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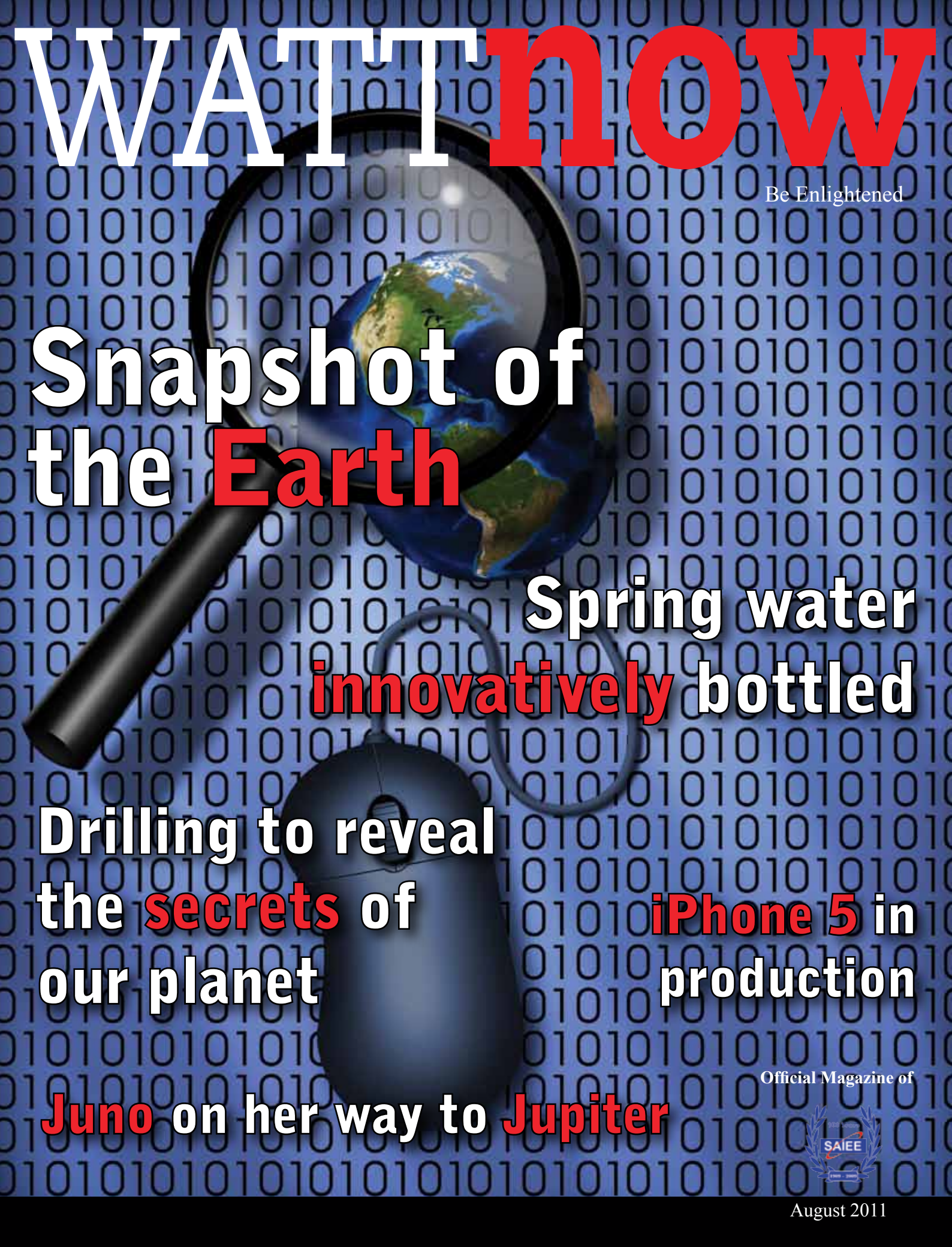

Snapshot of the Earth

Spring water innovatively bottled

Drilling to reveal the secrets of our planet

iPhone 5 in production

Juno on her way to Jupiter

Official Magazine of SAIEE

August 2011

THE JUDGES ARE SHARPENING THEIR PENCILS

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PNEUDRIVE CHALLENGE 2011

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FESTO

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ADB's promise is good news – but does it mean anything?

The ADB has already committed $600-million to the North-South Corridor as part of a plan to promote greater intra-country trade and to improve regional co-operation. It is also supporting efforts to improve the railways, energy generation, broadband connectivity and a variety of different water and sanitation projects for the 12 countries that make up the southern Africa region.

These are wonderful promises but the challenge is to translate them into meaningful change that will have an impact on the lives of the more than 160-million people living in this region.

And that is where the problem lies.

Political intransigence, greed, corruption, poor policing and tender manipulation all play a part in holding up significant progress in African countries. Added to this are the problems of getting the regulatory frameworks that will sustain major projects in these countries.

It's taken years, for instance, to secure funding for the Inga hydropower project in the DRC and while investors are now prepared to put down money, they require assurances that the power generated can be bought through a water-tight and bankable power purchase agreement from the utility.

And without that condition, the project will grind to a halt – as it did a few years ago.

There are many examples of government incompetence when it comes to maintenance and rehabilitation of the transportation infrastructure, so it's all well and good for the ADB to promise that it will support development, infrastructure, poverty reduction and sustainable economic growth but these sentiments are meaningless unless they result in tangible change.

While South Africa is seen as being the driver for growth – by the ADB and other funders and investors– the reality is that it might have the skills, know-how, materials and abilities but these mean nothing when political intransigence creeps into the picture.

Already many African countries have expressed concerns about South Africa's dominant position in the region and these fears are likely to make the governments of neighbouring countries even more cautious in their dealings with this country.

And so the political problems continue to manifest.

Given the shortage of jobs that the region faces – and the lack of skills that some of them demonstrate – it's clear that there are tremendous opportunities available to the entire area. But we have to see how best these can be put into effect and I believe the only way to do so is for the partners in this region to start working together instead of merely paying lip-service.

And I don't believe that South Africa should remain a totally dominant partner. Namibia is sitting on huge oil reserves and will shortly become a major economic force in the region. Angola is immensely wealthy already and needs to focus not only on developing its own infrastructure but participating with others to develop the whole region.

The same can be said for Botswana, Zambia and Tanzania – and while these countries might not be as rich as the West Coast, they certainly have a significant role to play.

I think what we really need is for the private sectors in different regions to takeover and run new projects. Governments have proved that they cannot manage and run enterprises efficiently. We've seen this in South Africa and there is ample evidence in other parts of southern Africa too. Like Zimbabwe – which can't run anything at all now.

But, with private sector investment and control, that could all change.

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WATT'S

WATT'S HAPPENING

7> WATT'S GOING ON?

Thousands making use of the Gautrain daily; Skills accord will boost fund by almost R2-billion; Waste-pickers can earn up to R10 000 a month; IDC creates 'expensive' jobs for SA; Special economic zones in Africa; Confidence down among professional graduates; Swazi get R2,5-billion loan from SA's taxpayers.

INSTITUTE PAGES

INSIDE

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The source of Valpré is a quartzite well 40-60m deep. Water is pumped from the well filtered to remove particulate and stored in tanks ready for bottling. The water's Ph is very close to 7 (perfectly neutral) and has TDS values of 40-90ppm.

Valpré's green, innovative best-practice bottling plant

On 7 July 2011, Coca-Cola South Africa opened its new Heidelberg bottling plant for Valpré Spring Water, the greenest plant in Africa and the first to introduce PlantBottle™, a PET plastic bottle 30% formulated from renewable plant-based material. Peter Middleton talks to Casper Durandt, senior technical operations manager at Coca-Cola South Africa about the plant's innovative features.

Speaking at the launch event, Minister of Water and Environmental Affairs, Bomo Molewa said that the opening of the new Valpré plant in Heidelberg and the launch of PlantBottle™ supported the government's mandate to create infrastructure, develop skills, increase the number of women in the workforce and ensure sustainable development with a focus on minimising the impact on the environment. It is a notable example of the kind of development that we encourage all South African industries to adopt.

Situated just off the N3, some seven kilometres from Heidelberg, a location chosen for its close proximity to markets and distribution sites in the Gauteng region, and to reduce the carbon footprint of its supply and distribution chain, the plant boasts several features that place it among the most green and the most advanced in the world.

Valpré is a proudly South African product that started life from a spring in Paulpietersburg in KZN. "The water coming out of Heidelberg is almost identical to that used in Paulpietersburg. Both sources come out of quartzite at 40-60m deep, and because quartzite is so unreactive, the mineral composition of water from these sources is almost identical: with a Ph very close to 7 (perfectly neutral) and with total dissolved solids (TDS) values of 40-90ppm.

In keeping with the pure image of the Valpré brand, the bottling plant has adopted a comprehensive range of environmentally friendly and energy efficient policies in the plant. "Firstly," says Durandt, "all the cladding and stone used for the building itself came from the farm." So from the start of building, the principle of minimal resource use was being applied.

In front of the clean-lined, modern building is a bank of solar PV panels. "We can generate up to 50kW on a sunny day but are averaging around 35kW," says Durandt. "We operate an eight hour daylight-only shift, so we don't use batteries to store any of the generated electricity. We connect it straight into our local power circuitry and use it to run the office and the borehole pumps. We use three pumps to feed water from the borehole into our tanks, 7,0kW, 11kW and 14kW, and by using solar energy, we turn our primary process into a net-zero energy activity," he adds.

The water is pumped into a fully flexible set of storage tanks: "The off-take water is taken directly from the borehole and, once passed through a simple particle filter, it is ready for bottling. The mineral composition of the water you drink is identical to that found in the borehole, which is important for natural mineral water.

The plant also used flat plate solar collectors on the roof to supply all of its domestic hot water needs. "We have no electric geysers on site and are completely self-sufficient when it comes to hot water."

The plant orientation and lighting was carefully designed after a comprehensive light study. Specially angled louvres on the roof and sun-facing walls channel light so that it doesn't fall directly onto the factory floor. Instead, it is diffused to give 1 000 lux into every corner at all times of day. "We use the sun to make electricity, heat water and to produce light. There are not many more ways to use the sun's natural energy," Durandt points out.

Ironically for a spring-water bottling plant, Valpré's Heidelburg plant has also put a lot of effort into collecting rainwater. Wide guttering and large drainpipes are used to collect the rainwater from the plant roof and to channel it into storage vessels. "We purify and chlorinate some of it for our own domestic use and use the rest to flush toilets and irrigate the grounds. We can't use Valpré to flush toilets but we don't draw off the municipal utility either," he adds.

On the energy management side, all of the offices are double glazed. "So they are very easy to keep warm or cool using very little energy. Also, all of the glass used in building the plant has recycled content and all the carpets are made by Van Dyck carpets from recycled PET (polyethyleneterephthalate) fibre. "PET from recycled plastic bottles can be spun into very thin yarns, made into hollow fibres, fluffed and made to mimic cotton or silk. It is amazing what you can do with a PET bottle!" Durandt exclaims. "PET also burns more cleanly than coal, because it all converts to CO_2 and produces no smoke."

PlantBottle is a global Coca-Cola initiative to further reduce the impact of the PET plastic used for its bottles. This packaging is the first-ever recyclable PET plastic beverage bottle made using plant-based material as a partial substitute for oil. "PET is made by mixing monoethylene glycol (MEG) with terephthalic acid (TA) and both of these ingredients are by-products of the petroleum industry," Durandt explains. "PlantBottle uses MEG derived from plant and waste plant material, which reduces PET's dependence on non-renewable oil resources." Up to 30% of the PET used for PlantBottle plastic packaging is now derived from renewable plant resources and this is set to increase. South Africa is the 10th country in the world to use PlantBottle PET for beverages and the first in Africa. The result is 100% recyclable packaging with a lighter carbon footprint.

"Everything we use at this plant gets recycled," adds Durandt. "We have a zero landfill policy, with no on-site landfill facilities and we don't have agreements with anyone else to provide one." Recycling chutes on the upper floors take waste materials and products into a recycling centre in the basement. Compactors are used for plastic bottles and glass is crushed on-site before being transported for recycling. "We use Enviroserve to handle the whole range of our waste," he confirms.

Partnering Coca-Cola and Valpré on the aftermarket recycling side of the PET equations is PETCO, the successful South African champion of the 'reduce/recycle/reuse' campaign. Since its inception seven years ago, PETCO has increased the number of post-consumer PET bottles recycled in South Africa from 328 to 957 million bottles per year, ie, from 16% to 32% of bottles used. "We have provided millions of rands worth of financial support to PET recycling companies, created income opportunities for an estimated 18 000 people and helped to establish 65 plastic recovery stations throughout South Africa," says Cheri Scholtz, PETCO's CEO.

The pioneering design of the bottling plant itself is also evidence of Coca-Cola's commitment to community development, and efficiency with respect to both production and energy-use. "This is currently the first plant in the world to be using a production support system called PUFT: Productive Use of Free Time," says Durandt, who is, in fact, the inventor of the theory. "Any coupled manufacturing system always has bottle necks. What PUFT does is to identify the non-bottle-neck areas, ie, the non-constraints of a production line. Basically, it predicts the locations of any free time during automated running operations. It knows the accumulation level between production station on a line and then, by counting the units entering and leaving each station, PUFT uses line state-specific algorithms

A bank of solar PV panels, that can generate up to 50kW on a sunny day, is used to drive the borehole pumps so as to maintain the company's primary process as a net zero energy activity.

and the wirelessly communicated data from every other station to calculate the amount of free time available at each station before overall production efficiency will be affected," he explains. This free time can be used to do minor tasks without affecting overall production efficiency.

"So PUFT can tell the label machine operator that she has four minutes of free time, meaning, she can stop her station and, while the whole line is still running, she can clean and maintain the station without affecting the performance of the line in any way. The idea is to make better use of this free time, because if you don't use it you lose it.

"In most production systems, people are unaware of the free time because the focus is always on the constraint. The tendency is not to look at the non-constraint machines at all. This theory says that we know we have free time, so first, we focus on how much free time we have and then we ask ourselves how we can best use that time, for autonomous maintenance, cleaning, measurement, etc. We can focus on all the things necessary to help the machine to perform at its peak – and our Valpré bottling line is currently operating at efficiencies of 90% plus," Durandt adds.

When the line is running in its steady state, then all the non-constraint stations – the pre-form feed hopper, the labelling station, the palletiser, the shrink wrapper, etc, will display green lights and the calculated free time for that station. The bottleneck station on the Valpré line is the blow moulding, filling and capping station. "This is currently the only machine of this type in this country, although several more will be installed over the next few months. It is a blocked blowing, filling and capping machine. It incorporates a pre-form heater that heats the plastic to 200°C for blowing. This also sterilises the bottle. The bottle is blown at a pressure of 40MPa or 400 bar, then removed and immediately filled and capped."

Durandt also points towards the compressors used for blowing the bottles as an example of how the energy efficiency of every machine has been optimised. "This huge 40 MPa compressor supplied by Krones is used for blow-moulding preforms into bottles. To make it as energy-efficient as possible, the air exhausted from the bottle after blowing is reintroduced into the input air. So 40% of the compressed air is recycled, which improves the energy efficiency," he explains.

"From start to finish, the bottle blowing, filling and capping sequence takes about three minutes per bottle, but once the first one is through, they come continuously," he adds. "This is the most flexible line in the country: With this machine on a single production line we can fill 300 mℓ, 500 mℓ and 1,0 ℓ still and sparkling bottles and 1,5 ℓ still water bottles. All bottles have identical necks, which enables them to be handled in exactly the same way."

The PUFT system in this machine/station, during steady-state operation of the Valpré line, would usually be showing a yellow light, indicating that it is the constraint station with zero free time. "If the supervisor sees a yellow light on this station, then she knows that the line is running well, there is enough free time on the other stations and, enough space to discharge and enough primed for continuous operation.

"But, say for example the labelling machine breaks down, bottles will begin to accumulate behind it, until it reaches a certain point where, even if the machine starts up immediately, the filling station will still have to be stopped if the accumulation is to be cleared. So the yellow light will move to the labelling station, because that has now become the bottleneck, and if you stop a bottleneck machine, then the production efficiency will drop and you start to cost the company money. So the yellow light is your first warning. It tells the operator not to stop her station and to fix whatever it is that is causing the bottleneck."

If a bottleneck station has to be shut down, due to a breakdown, for example, then the first thing the system asks is how long the operator expects the machine to be down. If say a sprocket is broken, it might take two hours to repair the machine. She enters the time into the PUFT interface, via a drop down menu, and immediately all other stations see this time added to their already accumulated free time. "So this might indicate a good time to hold a union meeting or to take an early lunch break," Durandt suggests.

PUFT is completely independent of the line itself, though. It simply communicates with the operator, who then has to take action based on the information provided. "It's like a heartbeat monitor," says Durandt. "It gives operators specific information about the health of a production line."

According to Durandt, early indications suggest that the Valpré Spring Water plant in Heidelberg will receive gold certification from LEED: Leadership in Energy & Environmental Design. All operators are black females, to reinforce the empowerment of women as part of Coca-Cola's 5 by 20 initiative, a pledge to bring five million women into business by the year 2020.

"This plant was designed with defined energy efficiency and environmental requirements from day one – and it has turned out to be everything we envisaged, and more. There is nothing like it anywhere else in the world," Durandt concludes.

Coca-Cola's Valpré bottling plant in Heidelberg is the first plant in the world to use a production support system called PUFT: Productive Use of Free Time.

Thousands making use of the Gautrain daily

After years of construction work and more than R30-billion in capital expenditure, the first leg of the Gautrain's operation – from Hatfield in Pretoria, via Midrand to Rosebank in Johannesburg – is running as thousands of commuters seek to abandon the congested highways.

According to Gautrain, the service could result in between 25 000 and 30 000 cars using the stretch of road that previously carried about 150 000 vehicles a day.

The service operates from 05h30 until 20h30 every day with trains at peak times running every 12 minutes and those in off-peak times running every 20 minutes. At Marlboro station, the train line splits, heading towards OR Tambo International Airport and Rhodesfield in Ekurhuleni.

The cost of a trip from Hatfield to Rosebank is R46, while a seven-day pass costs R417 and a 35-day pass is R1 633. The bus system that links with the train service is also fully operational and a bus ticket costs R6. The section of line between Rosebank and Park Station in central Johannesburg has not yet been opened because of water seepage problems affecting the underground tunnels that run beneath Parktown Ridge.

Remedial work on the tunnels is currently underway and includes drilling small-diameter holes through the tunnel floor and injecting low-viscosity grout into the surrounding rock. Bombela, the company responsible for building and operating the Gautrain, says that it will bear the costs of this remedial work.

The train is capable of running at speeds of up to 180 kilometres an hour and the trip from Hatfield to Rosebank takes about 35 minutes which at rush-hour, when the Ben Schoeman Highway is clogged with thousands of inter-city commuters, is certainly an option for those people working in offices in the two cities.

Once at a particular station, the Gautrain bus service can be used to get commuters from stations such as Rosebank or Sandton to outlying suburbs such as Sunninghill and Randburg.

Similarly, people working in Bedfordview, Eastgate or Isando have the option of using the bus service from Rhodesfield station to reach their destination.

Anyone interested in finding out more about the service, including details of its construction, can visit www.gautrain.co.za.

Skills accords will boost fund by almost R2-billion

A voluntary skills levy of between 4% and 6% of a company's payroll has been introduced to boost the National Skills Fund and it is expected to provide at least R1,7-billion more money to the fund.

The fund currently has more than R4-billion to spend on effective skills training earmarked for it by government and the additional cash will mean that it is able to strengthen the capacity of existing educational institutions.

In August, various accords were signed between government, labour and business. The National Skills Accord, the Accord on Basic Education and the Partnership with Schools are aimed at speeding up the production of skills – particularly of young people – as part of the New Growth Path economic policy for the country.

Minister of Higher Education and Training, Blade Nzimande, conceded that the money in the National Skills Fund had not been spent but added that he was satisfied that proper planning was underway to resolve this problem.

He said the government would announce its plans "at the appropriate time" but added that without proper planning it would be pointless. He said that the government "can't just throw money at a problem" adding that to spend R6-billion in a single year would be difficult.

Some of the money will be used to increase the capacity of educational institutions, which will then be in a position to use the money from the fund more effectively.

As part of the National Skills Accord, businesses pledged their support for plans to increase the training of artisans in South Africa.

Moreover the labour movement has also pledged its support to the scheme and its spokesman, Zwelinzima Vavi said that part of its plan was to "change the mindset of teachers, many of them members of trade union movements".

He said that a commitment had been given to organised labour by the teachers that they would arrive at school on time and stay at school to teach the children for at least 7,5 hours each day.

He said they have been encouraged to give up their own time to help struggling students.

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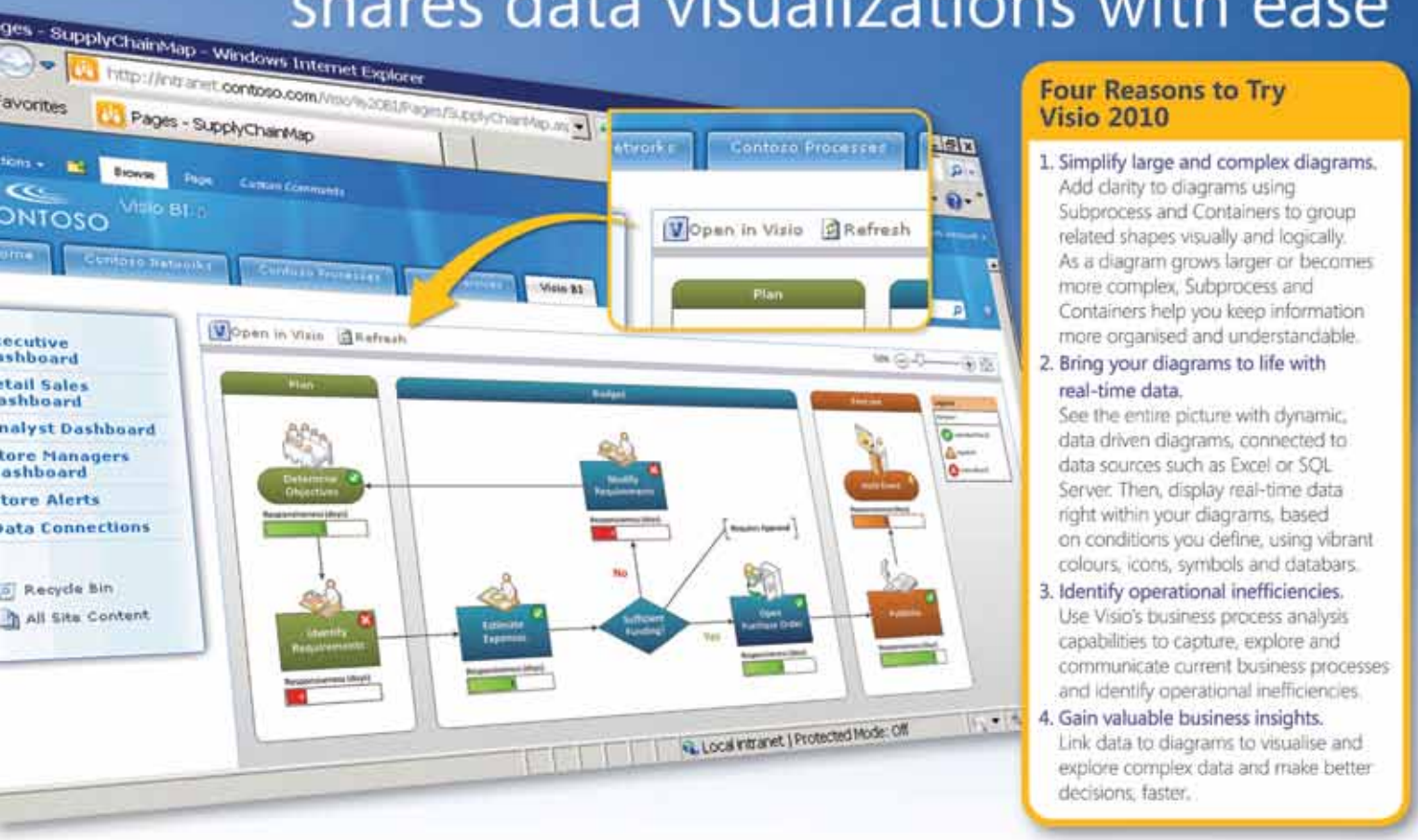

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"Humans have always communicated visually, to make sense of the world and communicate quickly with others."
James Avenant

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Waste-pickers can earn up to R10 000 a month

Almost 90 000 people earn a living from the rubbish dumps around South Africa, by picking out useful items and selling them, according to Andrew Marthinusen, executive director of the Packaging Council of South Africa.

At a workshop hosted by the Institute of Waste Management of Southern Africa, Marthinusen told delegates that waste-pickers generally made a living by reclaiming recyclable materials from the rubbish dumps and selling these to recycling companies.

Waste-pickers can earn about R120 a day from selling recyclable materials but, more importantly, many of the items found at landfill sites can be repaired and resold.

The waste-pickers have organised themselves by creating the South African Waste Pickers Association, and its chairman, Simon Mbata, says that so far they've managed to get 20 000 members.

He says that waste-pickers are not there to compete with other companies or sectors of the industry but are performing a valuable service for the waste management sector. Mbata believes that if household rubbish were separated within households, then work by waste-pickers might be reduced.

He says that some of the waste-pickers working the Free State are earning up to R10 000 a month. Mbata is a waste-picker himself and has been picking out waste for more than 16 years at the dumps near Sasolburg where he lives with his family.

The waste industry in South Africa is currently estimated to be worth about R10-billion a year; South Africans create about 3,4-million tons of waste in packaging materials every year.

In a separate development, residents of Johannesburg will have to start separating their waste or risk being fined if a new waste-management by-law comes into operation.

Gugu Mathibela, spokesman for the City of Johannesburg, says the new by-laws are currently being drafted and will be available for public comment within the next four months. He says the city has to meet its obligations in terms of the National Waste Act, which came into effect in January this year.

Mathibela says the national legislation has set targets for waste minimisation and that these targets have direct implications for the individual cities.

Waste management utility at the Johannesburg council, Pikitup, has been running a pilot project for waste separation involving 35 000 households since 2009. Residents sort their waste by putting recyclable materials such as glass and cans into clear bags and paper into orange ones.

IDC creates 'expensive' jobs for SA

The Industrial Development Corporation (IDC) has said that 31 300 jobs were created in South Africa last year as a result of the R8,4-billion it loaned to various enterprises.

Geoffrey Qhena, chief executive of the corporation, said that this would have to double if the institution were to have an impact on reducing unemployment levels. South Africa's unemployment level is currently at 25%.

The IDC said that in terms of the South African industrial plan, it would have to facilitate the creation of about 300 000 new jobs in the country and was planning to invest about R100-billion in initiatives that would create jobs over the next five years.

Qhena called on South African entrepreneurs to come forward with their ideas as the IDC was looking for good businesses in which to invest. The state-owned IDC was established in 1940 to promote economic growth and industrial development.

Qhena said that the government intended to use the IDC as the "main vehicle" to create additional employment for the people of South Africa. However, the fact that it spent R8,4-billion on creating 31 300 jobs meant that each job cost about R268 300.

Tony Twine, economist at Econometrix, said that this showed how expensive it was to create jobs in this country and that a significant amount of capital would have to be invested before there would be an impact on unemployment levels.

State-owned enterprises are planning to invest significantly in a number of projects over the coming few years and Transnet, for instance, has said that it would spend R110,6-billion over the next five years on improving its rolling stock and infrastructure.

However, the IDC pointed out that most of its investments in the next five years would focus on the green energy sector and in various manufacturing, mining and beneficiation projects.

Special economic zones in Africa

While economic relations between China and various African countries have grown rapidly, the flow of cheap Chinese products is having a direct impact on many small- and medium-sized businesses on the continent.

The importation of cheaper Chinese products is viewed by many African businesses as being a threat to their own interests and there are already allegations that China is now trying to 'colonise' parts of Africa, according to a report by Consultancy Africa Intelligence (CAI).

In 2006, during a Forum on China-Africa Co-operation held in Beijing, the Chinese government promised to help Africa establish five Special Economic Zones (SEZs) to provide support for trade and investment.

CAI says that China has both political and economic interests in establishing these economic zones but points out that previous attempts to establish SEZs have mostly failed.

The SEZs are aimed at promoting economic integration between African countries; and privately-owned companies have a direct influence on the success, growth and implementation of these zones. However, CAI points out that governments have to set up the frameworks and policies and provide the incentives for these private companies.

In China, SEZs were established in Shenzhen, Zhuhai, Shantou and Xiamen in the 1970s and 1980s to attract foreign direct investment and help the country develop its export markets partly by encouraging the importation of new technologies.

The SEZs were liberalised, given special open policies and companies were encouraged to move there. It is these SEZs that have been responsible for much of China's impressive growth over the years since the zones were established.

According to CAI, the country also formed partnerships with other countries in Asia to help them create development zones and, in the 1990s working with Singapore, two additional zones were created. Those zones were initially managed by Singapore but then local Chinese companies took them over and became major shareholders.

CAI says that rising labour costs in China pose problems for the Chinese government, which wants to move industries such as textiles and leather goods to emerging markets where the labour costs are relatively cheaper and where industries are closer to raw materials suppliers.

It says that the development and implementation of SEZs has the potential to make a significant impact on the development of African countries and provides the potential for technology transfers between companies in Africa and those in China.

However, CAI points out that the development of SEZs is not new in Africa and their success has been hampered by poor infrastructure, a lack of innovation and technology, and the absence of government support. Mauritius, Kenya and Madagascar are the only examples of where these special zones have boosted economic activity.

The CAI says that the SEZs must be part of a country's trade and economic agenda if they are to succeed and these governments must embrace the development of local infrastructure as a fundamental part of the economic zones.

For instance, local government authorities will have to improve the existing infrastructure so that the SEZs are able to provide a steady supply of electricity, water and sanitation and have a transportation infrastructure that can carry finished goods to the different markets, either local or international.

It says, too, that the governments need to set up incentives for those companies wishing to locate themselves in SEZ areas, reduce their tax charges and any tariffs on raw materials needed to manufacture products.

The CAI report also points out that the SEZs in Africa will have to create local employment opportunities and encourage exports. It will also be necessary to transfer technology and skills, to insure local workers are able to perform at the required levels.

Confidence down among professional graduates

Confidence levels among graduate professionals in South Africa have dropped in the second quarter of this year according to figures released by PPS, the specialist South African financial service provider, which tracks the confidence levels of more than 4 000 professional people in the country.

The average age of respondents in the survey was 43 and they were asked to rate their confidence levels on a number of topics including emigration, crime, healthcare, investments and work opportunities.

According to Gerhard Joubert, PPS's head of group marketing and stakeholder relations, the first quarter results show that the confidence level among graduate professionals is 60%, indicating that most people were still reasonably positive about developments in South Africa.

However, in the second quarter, confidence levels fell on a variety of issues including crime, healthcare and opportunities, pushing the overall confidence level down to 57%.

He says that many graduate professionals are working in the fields of accountancy, engineering, medicine and law and it's significant that they see themselves remaining in the country for the foreseeable future.

He believes that the reason for the downward trend in confidence levels may be the widespread strike action and increasing calls for nationalisation of various sectors by organisations such as the labour unions and the ANC Youth League.

Joubert points out that the average confidence levels among graduate professionals dropped to 81% - down from 84% in the first quarter – indicating that most professional people in the country were likely to remain here.

In response to questions about the opportunities available for professional people, the survey shows that confidence levels fell from 77% in the first quarter to 74% in the second.

Moreover, there was muted response to the unemployment situation in the country with only 42% of respondents indicating that there would be meaningful change in unemployment levels within the next five years.

With regard to the high crime levels in South Africa, respondents felt that there was just a 43% chance that the crime rate would fall over the same period.

Confidence in South Africa's health care system was also down with 46% of respondents suggesting that it was unlikely this sector would improve over the next five years.

Asked if the National Health Insurance initiative would have a positive impact on the country, only 44% of respondents felt that it would.

Swazi get R2,5-billion loan from SA's taxpayers

South Africa has agreed to lend Swaziland R2,5-billion to keep it afloat and Finance Minister, Pravin Gordhan has said that it was decided that this was "in South Africa's best interests" as the country needed to have a stable neighbour.

He said the government would not force any political reforms on the reigning monarch, King Mswati III, who has been roundly condemned by global powers who accuse him of gross financial mismanagement amid continued autocratic rule.

Gordhan said that Swaziland was a sovereign country and that South Africa could not interfere in its political situation or use these financial measures to force change.

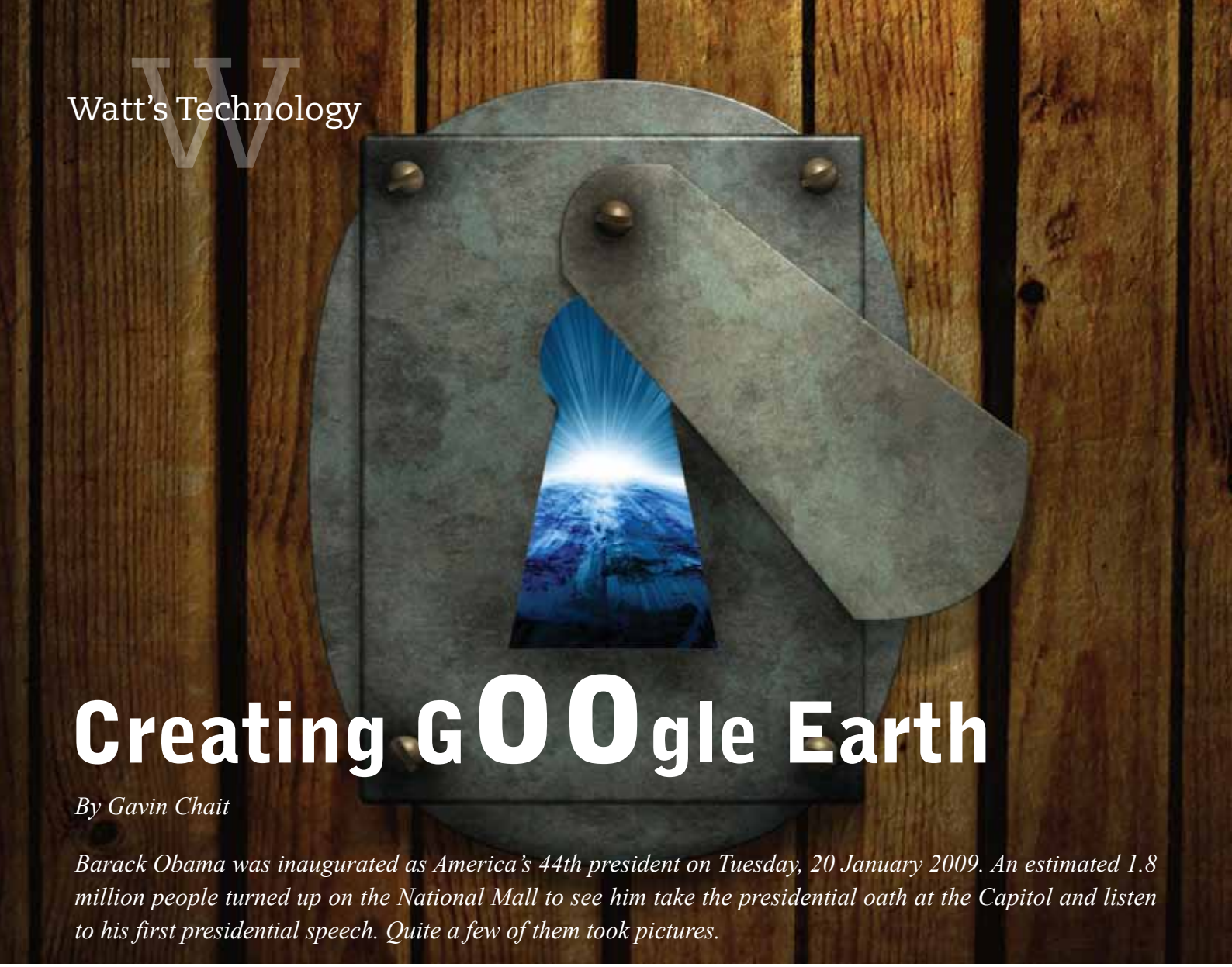
The first tranche of the loan was dispensed in August, allowing Mswati to pay public sector wages after he had allegedly used the country's money to fund his lavish lifestyle.

Gordhan said that the money might create the space for political dialogue with the monarch who had apparently pledged to introduce some reforms in the country. Critics of the decision say that it was "scandalous" that the ANC had not used its economic might to bring democracy to Swaziland.

According to dissident group, Swaziland Solidarity Network, the fiscal crisis in the country should have been used to bring about democratic change and a much greater degree of transparency. The financial crisis there was brought about by the 2009 recession in South Africa, which triggered a collapse in revenue coming from the South African Customs Union. The SACU provides almost 70% of Swaziland's income.

The Swazi government has managed to keep itself afloat by using central bank reserves of $500-million but has also managed to accrue bills of about $180-million, which remain unpaid.

Mswati had tried to raise cash from the International Monetary Fund but its application for funding was turned down because it refused to accept dramatic and significant cuts in the government's bureaucracy.



Creating GOOgle Earth

By Gavin Chait

Barack Obama was inaugurated as America's 44th president on Tuesday, 20 January 2009. An estimated 1.8 million people turned up on the National Mall to see him take the presidential oath at the Capitol and listen to his first presidential speech. Quite a few of them took pictures.

CNN, which only two months earlier had broadcast a holographic journalist into its news studio while covering the US elections, was ready with a new bit of tech 'The Moment'; a collaboration with Microsoft.

CNN's instructions were simple: "Take one photo of the moment when Obama takes the oath. If you have a digital camera with a zoom lens, take three photos (wide-angle, mid-zoom, full-zoom). E-mail each photo as soon as possible to themoment@cnn.com."

Microsoft Photosynth would then line these photographs up and stitch them together to create a single, massive, three-dimensional fly-through of that moment. Six hundred and twenty eight of the best photographs were assembled creating a powerful montage of one of America's deeply symbolic moments.

The results are really quite breath-taking even for those of us only interested in the tech.

The technology behind Photosynth works in two steps. First, multiple photographs of the same areas are processed using object recognition algorithms and interest point detection to identify recognisable components of the image and then match them to other images. Bundle adjustment, an optimisation process for refining 3D coordinates in scene geometry, is used to reconstruct a single scene from the images. This process has its origins in photogrammetry, which is used to determine geometric properties of images from photographic images and was first developed in the mid-nineteenth century.

The second step is to view these images and smooth the transitions between them to create a seamless and contiguous 3D experience.

This digital technique was developed by Noah Snavely while a graduate student at the University of Washington. It's very clever stuff and you can see right away how such techniques are essential if you intend to stitch together the millions of images required to visualise the Earth's surface. Microsoft didn't create the first virtual earth viewer. But neither did Google.

In 2001, John Hanke, Mark Aubin and Avi Bar-Zeev co-founded Keyhole to exploit work they had created for a demo showcasing an Earth viewing 'universal texture' engine. The name Keyhole is a nod to the original Corona reconnaissance satellites developed and operated by the CIA to observe the USSR and China during the height of the Cold War, from 1959 to 1972. The satellites were named KH-1, KH-2, KH-3, KH-4A and KH-4B; where KH stood for Keyhole.

Says Bar-Zeev, "Some of the work I did remains highly visible, like

the way you zoom across the planet from one spot to another, the labelling of roads and cities, and hashing out much of the original user-interface design."

2001 wasn't the most auspicious moment to start a new dotcom business. Over the period 2000 to 2002 the market value of listed companies fell $5 trillion. Dotcom companies were closing down and thousands of programmers were being laid off. Keyhole, despite its clever visuals, languished and key programmers – like Bar-Zeev – moved on to what appeared to be better opportunities elsewhere.

Then George W Bush decided to invade Iraq.

The reasons for Operation Iraqi Freedom, according to the US President, were "to disarm Iraq of weapons of mass destruction, to end Saddam Hussein's alleged support for terrorism, and to free the Iraqi people."

Whether these were good or bad reasons is still up for debate. Right then, though, the war would need to be televised.

CNN was looking for a way to bring the war to life for its viewers. Gulf War 1 had introduced 24-hour news and embedded journalists giving real-time coverage of the battles. CNN had become a global news agency off the back of its transmissions. That was 1991. In 2003, CNN was in competition with dozens of other global news agencies, all with the same capabilities.

Despite the imagery and coverage, viewers still didn't have much context as to what was going on. Wars make for messy and disconnected television. Flashes and bangs in one part of Iraq, with journalists hiding behind walls for shelter, don't look much different from each other.

What CNN wanted was a way to tie these disparate battles together. Sweeping fly-through maps giving way to journalists embedded with troops was what they needed and Keyhole's clever tools were perfect.

"Zoom in and the software takes a few seconds to update your screen with higher-resolution images, but the most amazing thing about this program is the way it integrates this satellite imagery, which, depending on where you live, will let you zoom in and see a picture of your house, to the point where you can pick out individual cars," gushed Mike Butler from LA's Splash Magazine in 2003.

Keyhole aggregated images from two private Colorado-based satellite companies, DigitalGlobe and Space Imaging, lower-resolution images from the US government and NASA, and lastly aerial photography from AirPhoto USA.

Keyhole Markup Language, which predates XML, was developed specifically to embed contextual information into the maps' spatial geometry. In 2003, Keyhole had already realised the value of geotagging addresses with local businesses.

Keyhole raised its initial funding from Sony Broadband with additional cash from In-Q-Tel, the venture capital firm of the CIA which added some of its staff as board members. Unsurprisingly, Google spotted the potential and bought the company, renaming the service Google Earth in 2005.

Consider the dimensions of our planet: it is 510 072 000km^2; 148 940 000km^2 of that is land.

If you wanted to capture that as a single image, with one pixel being one square kilometre, you'd need an image 40 000 pixels by 1 275 pixels high. That's about 2.4 gigabytes.

Such an image would not be of any use in a virtual map as you wouldn't be able to resolve roads, rivers, or any sort of local geography. Google Earth can resolve down to mere metres for most parts of the world. That requires resolution millions of times greater than our rather simple example and an image in the terrabytes. Clearly you can't be loading an image that size merely to check an address and see where you might want to go for dinner tonight.

The full version of Google Earth goes further, allowing you to tilt and rotate the image to get a sense of scale and perspective.

Prior to Keyhole, companies solved this problem by breaking up their super-image into smaller blocks, mapping these onto a sphere littered with small 3D surfaces to mimic the contours of the map, and then draw only the tiles you need to view on

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screen. What Keyhole did is slightly more subtle and is well-described in a lengthy article by Bar-Zeev on his blog.

They started with bilinear filtering, a process in which 2D images can be rotated and warped by blending the four 'best' pixels from the source image, two pixels along each axis and then blending the two together to produce a new colour. Once all that distortion is complete you should see the image from a slightly different perspective.

The problem here is that all this blending results in information being lost and the image becomes fuzzy, which is known as aliasing.

The process of anti-aliasing requires that the input and output pixels be as close to 1:1 in correspondence, or that extra pixels are generated so that sampling does not result in a loss of resolution. However, in Google Earth you expect to rapidly zoom in and out. Such resizing only increases the difficulty.

Enter trilinear filtering and mipmapping. Multum in parvo ('much in a small space') maps were invented by Lance Williams in 1983 and described in his academic paper 'Pyramidal Parametrics'.

Mipmaps are pre-calculated and optimised collections of images accompanying a main texture, each at a reduced level of detail. Trilinear filtering allows interpolation between the textures of the two nearest resolutions to create smooth, anti-aliased, transitions.

A basic 256x256 pixel image would contain eight individual textures, each a quarter the size of the previous texture: 128x128, 64x64, 32x32, 16x16, 8x8, 4x4, 2x2 and 1x1.

A 40x40 rendered texture is produced by interpolation from the 64x64 and 32x32 images. Fourier transforms and signal processing can be used to further improve these variations.

A mipmap (image from Wikipedia)

This also means that, if you 'tilt' the image, the interpolation can create perspective by 'slicing' through the different mipmap textures ('closer' parts of the image coming from larger mipmap textures, and vice versa).

Anisotropic filtering further enhances the quality of texture surface being viewed at oblique angles. Mipmaps may also contain non-linear texture transformations. These are known as ripmaps and they contain sub-textures where each axis is halved individually (128x128 down to 64x128, 128x64 and 64x64).The computation involved to resolve interpolations of these images is a memory-intensive process and is now hardwired into modern graphics cards.

A single multi-terabyte image is impossible to load, and Keyhole didn't want to have to break the image down into billions of tiles that would have reduced resolution. Chris Tanner, one of the original Keyhole founders, invented a process known as clipmapping in which the stack of textures in the ripmap was made even taller, perhaps more than 30 levels high and billions of pixels wide, but clipped.

Instead of loading everything, Keyhole's algorithm calculates where on the image you are and then only loads that part of the image stack into the texture mapper on your computer. All of this results in the smooth scrolling and rapid scaling and tilting possible in Google Earth.

In 2006 Google opened Google Earth to the public where before it had continued with Keyhole's subscription model. Users could upload their own geotagged images to the maps. Wikipedia articles were tagged directly onto the places they referred to. In addition, it became about more than the Earth, as Mars, the Moon and even stars and celestial bodies visible in the night sky became available.

Microsoft wasn't sitting still. Its version of Microsoft Live Maps was released in about 2006 but never really captured the imagination even though they were mapping 3D images (as compared to Keyhole's 2D). When Live was rebranded as Bing, Microsoft's maps went through a revolution.

Blaise Agüera y Arcas founded Seadragon Software in Princeton in 2003, moving to Seattle in 2004. Based around Ajax, the asynchronous JavaScript process that moves processing on websites to the user side, Seadragon creates a digital tiled mosaic of small (256x256) images. Similar to a ripmap, each tile represents a portion, layer or set of pixels

of an image at one specific resolution. However, instead of paging from one large image and showing only a component, Seadragon loads these tiny images as needed. Normally this would lead to a loss of resolution or even distortion between tiles but that could be overcome if combined with something like Photosynth.

The potential for synergy was enormous and Microsoft bought Seadragon in 2006. Agüera y Arcas now heads up Bing maps and is behind much of the new functionality.

Moving around a Bing map is smooth and blindingly fast. The images are loaded progressively. If you zoom quickly only the main components of the image are rendered while the rest remains fuzzy. Stop and the image quickly resolves.

Microsoft calls this Deep Zoom. With this degree of competition, the next step was to bring things down to street level.

But first, The Matrix. The movie introduced us to Bullet Time. Individual sequences were filmed on a blue-screen with the actors surrounded by a ring of HD cameras.

Each image frame overlaps the other. Stitching these together allowed the director to move between the reference frames to give that peculiar sense of frozen time. Google's Street View cameras take a ring of photographs and similarly stitch these together. Google's system limits the images to almost run on rails; your track down the road is limited to where its vehicles operate.

Microsoft Bing, with its large stable of powerful imaging systems, goes further, interpolating between images and allowing the same smooth scrolling as on its maps. Where it has geotagged images uploaded by users, Photosynth stitches them together to allow you to 'see around corners'.

The most recent generation of Bing even uses Photosynth not just to peg photographs to particular spots (as Google does) but to lay the images over its Streetside View so you can see the same spot as seen by others or throughout periods of time and, potentially, more recent views than the last time the area was 'officially' indexed.

For teachers and educators, the opportunity of bringing their students close to the places where history was made, or to see geographic features they would normally only be able to talk about, has added – for creative teachers – new ways of improving learning.

A recent demonstration by Agüera y Arcas at TED2010 showed a real-time video conference from a mobile phone directly over his street view so that you could see where the person he was talking to actually was. Agüera y Arcas' demo also threw up some of the difficulties. "Turn the other way, I want to show the audience something," he asked, only for them to head in the wrong direction.

The imagery used is getting better, with Navteq – the biggest supplier of street level data – using seven cameras and 64 lasers mounted on top of a vehicle. The system processes 1.2 million points of data per second and creates a very rich 3D experience. Navteq is owned by Nokia; Microsoft has a partnership with Nokia.

Microsoft also developed algorithms to convert 2D images into 3D through recognition of objects, like buildings.

Early versions looked a little odd, but the most recent version of Bing uses Bird's-eye View taken by aircraft and featuring 45 degree views. The processing here creates a tremendous sense of flying over a city.

Once you've got all this power, the next services follow rapidly. Directions and navigation, live traffic updates, public transport services and even disaster relief.

Following both the Haiti and Japan earthquakes, Google and Microsoft services were roped in by relief workers to bring in aid.

During the conflict in Libya, a journalist asked one of the rebels, "How do you plan your attacks?"

"With Google Earth, of course," came the reply.

And why stop with real life?

Google Earth has an embedded flight simulator allowing you to fly an F-16 Fighting Falcon and Cirrus SR-22 and land at a number of airports worldwide. Singapore University's Mixed Reality Lab developed Human Pac-Man where you can play the 1980 arcade game overlaid over a real map. Bing's real-time map also shows how you can view blogs, news and comments pinned to locations as you view them.

Such augmented reality has the potential to bring search down to a very local level.

Point your phone's camera at the street ahead of you and get a head-up display that can guide you to restaurants or even give you a potted news feed of conversations and events happening all around you.

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Rioters use messaging service to loot England

Police in England are using information from mobile phone networks to help convict people guilty of rioting and looting in many of the major cities around the country. Investigators have applied to mobile service providers for phone records along with contents of the text and instant messages that were sent from the phones.

The police may not be able to access all the data available to telecommunications companies unless they get a court order allowing them to do so. Moreover, guidelines imposed on the police require that they establish the person's identity before obtaining records from trouble spots.

Research in Motion, the manufacturer of BlackBerry phones has confirmed that it will co-operate with investigators and will hand over subscriber information that relates to any criminal activity. The company's BBM (BlackBerry Messenger) instant messaging service was used by some of the rioters to co-ordinate their actions.

In terms of the Regulation of Investigatory Powers Act (RIPA) the police can apply for details of a customer's phone records, including their location, details of calls made and received and any Internet activity. However, requests must be made on a case-by-case basis.

Police are not able to carry out a broadly-based search by identifying, for example, every person who was in Clapham Junction sending the word 'riot'. According to British solicitor, Simon McKay, the police would have to request each individual's communications data and provide reasons for why it wanted access to that information.

As a result, initial identification of individuals involved in criminal activity during the riots will be drawn from photographs, CCTV and video footage of the events.

McKay says that the communications data will be useful additional evidence rather than a means of identifying whether or not a person might have been involved in the riots.

However, the police have applied for a special dispensation that will allow them to use mobile phone data to 'trawl' for possible suspects. If this is considered appropriate by the judiciary then the police may be allowed to use the mobile phone data to track down suspects and convict them.

Billions going into OEL display production

South Korean company LG Display will invest $2.83-billion on boosting mass production of its organic electro-luminescence (OEL) panels that it hopes to have on the market by 2014.

These displays consume less power and offer sharper images than conventional liquid-crystal displays, the dominant technology being used in the manufacture of television sets today.

Samsung has also said that it will invest in this new technology, giving the two companies an advantage over the Japanese rivals that have been slower to adopt it.

The new LG displays will be made using 8,5-generation glass substrates measuring 220 x 250 centimetres. LG says it will make a small number of the new OEL panels for LG Electronics and these will be used in the company's 55-inch television sets.

LG Electronics expects to sell about 30 000 of these television sets a month from the second half of next year but the final decision to go ahead with mass production of the OEL technology will only be made after an evaluation of the sales and production costs has been completed.

It says that should the 55-inch television sales be successful then the company will start manufacturing similar displays in smaller sizes.

Samsung is the global leader in flat-panel television sets and it is also aggressively developing its OEL technology. Sony, which pioneered the OEL technology with its 11-inch display released in 2007, has dropped all plans to continue using or developing the panels.

Meanwhile, Pioneer Electronics uses OEL displays in some of its in-car CD players after it developed the technology years ago and introduced it as far back as 1999. It is currently the only company currently mass-producing OEL displays.

Advantages of the technology include the fact that it provides vivid images with shading and textures, a wide viewing angle and very low voltages. It can be used to design exceptionally thin devices and the self-emitting display elements eliminate the need for additional backlighting.

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iPhone 5 is already in production

Apple has started rolling out its new iPhone 5 to select suppliers as it prepares for the next consumer rush that will doubtless see millions of the new, slimmer and lighter versions of the phone being sold when it hits the United States market in September. The new phone will include an eight-megapixel camera. The company says it is expecting to sell about 25-million units by the end of the year although the initial production volumes have been limited to "just a couple of million" units. Hon Hai in Taiwan has been assembling the phones since August. Hon Hai, which owns the Chinese manufacturing company Foxconn, is the world's biggest contract manufacturer of electronics by revenue, and it assembles products for a number of companies including Acer, Amazon, Asus, Dell and Nokia.

However, a Taiwanese newspaper, Digitimes, says that a different supplier, Pegatron, had received orders from Apple to make 15-million units of a new phone dubbed the iPhone 4S or the iPhone 5. It has apparently been building CDMA phones for Apple that can be used on the Verizon network. Most iPhones sold in the US use GSM rather than CDMA, which was only introduced in the US in January this year. Mobile phone and gadget specialists appear to be "slightly puzzled" by the supposed launch date of the new phone in September because Apple's last operating system for the phone, iOS5,0 will not yet be available.

They suspect that the launch might be delayed by a month or so to allow Apple to incorporate the new operating system. Although Apple is typically not saying much about iPhone 5, it is likely to include a charging method that will use an induction system to wirelessly recharge the battery. Alternatively, it might mean that Apple is sticking to the ETSI's EC regulations that were introduced last year and mandate the use of a micro-USB port for charging.

Apple's iPhone sales have been remarkable with the company shipping 18,6-million iPhones in the first quarter of 2011 and figures for the third quarter of its financial year – released in mid-July – show that it sold 20,3-million iPhones in that quarter giving it unit growth of 142% compared with the previous year.

In mid-August, Apple was named as the biggest company in the United States – surpassing Exxon Mobil, which is valued at $335,1-billion – with a market value of $336,3-billion. In the past two months, Apple's value has climbed by six percent while Exxon's value has dropped by 17%.

Interactive map illustrates effects of climate change

The National Resources Defense Council (NRDC) in America has produced an interactive map that shows US citizens how climate change will directly affect their health. The NRDC describes itself as an environmental action group and claims it has about 1,3-million supporters around the world, with offices in the US and in Beijing, China.

The interactive map, available on the organisation's website, predicts the effects of climate change on areas throughout the US. Users can zoom into different states or areas and see the likelihood of threats such as drought, floods, extreme heat or the spread of infectious diseases.

Scientists throughout the world are increasingly using online mapping for a wide number of different purposes including tracking environmental change and pollution levels. In Europe, for instance, the Intamap project allows members of the public to monitor air pollution levels in the suburbs in which they live.

Google's Earth Engine brings together scientific measurements dating back 25 years and combines these with satellite imagery to produce a variety of maps. One of its featured maps shows the forest cover change of the Democratic Republic of Congo over the past ten years while another provides an index for detecting forest canopy damage caused by selective logging and forest fires over the Amazon.

Local users might find the Planet GIS website particularly valuable as it provides the topographical maps for the nine provinces and the cadastral boundaries, maps of the contours in 20-m and 5-m scales, and a number of route maps as well.

The South African National Biodiversity Institute provides a variety of national and provincial maps illustrating the biodiversity of this country. The South African National Parks has a series of Internet-based cameras at different parks around the country and links its maps to tourist information such as the facilities at the camps. Clearly South Africa leads Africa in many of the mapping applications but there is much that will still be done to turn some of the interactive maps into truly scientific tools in the way the Google's Earth Engine does. Of course, Google has buckets full of money and SANParks sadly is not in the same position.

Investor injects millions into new battery technology

British company Nexeon has received a £40-million injection to scale up production of its battery parts that provide significantly higher performance than existing batteries. The company has patented a way of structuring silicon so that it delivers an extended cycle life and significantly increases a battery's capacity.

According to the company's chief executive Dr Scott Brown, in contrast to carbon, Nexeon's silicon anode materials have a much higher capacity for lithium and as a result are capable of almost ten times the gravimetre capacity per gram (mAh/g).

He says that the silicon structures overcome the problem of poor cycle life encountered when using silicon by mitigating the volume expansion issue. The materials deliver extended cycle life without degradation of capacity.

Brown says that the materials the company makes include the low-cost silicon with a capacity of just 1 000mAh/g, but that second-generation materials have been significantly improved and, using a different morphology, provide higher capacities of up to 3 600mAh/g. Nexeon's technology has been designed in such a way that it can easily be incorporated into existing lithium-ion battery production lines.

Brown says the graphite used in these conventional battery production lines can simply be replaced with the Nexeon materials and then used in combination with polymer binders and current collectors as part of the standard battery manufacturing process.

He points out that Nexeon's technology provides greater storage capacity, smaller battery sizes and much longer battery life between charges. It also reduces the amount of material used in a conventional lithium-ion battery, providing consumer electronics manufacturers with additional savings.

However, Brown says its uses are not limited to consumer electronics as lighter lithium-ion batteries using silicon anode materials are suitable for use in electric vehicles, sustainable energy plants – such as wind farms – and for a variety of applications in the medical and scientific sectors.

Mathematics is simple for everyone – academic claims

A leading French academic, Marc Chemillier, has shown that all humans have an innate ability to work with numbers but he has had to travel all the way to Madagascar to prove his views.

In a remote part of this Indian island, Chemillier found an illiterate, chain-smoking, witchdoctor who lives in a beehive hut on a cactus savannah on the western side of Madagascar.

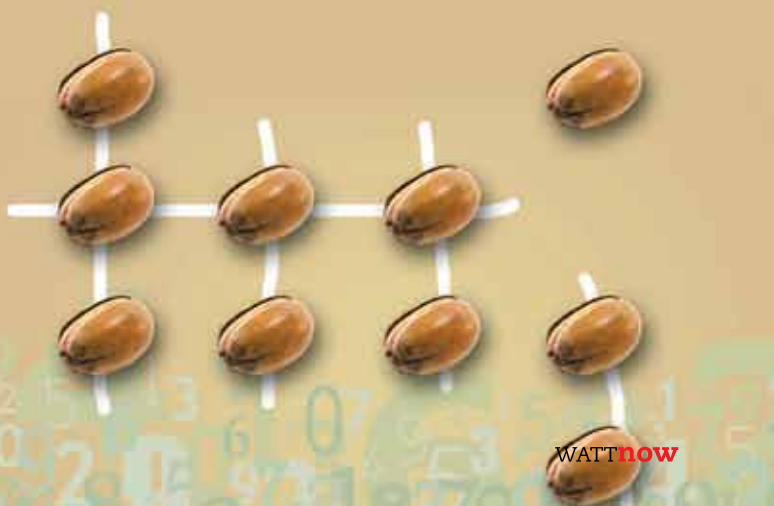
Known simply as Raoke, this man became the centre of a study by Chemillier, the director of the School for Advanced Studies in Social Sciences. His findings are published in his book, entitled *Les Mathematiques Naturelles*, where he claims that mathematics is not only simple but is "rooted in human sensorial intuition" . He argues that children should be encouraged to understand mathematics before they are even taught to read or write and adds that maths only becomes complicated when basic measurements found in nature are abandoned for apparently more sophisticated systems.

Chemillier says that he has watched Raoke using sikidy (reading random patterns) to predict the future or to devise remedies for people in his community. At such a 'reading' Raoke pours a number of fane tree seeds onto the table in front of him and then places them on a grid from right to left, either singly or in pairs.

Each horizontal grid line has a name – be it of a son, some livestock, a woman or an enemy – and each vertical line has a name as well, from a chief, zebu (cattle), brother or place. Whether one or two seeds lie at the intersection of the grid lines determines the subject's fortune and provides Raoke with the cure that is required.

He then uses various concoctions to cure ailments, banish evil spirits or restore friendships based on what the seeds tell him. When he is not doing readings for individuals, Raoke carefully copies down different seed configurations on a sheet of paper and then sells these to other witchdoctors who use the same process of divination to foretell the future.

As Chemillier points out in his book, the entire process is rooted in mathematics and each grid is clearly understood to have specific meanings when seeds intersect in a certain way.



Eco-rally attracts a variety of entrants

Sports cars that can run on fuels made from cheese and wine or others that can run for more than 500km on a single 10-minute electricity charge are just some of the entrants in an eco-rally that was recently held in Oxford, England.

The rally started in Broad Street in Oxford and headed for the Building Research Establishment Innovation Park in Watford for a pitstop to allow electric cars to recharge if they needed to. Then each car had to make its way to The Mall in central London, a distance of 120km.

The event is designed to showcase low- and zero-emissions vehicles, particularly as road transportation accounts for about 25% of Britain's carbon emissions each year.

The rally, sponsored by Bridgestone, attracted 30 entrants from a variety of manufacturers including Mitsubishi, Volvo, Aston Martin, Lotus, Nissan, Ford, Tesla and Honda.

In Britain, manufacturers can take advantage of special grants worth £43-million from the government to develop electric vehicles with zero-emissions. There are currently six electric vehicles available in Britain and the government is trying to boost sales of these cars by offering a £5 000 grant to people buying them.

The government has also approved the construction of 11 000 electrical charging points in London and most of these will be sited in public spaces such as in supermarkets, streets and car parks. The cost of this project is £400-million.

The Mitsubishi i-MiVE electric vehicle won the event. It uses lithium batteries, provides a range of up to 140km and can carry four people.

Unusually, the Aston Martin Cygnet was included in this event even though it runs on petrol. It was chosen because it has been designed specifically for a congested city and also provides extremely low emissions compared with similar vehicles in its class.

Facebook Messenger – a problem for BlackBerry?

The world's largest social network, Facebook, has launched an instant messaging service that is similar to the BlackBerry Messenger service and it says that it will replace texting on mobile phones with the new messenger service.

The dedicated application – available for iPhones and Android devices – allows users to contact friends or groups and send messages to them via the application rather than via the mobile networks' SMS technology.

At the moment the Facebook mobile messenger service is limited to users in the United States but the company says that it will soon roll-out the service to all countries. It has 750-million users around the world and they are able to send messages via the company's website or through the Facebook smartphone application.

The company's move has prompted some questions from analysts after it was confirmed that rioters in Britain had used BlackBerry's Messenger service to communicate with each other and to choose places to stage riots.

They say that Facebook might be trying to gain additional market share by using the application to communicate with users of different types of devices. For instance, the BlackBerry Messenger service can only be used with other BlackBerry phones and the iPhone's new application has the identical limitation.

The Facebook application might allow users to communicate with BlackBerry, Android, Nokia or iPhone devices, giving it a huge advantage over its competitors.

According to Stuart Miles, an analyst and founder of Lint.com, it won't be long before Google's latest social networking service, Google Plus, will have a messaging service built into it as well.

Facebook Messenger allows users to chat, send messages over Wi-Fi, 3G and 4G connections as well as via SMS. Individual preferences can be set for conversation in the messenger application. It also provides a map function, which relies on Google Maps to show the precise location of the person sending the messages.

View the Earth to understand her soul

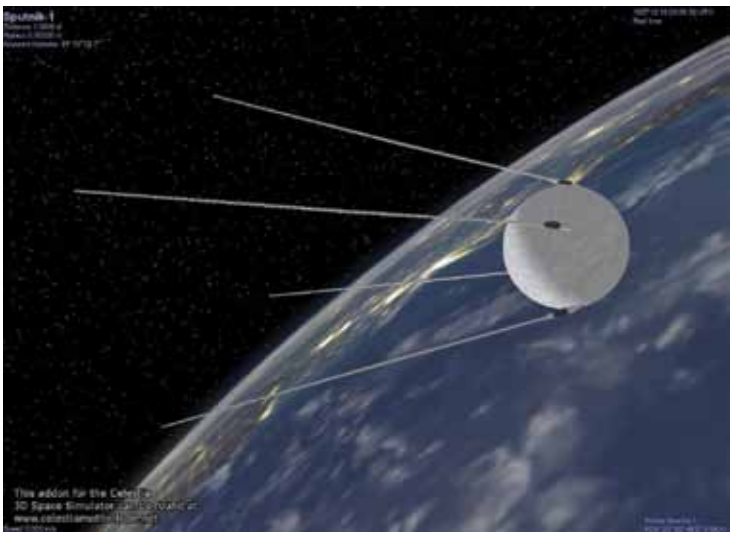
By Gavin Chait

On 21 July 2011, NASA space shuttle Atlantis landed at the Kennedy Space Centre after a 13-day mission. This was also the 135th, and final, flight in the 30-year Space Shuttle Program.

Commander Chris Ferguson piloting the craft made this final call to the control tower: "Mission complete, Houston. After serving the world for over 30 years, the shuttle has earned its place in history, and it has come to a final stop."

Mission STS-135 supplied materials to the International Space Station, performed a few minor repairs and a few redundant experiments. The manned space program was always more about the symbolism than about any obvious utility. Unmanned satellites are cheaper and perform better work than the expensively-trained and operated space shuttle crews.

The first artificial satellite was the Soviet Union's Sputnik 1, launched on 4 October 1957. It went ping. But it also helped identify the density of the higher atmospheric layers through measurement of the impact that drag had on its orbital decay, as well as providing data on radio-signal distribution in the ionosphere. It survived three months before plunging back to earth on 4 January 1958.



Sputnik-I, Russia, October 4, 1957.

By 1961, only three-and-a-half years after the launch of Sputnik 1, the United States Space Surveillance Network was monitoring 115 orbital satellites. As of 2011, more than 26 000 satellites or objects larger than 10cm in diameter have been monitored by the USSSN (including tools lost by space crews). At the moment, 8 000 objects orbit the earth with the

rest having re-entered the atmosphere. Only about 560 of them are functioning and operational satellites; the rest are space junk—the vast majority being from 2007, when the Chinese shot down an old weather satellite in an effort to show how dangerous they were. Instead, they have made space dangerous for everyone as tiny pieces of debris pose a threat to the remaining satellites.

As much as satellites and space offer prestige projects to government, military observations of foreign troop movements and technological investments, as well as telecommunications, there is also tremendous scope for studying the Earth.

The first weather satellite launched was in February 1959 as part of the US Navy's Vanguard Project. The purpose of the mission was to measure cloud-cover distribution for 19 days, and the density of the atmosphere over a period of 300 years. As of 2011, it's still in orbit.

A team of Vanguard 1 scientists mount the satellite in the rocket.

However, with such a limited subset of data, Vanguard 2 wasn't much use as a weather satellite. The first satellite to be considered a successful weather measuring device is the Television Infrared Observation Satellite 1 (TIROS-1), launched from Cape Canaveral in Florida on 1 April 1960.

TIROS-1.

TIROS-1 took television images of weather patterns from a circular orbit ranging from 700 to 753 km above the Earth; over a period of 78 days, the device sent back 22 952 images. Two television cameras, powered by solar panels and with two magnetic tape recorders for information storage when the satellite was out of transmission range, completed the package. It certainly didn't last as long as the Vanguards but it proved that weather satellites could be useful.

Lessons learned from TIROS informed the Nimbus satellites that formed, for 30-years, the backbone of US space-based atmospheric, surface, ecosystem, weather and oceanographic research.

"When Nimbus 1 launched in 1964, it gave meteorologists their first global images of clouds and large weather systems," says Rebecca Lindsey, writing for NASA in 2005 during the 40-year anniversary of Nimbus 1's launch.

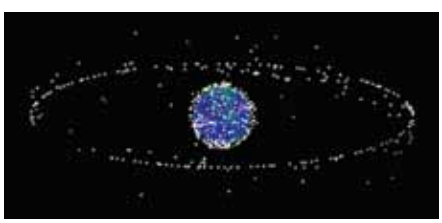
A painting of Nimbus orbiting Earth. NASA.

It was Nimbus 7, which measured the fluctuations of the ozone layers from 1978 to 1994, that gave rise to the global banning of CFC aerosol propellants. Nimbus satellites have also, since the 1960s, been monitoring the changing expanse of polar sea ice. Nimbus 3, starting in 1969, even offered modern GPS services with search and rescue and data collection systems.

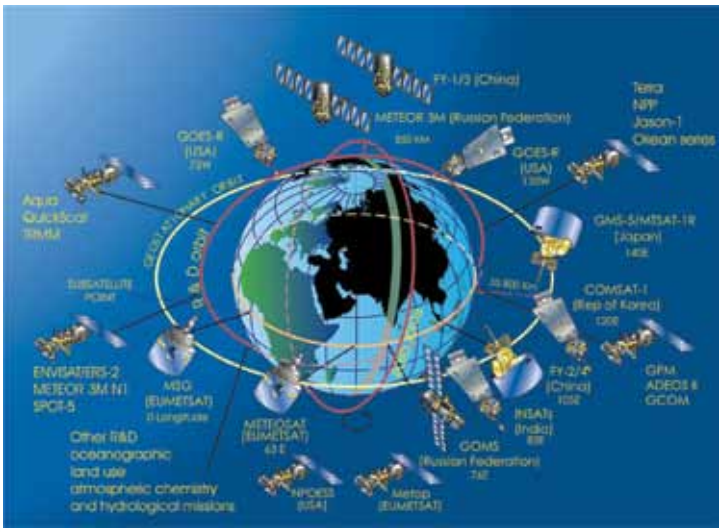
In 1994, NASA handed the project over to the National Oceanic and Atmospheric Administration (NOAA).

Weather satellites operate imaging equipment in both the visible and infrared spectra. Visible-light images allow direct observation of cloud systems and pollution. Infrared is more useful, permitting the determination of cloud heights, the intensity of cyclones, land and water temperatures and even ocean currents.

There are two basic types of weather satellites. The geostationary variety orbit above the equator at 35 880km; this is a height at which they remain stationary with respect to the Earth and can transmit images of the entire hemisphere continuously. The US operates two for each hemisphere, as do the Europeans. Japan, Russia and India each operate one.



A 'snapshot' of the earth and about 500 of its artificial satellites generated one summer evening in 2002. Nearly all of them are GEOs or LEOs. Satellites on the ring are in geosynchronous earth orbit (GEO). Those clustered near the earth are in low earth orbits (LEO). Scattered in between are satellites in medium earth orbits (MEO). The moon, earth's only natural satellite, is approximately nine times farther from the earth than the ring of geosynchronous satellites. Source: NASA.



The red lines indicate polar orbiting satellites.

Polar orbiting satellites circle the Earth in low orbit at about 850km. They maintain sun-synchronous orbits, passing twice around the Earth – pole-to-pole – and maintaining near constant local solar time while ensuring that their images offer high resolution and consistent lighting conditions. NOAA operates a large number, while Europe, Russia, China and India each operate their own.

If you've ever seen night-time shots of continents lit up by city lights, fires, volcanoes, or even the Aurora at either pole, you've seen images taken from the US Department of Defence's Meteorological Satellite (DMSP), which is the only publicly known satellite able to take these images.

It isn't only weather that we're interested in. In 2002, an oil spill off the northwest coast of Spain was monitored by the recently launched European Environmental Satellite (ENVISAT). ENVISAT is also, at 26m long, one of the largest satellites put into space and boasts an impressive array of equipment to measure everything from hydrology, agriculture, maritime traffic and pollution to snow.

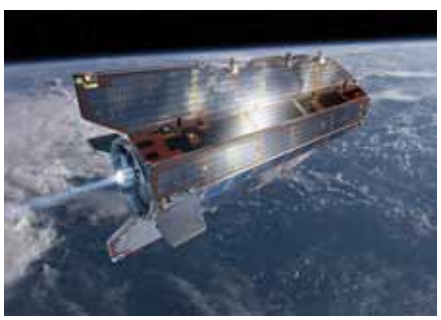
The Earth observation satellite Envisat supplies valuable information about the condition of our planet. The instrument SCIAMACHY (SCanning Imaging Absorption SpectroMeter for Atmospheric CHartographY) onboard Envisat measures the solar radiation scattered back from Earth's surface and atmosphere in the ultraviolet to the near-infrared parts of the spectrum. Credit: ESA.

In 2009, the European Space Agency (ESA) launched the Soil Moisture and Ocean Salinity (SMOS) satellite to measure the water content of soil across the planet up to a depth of two metres.

SMOS will study ocean salinity and soil moisture. Credit: ESA.

The purpose is to monitor photosynthesis and plant growth in order to calculate how carbon dioxide is released and absorbed. Its second purpose is to measure the changes in salt content of the oceans to assess whether this has an impact on currents. A companion satellite to SMOS is the Gravity Field and Steady-State Ocean Circulation Explorer (GOCE) which has a gravity gradiometer to detect fine differences in the density of the crust and oceans of the Earth. The purpose of this satellite is to understand the geodynamics of the Earth's surface to monitor and predict everything from earthquakes to ocean currents and the thickness of polar ice-sheets.

GOCE was designed to operate at 255km above the Earth, an extremely low orbit requiring drag-control systems and using ion-electric propulsion to overcome this drag. The propulsion system ejects xenon ions at 40 000m/s. However, an unusually low period of solar activity reduced the amount of atmospheric thickening and the ion-electric drive is expected to permit the device to maintain its orbit till 2014, two years longer than estimated.



GOCE Satellite. Credit: ESA.

The gradiometer—a device that until 1994 was classified until famously exposed in the film The Hunt for Red October as a mechanism used by US Navy submarines for covert navigation—consists of sets of opposing pairs of accelerometers arranged on a spinning disc. The GOCE gradiometer consists of a three-axis diagonal gradiometer based on three pairs of electrostatic servo-controlled accelerometers. It measures the impact of gravity on a constant acceleration.

In 2010, the ESA launched CryoSat-2 (CryoSat-1, launched in 2005, crashed) filling in the third of the three earth monitoring satellites it manages. CryoSat-2 tracks changes in the thickness of polar ice to a resolution of about 1.3cm and is designed exclusively to monitor climate change.

A computer generated image showing the release of CryoSat-2 by the last stage of the Dnepr launch vehicle (© ESA / P. Carril).

NASA, in August, launched its Aquarius satellite which will also monitor the ocean's salinity in order to track currents, and the water cycle. Aquarius will measure variations in salt concentration – ranging from 3.2 to 3.7 percent around the oceans – in order to assess what impact this has on climate and precipitation.

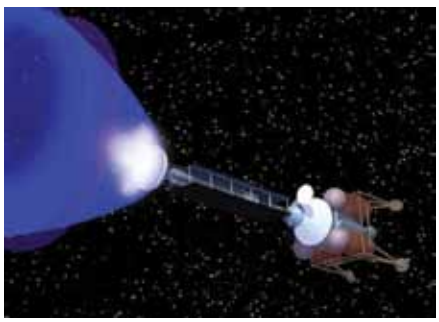
A United Launch Alliance Delta II rocket blasts off from Space Launch Complex-2 at 7:20 a.m. PDT with the Aquarius/SAC-D observatory for NASA and the Space Agency of Argentina. Photos by William G. Hartenstein, ULA.

Aquarius/SAC-D launch vehicle.

Not everything is looking down.

In August, scientists announced that the Earth has its own ring; a ring of antimatter particles held in orbit by the Earth's magnetic field in a torus-shaped region about 100 to 100 000 km and 13 000 to 60 000 km above the Earth, known as the Van Allen radiation belt.

The PAMELA satellite (Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics), which has been in orbit since 2006, has been monitoring cosmic rays in an area known as the South Atlantic Anomaly, where the inner Van Allen belt comes closest to the Earth.



PAMELA satellite.

The project is part of the Wizard Collaboration – a joint Russian, Italian, German and Swedish initiate – and antiproton energy ranges have been measured from 60 - 750 MeV.

The problem for further research is both the militarisation of space as China, in particular, attempts to establish itself, as well as the ever-increasing amount of space junk from decaying satellites and debris. Vanity also causes problems.

In May 2007 a Nigerian satellite, which cost $340 million and was designed and built by the Chinese on their behalf, spun out of control shortly after reaching orbit and had to be shut down to protect other satellites.

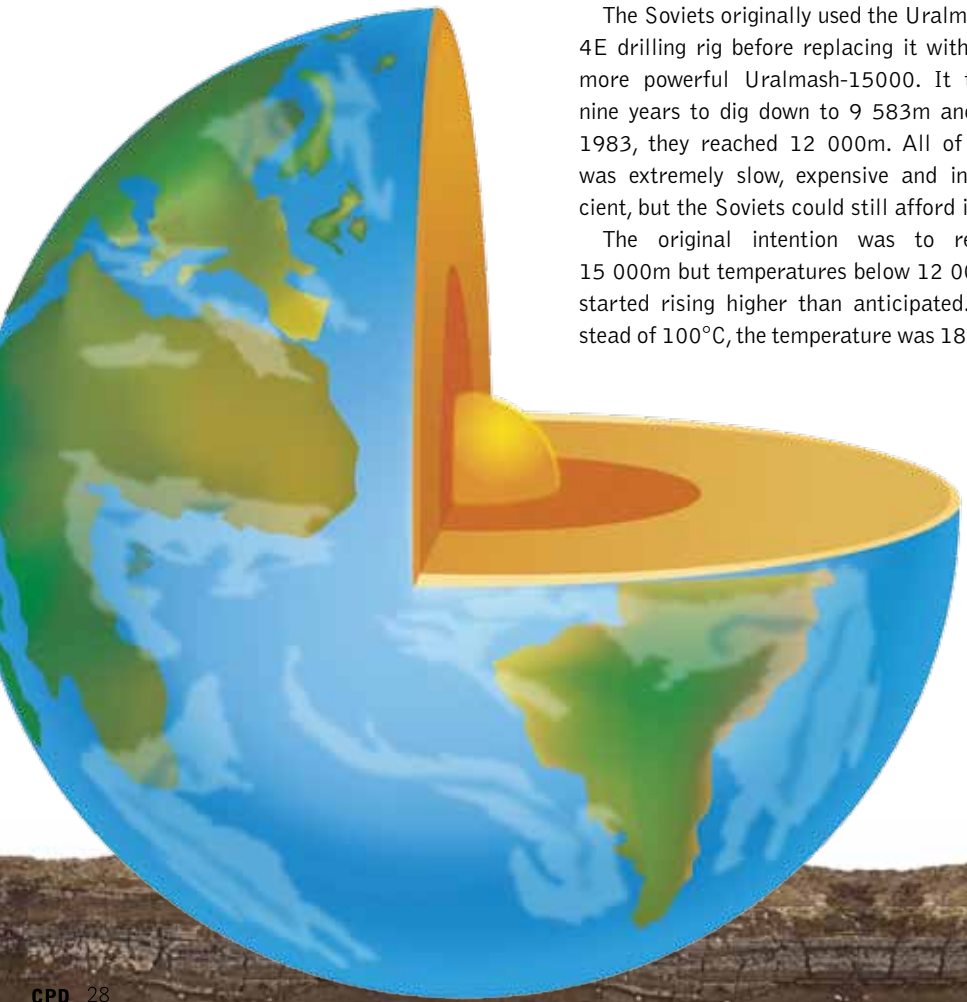
There is still much to learn about our planet and its place in our solar system. Let's hope we learn as much as possible before pollution in orbit pins us to the Earth.

Drilling to the centre of the Earth

By Gavin Chait

The Soviets, famously, lost the Cold War. They discovered rather sooner than their political foes in Western Europe and North America that you cannot run a country while spending more than you produce.

Soviet technology was a paler, grainy copy of original research conducted elsewhere. Occasionally, though, they did something amazing.



On 24 May 1970, the Soviets began digging a hole in the ground in the Kola Peninsula in Murmansk. They continued digging for two decades reaching a final depth of 12 262m which, as of 2011, is still the deepest artificial point on earth.

The Soviets originally used the Uralmash-4E drilling rig before replacing it with the more powerful Uralmash-15000. It took nine years to dig down to 9 583m and, in 1983, they reached 12 000m. All of this was extremely slow, expensive and inefficient, but the Soviets could still afford it.

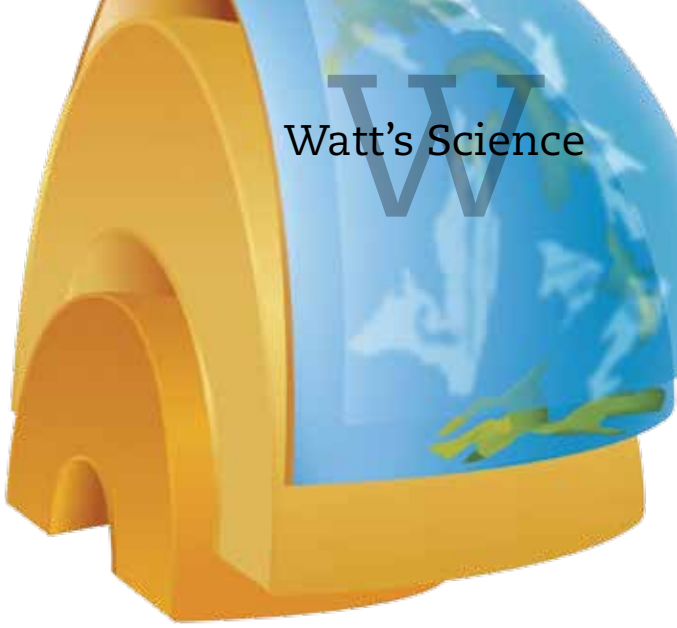
The original intention was to reach 15 000m but temperatures below 12 000m started rising higher than anticipated. Instead of 100°C, the temperature was 180°C.

Predicted temperatures at 15 000m were revised upwards to 300°C, at which point the Soviet bits would simply not have worked.

In 1992 all drilling was stopped; 22 years to reach 12 262m. To put this in context, in January 2011, Exxon Neftegas started drilling an extended-reach gas-well offshore of the Russian island of Sakhalin. The Odoptu OP-11 well reached a total length of 12 345m, and a depth of 11 475m—short of the Kola Superdeep Borehole, but they completed it in 60 days.

Still, the Soviet effort resulted in a wealth of new information about the Earth. For starters, there appear to be massive quantities of hydrogen gas at this depth. Most interestingly, though, is that the hypothetical transition from granite to basalt marking a change in seismic velocities was found elsewhere. Within a layer of metamorphic rock, between five and 10 kilometres down, the rock had been thoroughly fractured and was filled with water. This water had never been at the Earth's surface but had come from deep-crust minerals and is trapped beneath a layer of impermeable rock.

There are two reasons to study the make-up of the deeper layers of the Earth. The first is directly commercial. There are lots of valuable minerals hidden within the



Earth and if we can understand its structure we can try and figure out what might be down there and where it might be.

The second is that the Earth has the potential to unleash incredibly destructive forces. If the Earth were rigid then we could try and predict how and where earthquakes might occur. However, the layers of different materials, including the penetration of liquids, change the way the Earth reacts to these forces, making the results rather unpredictable.

Earthquakes have always been a problem for human settlements and so, unsurprisingly, one of the oldest technical inventions is that of a seismometer. The oldest description of a device for measuring the seismic waves generated by earthquakes and volcanoes comes from Han Dynasty China when Zhang Heng invented his Houfeng Didong Yi ('instrument for measuring the seasonal winds and the movements of the Earth') in 132 AD. Zhang's Houfeng Didong Yi was rather ornate; a massive two-metre diameter brass vessel with eight dragons' heads distributed evenly around the perimeter pointing in different directions. A seismic wave would trigger the release of a bronze ball from a dragon's mouth pointing in the direction of the event.

It's unknown how the device worked but it is likely that it was an early pendulum-based meter. The basic principle is that the heavy weight at the base of the pendulum maintains its position owing to inertia.

In 1880, John Milne, James Ewing and Thomas Gray developed a damped horizontal pendulum. These are pendulums that swing in only one direction, a bit like a hinged door. This means that individual axes can be monitored and measured independently. Three axes are measured: north-south, east-west, and the vertical.

Modern seismographs use a force balance accelerometer in which a mass is held motionless relative to a fixed frame of reference. As the frame moves, owing to earth movement, electronic feedback systems attempt to hold the mass steady. The amount of force necessary to do this is translated using a linear variable differential transformer into an acceleration of ground movement.

These are very sensitive devices, capable of measuring a seismic oscillation of 0.002 seconds per cycle. The seismometers must be isolated from their environments both physically and even magnetically. For instance, if a magnetic mass were used the meter would be influenced by movements in the Earth's magnetic field.

Seismometers can also be connected together as an array in order to locate, in three dimensions, the source of an earthquake and are even used by intelligence agencies to detect whether rogue states – like North Korea – are testing nuclear bombs.

These arrays are used in reflection seismology to calculate the geophysics of the Earth's subsurface environment. The interference patterns of earthquakes can be used or, more recently, controlled seismic sources, like explosives.

Reginald Fessenden was a Canadian engineer who first patented this idea in 1914. The idea was good enough to have been independently invented several times; by Ludger Mintrop, a German, in 1919 and John Karcher, working for the US Bureau of Standards, in 1920.

The system works a little like sonar, using reflections and interference patterns to calculate density and other information. These devices have always been interesting for finding oil.

A modern seismographic imaging system consists of a smaller number of geophones, a 'thumper' which physically strikes the ground to generate a pulse wave, and a notebook computer reading the geophones and converting the signals into patterns.

Earthquakes release a tremendous amount of energy which propagates through the planet in a series of waves. The way in which the wave propagates is entirely related to the density and elasticity of the medium. The deeper the wave, the faster it goes, with speeds ranging from 2-8 km/s in the crust, up to 13km/s in the mantle.

Two main types of waves are measured by seismologists: body waves travel through the interior of the planet, and surface waves travel along the outer surface. Body waves consist of two types: P-waves (primary waves), which are longitudinal pressure waves and travel through any medium, gas, solid or liquid; and S-waves (secondary waves), which are transverse, move perpendicular to the direction of propagation and can only travel through solids.

Surface waves consist of Rayleigh waves

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(discovered by Lord Rayleigh who also described why the sky is blue, and discovered argon), which describe ground roll; and Love waves which describe the circular shearing of the ground (and discovered by AEH Love, a British mathematician). Their interference patterns have led to a number of theories about the nature of the Earth's geology.

Richard Dixon Oldham used the relationship of P- and S-waves to observe that the Earth has a liquid outer core as compared to the Moon's rigid outer core.

Andrija Mohorovičič, a Croation seismologist, described a phase change gradient that appears to mark the transition between the Earth's crust and its mantle. This Mohorovičič discontinuity was observed in 1909 when he was studying seismograms from shallow-focus earthquakes showing refracted P- and S-wave patterns.

This Moho is estimated to be 5 to 10 km beneath the ocean floor and 20 to 90 km beneath the continents. In the 1960s the US government attempted Project Mohole to verify the theory but the entire project fell apart owing to Congressional incompetence.

A 2005 paper published in Atomic Energy - Probing of the Interior Layers of the Earth with Self-Sinking Capsules – is a British Russian collaboration that offers a novel approach to digging into the Moho: "It is shown that self-sinking of a spherical probe in the form of a capsule filled with radionuclides, whose decay heats and melts the rock in its path, deep into the Earth is possible. Information on the formation, structure, and shifts deep in the Earth can be obtained by recording and analysing acoustic signals from the recrystallization of the rock by the probe."

More traditionally, the Chikyū is a Japanese scientific drilling ship that supports the Integrated Ocean Drilling Program. It is to drill seven kilometres into the seabed and into the mantle. This is quite a complex task as its drill speed will slow as it gets deeper: 15m/h for the first 1 000m, 8m/h to 2,000m, 3m/h thereafter. It will need to remain stationary for over a year in a seismically active area in order to complete its goal. Unfortunately, during the 2011 earthquake off the coast of Japan, the Chikyū was damaged. It has been repaired and is back in service so perhaps soon it will bring us the first samples from the mantle. Even more ambitious is the US Earthscope project which is comprised of an array of thousands of geophysical instruments across the US. There are three observatories making up the overall project: the San Andreas Fault Observatory at Depth (SAFOD), the Plate Boundary Observatory (PBO) and the Seismic and Magnetotelluric Observatory (USArray). Magnetotellurics is a method of measuring natural variations of electrical and magnetic fields in the Earth's surface.

SAFOD consists of a borehole 3km deep cutting across the San Andreas Fault. PBO consists of GPS receivers and borehole strain meters to measure the North American and Pacific plates, which are moving away from the mid-Atlantic ridge.

USArray consists of almost 2 000 different seismographs measuring seismic waves across the US.

There may even be other discoveries. Earlier this year *Halicephalobus mephisto*, a nematode, was found living a kilometre down one of South Africa's mines. This tiny, half-a-millimetre long, organism eats bacteria also found living at that depth. Bacteria have been found 3km down.

As our planet reveals its secrets we may find new sources of energy, new minerals and new life.

Kola Superdeep Borehole, 2007.

Drilling during the first stage, when it reached a depth of 7 600 m.

UralMash 3D, Sendre Kharayaga,Russia.

Odoptu OP-11 well.

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Fingerprints tell more of a story

A remarkable new technology allows police investigators to establish, from a fingerprint, if a criminal suspect has taken drugs or been in contact with explosives. The technology has been developed by researchers at the Sheffield Hallam University in England.

It will, however, take at least three years before this technology will be freely available for use by police. Until now, police methods have scanned the ridge patterns on the finger to give a fingerprint that can be compared and accurately identified.

The new technology takes multiple images of a print using mass spectrometry imaging and these images produce a detailed chemical signature of the substances that have been touched by that finger or hand.

Dr Simona Francese, who led the research team, says that a special powder is used to recover the fingerprints from glass, wood, metal or leather and when a solvent is sprayed onto the powder it dissolves into crystals that contain chemical substances.

These substances will then show whether the finger has been in contact with any contaminants including drugs, explosives or cosmetics. In one example, scientists were able to confirm that a person's fingerprint had been in contact with a condom used in a sexual crime.

The process can also be used to detect drugs and was discovered after Dr Francese drank a cup of coffee while testing herself. She found traces of caffeine in her own fingerprints and these increased as her body absorbed more of the drink.

The British government has agreed to provide £80 000 to the university for further research into the technology.

In a separate development, Australian researchers have found a means to recover usable fingerprints from old evidence. Scientists from the University of Technology in Sydney used nano-technology to detect dry and weak fingerprints that were not revealed using traditional techniques.

New chemical treatments that target amino acid traces from the old fingerprints are used and then nano-technology methods provide much sharper detail from the degraded samples. Australian investigators are hoping to use this technology to solve some of the many unsolved cases in their files.

'New' Moon formed from two bodies

Our Moon was formed after a primordial collision between two moons that originally orbited Earth and this is why the rocky body is slightly lopsided with its far side much more rocky than the lunar surface that faces our planet.

Scientists from the University of California, Santa Cruz, say that the moons evolved further away from Earth but were coming under an increasing gravitational pull from the Sun.

This upset the stability of the orbits of both moons, eventually putting them on a collision course according to Professor Erik Asphaug, a planetary scientist who led the study.

Their research indicates that a smaller companion satellite, about 30 times smaller than the moon, circled the Earth in tandem with the Moon about four billion years ago. After about 100 million years of cohabitation, the smaller moon crashed into the larger moon in an impact that lasted several hours.

It was this collision that merged the two celestial bodies. At the time the new Moon – the one we know today – was about 129 000km from the Earth, much closer than its current distance of 402 340km.

It is the violent but slow celestial union of the two bodies that explains why there is such a striking difference between the mountainous far side of the Moon and the smoother lunar surface of vast plains that are visible from Earth.

Asphaug says the low velocity collision would have piled material into a jagged layer of solid crust and the fact that the Moon's crust is 50km thicker on its far side than on its near side is further evidence of the crash that happened millions of years ago.

To add to this, the composition of the Moon's crust is different, with the near side containing much more potassium, rare-earth elements and phosphorous.

Asphaug says that those elements would have been concentrated in molten material that was still cooling beneath the Moon's surface and it was splattered away in the opposite direction by the force of the impact.

The research adds to the giant impact model for the origin of the Moon, which theorises that it was created from debris ejected by the last series of collisions between the primordial Earth and about 10 Mars-sized proto-planets.

Mentorship

The SAIEE is offering mentorship and advice to young engineers.

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The service will be of particular benefit to those young engineers working under the leadership of busy and pressurized engineers, who may not have the time to spend with the young engineers discussing and planning their career paths.

This service is particularly relevant to young engineers who are working in an environment devoid of engineers or with non technical managers. The young engineer may feel frustrated because he or she cannot benefit from the wisdom of an experienced engineer.

It will give a young engineer, the mentee, a chance to talk to a mentor, who will be his or her advisor, teacher and role model, away from the work environment. His or her mentor, matched to a similar profile, will understand the mentee's work and personal situation, having been there him- or herself.

The mentee will be able to discuss problems and frustrations with his independent mentor, who would have no stake in the outcome, and who would be able to provide an unbiased opinion and advice. The mentee might not be able to do so with his superiors, particularly if he is unhappy, and is considering an alternative career.

The mentor and mentee could arrange to meet regularly, but not too often, say a few times a year, when both should have enough time to listen properly to what the other has to say.

The mentor could recommend to the mentee what course of action to take without being too prescriptive while the final decision and the consequences remain with the mentee.

Among its more than 5000 members the SAIEE has many experienced engineers who are willing to act as mentors. They are are spread across the country and include engineers who are experienced in steelworks, furnaces, rolling mills, mining, manufacturing, electrical generation, transmission and distribution, through to light industrial, process control, instrumentation, telecommunication, robotics, automation, software development and engineering management of these sectors.

So if you feel that you would benefit by talking to a mentor, please contact Ansie Smith on the number below. She has a database to match the profiles of mentors and mentees.

Prospective SAIEE Mentors
If you feel you have the time and interest to help mentees, please contact Craig Smith on craigs@saiee.org.za or 011 487 9042
In addition you gain CPD credits, for when you are required to re-register.

NRC revises nuclear safety projections

A meltdown at any of America's nuclear plants would lead to far fewer deaths than originally assumed according to the Nuclear Regulatory Commission (NRC) that is working on an ambitious study that has taken six years to complete.

The final report will only be published in April next year but a radical revision of the projections of how much Cesium 137 – a radioactive material created when uranium splits – would escape from a nuclear meltdown shows that only between one and two percent would be ejected.

Previously, nuclear experts had predicted that as much as 60% of the radioactive material would escape into the atmosphere causing widespread death, destruction and disease.

A draft version of the report was circulated to the media by the Union of Concerned Scientists, a nuclear watchdog that has been critical of the commission's risk assessments. It wants greater safeguards to prevent a nuclear meltdown in the country.

The NRC's report states that if there were a prolonged loss of electrical power, causing a typical reactor's core to melt down, the bulk of the material released during the process would remain inside the building even if the building's shell had been breached.

Big releases of radioactive material would not be immediate and people within a 16-kilometre radius would have sufficient time to evacuate the area. It says the chance of death within the radiation zone would be close to zero as a result.

The study concedes that people in the area who did receive high doses of radiation would develop fatal cancers in decades ahead. It adds that one person in 4 348 living within 16km of the event would develop a latent cancer as a result of radiation exposure.

Previously the NRC had estimated that one in 167 would develop the fatal disease. Charles Tinker, a senior adviser on research for severe accidents and one of the authors of the study says that the release of radiation from a nuclear facility is likely to be much smaller than previously thought.

The NRC says that it's not prepared to release its report until it has been through a rigorous and thorough peer review process and that's the main reason why it will only be available next year.

A meltdown at Three Mile Island in 1979 destroyed the billion-dollar reactor there but caused little or no physical harm to nearby residents. Nuclear experts have debated whether the Three Mile Island accident skirted a potentially catastrophic disaster or whether the accident was about as bad as it could be.

Edwin Lyman, a nuclear physicist with the Union of Concerned Scientists, contends that the nuclear commission has painted a rosy picture of the dangers of radiation exposure. He says the report assumes that 99,5% of the people living within a 16km radius of a meltdown would be evacuated and that the weather conditions would be "average".

However, he points out that if a rainstorm were underway during the meltdown it would wash contaminants out of the air and into a small area, exposing people to higher doses there.

The deputy director of the NRC's nuclear regulatory research division, Jennifer Uhle, says that the report was meant to present a "best estimate" and not a "worst case".

Lyman contends that the report is flawed because it should focus on people living within 80km of the plant. He says this would mean that five million people were exposed to radiation whereas those living within 16km amount to just 62 000.

The NRC's previous study estimated that eventual cancer deaths would amount to one in 2 128 within 80km after a meltdown but the new study says this figure would be one in 6 250 people exposed. The commission concedes that this figure still represents hundreds of cancer deaths in the surrounding area.

The reason that the commission has shifted its thinking on nuclear safety is based on a conclusion it reached that most of the Cesium 137 would dissolve in water that stays inside the reactor or adhere to surfaces inside the plant. Previously the commission had assumed that the Cesium 137 would escape into the atmosphere but computer modelling and laboratory studies have not borne this out.

The study focused on two common types of reactors: boiling-water reactors such as the one at Peach Bottom atomic power station in Pennsylvania – similar to the Fukushima plant in Japan – and pressurised-water reactors such as the one at Surry power station in Virginia.

The report found that Peach Bottom would not release enough radioactive material to kill anyone immediately, although it would increase the number of cancer deaths in the future. At Surry, the probability of death was so low – and so few people live within 16km of the facility – that the death toll would amount to just a fraction of a person.

Dyslexia – more than just reading difficulties

The reading problems caused by dyslexia are part of a larger problem that relates to how the brain processes speech and puts words together from smaller units of sound.

Researchers at the Massachusetts Institute of Technology have found that people with dyslexia have more trouble recognising voices than those without the condition.

John Gabrieli, a professor of cognitive neuroscience, and Tyler Perrachione, a graduate student, asked people with, and without, dyslexia to listen to recorded voices paired with cartoon avatars on computer screens.

Non-dyslexics matched the voices to the cartoons about 70% of the time when the language was English and about 35% of the time when the language was Mandarin. However, people with dyslexia could only match the voice with the cartoon 50% of the time and, for them, it didn't matter which language was used.

Dr Gabrieli says that the findings underlined the critical problem that dyslexic children experience when learning to read or write. The ability of a child to hear what a parent or teacher says has to then be connected to the sounds that make up words, known as phonemes. These must be linked to the sight of written words. If a child has trouble grasping the sounds that make up language, it will be more difficult for the child to develop reading skills. Importantly, the spoken language deficiencies persist even when dyslexics have learned to read well.

The research indicates that normal reading involves a circuit in the brain where all the components are integrated automatically. Dyslexia means that the system is not able to integrate the phoneme-driven systems with other aspects of language comprehension.

Researchers say that the study demonstrates how different processes in the brain are inter-connected and emphasises that voice recognition is not a separate task from understanding language. The MIT team is hoping that voice-recognition tasks can be used to identify young children who might be at risk for dyslexia.

Antimatter trapped in Van Allen belt

A thin band of antimatter particles, known as antiprotons, surrounds the Earth and has probably been trapped there by the Earth's magnetic field, according to a paper published in Astrophysical Journal Letters. The antiprotons lie in the Van Allen belt of trapped 'normal' matter.

The Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics or PAMELA satellite that was launched in 2006 to study high-energy particles or cosmic rays first spotted the antiprotons.

The particles in cosmic rays slam into the Earth's atmosphere, creating showers of particles many of which are trapped in the Van Allen belt. A new analysis of data from the PAMELA satellite showed that when it passed through the South Atlantic Anomaly, it observed thousands more antiprotons than expected.

The researchers studied the evidence from this data and, according to Alessandro Bruno of the University of Bari and co-author of the work, the band in the South Atlantic Anomaly is the most abundant source of antiprotons close to Earth.

He says that trapped antiprotons are often lost or annihilated when they strike the atmosphere but when these particles are several hundred kilometres above the Earth the loss is significantly lower.

He says the research team has confirmed the theoretical work that predicted the existence of this antimatter and adds that these particles could possibly be used as a fuel source for future spacecraft.

In a separate paper produced by James Bickford, principal investigator at the NASA's Institute for Advance Concepts, he says that antiprotons can be used to catalyse nuclear reactions and propel spacecraft at velocities of up to 100km a second.

He says that this is well beyond the capability of traditional chemical propellants and opens up a number of opportunities for space travel. Bickford says that larger suppliers of antiprotons would eventually enable spacecraft to travel at relativistic velocities.

The reason for this is that antiparticles release an enormous amount of energy when they come into contact with ordinary matter and, in fact, the energy density is two to three orders of magnitude higher than nuclear reactions and nearly ten orders of magnitude greater than the best chemical propellants used in spacecraft such as the Shuttle. Bickford's paper can be downloaded from:

www.niac.usra.edu/files/studies/final_report/1071Bickford.pdf

A painting of Earth's magnetic field (white arrows) depicts the Van Allen radiation belts (orange) being hit by incoming cosmic rays.

Huge water reservoir found light years away

Astronomers have found an enormous reservoir of water that contains 140-trillion times more water than the Earth. It is 12-billion light years away in the obscurely named and distant APM 08279+5255 quasar. Quasars are bright and violent galactic nuclei fuelled by a super-massive black hole at the centre. This particular quasar has a black hole that is about 20-billion times more massive than the sun and it is blasting out as much energy as a thousand trillion of our suns would do. The water vapour is spread around the black hole in a gaseous region that spans hundreds of light years.

According to Matt Bradford of NASA's Jet Propulsion Laboratory, the environment around this quasar is producing the huge mass of water. He says that considering it has taken 12-billion years for light from the black hole to reach Earth, it's evident that the black hole was born when the universe was just 1,6-billion years old. The water reservoir was discovered by astronomers at the California Institute of Technology using the Z-Spec instrument at the Caltech Submillimetre Observatory in Hawaii and the Combined Array for Research in Millimetre-Wave Astronomy in the Inyo Mountains of South California.

Both these instruments observe in the millimetre and sub-millimetre wavelengths, which lie between infrared and microwave wavelengths. It is this technique that has allowed astronomers to find trace gases, including water vapour, in the earliest universe.

A new telescope that specialises in these wavelengths is planned for the Cerro Chajnantor lava dome, more than 5 600m above sea level. It is known as the Cornell Caltech Atacama Telescope and will allow astronomers to find primordial galaxies and more accurately study their composition. Work on the telescope will start in 2013 and it will be operational by 2017.

This artist's concept illustrates a quasar, or feeding black hole, similar to APM 08279+5255, where astronomers discovered huge amounts of water vapour. Gas and dust likely form a torus around the black hole, with clouds of charged gas above and below. X-rays emerge from the centre, while dust throughout the torus emits infrared radiation. While this figure shows the quasar's torus approximately edge-on, the torus around APM 08279+5255 is likely positioned face-on from our point of view (Credit: NASA/ESA).

Juno's on its way to Jupiter

An Atlas 5 rocket has blasted off from Cape Canaveral carrying the $1,1-billion unmanned Juno spacecraft that will travel to Jupiter and go into orbit around the gas giant in 2016. The solar-powered craft will have just a fraction of sunlight to keep its batteries charged as the sun intensity is about 1/25th that of Earth.

Juno has three wings coated with 18 000 solar cells to trap the energy and, according to the mission's chief scientist Scott Bolton, these panels will be kept facing the Sun and won't venture into Jupiter's shadow.

The nine-metre long solar arrays produce about 14 000W on Earth but by the time Juno reaches Jupiter they will muster just over 400W, sufficient to keep a few incandescent lamps burning.

Juno's mission is to discover some of the secrets, origins and the evolution of Jupiter, the biggest planet in the solar system. Remote sensing instruments will be used to look down on the giant gas planet and measure its composition, temperature, motion and other properties.

It is expected that the probe will provide some remarkable new insights into the coloured bands that envelop the planet and also give scientists new perspectives on the Great Red Spot, the colossal storm that has raged on Jupiter for hundreds of years.

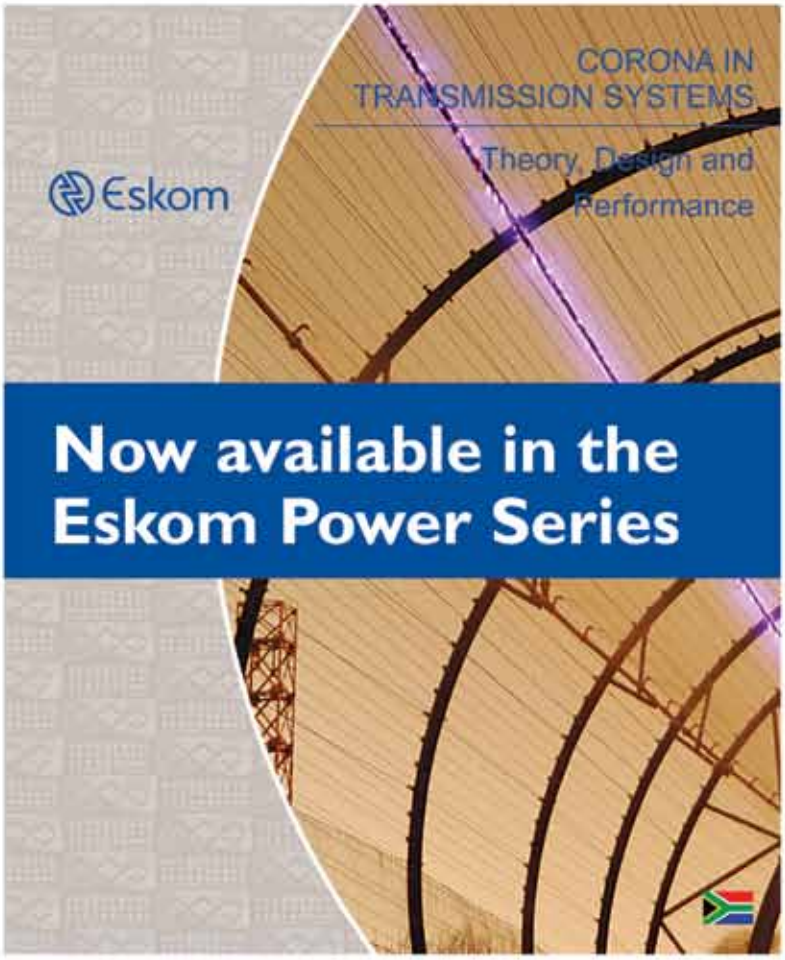
Scientists also want to measure the amount of water in the atmosphere, as this will provide an indication of how much oxygen was present in Jupiter when the solar system developed.

It's hoped that data from Juno will resolve the long-standing debate that the planet has a solid rocky core or whether it is purely a gas giant with gas that is increasingly compressed towards its centre.

Juno will also attempt to help scientists find the source for the deep and swirling sea of liquid metallic hydrogen that is thought to be the reason that Jupiter has such a strong magnetic field.

NASA's keeping people updated with the progress of the mission and anyone interested in following it can do so at www.nasa.gov/mission_pages/juno.

NASA's Juno mission lifts off from Cape Canaveral Air Force Station in Florida.



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This book is a valuable resource for transmission line design engineers and for those involved in carrying out corona research studies as well as for developing university undergraduate and graduate courses.

For further information contact: Lauren Baird: +27 11 629 5452 or
Sanjeev Bisnath: +27 11 629 5702

Eskom

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Carbon-dating adapted to measure emissions

A new use for carbon dating will aid the production of energy from wood and waste. Carbon dating is commonly used to estimate the age of ancient artefacts and is based on the time that it takes for a particular type of carbon to disappear or decay.

A technique developed by the Energy Research Centre in the Netherlands takes samples of carbon-14 from the smoke stacks of power plants and then tallies these with the energy produced to estimate how much carbon dioxide comes from burning ancient fossil fuels and how much comes from younger fuels such as wood or crops.

The practice of using biomass with coal is increasing in Europe as energy producers try to cut down on the production of carbon dioxide and earn green energy incentives by doing so.

According to lobby group, British National Centre for Bio-renewable Energy, Fuels and Materials (NNFCC), the technique makes it easy and accurate to differentiate between carbon dioxide emissions from the different types of fuel.

The success of the Energy Research Centre's project has seen it using the technology throughout the Netherlands and it has also set up a monitoring programme in Belgium.

The NNFCC says that the carbon-14 process is well understood and is at least as accurate as existing sampling methods. From 2013, all fossil fuel power plants in Western Europe will have to pay for every ton of carbon dioxide emissions in terms of the European Union's emission trading scheme. The British regulator of the electricity and gas market OFGEM has approved the carbon-14 process for use in that country and will provide Renewable Obligation Certificates to power companies based on the measurements taken from smoke stacks at their power stations.

Recently-living materials contain much higher proportions of carbon-14 than older fossil fuels. By measuring the ratio of carbon-12 isotopes in fossil fuels and comparing these with the biogenic carbon-14 isotopes it is possible to determine how much of the energy came from a renewable source.

Municipalities, residents get suspension notices

Eskom has threatened to cut off the power supply to Ventersdorp and Vryburg in the North West Province unless it is paid the R8-million and R12-million it is owed respectively by these municipalities. The utility has sent notices to all the residents of both towns demanding to know why their electricity supply should not be suspended and why it has not been paid for the electricity they have used.

The notices say that: "... in terms of the bulk supply agreement between Eskom and municipality, if payment is not made within 15 days of the billing date then Eskom has the right to discontinue the supply on 14-days notice and terminate the agreement".

Eskom says that the municipalities have failed to honour their agreements and in both cases the utility's accounts have been outstanding for more than 90 days. It says that unless it is paid, the supplies will be suspended from September.

According to Eskom spokesman, Hillary Joffe, the law requires Eskom to advertise when final warnings are issued to municipalities in order to protect end users. Eskom has issued these notices and has asked residents for written comments before deciding whether to proceed with the disconnections.

She concedes that in some cases, amounts are paid once government grants are issued to the municipalities and that it is possible that the utility could be paid the money it is owed before the cut-off date.

According to Clive Keegan, Local Government Research Centre director, several Free State municipalities have also been issued with suspension notices in recent months and he says the main problem appears to be the inefficient financial systems that are used in municipal structures.

He says that many of the cash-strapped municipalities are diverting funds, paid to them by homeowners, towards the day-to-day operating costs of the local authorities and as a result, these organisations are unable to pay the amounts owed to Eskom.

Eskom has threatened to suspend the electricity supplies to at least ten municipalities in South Africa but has so far not carried out its threats, apparently because the money has been paid after public demands are issued.

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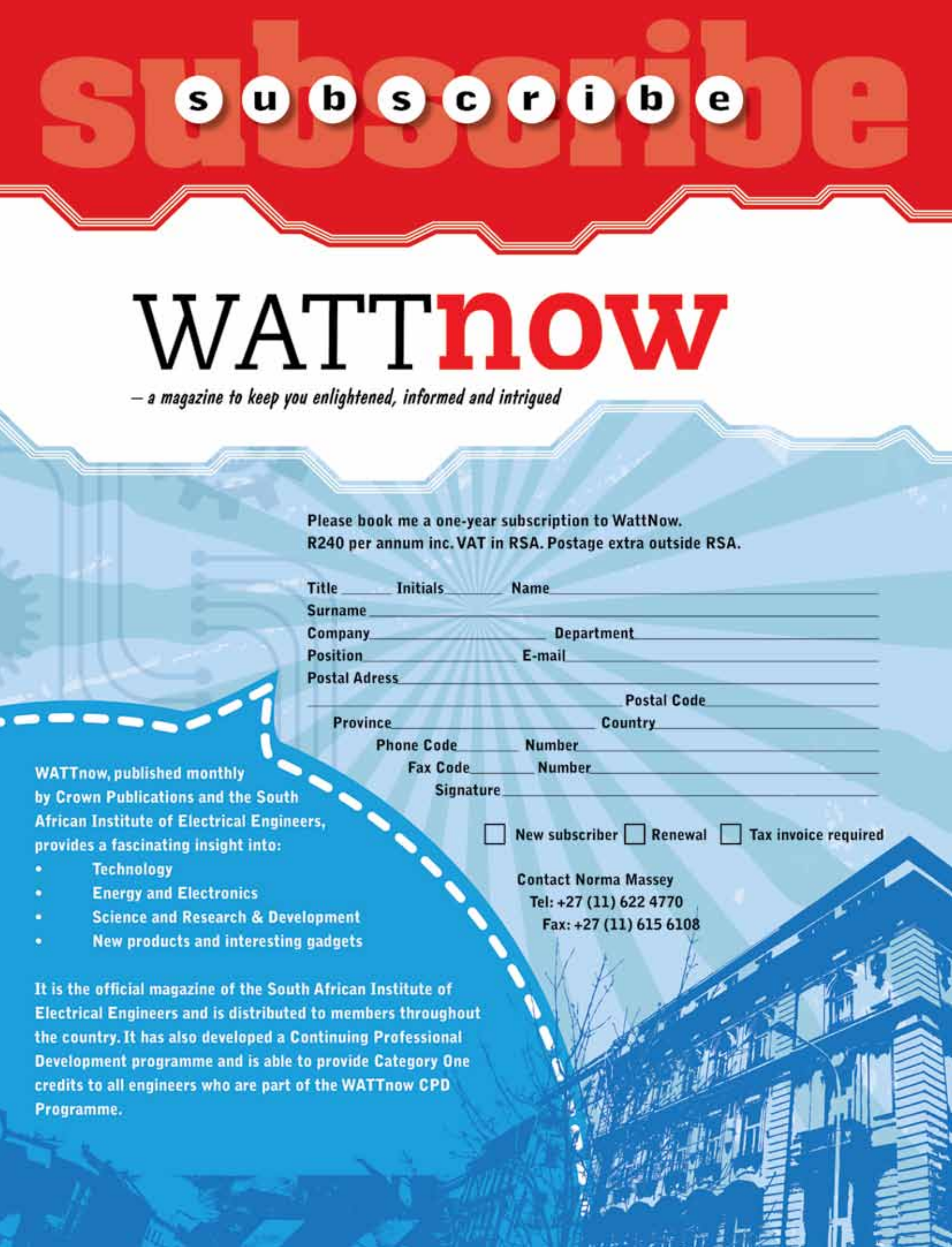
It is the official magazine of the South African Institute of Electrical Engineers and is distributed to members throughout the country. It has also developed a Continuing Professional Development programme and is able to provide Category One credits to all engineers who are part of the WATTnow CPD Programme.



Shell given go-ahead to explore oil reserves

Dutch company Shell has been given permission to drill exploration wells in Beaufort Sea despite fierce opposition from environmentalists in the United States.

Holly Harris, a lawyer with Earthjustice – one of several groups opposed to drilling – says the approval of exploration drilling is a "disaster waiting to happen". The Bureau for Ocean Energy Management, Regulation and Enforcement gave Shell permission to hunt for oil in the freezing Alaskan waters. Plans for Shell to drill in the Atlantic Arctic were well advanced until the Gulf of Mexico disaster occurred last year when BP spilled billions of litres of oil into the ocean and US authorities suspended all drilling projects as a result.

Shell's spokesman, Kelly op de Weegh welcomed the news and confirmed that the company will immediately proceed to the rest of the permit applications that are required before work at the site can begin. The oil reserves off the Alaskan coast are thought to be enormous and probably second only to the fields off the Gulf of Mexico. Shell's geologists will be exploring areas of the Beaufort Sea and the adjacent Chukchi Sea.

If significant fields of oil are found, Shell will develop them but they are sited in much more shallow water than the wells in the Gulf of Mexico. High winds and marauding icebergs make exploration of the area perilous and pose risks for oil rigs too.

The waters have a rich biodiversity. Opponents of the drilling work point out that it would have widespread and disastrous effects on sea life.

Moreover, it would be much more difficult to clean up an oil spill because of the cold sea conditions. The effects of last year's spill in the Gulf of Mexico area were reduced because the warmer water helped to disperse the oil.

The remote location of the drilling sites is also a problem for workers and exploration rigs as the nearest Coast Guard station is almost 2000 km away.

Exploration leases outside Alaska's Arctic National Wildlife Refuge were granted to Royal Dutch Shell, Conoco Phillips, Norway's Statoil and a handful of other companies. The companies paid billions of dollars to Alaska's federal government for these leases but Shell is the first one to be given permission to start drilling there.

Row over power supply to flats in KZN

Serious irregularities in an R11-million rewiring contract for flats in Chatsworth, Durban have resulted in the work having to be completely redone at a cost of millions more to the residents of the township. Apparently, the eThekwini Council had been told about the problems at the time but had failed to do anything about them.

A new tender includes upgrading the power supply in the blocks of flats from 40A to 60A, replacing 6mm with 16mm conductor cables, and has been advertised at a bid price of R5-million. In the original contract, undertaken by NCO Electrical, the distribution boards were replaced and new cables installed and it took the company about two years to complete the task.

However, residents point out that as part of the contract, the power supply was reduced from 60A to 40A making it impossible for them to use more than one appliance at a time. Moreover, they complain that they have had to employ and pay private contractors to ensure a stable supply of electricity.

Community activist, Orlean Naidoo, of the Westcliff Concerned Residents group, says that there has been a continued and sustained argument with eThekwini Council and, while the municipality has been aware of problems in Chatsworth for many years, it has consistently failed to do anything to resolve them. NCO Electrical's owner Nadaraj Perumal says that he warned the council that it would not be safe to supply 60A of electricity through a 6mm cable and as a result the council had instructed him to reduce the supply to just 40A. He agreed that residents would experience problems when trying to use more than one appliance at a time.

He says a 40A supply would run stove plates – that consume about 10A each – and a geyser, whereas a 60A supply would mean that the stove, geyser, fridge and microwave could all be used at the same time. The council's spokesman, Thabo Mofokeng, denies that the city issued a new tender for the work but concedes that the circuit breakers in the flats are finally being upgraded to allow 60A of power to be supplied. He did not know if the cables were being replaced.

Renewable energy – but not based on REFIT

The Department of Energy has been congratulated for its 'pragmatic' approach to the bid process by companies involved in renewable energy projects.

Mark Tanton, managing director of wind farm developer, Red Cap, says the department wants projects that not only meet the energy criteria but involve job creation and technology transfer initiatives.

Davin Chown, director of Mainstream Renewable Power SA, says the procurement process will be a test for energy producers particularly as the bidding process, which includes prices, has shifted the burden of risk to the developers. He says that independent power producers have been counting on a fixed tariff and that they need clarity on certain technical aspects such as land agreements. He says that wind farm developers generally lease the land they use, rather than buy it.

Chown's company negotiated a joint venture several years ago with Genesis Eco-Energy to build wind farms in the Eastern, Western and Northern Cape but, to date, these ventures have not been finalised.

According to Chown there are seven wind and solar projects being considered by Mainstream Renewable Power but it is still studying and evaluating the Department of Energy's bid documents to determine which of the projects will fall into the procurement processes. The Development Bank of Southern Africa has undertaken to provide funding for renewable energy projects and says that the funding will ensure that black enterprises are able to participate in renewable energy projects.

While the department appears to have backtracked on its Renewable Energy Feed-In Tariffs (REFIT) scheme, it has allocated 1 850MW to wind power, 1 450MW to photovoltaic projects and 200MW to concentrated solar power.

In terms of these allocations, a total of 3 725MW will be allocated to renewable energy technologies. Meanwhile, Chris Haw, chairman of the South African Photovoltaic Industry Association, says that while its members are disappointed that the procurement process will not be based on REFIT, they are happy with the larger allocation that has been made to photovoltaic power by the department.

Man tries to build reactor in his kitchen

A Swedish man was arrested in Angelholm in southern Sweden after he tried to build a nuclear reactor in his kitchen and then document his progress on the Internet.

Richard Handl, 31, gathered a variety of materials including smoke detectors, a clock and watch hands and used pots from his home. He said he was "curious" to see if he could make it work and it was a "hobby project".

He actually got as far as mixing some ingredients - including americium, radium, beryllium and 96% sulphuric acid – in a pot on the stove. The materials boiled, and then exploded. Handl says that this experiment was carried out about four months ago although the police only arrived a couple of weeks ago.

He tagged the incident as a "meltdown" on his Facebook page and in a blog that he wrote during the project. He said that he had had a problem cleaning up the materials after the explosion but bought some more radium and started working on the next phase.

He then sought some advice from radiation authorities on the legality of building a nuclear reactor in a domestic kitchen and that's when the Radiation Safety Authority decided to raid his flat and immediately asked police to confiscate the materials.

No special precautions were taken by Handl to store the materials.

Research chief at the RSA, Leif Moberg, says that there were no raised levels of radiation in the apartment and that neighbours had not been exposed to any radiation either. Handl's Facebook page refers simply to the fact that the project had been cancelled.

The Swedish police detained him for several hours before he was freed. However, he could still face prosecution for contravening radiation safety laws in the country.

He is reported to have spent about $950 on the project. He says that from now on he will focus on the "theoretical" aspects of nuclear physics.

$1-billion needed to clean Niger Delta

It will cost more than $1-billion and take 30 years to clean up the Niger Delta according to a report released by the United Nations Environmental Programme (UNEP). It says that 50 years of oil production in the Delta has had a disastrous effect on the south-eastern region of Ogoniland.

The report says that residents in the Delta are forced to breathe contaminated air and drink polluted water and that, as the average life expectancy in Nigeria is less than 50 years, it is likely that the people of Ogoniland have lived with chronic oil pollution throughout their lives.

UNEP's research found that one community in western Ogoniland was drinking water from wells that have been contaminated with 900 times the safe level of benzene, a known carcinogen. UNEP investigators found excessive contamination in 10 of the 15 sites that were meant to have been made safe by the joint venture between Shell and the Nigerian National oil company called the Shell Petroleum Development Company (SPDC).

It also found that Shell had failed to meet industry best practice standards and had not met its own guidelines on cleaning up pollution caused after drilling.

The report was funded by Royal Dutch Shell. Recently two further oil spills have occurred in Ogoniland and Shell admits that it will cost the company hundreds of millions of dollars to clean up the mess these spills have caused.

UNEP has also appealed to the Nigerian government for assistance in advising on decontaminating the area and has urged Nigerian authorities to compel all companies to decontaminate areas where oil spills have occurred.

Nigeria's President, Goodluck Jonathan, welcomed the UNEP report and agreed to set up a commission at Shell's expense – on the basis of "the polluter pays". He says he will implement the commission's findings to guide the clean-up procedures.

View from the Niger Delta by Terry Wha.

'Peaker power' plants strongly criticised

Two new 'peaker' power stations will be built by private companies at a cost of R8-billion in KwaZulu-Natal and the Eastern Cape and critics of the plan say that these plants will increase the already high costs of electricity in both provinces.

Both projects are open-cycle gas turbines and will generate electricity at peak times. The Avon project will be built near Shaka's Kraal and the Dedisa project will be erected outside Port Elizabeth and the two will have a combined capacity of 1 020MW.

Public hearings on the two projects have been held by the National Electricity Regulator of South Africa and at these, critics of the projects said that the government could make use of a far cheaper option for peak electricity demand by using the many existing – but privately owned – generators installed at factories and businesses throughout the country.

These privately owned generators have a combined capacity to generate about 3 500MW of standby or peak power. The two peaker projects, that will use diesel fuel to generate electricity in the open-cycle turbines, will increase both the costs of electricity and the carbon footprint.

The Institute for Democracy in Africa's director, Gary Pienaar, asked the regulator not to issue a licence for these projects saying that there was "no rational basis" on which to approve them.

He says that the high costs of the projects will be recovered from consumers over the next 15 years and if the government – through NERSA – were to approve them, it would be in direct conflict with the Public Finance Management Act.

He says the projects were "just carried forward" as part of the Integrated Resource Plan 2010 and were no longer needed. Moreover, he claims, the lack of public consultation on the projects meant that many people were "in the dark" about the details of the power stations at Avon and Dedisa.

He says that no feasibility studies on either power station had been completed and warns that if NERSA were to grant the licences then the organisation could face a judicial review of its processes.

ADB's ambitious plans for the southern African region

by Paddy Hartdegen

In its first Regional Integration Strategy Paper (RISP) for the period 2011 to 2015, the African Development Bank (ADB) has outlined ambitious plans to develop and integrate 12 countries in the southern Africa region.

While it stops short of outlining the actual amount of money it will spend in implementing this RISP, it does focus on the core areas that will help to provide improved intra-country trade and greater competitiveness.

According to figures contained in the report, the 12 countries in the region represent a formidable market comprising 16,7% of the continent's population and producing 40% of Africa's gross domestic product. The region is well endowed with natural resources, has potential for major energy generation projects and offers many value-added productive activities.

Worryingly, the ADB says, the southern Africa region accounted for less than one percent of global trade in 2008 and intra-regional trade remains extremely low and is largely dominated by South Africa.

The bank says that energy generation in the region is hampered by low investment (apart from South Africa) and unfavourable regulation. Moreover, sub-standard or missing road segments reduce the competitiveness of countries in the region, increasing cost and time of transportation.

According to the lead authors of the report, Aloysius Ordu, vice president for operations, country and regional programmes and policy, and Bobby Pittman, vice president for operations, infrastructure, private sector and regional integration, the bank will focus on creating a fully integrated and internationally competitive region in southern Africa.

It hopes first to create – with the agreement of the respective countries – a free trade area that will grow into an African customs union, then into a common market and monetary union and finally establish the African Economic Community. In terms of the RISP, the primary goals are:

- To facilitate trade.
- Increase energy production.
- Improve transportation infrastructure.
- Create greater integration within the information and communications technology sectors.

It says that while southern Africa represents about 4% of the world's population it contributes less than one percent to global trade, and exports are mainly of primary resources. On an intra-regional basis, manufactured products dominate exports.

The ADB concedes that South Africa is a driver for growth of the region as it accounts for 71,5% of the region's gross domestic product, and about 70% of the intra-regional investment flows from South African firms.

Moreover, South African investments account for between 9% and 20% of gross domestic product in Lesotho, Mauritius, Mozambique, Namibia and Swaziland.

It also facilitates production and trade financing and has a common and accessible financial service network. In terms of telecommunications, South African companies are contributing to the consolidation of telecommunications networks across most of the region.

Southern Africa's dependence on commodity exports has left it vulnerable to shocks induced by fluctuating commodity prices and demand. With a population of 160,7-million people living in the region's 6,574-million square kilometres, it is dominated by South Africa.

Angola – the second largest economy in the region – contributes 10% to the regional gross domestic product. The other ten countries between them contribute 18,5%, and South Africa the balance. The economies of most of the countries have shown consistent growth of between 3,5% and 4,5% in the first ten years of this century.

In terms of foreign direct investments (FDI) in the region, Angola has attracted the largest share of 55%, followed by South Africa at 28% and Zambia a paltry 4%.

To put this in perspective, the ADB points out that in South Africa the FDI flows constitute about 1,8% of gross domestic product while for other economies, it constitutes considerably more. In Zambia, a FDI of 4% equates to 6,4% of gross domestic product while in Namibia it amounts to 5,9% and Mozambique, 5,3%.

The ADB says that this is an indication of the importance of FDI in gross capital formation and as a growth driver for economies other than South Africa. Most of the investment in other countries is focused on raw materials and resources.

To overcome some of the problems facing the southern Africa region, the ADB seeks to improve levels of trade between different countries. While the value of the region's total trade increased from $55-billion in 1980 to $322,4-billion in 2008, the intra-regional trade growth was not as impressive. It rose from $11,6-billion in 2000 to $29,3-billion.

According to the bank this was driven mainly by a shift from Europe to South Africa as a source for imported goods in line with the Southern Africa Development Community's trade protocol.

As the bank points out, though, trade between South Africa and its neighbours is heavily skewed and between 2005 and 2008 South Africa supplied nearly 44% of total intra-regional exports but took up only 11% of the imported goods available from neighbouring countries. In turn, this means that the trade deficit for countries doing business with South Africa has increased substantially.

In examining the region, the ADB has identified a number of opportunities for regional integration initiatives that it will support, and these include the North-South Corridor investment programme along with on-going projects in the ICT sector, energy development, water supply and sanitation.

It is supporting the transport corridor programme and is encouraging countries to shift away from road transportation to railways by rebuilding and maintaining a reliable railway network that can be used for long-haul transportation, particularly by the extractive industries.

It says there are a variety of business opportunities for the rehabilitation, construction and concession management of railways throughout the region. Added to this is the implementation of the SADC's Regional Information Infrastructure project that is 80% complete with building an optical-fibre-based backbone.

In terms of energy, the ADB points out that the region has rich energy resources – much of it coal-based with huge reserves – and contains about two-thirds of the world's uranium resources too. It has rich hydropower potential in Mozambique, Angola and Zambia together with the enormous potential of the Democratic Republic of Congo and Tanzania.

Worryingly again, it points out that just 8% of the hydropower potential is being developed and gas from oil production in Angola is being burned rather than turned into electrical power.

The South African Power Pool's short-term investment plan seeks to address these problems by increasing availability and reserve margins to 95% and 10,2% respectively by 2013.

On the basis of its research for the RISP, the ADB has set up its regional infrastructure plan, which will form a core operational thrust of its own medium-term strategy. In terms of new projects, the bank says it will focus on regional transportation and infrastructure, trade facilitation, energy and information communications technology.

The North-South Corridor will link Maputo, Mtwara, Ncala, Lobito and Beira and is the core element in this infrastructure support project with special emphasis being placed on rail transportation along with the awarding of concession to independent companies to operate the railways. It also plans the development of one-stop border posts along the corridor to improve transit time and lower the costs of transportation. The bank has already committed $600-million to the project. From a regional energy perspective the ADB seeks to assist in the development of an Integrated Transmission Backbone Line between, for example, Mozambique and South Africa and then assist in providing the missing links in the South African Power Pool, namely for Angola, Malawi and Tanzania.

This, it says, will stimulate private investments in the abundant hydropower potential within the region and the bank wants to play what it calls a 'catalytic role' in financing these regional energy projects. It says it will support energy projects that are developed by one country but are aimed at providing exports to another country.

However, it says that for the regional energy development, binding power purchase agreements must be negotiated and finalised because many planned projects have already been derailed by a lack of a bankable power purchase agreement.

In terms of the information communications and technology sector, the bank says it will focus on consolidating connectivity on a regional basis and leveraging private investment for this. It also wants to deliver public services that will promote education, innovation and job creation initiatives.

To this end, the bank says that in two of its projects, it is laying transmission lines and fibre-optic cables in roads, electricity transmission lines and railways to address the issue of regional connectivity. The bank plans to support various other initiatives including the tripartite arrangement between COMESA, the ECA and SADC.

The ADB says that in terms of the RISP, the goal for southern Africa is to create a fully integrated and internationally competitive region that will sustain economic growth and help to alleviate poverty. It says it will support southern Africa in developing its regional infrastructure and the capacity building of its people.

It seeks to promote development of the regional economic community while encouraging private sector financing of regional projects by increasing the quality and quantity of bankable projects and by improving the business environment for all the people of the region.

Rod Harker recognised for his contribution to education

Roderick (Rod) Harker (Pr Eng BSc MSc MBL), SAIEE Past President (1996) and current Council Member of the Engineering Council of SA, has been awarded the 2011 IEEE Educational Activities Board Meritorious Achievement Award in Accreditation Activities with the following citation: 'For accreditation activities in South African education and impacting accreditation activities world wide'.

The award was established by the IEEE EAB to provide recognition for efforts to foster the maintenance and improvement of education through the process of accreditation of engineering, engineering technology, computer science and applied science programs.

SAIEE President, Andries Tshabalala, on behalf of the Council and Office Bearers, has congratulated Rod for the work he has done in this regard and wishes him strength to continue with Institute and ECSA work in the future.

Andries invites all members to join in the celebration of this award, which will be presented to Rod at the IEEE EAB Award Presentation Ceremony that will take place during the IEEE Meeting Series in New Brunswick, NJ, USA on 18 November 2011.

Continuing professional development

Project Management

An intensive, four day long Project Management CPD course presented by Tony Lydall was held at the Corporate Conference Centre in Dowerglen from the 19th to the 22nd of July. The course, which offers a job related approach to successful project management, is designed for experienced project managers who want to increase their project management skills and apply a standards-based approach to project management.

The course worked through the principles of initiating a project, planning project work, developing project schedules, planning project quality, analysing risks, project procurement, executing project work, monitoring project schedules and costs and closing the project.

Delegates were awarded four Category 1 CPD credits for attending.

East London CPD

During July, the SAIEE held two courses in East London at the Blue Lagoon Hotel and Conference Centre. Both courses were well attended. The Electric Power Cable tutorial was presented on Tuesday 12 July by popular presenter Dick Hardie. Dick's knowledge of power cables along with his wicked sense of humour have made him and his course a crowd favourite. All delegates who attended received one CPD credit.

The fully-booked Technical Writing for Engineers course was presented on the 13th and 14th of July by Malcolm Haffner. Malcolm's technical writing presentation was a huge success and thoroughly enjoyed by all SAIEE members who attended. Delegates each received two CPD credits for attending the two day course.

Continuing Professional Development (CPD)

Article written by: Rod Harker

ECSA is responsible for regulating the practice of engineering in South Africa. Registered persons are required by their Code of Conduct to practise strictly within their area of competence and to maintain and enhance this competence. They therefore have the responsibility to keep abreast of developments and knowledge in their areas of expertise in order to maintain their competence. In addition to maintaining their own competence, they should strive to contribute to the advancement of the body of knowledge with which they practise, and to the profession in general.

Section 22(1) of the Professional Engineers Act imposes a duty on a registered person to apply for the renewal of his/her registration with ECSA "at least three months prior to the prescribed expiry date of his/her registration". Subsection (2) of this section confers the power on the Council to determine conditions for renewal of registration.

ECSA decided to make use of Continuing Professional Development (CPD) as a mechanism to determine renewal of registration.

ECSA therefore instituted a system of CPD, starting in January 2006, which was linked to renewal of registration from 1 Jan 2007 for all registered persons according to the CPD Policy Document.

The CPD system, the application of the CPD Policy, the CPD requirements, the Categories of Activities for CPD Credits the process of renewal of Registration and the role of the recognised Voluntary Associations in the approval of activities for CPD purposes are detailed on the ECSA website, www.ecsa.co.za.

CPD is very important for Professionals in order for them to retain their professional registration, particularly in view of the impending implementation of regulations identifying work to be reserved for registered Professionals.

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- Superior communication, networking and interpersonal skills
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- Ability to work without supervision
- Excellent planning, organisation and time management skills
- Ability to be assertive yet remain professional at all times
- Self-motivated, takes responsibility and a sense of pride in work
- Ability to handle conflict situations

If you meet the above criteria please send your CV to: lee@sam.co.za .

Annual Banquet

The Annual Banquet of the SAIEE, which is a public function, will be held in the Ball Room of The Wanderers club, Illovo, Johannesburg, on the 14th of October 2011 at 18:45 for 19:15:

Members are encouraged to bring their spouses or partners and will be received by the President, Mr Andries Tshabalala.

Seating is at circular tables of ten and those members who wish to be seated together at the Banquet are asked to note this on their reply cards.

Tables will be reserved for groups on request, but individual seating arrangements at these tables must be arranged by the parties concerned.

Please note: A cash bar is available and all liquor tabs are to be settled with The Wanderers prior to departure. Closing date for reservations is 30 September 2011 and telephone bookings will not be accepted.

Dress: Black Tie, Lounge Suit or Traditional
Tickets: R500-00 - per person
Enquiries: Gerda Geyer, SAIEE, Telephone (011) 487-3003, Fax (011) 487-3002, e-mail: geyerg@saiee.org.za

Call for nominations

Each year on the occasion of our annual banquet, the SAIEE takes pleasure in presenting three awards, i.e., the President's Award, Engineer of the Year Award and the SAIEE Young Achiever's Award.

If you would like to nominate someone who you consider worthy of one of these awards, please do so by contacting Gerda Geyer, whose details are listed at the end of this article.

The President's Award

Sponsored by Rotek Engineering, this prestigious award recognises current major contributions in any section of electrical, electronics, telecommunications and computer engineering in South Africa.

Engineer of the Year Award

This award is sponsored by ACTOM and recognises a member of the SAIEE who has energetically and voluntarily worked towards promoting electrical science and its applications for the benefit of the SAIEE members and the Southern African community through his/her involvement in Institute affairs.

SAIEE Young Achiever's Award

Open to all persons (Members and Non-Members) in South Africa for current major contributions in the electrical/electronic engineering field.
The award, sponsored by Powertech Transformers, has an age limit of up to and including 35 years during the stated calendar year of the award.

The South African Institute of Electrical Engineers gratefully acknowledges the sponsors of these prestigious awards.

Nomination forms can be obtained from Gerda Geyer, Tel: 011 487-3003 or e-mail: geyerg@saiee.org.za. The closing date for nominations is 16 September 2011.

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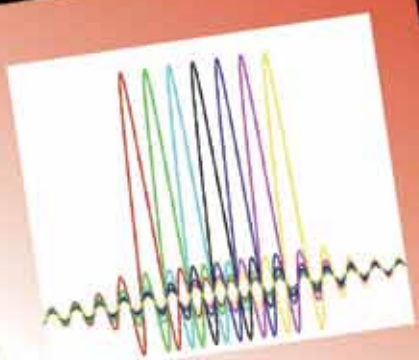

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