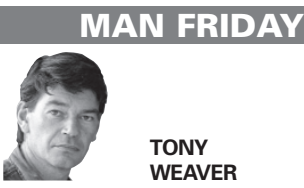


Gutsy underdog sea dogs who raised the flag and kept it flying high in defeat

HERE haven't been all that many warm and fuzzy moments for us patriotic South Africans lately. Our humiliating crash out of the cricket World Cup, a spate of particularly heinous criminal acts, some highly unedifying political moments – not exactly Rainbow Nation stuff.

I suppose this weekend's Super 14 rugby semi-finals, with the Sharks and the Bulls playing, is a cause for celebration, but somehow, without the Stormers taking part it all feels a bit flat down here in the deep south (at least there is something to cheer about, but it's a tough ask having to choose between backing either of those two teams, both our arch-foes).

There are many who are celebrating Helen Zille's election as leader of the Democratic Alliance



MAN FRIDAY
TONY WEAVER

as a watershed in South African politics, but even that's a tough one to get exercised about if you're not a particular fan of the DA.

And that's why the gutsy performance of one of the biggest underdog sporting teams in South African history is so exciting.

On Wednesday, Team Shosholozu were finally eliminated from the Louis Vuitton Cup, the lead-in to the 32nd America's Cup, in Valencia, Spain. In their final race (or "flight", in the quaint terminology of ocean racing), Shosholozu man-

aged to edge out the French team, Aereva Challenge, and secure seventh place out of the 11 teams taking part.

What's so great about that, the cynics might ask. And what's the big deal about an elitist sport like yachting?

That, I would venture, is missing the point. Team Shosholozu entered the America's Cup as a wildcard challenger, a rank outsider driven by the dream of one man, Captain Salvatore Sarno, an Italian who moved to South Africa two decades ago. The redoubtable Captain Sarno is already talking up the next America's Cup, dreaming of taking two boats and a much bigger team to the next event.

That the South Africans managed to last this long and get to a very creditable seventh position, is

all the more remarkable in that they had no major local corporate sponsors. Shosholozu had a relatively tiny budget of around \$34 million for the three-year campaign.

Not only that, the crew of 17 – 13 of them South Africans – was one of the smallest in the event: BMW Oracle Racing, which came second on the rankings, have a team of 150 from 16 different countries, and a budget that is reputedly between \$135m and \$200m.

The team that beat Shosholozu into sixth place overall – but which the South Africans beat in the round robin on day eight of racing – is Italy's Mascalzone Latino Capitalia. MLC had a budget of \$87m, and a team of more than 100 from 17 different nationalities.

But it is not all about the money, and size doesn't always count, as

Shosholozu have shown so convincingly. What is all-important here is that the Shosholozu team have gone into this campaign as aggressively proud South Africans.

Literally millions of television viewers around the world have thrilled to the sight of the yacht sailing out with a huge South African flag aloft, the strains of Shosholozu pumping out over the loudspeakers. International media reports from Valencia have all enthused about the openness and accessibility of the South African team, in stark contrast to the stuffiness and clubbiness of some of the others.

All the world's top yachting writers have been in Valencia, and Team Shosholozu probably gained more column inches than any other yacht. The Associated Press's Paul

Logothetis enthused that the South Africans had "exceeded all expectations". Chris Wright from Agence France Presse wrote that "South African debutantes Team Shosholozu were a breath of fresh air at the Louis Vuitton Cup".

And the usually restrained Stuart Alexander of the London Independent wrote: "For them, Valencia has been a resounding success and the reputation of South Africa has been enhanced. They will probably be back because, for them, it is the sport which is important".

High praise indeed from a usually cautious bunch of writers.

And that is why it is sad to see the lack of major South African sponsorship of the team. There must be many a marketing rep who is cursing the missed opportunities. There can be few advertising bill-

boards in the world that can match a billowing spinnaker or a flashing hull as it cuts through the water.

All of it carried out under extremely testing conditions, with a bunch of rugged, sun-bronzed sailors who are, by the very definition of their sport, all glowing with ruddy good health. Hell, I could write the advertising copy myself, it is such a doddle. But no, our big corporates seem to stick to the safe and traditional avenues, such as rugby, cricket and soccer.

So even if the corporates haven't come to the party, let me, as a little voice down here on the southern tip of Africa, raise my hand and say: "Damn, guys, you've given me plenty of lumps in my throat and made me proud to be South African."

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SA AT FOREFRONT OF RESEARCH

Earth's centre holds powerful secrets

RICKY SMIT and ROB DE MEIJER

IF ONE considers how easily we go to sleep every night and how easily we take out 20-year mortgages for our own small part of the Earth, one would never guess that its interior is still such a mysterious place. Unlike the characters of Jules Verne, we cannot travel to the centre of the Earth because of the rapid increase in temperature and pressure as one goes deeper below the surface of the Earth.

Most of what we know about the make up of the Earth is based on the assumption that the Earth was formed out of solar-dust matter similar to that in comets and meteorites. Until now the only definite information we have had about the interior of the Earth is from seismic measurements of density variations in the Earth and lava from the mantle of the Earth.

Seismic data on the interior of the Earth shows that the solar-dust material has redistributed itself into dense and less dense compartments. The densest materials are found at the centre, the lightest materials are the continents at the Earth's surface.

The centre, or the core, of the Earth is divided into a solid inner core surrounded by a liquid outer core. Surrounding the liquid inner core is the mantle and floating on top of the mantle is the continental crust.

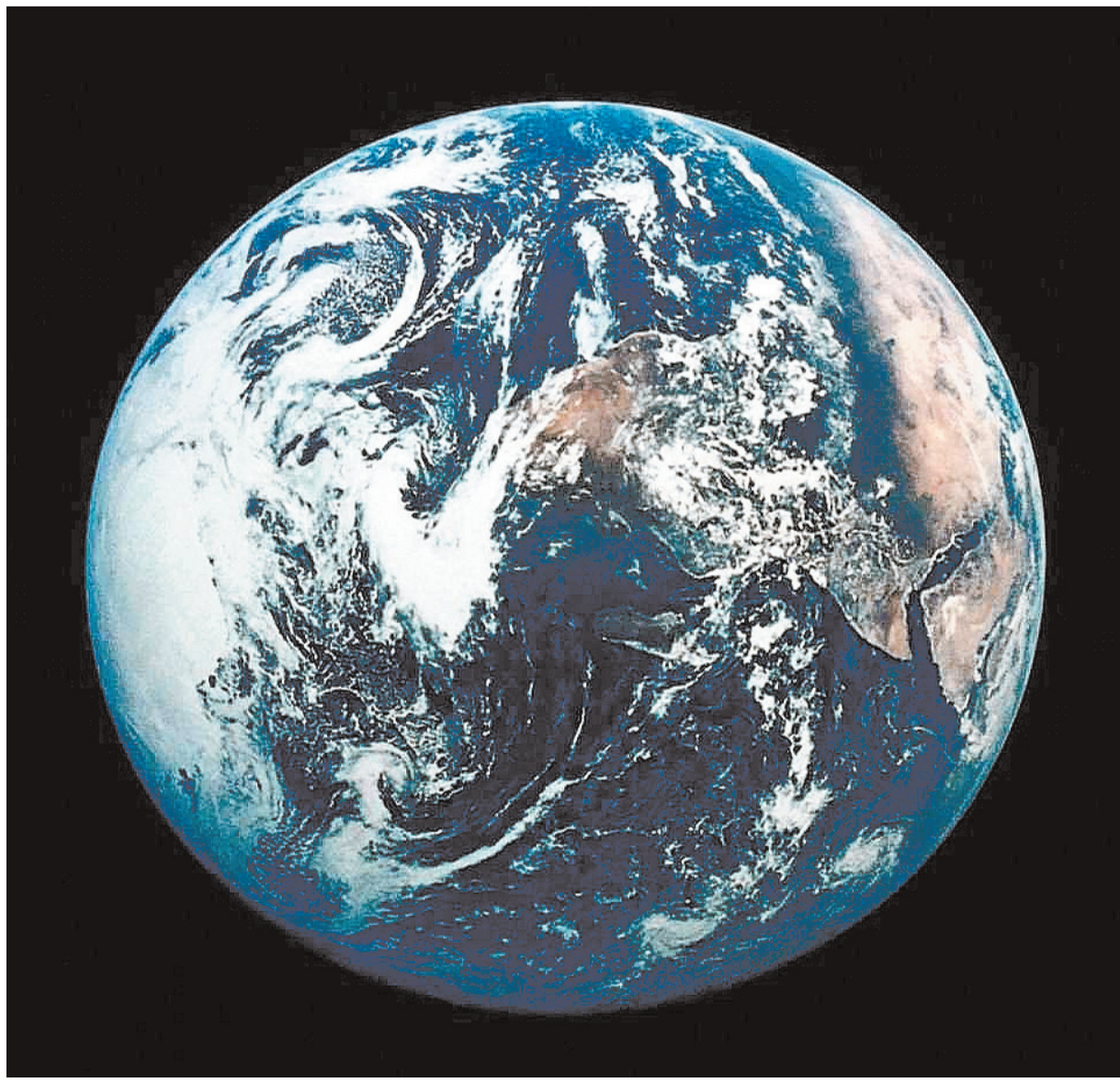
Movement of the liquid outer core produces the geomagnetic field. The geomagnetic field, in turn, protects the atmosphere of the Earth from being eroded away through collisions by high-energy particles such as those spewed out in great volumes and intensities by the Sun during solar flares.

Presently, institutions such as the Hermanus Magnetic Observatory are recording very rapidly changing magnetic fields over South Africa. Southern Africa is part of one of the three large areas on Earth where the magnetic field is changing most rapidly (diminishing by about 10% over the last 20 years).

In a large area between South America and other parts of southern Africa the magnetic field is lower than anywhere else on Earth (ranging between 50 to 60% lower). Consequently there is some debate as to whether the polarity of the magnetic field of the Earth may even be in the process of reversing, something which has happened at long irregular intervals, many times before in the history of the Earth.

One of the most interesting questions in geophysics is how the heating process of the outer core of the Earth takes place.

Due to so little definite information on the interior of the Earth, a



CORE SKILLS: South Africa has signed on for a project to study how antineutrinos are generated in the Earth.

great variety of models exists. It is generally accepted that half of the power released by the Earth (45 million megawatts) is produced in radioactive decay of naturally radioactive elements inside the Earth, such as potassium, uranium and thorium.

The geomagnetic field is the result of the movements in the liquid inner core, and these movements are only present due to the heat transport from the core to the surface which occurs mainly at the mid-ocean ridges. However, without radioactive heat sources, the core of the Earth would by now have completely solidified and the geomagnetic field would have disappeared.

Here nuclear physics provides us with another possibility of gaining information about what is happening in the interior of the Earth, because during radioactive decay antineutrinos are emitted.

Antineutrinos belong to a class of particles that interact only weakly with all other particles, and therefore even if antineutrinos were to

start from the centre of the Earth, most will reach the surface of the Earth. At the surface of the Earth, the resulting antineutrino flux is about one million per square centimetre per second. An obvious disadvantage of this very weak interaction is that very large detectors need to be built for detecting them.

Rob de Meijer initiated a project using antineutrinos from the Earth to try to determine the distribution of radioactivity and therefore to locate the heat sources of the Earth inside the Earth. The project named Earth Antineutrino Tomography (EARTH) (www.geoneutrino.nl) has as its eventual goal the production of a 3D map of the distribution of the heat sources in the Earth.

This will require about 10 huge underground facilities, each hosting an antenna to detect the direction from which the antineutrinos came. Each one of these antennas would consist of very many small direction-sensitive antineutrino detector modules. These antineutrinos, because they come from the Earth,

are also called geoneutrinos.

During one of De Meijer's visits to the Cape, the work, in collaboration with members of the physics department at the University of Cape Town and iThemba Laboratory for Accelerator Based Sciences (iThemba LABS), was begun with a few simulations and tests to ascertain whether direction sensitive antineutrino detectors would at all be feasible.

These showed that it was worth pursuing. The collaboration has since grown to now also include the universities of Stellenbosch and the Western Cape.

On March 16 this year, a memorandum of understanding was signed between the EARTH board, which controls research on the EARTH project, and the University of Cape Town, University of Stellenbosch and iThemba LABS.

It will provide the framework in South Africa for research to be undertaken on this project in which also the Netherlands, Italy and Fin-

land are taking part. This year some students from the University of Stellenbosch and the University of Cape Town will have postgraduate projects related to the greater EARTH project.

If successful, the project will have to be tackled on an international scale. It has been divided up into small initial steps where the South African nuclear physics research community can play a significant role. The goal of the present step is the development of detectors which measure, not only the energy of the antineutrinos, but also their direction. These detectors will be tested in the Western Cape.

One of the methods by which uranium naturally decays, is fission, a process that splits the uranium atom into two smaller atoms and a number of neutrons. The neutrons emitted in this process can stimulate fission to take place more often. In a nuclear power reactor, a carefully controlled version of this is what produces the heat that eventually generates electricity.

In the process, it also emits a large flux of antineutrinos. Reactors such as Koeberg can therefore be used as a strong source of antineutrinos with which the detectors that need to be developed can be tested. For the initial development of the project, the universities in the Western Cape are therefore well situated.

Once the best shape, size and type for these detectors have been determined, the project can be scaled up to build a detector large enough to detect the antineutrinos coming from the interior of the Earth.

Apart from radiation therapy for cancer as well as radioisotope production for medical diagnostic purposes, iThemba LABS also provides materials and nuclear research facilities for physics departments countrywide. iThemba LABS therefore becomes the obvious base in South Africa to look after and co-ordinate a technical development of such a prototype detector.

The inevitable future growth in the nuclear industry, the pebble bed modular reactor and most probably further nuclear power stations in South Africa, herald the need for postgraduates with neutron physics skills. To develop, not only the skills for the industry, but also the capacity of universities to develop these skills, a project with popular appeal such as the EARTH project can act as a vehicle to promote neutron physics and also nuclear physics research in general.

● *Dr Smit is a scientist at iThemba LABS and Professor De Meijer is extraordinary professor at the University of the Western Cape and emeritus professor at the Universities of Groningen and Eindhoven in the Netherlands.*

Stand by for new projects as we reach for the stars

STEVE CONNOR

LONDON: Professor Stephen Hawking has just completed a series of "zero-gravity" dives in an aircraft designed to test weightlessness in space. Hawking, one of the foremost experts on the cosmological theories of gravity and black holes, said he wanted to see the Earth from space by going for a ride with Sir Richard Branson's company, Virgin Galactic, which is scheduled to offer tourist trips into space in two years.

Hawking believes travelling into space is the only way humans will be able to survive in the long term. He said before his flight: "Life on Earth is at ever-increasing risk of being wiped out by a disaster such as sudden global warming, nuclear war, a genetically engineered virus or other dangers ... I think the human race has no future if it doesn't go into space."

For now, and the foreseeable future, space will remain a preserve of rich people. A number of organisations led by wealthy entrepreneurs are following Sir Richard's lead in developing a fledgling space-tourism business.

Sir Richard is said to be investing £100 million in Virgin Galactic and has signed up 200 people, at a cost of £100 000 a ticket. The flight will take two-and-a-half hours, but the period in space will last just a few minutes – less than four to be precise – before the passengers are returned to the space port in New Mexico where they took off.

The Benson Space Company, led by American Jim Benson, is also offering similar flights into space – actually, a high-altitude trip to a point 101km above ground. Space officially starts at 99.2km, so at this altitude the passengers will earn their "space wings" from Nasa and the US Air Force. Like Virgin Galactic's tour, however, these flights will be suborbital trips, which means the passengers will not get to orbit the Earth. They will merely be taken to a great height and back again to the same point on the ground.

What is the point of a suborbital space trip?

At these altitudes it is possible to see the curvature of the Earth and look down on the thin smudge of air that is our life-support system.

Critics will argue that the space tours being promoted by billionaires such as Branson and Benson will merely provide rich people with a good view of the atmosphere that their carbon-hungry trip has just helped to destroy – the ultimate 4x4 experience.

Encouraging rich people to go for short, but expensive, joyrides into space appears to be led by even richer men with a boyish fascination for space travel. Alongside Branson and Benson, other entrepreneurs of the private space-tourism industry include Elon Musk, the founder of PayPal, Paul Allen, the co-founder of Microsoft, Jeff Bezos, the founder of Amazon.com, and Robert Bigelow, the American hotelier.

They argue that space tourism is about adventure and excitement, but the bottom line is that they also believe, with the right work behind it, it can be profitable.

Yuri Gagarin became the first man in space on April 12, 1961 when he circled the Earth for 108 minutes in the Soviet spacecraft Vostok-1. Since then, scores of astronauts from dozens of countries have followed his lead. Most have stayed in near-Earth orbits, either servicing satellites or the International Space Station, or travelling to the higher orbit of the Hubble Space Telescope.

A few have gone beyond the orbit of the Earth, notably Nasa astronauts on the Apollo missions to the Moon.

US President George Bush has announced a mission to return to the Moon by 2020, and many countries, such as Russia, China and the nations that make up the European Space Agency (ESA), have stated that they, too, want to send people to the Moon. Once on the Moon, the US intends to build a permanent lunar base and use it as a possible staging post for a manned mission to Mars by the middle of this century.

But is it not better to send robots to explore space? Many intelligent people believe this is the case, given that a robot mission costs between 10 and 100 times less than a manned mission. In addition, safety in space can be incredibly expensive.

However, a recent BBC poll found that 61% of the public is in favour of Britain playing a leading role in human space exploration.

And the proportion is even higher in the US.

Perhaps the argument for manned space flight is best summed up by Lord Rees of Ludlow, the Astronomer Royal Martin Rees: "My view about manned space flight is that, as a scientist and practical man, I'm against it, but as a human being I'm in favour of it."

Advances in robotics are making the case for manned space flight weaker, but there is still a need for it in terms of human adventure. –The Independent

Brainy moms are mothering the next generation of women in science

CHRISTINA SCOTT

THIS year, Mother's Day is on Sunday, placing it firmly within National Science Week, which runs from tomorrow to next Friday.

An interesting combination, motherhood and science. It's not a well-known pairing, like apple pie and ice-cream. Nonetheless, motherhood and science has been happening simultaneously since the days of Marie Sklodowska Curie, the astonishingly brilliant Polish-French researcher who helped discover radioactivity and who remains the only person – and of course the only woman – to win two different Nobel science prizes. In between, she also raised two daughters, for which there are no Nobel prizes.

Motherhood, for many busy women scientists, is perhaps more like chilli-flavoured chocolate – sweet-smelling, with a lethal kick. It

can be done. Marie Curie may be a role model once again: after all, one of her daughters, Irene, went on to win her own Nobel prize in chemistry, 23 years after her mother. And Irene's daughter Helene is, to this day, an internationally renowned physicist.

Closer to home, South Africa is providing lots of its own role models. Good scientists. Good mothers. And given the pressing need for scientists, and the pressing need for the transformation of society, these women often take on another task: mothering the next generation of scientists – especially the girls.

South African Women in Science and Engineering is not just a goal. It's an organisation, website and acronym and all, dedicated to getting and keeping women in science.

"Science is very important for the upliftment of our country and our people," says SAWISE chair

Anusuya Chinsamy-Turan, the mother of two boys and a renowned writer and researcher on dinosaur fossils. "I'm particularly interested in women seeing the scope there is for careers in science," says the UCT-based winner of the 2005 Shoprite Checkers/SABC 2 Woman of the Year Award. "Science hasn't been strongly promoted among women and I think it's extremely important that we play this role."

A young organisation, not all the members of SAWISE will be on the receiving end of Mother's Day, obviously. Some of them are new to motherhood. University of Cape Town mathematician Diane Wilcox, a prominent SAWISE member, will be celebrating her first Mother's Day. Her son Aidan is seven months old. Diane was in the news a few months ago when she swam for nearly three hours from Robben Island to Bloubaai in honour of her

father Robert, sent to the Island as a terrorist when Diane was still in nappies, and her mother, for keeping them all together.

She likes SAWISE for the wonderful environment it provides "to interact with other excellent, like-minded women scientists" and fully endorses all its plans to encourage young women in the sciences, including the August Women's Day talks for high school pupils and teachers. "You like to do what you would have liked done for you, to have it available for others," she points out in a brief moment between juggling two jobs and parenting.

Éva Plagányi-Lloyd, who leads the SAWISE scholarship committee, is the mother of two daughters, aged nine and five. Another University of Cape Town mathematician, Éva uses her skills to understand what's happening in fish populations. She

also does quite a lot of outreach activities, ranging from writing books about sharks, whales and dolphins to speaking at schools. "I love going to talk to the kids. One of the nice things about going to speak at these schools has been a comment by my daughter: 'Wow, your mom's a scientist. Can mummies be scientists?'" she recalls.

In November, Éva will give out R22 000 in scholarships for young women who have already completed their undergraduate degree in science and wish to continue to their fourth year. Half of it will be funded by Element 6, the industrial diamonds branch of De Beers, proving that diamonds really are a smart girl's best friend.

This year, scholarships went to Jen de Beyer, a biochemistry student at the University of Stellenbosch, and Tsungai Jongwe, a microbiologist at UCT. "The honours year is

often the toughest year financially for most students, especially those from poorer backgrounds," Éva explains. "We hope they will be role models who will encourage young women to stay in university after their first degree because it does pay off in the long run."

Others aim younger. Julie Cleverdon, mother of one and current head of the MTN ScienCentre in Canal Walk, hopes mothers and fathers will take advantage of their Family Fun days this weekend and next, when kids are allowed in free when accompanied by a parent. It's being done in honour of National Science Week, which the MTN ScienCentre is co-ordinating in the Western Cape with partners such as the Hermanus Magnetic Laboratory, the iThemba LABS particle accelerator and the South African Astronomical Observatory. For Cleverdon, Mother's Day is likely to be

very, very busy. There's a lot of science going on.

Aiming still younger, Rebecca Felix used her PhD in human genetics to launch Curious Cubs, a weekly fun science lesson for pre-schoolers in the Cape, while on maternity leave. From her home in Crawford in Athlone, she says that the "experiment" has been so successful that she has plans to expand to more pre-schools.

The final word, taken from one of her classes, seems pretty positive for female scientists, from pre-schoolers to professors: nothing holds you down, but gravity.

● *The full schedule of Western Cape events for National Science Week (May 12-19) is online at www.mtnsciencentre.org.za or 021 5298100. SA Women in Science and Engineering is online at www.sawise.org.za. Curious Cubs can be reached at curious_cubs@yahoo.co.uk*