solar wind and the Earth's ionosphere. The energetic, high-velocity particles from the solar wind enter the Earth's atmosphere following the orientation of the magnetic field around the planet. When these particles enter the atmosphere, collisions occur with atmospheric particles. Since the air is denser (more particles are present) closer to the ground, more collisions occur as the solar wind descends along the magnetic field. With every collision, kinetic energy is transferred from the solar wind particles into the potential energy of the electrons in the atmospheric particles. The now



excited electron cannot stay at this heightened level of energy and has to return to the base energy state, giving off the extra energy in the form of a light photon. Particles that hit oxygen produce green; particles that hit nitrogen produce pink; particles that hit ozone, a rare form of oxygen, produce a deep red.

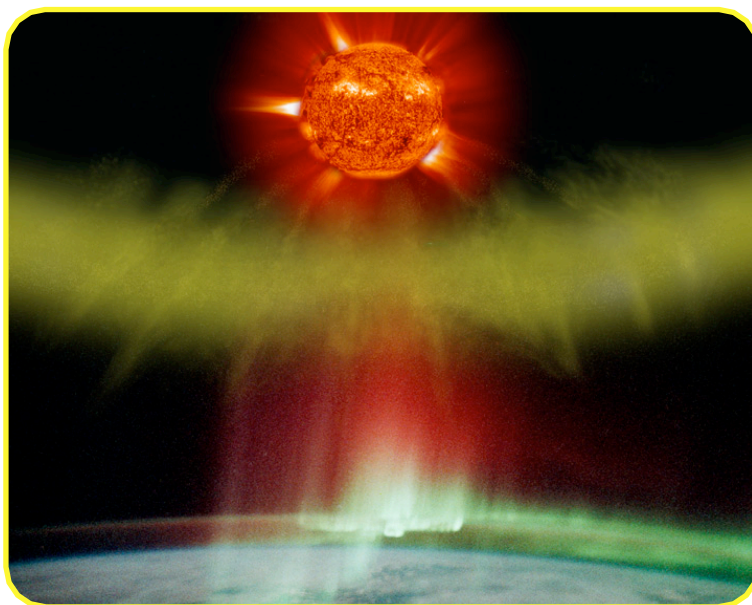
The fact that aurora only appears around polar regions is related to the Earth's magnetic field converging at the poles. Since the particles follow the orientation of the magnetic field into the atmosphere, they are directed towards the magnetic poles. The frequency of occurrence and the intensities of auroras are clearly correlated with the activity of the sun. This region where auroras are most probable is called the auroral oval and is situated between 67° and 77° magnetic latitude.

SANAE IV is situated at 71°, making it a great spot for aurora gazing.



Even though we understand most of the science behind this phenomena, the words of Tromholt in 1885 still describes it best: *“Lovely celestial display! Before your fascinating mysterious play, in which enigmatic forces of Nature flood the heavens with light and colour throughout the long Polar night, the golden sunsets of the Pacific Ocean, the gorgeous flora of the Tropics, the resplendent lustre of gems of Golconda, must pale. Lovely celestial display!”* ☺

** photos courtesy of NASA website

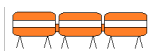
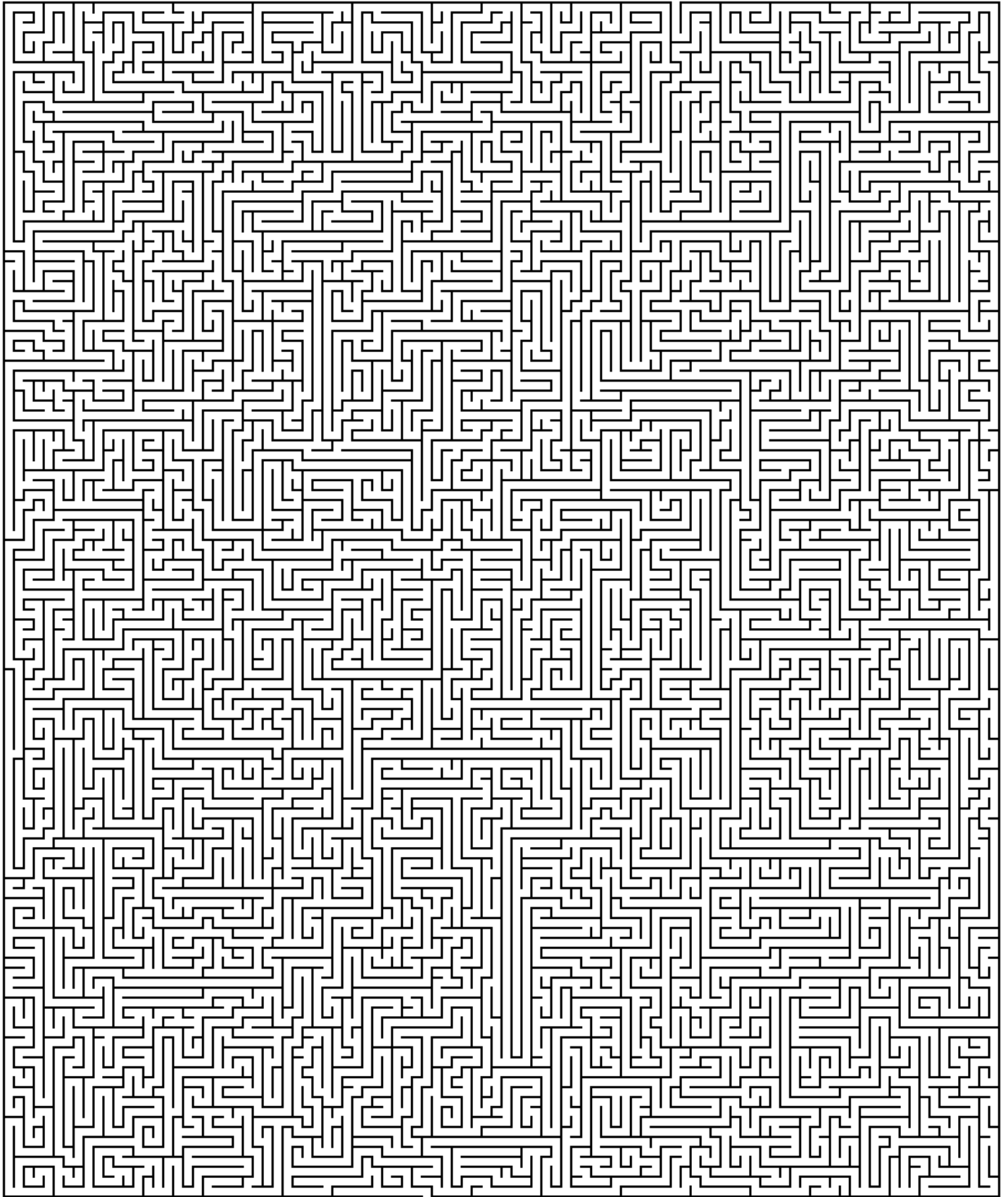


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S51 PUZZLE 2 - ANTARCTIC MAZE

Oh no! Challenger 3 has lost its way in a whiteout. Help it find a way through the maze and back to SANAE



Send your completed puzzle to s51puzzles@gmail.com
*solution will appear in the next issue

SANAE TRENDS

Temperature

Maximum	-10.0 °C
Average Max	-15.1 °C
Average	-18.1 °C
Average Min	-21.0 °C
Minimum	-30.2 °C

Pressure

Maximum	895.9 hPa
Average Max	886.3 hPa
Average	883.0 hPa
Average Min	879.3 hPa
Minimum	867.3 hPa

Humidity

Maximum	100%
Average	76%
Minimum	21%

Wind speed

Mean	23.2 Knots (46.4 km/h)
Maximum Gust	116 Knots (232 km/h)

Daytime lengths

Average day length	0 hrs
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Quote of the month

Elrich (roughly translated as): “No really, tomorrow I HAVE to shower!”

Johan (while busy in the wetlab): “Jako, smell this and tell me if you think our team is healthy”

Movie of the month

Band of Brothers

Song of the month

Seven Devils - Florence and the Machine

Dish of the month

Leg of lamb

THANKS TO OUR SUPPORTERS:



MEERLUST



