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Who is liable when the robots are among us?

The curse of Prometheus

Dull jobs soon to become obsolete

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$40-billion a year being sent to Africa

Official Magazine of

SAIEE

June 2011

Kristy Myers dares to ask.
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Advance of the machines - our laws lag behind

When Karel Čapek invented the concept of robots in his 1921 play *Rossum's Universal Robots* he set the tone for all our imaginings. His robots were used in factories as labourers and eventually overthrew and destroyed humanity.

Humanoid robots would do all the dull jobs we hated, upending society and leading to a brave new world while also threatening our way of life. Isaac Asimov came up with his three universal laws for robots and then showed how even these wouldn't be sufficient to protect us.

Yet humanoid robots have never been anything more than children's toys. What happened to them? Truth is they're all around.

Who needs a robot to wash dishes when you have a dishwasher? Or a robot to navigate when you have GPS? Robotic arms make cars, cut glass, and run factories. New robots are automating many of the dull and dangerous jobs we hate.

In so doing, though, they are as disruptive as the internet. Our laws lag behind. How are robotic cars to be launched when traffic rules require a vehicle to be operated by a driver with both hands on the steering wheel? Who is responsible when a robotic surgeon harms a patient?

Google is fighting that battle right now as they attempt to release self-driving vehicles to automate the tedious process of generating images for Google Streetview.

When the lights in an entire factory can be switched off, where does that leave the millions of unskilled South Africans who were hoping to take on the dull, routine jobs now being done by machines? What jobs will be left once this latest wave of innovation, industrialisation and automation sends another generation of professionals the way of wainwrights, sawyers and tinkers?

For some, all this disruption is going to be immensely worrying. For young engineers just starting out this is a tremendous opportunity. Just as the birth of the internet created thousands of new professions and opened the way for the quick-witted, the fields of robotics and automation are doing the same. Every industry is involved, from mining to manufacturing and even to services. Software automation is no less 'robotic' for being virtual.

There are risks, of course. The recent LulzSec attacks against companies, countries and individuals have exposed just how fragile many of the security systems we rely on are. They are also giving governments around the world the opportunity and excuse to reduce our freedoms. They are co-opting the same robotics and automation systems to process more data on us to curtail our liberty.

The UN has estimated that there were 742 500 industrial robots in use worldwide. More than half of these are being used in Japan. Strike action in the UK by tube drivers is also about protecting their jobs from the march of the machines. Two tube lines are already run by autonomous systems. All could easily follow.

Those of us fortunate to have gained a technical education need see only opportunity in the advance of the machines, but the rest of society – including its lawmakers – are still far behind in imagining a world where everything is different.

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WATTnow

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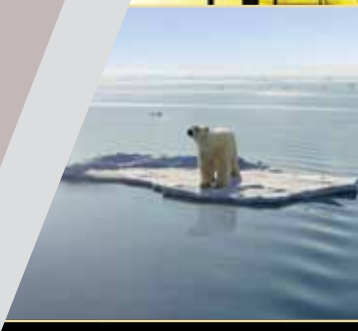
5> WATT'S GOING ON?

$650-million more to be invested in Maputo; $40-billion a year being sent home to Africa by migrants; Toll roads are here to stay; Change apprenticeship laws; Mtunzini residents want dune mining outlawed; South Africa must start nuclear procurement next year; SA company invents anti-piracy deterrent; Transnet to invest R110-billion over the next five years; Wealthy councils battle with service delivery; Fracking will not affect the SKA radio telescope.



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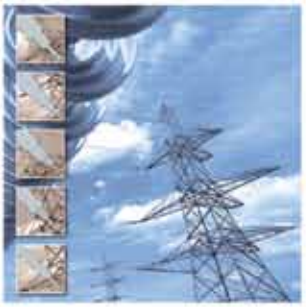





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$650-million more to be invested in Maputo

Maputo is to invest $650-million on upgrading its port infrastructure over the next 20 years according to the Maputo Development Company's chief financial officer Jorge Ferraz.

The port will be able to handle up to 50-million tons of cargo by 2030, most of it destined for the busy inland regions of Gauteng and other parts of South Africa, particularly Mpumalanga.

About $225-million has been invested over the past eight years in upgrading the Maputo and Matola ports and cargo volumes have increased from five-million tons in 2003 to 12,6-million tons this year. Further investments are likely to see cargo volumes double again in the next four years.

In 2003 the Maputo Port Development Company, in association with Grindrod, DFM and DP World, received a concession to operate the harbour and to implement the master plan that had been devised for the port.

The plan underpins economic growth for the southern African region and includes the development of a new coal terminal to export coal from the Mpumalanga coalfields to international customers in other parts of the world.

Grindrod was primarily responsible for the expansion and noted that the terminal had been operating at full capacity since Transnet Freight Rail upgraded the capacity of the line and improved cargo-handling facilities.

The next phase of the upgrading of the harbour will see it being expanded to handle up to 20-million tons of coal via the coal terminal.

$40-billion a year being sent home to Africa by migrants

More than $40-billion is being repatriated to Africa every year according to a report compiled by the African Development Bank, which says that about 30-million Africans living outside their home countries are sending money home to dependants there.

It says that this money is a vital economic lifeline for many African countries. The report, entitled 'Leveraging Migration for Africa: Remittances, Skills and Investments', shows that migration and remittances reduce poverty in the African communities and lead to greater investments in health, education, and housing.

It says that almost 70% of migrants from sub-Saharan Africa – particularly the poorest – move to other countries within the region while more than 90% of migrants from North Africa move away from the continent.

According to the report, the principal destinations for African migrants are France (9%), Cote d'Ivoire (8%), South Africa (6%), Saudi Arabia (5%) and the United States and Britain (4% respectively). African governments need to strengthen ties between Diasporas and home countries and protect migrants, according to Dilip Ratha, the main author of the report. He says that one innovation worth considering is to register Diaspora bonds by governments or private companies for nationals living abroad.

He says these bonds have been successfully used in Israel and India and if applied in sub-Saharan Africa could raise between $5-billion and $10-billion a year. He says that countries that should consider registering such bonds include Ethiopia, Ghana, Kenya, Liberia, Nigeria, Senegal, Uganda and Zambia.

Remittances have grown four-fold in the past 20 years to $40-billion and recent surveys conducted by the African Development Bank (and others) show that investments such as land purchases, building a home or starting a business were the highest uses for investments that are being sent home.

The remittances represent about 36% of Burkina Faso's total investment whereas this climbs to 55% in Kenya and 57% in Nigeria. Education was the second highest use for remittances sent to Nigeria and Uganda.

Ratha says that remittance flows to Africa are still being significantly under-estimated as only about 50% of the countries on the continent actually collect and report remittance data.

He says that another restriction on the flow of money into African countries is that the costs of transmitting money are very high compared with other parts of the world and as a result many migrants use informal channels to get money back to their home countries.

The report points out that organisations such as the Post Offices, savings and credit co-operatives, rural banks and micro-finance institutions can play an important role in expanding access to remittances and providing financial services to poor people in rural areas.

Toll roads are here to stay

The controversial toll road plan for Gauteng is just the first in a string of new toll roads that are planned for highways across the length and breadth of South Africa and are designed to plug the multi-billion rand hole that exists in the government's road maintenance bill.

Transport Minister Sibusiso Ndebele told Parliament recently that the user-pays principle is being applied and will go some way towards the maintenance shortfall that is currently estimated at R149-billion.

He says that the toll road principle remains government policy but that it will be used selectively, where a toll road is feasible and where the benefits outweigh the costs to the road user.

Ndebele said that the R149-billion maintenance backlog excluded the periodic resurfacing of the road networks, the upgrading of gravel roads to tarred surfaces or the adding of new lanes to existing roads.

It also excluded the construction of any new roads that are needed to ease congestion in certain areas of the country.

Other toll roads in the pipeline include the N1-N2 Winelands Toll Highway of 171km, the N2 Wild Coast Toll Highway of 560km, the R300 Cape Town Ring Road (105km), the R30 Bloemfontein to Welkom road (160km), the N3 from Mariannhill to Cedera (90km) road and the N2 Knysna Bypass of 35km.

He says these roads all form part of the South African National Roads Agency's long-term plans for the national road network but emphasised that extensive investigation and evaluation would first be done before final decisions were taken on building new toll roads.

Money collected from the tolls on the different routes will apparently be 'ring-fenced' and used exclusively for maintenance on the respective roads. Ndebele says that toll roads will eventually cover about 3 120km, equivalent to just 2,4% of the country's 135 000km of surfaced roads.

Change apprenticeship laws

Associated Motor Holdings has called on the Department of Labour to exempt apprentices from the country's labour laws until they reach the age of 23 or have been fully qualified. Chief executive Manny de Canha says the labour laws currently protect apprentices to such a degree that this discourages firms from taking on new people.

He says that AMH and its parent group, Imperial Holdings, plan to engage the government through the Retail Motor Industry (RMI) and the National Association of Automobile Manufacturers of South Africa.

He says there is a critical shortage of apprentices in the motor industry but efforts to promote job creation are seriously hampered by the existing labour laws. He says apprenticeship is an ideal and practical way to increase South Africa's skills base and provide jobs for the millions of unemployed young people in the country.

De Canha says the problems could partly be resolved by easing the labour laws and getting more inexperienced people into the motor industry, which is a major employer of skills in South Africa but is facing a shortage of skills in the future.

AMH currently employs about 4 500 people directly but it has a further 3 000 indirect jobs in the after-market and among its suppliers. He says the company is spending about R400-million a year with different local suppliers for items that include bull bars for its bakkies, air conditioners, radios and canopies.

He says that to complicate matters, South African vehicle component manufacturers want to export products to major motor manufacturers but the major restriction they face is that the parts are highly technical and South Africa does not have the skills base to produce them.

According to De Canha, the country's cost of manufacturing is about 20% higher than its international competitors.

AMH accounts for a massive growth in sales of fully imported vehicles; about 70% of sales of vehicles in South Africa. The group's two dominant brands are Hyundai, with a market share of about eight percent and Kia with a market share of about three percent.

Mtunzini residents want dune mining outlawed

Mtunzini residents on the north coast of KwaZulu-Natal are deeply concerned that their sleepy village and the Umlazi Nature Reserve will soon become a mining camp unless the Exxaro group is prevented from extracting large quantities of heavy metals contained in the dunes. The heavy metals include ilmenite, titanium and zircon. Exxaro argues that the benefits of mining the dunes far outweigh any of the disadvantages as it will generate significant revenue and create much-needed jobs.

However, Barbara Chedzey, head of the Mtunzini Conservancy, argues that any benefits from the job creation opportunities will be offset by a drop in property values, significant dust pollution, irreversible environmental damage and excessive levels of water consumption in an area where there is a perennial water shortage.

The Exxaro plan involves mining the sand dunes in the Fairbreeze coastal strip immediately south of Mtunzini. The mining path will run within a hundred metres of some of the existing homes there.

Chedzey says that Mtunzini relies heavily on attracting tourists to the unspoilt area and the attractive beaches with an estuary surrounded by a forest environment. She says that a full and independent environmental assessment should be done before any further plans are made to mine the dunes.

Exxaro is believed to be nearing exhaustion of its KwaZulu-Natal mining operation at Hillendale, 20km from Mtunzini and is hoping to start mining at the town before 2013.

The company is applying for a licence to mine a 40km stretch within the Port Durnford area, and Mtunzini lies in the centre of this coastal stretch of land.

There are currently about 700 homes in the village and many of them belong to permanent residents. It also has an environmental education centre situated on property owned by Mondi.

South Africa must start nuclear procurement next year

South Africa needs to start commissioning its planned new nuclear plants now if it wants to have these facilities operating by 2023, according to Energy Minister Dipuo Peters.

She says that in order for the country to meet its target of having a new 1 600MW nuclear facility operating by 2023, the procurement process will have to start early next year.

South Africa currently operates Africa's only nuclear power generation plant and plans to build several new plants capable of generating 9 600MW of power over the next 20 years.

South Africa remains committed to its nuclear build programme despite the international fears that have seen Germany closing down some of its plants and announcing that other plants will soon be decommissioned.

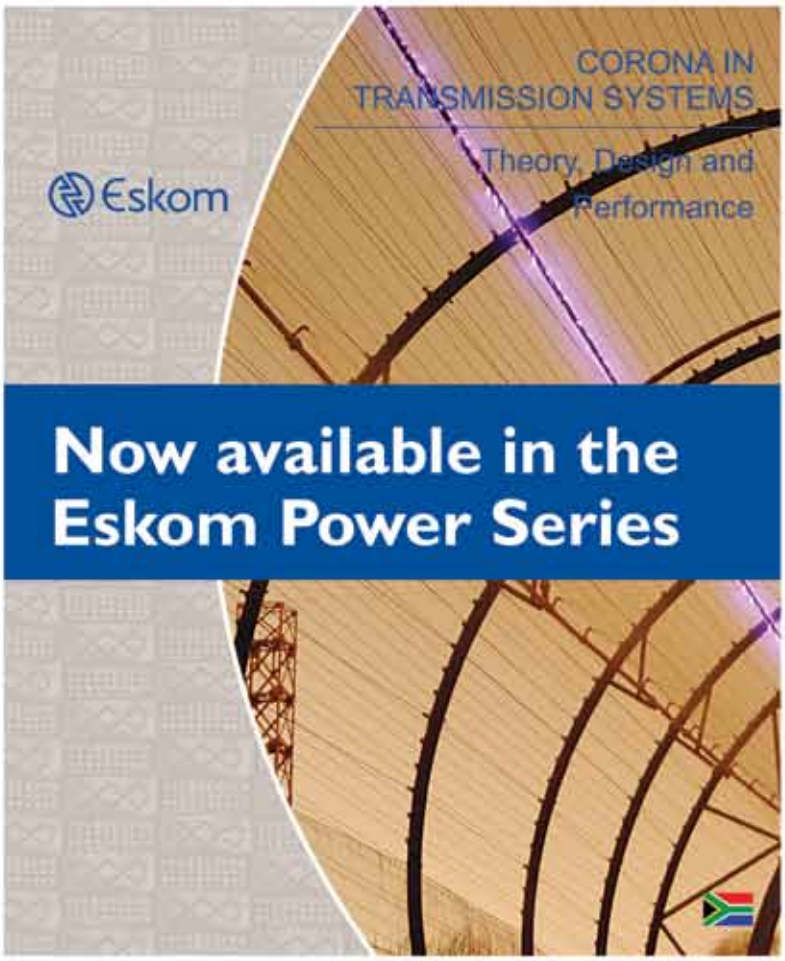
The international response to the Japanese nuclear disaster at the Fukushima Dai-Ichi plant – now rated as one of the worst nuclear accidents in the world and equivalent to the meltdown at Chernobyl – prompted calls for nuclear power to be comprehensively re-evaluated before any plans to build new nuclear plants go ahead.

Opposition to nuclear power has been growing in France with environmental activists staging protests outside the Fessenheim nuclear power plant, one of the oldest in the country. France operates 58 nuclear reactors that produce about 80% of the country's power.

In Germany, Chancellor Angela Merkel instructed that comprehensive stress tests be conducted on all 17 of Germany's reactors and ordered that the seven oldest plants in the country be shut down for at least three months so that safety inspections could be carried out.

Meanwhile, in South Africa the Integrated Resource Plan 2010 stipulates that about 23% of South Africa's energy will have to come from nuclear facilities within the next 20 years and about 42% of all new plants coming on stream during this period must be based on renewable energy resources.

This is part of the government's plan to cut carbon emissions and, more importantly, to reduce the country's dependence on coal as a primary energy source.



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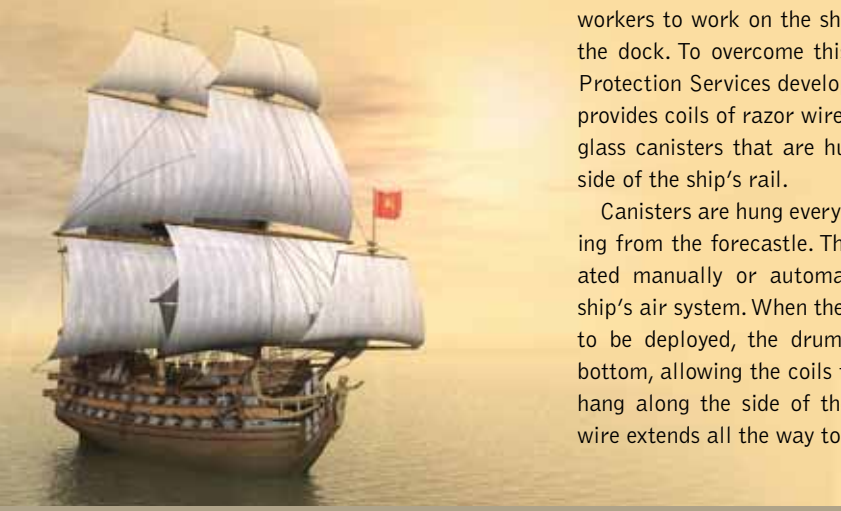
SA company invents anti-piracy deterrent

A South African company has invented a means to prevent pirates from boarding ships in the middle of the Indian Ocean.

It comes at a time when the International Maritime Organisation – the United Nations body responsible for setting and maintaining international laws of the sea – has given its reserved blessing to the use of armed guards on merchant ships sailing through pirate-infested water, typically off the west and east coasts of Africa.



Vessel Protection Services invented a system using razor wire that is dropped over the side of a ship to prevent pirates from boarding the craft. The first systems comprised razor wire fastened along the deck railings and dropped over the side of the ship, making it difficult for anyone – include a pilot captain – to board the ship or even lower a lifeboat.

The use of razor wire permanently affixed to the side of a ship was not practical as it made it impossible for stevedores or other workers to work on the ship when it was in the dock. To overcome this problem, Vessel Protection Services developed a system that provides coils of razor wire encased in fibreglass canisters that are hung over the outside of the ship's rail.

Canisters are hung every 18 metres, starting from the forecastle. The system is operated manually or automatically using the ship's air system. When the razor wire needs to be deployed, the drums open from the bottom, allowing the coils to drop down and hang along the side of the ship. The razor wire extends all the way to the water level.

The system presents attackers with multiple, parallel and overlapping coils that move erratically depending on how the ship rolls in the waves and how fast it is moving when pirates try to board it. This makes it extremely hazardous for anyone trying to board the vessel.

Each fibreglass canister weighs about 30kg and these can easily be carried and hung over the rails. The razor wire coils will prevent a gangway from being deployed and when they are not needed, the canisters can be lifted off the rail so that the ship is safe for workers and the pilot when it enters a port.

The product has drawn a great deal of interest from the shipping industry and various negotiations are underway with different shipping companies for installation of the system.

In a related development, the Indian government has instructed its navy not to capture pirates for possible trial but rather to confiscate their guns and spare fuel and then set them free on the oceans to survive as best they can.

Transnet to invest R110-billion over the next five years

The government and Transnet are looking at significantly increasing the fleet of locomotives owned by the organisation, and Public Enterprises Minister Malusi Gigaba says that significant quantities of new diesel and electric locomotives will be purchased annually over the next 15 years.

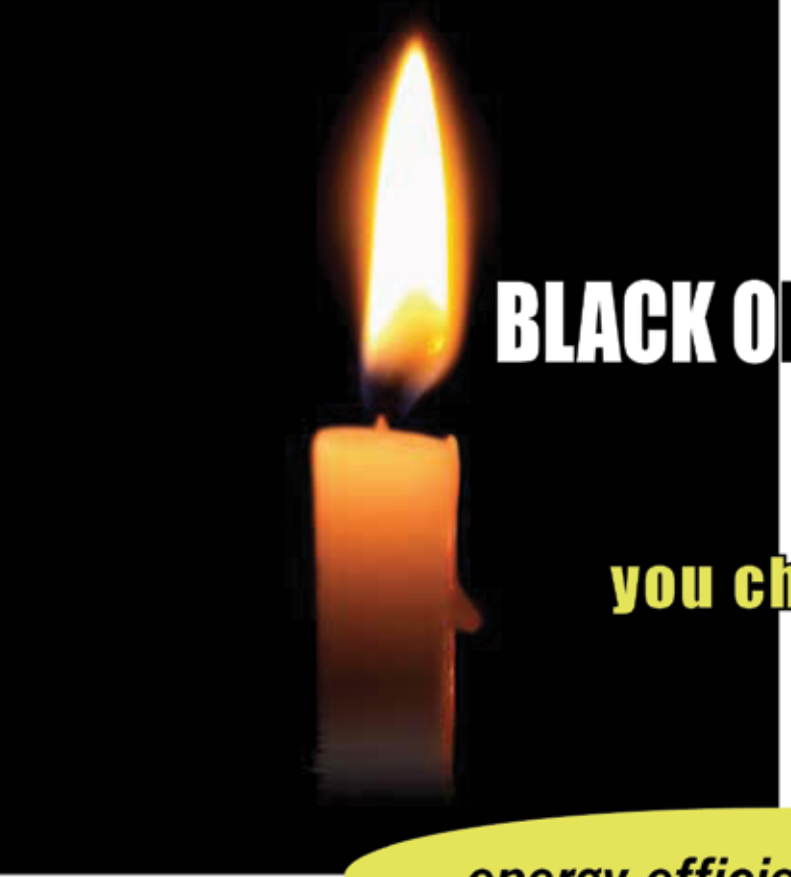
The average age of Transnet's locomotives is 33 years and Gigaba says that the age of the fleet must be reduced and that significant new capacity needs to be introduced to unlock the growth potential of Transnet's railway network.

Gigaba says that the government is seeking international partners to work with South African companies so as to develop a local manufacturing capability and a niche engineering hub that can serve Transnet and various other potential customers in parts of Africa. He says the Department will be "exploring partnerships with development finance and mainstream finance institutions" to find ways to finance Transnet's ambitious expansion projects as well as the local development of a locomotive manufacturing industry.

It is looking at various proposals that include branch line 'concessioning' and moving cargo from road to rail. Gigaba says that far too much cargo is carried on the road network and that South Africa urgently needs to move its carrying capacity to the rail network. This applies particularly to mines and to the ports.

Transnet is currently planning to invest about R110-billion over the next five years and almost R21-billion will go to ports, R23-billion to building or buying new locomotives and R17-billion for new rolling stock. The company will invest R13,2-billion in its pipelines and about R7-billion in new machinery and equipment.

The investment in the railway network will concentrate on the main lines between Johannesburg, Cape Town, Durban, Richards Bay, Beit Bridge and Maputo.



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Wealthy councils battle with service delivery

Some of the wealthiest municipalities in the country are unable to manage their money and, as a result, are struggling to provide basic services. For this reason–plus others including the fact that councils fail to spend their annual development budgets–the Local Government Systems Amendment Bill has been introduced.

Its aim is to return dysfunctional municipalities to full functionality. Moreover, the bill sets out how local councils should find ways to raise cash to maintain existing infrastructure and to improve delivery of basic services such as water, electricity and sanitation.

A new report on the state of South African cities–released in April by Deputy Co-operative Governance Minister Yunus Carrim–is aimed at encouraging municipalities to collect all outstanding monies and not to rely so heavily on government grants.

Carrim says the metropolitan areas, including Johannesburg, Tshwane, Ekurhuleni, Cape Town, eThekwini and Nelson Mandela Bay, could issue bonds to provide essential funds for maintenance of the new services.

The report on the state of South Africa's cities shows that:

- Metropolitan councils are battling to provide essential services, including water and electricity to all residents.
- Poor city planning had led to residential development being erected far from the workplace and this had contributed to extensive traffic congestion.
- Metros are not coping with the population growth or the increased economic activity within their boundaries.

The report has recommended that cities review how staff are appointed to ensure that they have the necessary qualifications to do the job.

Fracking will not affect the SKA radio telescope

Shell's prospecting for natural gas in the Karoo Basin will not affect South Africa's bid for the Square Kilometre Array radio telescope, according to the Minister of Science and Technology, Naledi Pandor. She says the only way that Shell's prospecting could affect the project is if it used communication systems with a radio frequency that interfered with the radio telescope's operations.

However, the South African SKA Project Office (SASPO) has met with Shell and Golder Associates to outline the communication restrictions that will be enforced.

Pandor says that all operations in the Karoo will be comprehensively addressed via regulations under the Astronomy Geographic Advantage Act of 2007, which will only be finalised sometime next year.

In April this year, the science and technology deputy director general, Val Munsami told the National Assembly's committee on science and technology that Shell's plans to use fracking in the Karoo had caused some concern for international partners involved in South Africa's bid for the SKA.

The radio telescope will cost about R15 billion to complete and South Africa is bidding against Australia for the right to erect the telescope. The annual running costs of the SKA are estimated at R1.5 billion.

The SKA is expected to operate for at least 50 years and perhaps even longer than that. The announcement on the successful bid is expected to be made some time next year. At this stage the Cabinet has endorsed a decision by the Department of Mineral Resources to invoke a moratorium on prospecting licences in the Karoo Basin.

The department will lead a multi-disciplinary team that includes the Department of Trade and Industry and the Department of Science and Technology to examine all aspects of hydraulic fracturing as a means to release underground repositories of natural gas.

However, the moratorium does not apply to Shell as it has already been granted a licence to prospect in the Karoo. It also seems possible that Shell will be within its rights – in terms of the licence agreement – to use fracking methods to locate and unlock underground gas reserves.

There has been a huge outcry throughout the country to the announcement that Shell was considering using this method and various protest groups have threatened court action against the company should it go ahead with its plans.

Shell has held widespread public meetings throughout the Karoo to try and persuade farmers and other interest groups that fracking will not have a detrimental effect on the environment or on the landscape.

Africa's agricultural sector
What needs to be done?

by Paddy Hartdegen

While Africa is a continent of doom and gloom, it is also a continent of tremendous hope and enterprise and the reality, when it comes to agriculture, is that engineering has an enormous role to play in rejuvenating the agricultural sector.

Reports from the African Development Bank indicate that the fundamental elements underpinning the development of the agricultural sector in Africa can be summarised as follows:

- Improving the rural infrastructure – including roads, transportations networks, dams, irrigation and energy provision.
- Building and operating a number of fertiliser plants in different regions around Africa and then setting up the necessary distribution infrastructure to get the fertilisers to the farmers.
- Capacity building among farmers while resolving policy issues and improving the level of regional trade.
- Increasing the scale of private sector food production operations.
- Establishing a Crisis Response Facility focused on science and technology while promoting agricultural research in the western, eastern, central and southern regions of Africa.

The essence of the Comprehensive African Agriculture Development Programme (CAADP) is that it seeks to increase food production in Africa and, to do so, relies on partnerships between international, regional, national, district and community-level stakeholders to play an active role in restoring and sustaining Africa's resources through:

- Sustainable land management.
- Agricultural water development.
- Land policy and administration.

Let's examine some of the immediate problems facing Africa – particularly within the context of engineering, science, technology and research.

- Land degradation alone affects about 67% of the total land area and 25% of that is characterised as severe. Between four and seven percent of the land will never be reclaimed or restored to its previous state.
- Productivity loss in Africa, as a direct result of soil degradation since the Second World War, is estimated at 25% for croplands and between 8% and 14% for croplands and pastures together.
- Africa is 'exporting' about 1,7-billion tons of sediment every year because of poor soil and water management, which leads to crop losses and productivity losses. There is also a negative nutrient balance in Africa's croplands with at least four million tons of nutrients being removed in harvested products compared with the one million tons that is returned to the soil in terms of fertiliser and manure.
- Worryingly, about 86% of African soils are under moisture stress.
- The consequences of the land degradation are, for instance, that Africa's agricultural gross domestic product is down by three percent each year – equivalent to $9-billion and getting greater as the land continues to degrade.

The CAADP therefore names the major challenges facing Africa as land degradation, soil nutrient loss and decline in soil fertility. It wants to develop a conservation-based agricultural system that will reduce tillage, provide permanent soil cover, introduce crop rotation and provide balanced plant nutrition using organic and inorganic compounds.

It also seeks to improve water control and increase water productivity (meaning how water is used) at all levels. The CAADP uses the Participatory Irrigation Development Project in Tanzania to illustrate how employment opportunities can be enhanced – along with agricultural production – simply by improving irrigation systems. It says that the project achieved an 86% increase in income for members of the project, enabling families to enjoy better quality housing and household assets because they could afford to from the proceeds of their farming activities. It also allowed access to health services and education for their children.

The CAADP refers to the fact that ownership of oxcarts and cattle increased sharply among participating families and the number of grinding mills rose from two to 12. Shops in the scheme increased from two to 74 and the farmers' own investment in water and sanitation were the most obvious signs of improved livelihoods.

In Mali, another project illustrates how an engineering solution is applied to a small-scale irrigation project and the result is significant. The solution is based at the Office du Niger (ON) in Mali, one of the oldest and largest small-scale irrigation schemes in sub-Saharan Africa.

Development of the scheme began in 1932 and it was intended to cover about a million hectares over a period of 50 years. By 1982, only 60 000 hectares had been developed and part of that area was abandoned because poor maintenance had forced it to stop operating.

Cotton production had ceased and average paddy-field yields slumped to 1,6t/ha. Attempts to rehabilitate the scheme were successful once physical investments to improve water security were matched with institutional reforms that allowed this to happen.

An impressive turnaround has now been achieved. In addition to the 50 000 hectares that were in use, a further 10 000 hectares has been reclaimed and rehabilitated and this has resulted in average paddy-field yields of 6t/ha. The operation and maintenance of the project has recovered about 97% of the capital costs so far.

The project provides improved water control and management and the adoption of improved technologies, such as using high-yield varieties of rice, have contributed to the achievements. Furthermore, improved uses of fertilisers and better husbandry practises have also played a role.

The institutional reforms included privatising the commercial farming functions, appointing contractors to manage and maintain the water works, downsizing the management agency and concentrating its core function on providing bulk water supplies.

The CAADP says that the research from the African Development Bank, the World Bank and various other financial institutions indicates that it is essential for structural changes in Africa's agricultural sector to be made immediately. The CAADP has its key projects already underway and more of these will be added annually.

However, it says the main requirements right now are summarised as:

- A strong investment portfolio that is monitored constantly and evaluated annually.
- The sustainable land and water management framework must focus on common goals with quantified objectives derived from existing operations.
- Increasing production and value of agricultural activities and at the same time increasing land and water productivity.
- Sharply increasing investment in sustainable land and water management.

Africa has consistently found itself in the spotlight when it comes to famine, starvation and malnutrition and this is hardly surprising given the startling number of people who die from starvation every year. So while the CAADP says that it can provide some hope for Africa as the continent of abundance the reality seems far removed from that.

The fundamental question is whether Africa can fix the many problems its faces.

East African heads of state recently met in Nairobi and resolved to adopt science-based technologies to improve the yields of the agricultural sector in the eastern regions of the continent.

A new initiative, falling under the control of Agricultural Innovation in Africa, funded by the Bill & Melinda Gates Foundation looks at how science and technology can be integrated into agricultural development.

According to Calestous Juma, Professor of the Practice of International Development at Harvard University, there are many success stories in Africa such as in Malawi where imports of genetically enhanced seeds and provision of subsidised fertilisers doubled the country's maize crop and enabled it to export maize in just two years.

Juma says that farmers and scientists in Africa have access to a wealth of knowledge and are now willing to use it as part of an investment in agriculture. He says the Presidents of Burundi, Kenya, Rwanda, Tanzania and Uganda have all considered his report entitled: New Harvest: Agricultural Innovation in Africa and given it a cautious endorsement.

Since 2008 a number of African heads of state have agreed to increase their budgets for agriculture by 10% each year and while 23 countries have done so another 46 that signed the NEPAD agreement have failed to.

Since 2003 the number of countries that have achieved a growth target of 6% has virtually doubled and nine countries have exceeded their targets. These are Angola, Eritrea, Ethiopia, Burkina Faso, Republic of Congo, Gambia, Guinea-Bissau, Nigeria, Senegal and Tanzania. Four countries achieved growth rates of between 4% and 6% – Rwanda, Benin, Ghana and Uganda.

Billions of dollars have already been invested in Africa's agricultural sector but billions more have to be ploughed into the sector because it is not just a question of providing better farming conditions, but creating an entire distribution network as well.

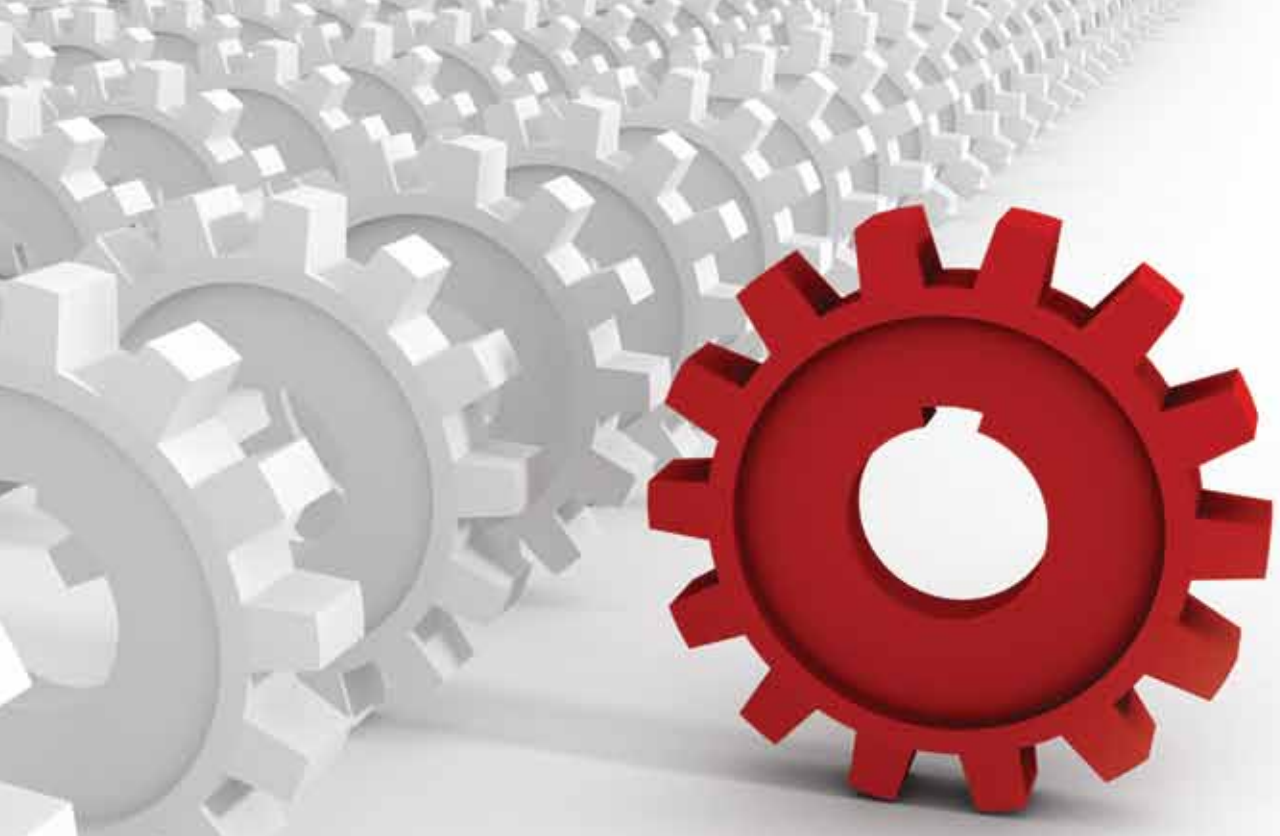
Not only do farmers have to be able to produce more—using reliable water sources from huge investments in dams and sustainable water management—but then they must have a transport and distribution infrastructure – railways, roads, ports and airports – to be able to get their produce to local and international markets.

So the engineering potential is enormous, the engineering investment enormous and the science and technology challenges just as daunting. The key elements for sustainable agriculture in Africa appear to be built around:

- Regional and country investments in land and water management (engineering and technology solutions required).
- Implementation on the Abuja Declaration on Fertilisers.
- Wide-ranging methods of improving food security (an engineering and technological challenge in itself).
- Huge investments in infrastructure development and energy generation.

With the scale of African enterprise that is widely evident in parts of the continent, I have no doubt that, in time, Africa will return to the continent of abundance that it should be. But to achieve that will require a great deal of focus on the disciplines of engineering, science and technology.

For without those, the agricultural sector will remain unproductive and unprofitable, and no-one will reap its manifest and bountiful harvests.



Automating
dull jobs into obsolescence

by Gavin Chait

In 1860 the United States census recorded that four million African slaves were living in the country. The majority of those slaves supported the American South's vast cotton farms where cotton bolls had to be individually picked.

American cotton was cheap and fed into rapidly industrialising England. Then came the Civil War, the emancipation of the slaves in 1865 and cotton prices began to climb.

The cost of labour spurred innovators to try and find a way to mechanise cotton picking. The Price Campbell Cotton Picker Corporation created its first cotton picker in 1889. International Harvester bought over the patents in 1924 but it wasn't until 1943 that the first effective pickers came into production. The problem was that mechanical cotton pickers damaged the bolls and so ruined the crop.

The first pickers could only harvest one row at a time but still replaced forty hand pickers. The current John Deere machines are 4-row pickers.

In 1870, out of a population of 40 million, 28 million Americans worked in agriculture. In 2010, out of a population of 300 million, fewer than 900,000 people work in agriculture.

Maybe that still doesn't give an impression of how much has changed. In 1945 it took 14 hours of labour to produce 100 bushels of corn on two acres of land. By 1987 it took three hours of labour to produce that same 100 bushels.

Millions of people lost their jobs on farms and headed for the cities to find work.

Industrialisation began first in England and in the textiles industry. Richard Arkwright's water frame, James Hargreave's Spinning Jenny and Samuel Crompton's Spinning Mule all contributed to a revolution in spinning cotton. The flying shuttle allowed automated textiles.

All of this so incensed handloom weavers that they started a short-lived revolution. Mobs would invade textiles factories and destroy the machines. These were the Luddites and their rallying fears of automation destroying jobs and creating unemployment has served to prevent the introduction of numerous innovations and labour-saving devices ever since.

Economists as fancied as Karl Marx and John Maynard Keynes predicted social disaster as a result of automation. Even Paul Krugman, a Nobel Prize-winner, has worried about the 'hollowing out' of the middle class.

All of this has been rubbished as the Luddite Fallacy. After all, says economist Alex Tabarrok, "If the Luddite fallacy were true we would all be out of work because productivity has been increasing for two centuries."

Nothing in industrialisation has had as much impact as automation of agriculture. There is no modern equivalent that would suffer as much disruption. Despite this, society flourished during the industrial era creating millions of new jobs. The telecommunications era has been almost as disruptive. Mechanical telephone exchanges gave way to Almon Strowger's 1891 invention of

the stepping switch which could automate switching and put thousands of telephone operators out of work.

With that in mind, whose jobs are next on the cutting-room floor of innovation?

Innovation is concentrated on a very particular area where human labour is vulnerable. The first is simply cost; that machines that are almost capable of performing a task are almost cheaper than the people doing so. Where the work is monotonous, routine, or dangerous creates an even greater incentive. Next are areas where it is near impossible for humans to work at all; the bottom of the ocean, nuclear reactors, volcanoes and space. And lastly, simply performing tasks that are beyond the limits of human ability.

That's quite a large area.

The obvious ones are being replaced by the telecommunications revolution. Photographic process workers, papermakers and printers are all in decline. Amazon now sells more e-books than all other books combined. Expect that to hit publishers, book shops and book distributors.

Companies produce billions of tons of documents. Converting text into pdf or other document forms is straightforward. Ray Kurzweil's 1974 invention of omni-font optical character recognition (OCR) is now well-established, allowing you to copy and paste directly from scanned documents (he also invented the CCD flatbed scanner).

Google has developed systems for automated and bulk scanning of books while Project Gutenberg and the Open Content Alliance continue to manually scan their libraries. Stanford University's library has developed a fully robotic page-turning and scanning device for the mass digitisation of its library.

Advances in OCR include intelligent character and intelligent word recognition used for handwriting recognition and conversion.

One of the most advanced products is produced by ABBYY, a Russian company founded in 1989 by David Yang. Its software can extract data from scanned tables as well as interpret multiple languages.

The impact on the commercial world of data digitisation is tremendous. Now imagine what it will do for the mundane world of bookkeeping when you can simply scan all your invoices, upload them to a web service and have them automatically processed and converted to completed accounts. If you don't want to scan them yourself, stick them in a box and send them to a business process outsourcing service to scan on your behalf. An entire layer of technical, but routine data processing, will vanish.

Following on from that, once data is digitised it can also be translated. Let's not get ahead of ourselves; machine translation is difficult. In 1954 the Georgetown-IBM experiment successfully resulted in the automatic translation of sixty Russian sentences into English. The project leaders claimed that within three to five years machine translation would be ubiquitous. It hasn't happened.

The approaches to machine translation include rules-based (which doesn't really work because of the nuance of living languages), statistical ('most people think this is the translation'), example-based (machine-learning based on teaching) and hybrids of these.

The University of Gothenburg, on behalf of the European Commission, runs one of the world's largest translation programs. IBM and Google are at the head of private efforts and use hybrid approaches.

Breakthroughs here are likely to create a vast number of new jobs as new synergies in business and communication emerge. Star Trek's universal translator may be on the way.

Still this does rather put clerical and data processing jobs under the knife.

Call centres have become a major employer, although many of us almost welcome arriving at a human being after suffering through numerous 'interactive' menu choices on the way. Interactive voice response (IVR), as the initial process is known, was first developed as a result of work by Leonard Baum and Lloyd Welch into speech recognition based on the Hidden Markov Model, based on Bayesian probability.

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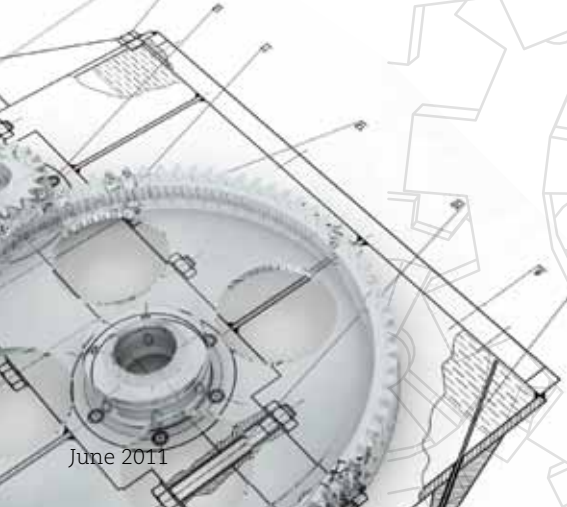
Companies have already used this to expand their telephone responses to 24-hour service and handling mundane information queries that make up the bulk of calls.

As the technology improves (so you don't find yourself yelling, "NO ONE! I SAID ONE YOU STUPID MACHINE!") the service can manage a greater range of services. However, I've already been subjected to such automated processes when paying for parking at Pay and Display locations.

Some of the largest users are Pop Idol and Big Brother who receive massive call volumes as bored viewers demand more entertainment.

That doesn't mean that call centres will vanish but it does put in doubt the massive growth predictions for employment in that sector. Combine IVR with translation and you have a massive new industry.

Automated storage and retrieval systems (ASRS) are at the heart of large internet businesses that sell real stuff, like Amazon and Newegg (which sells computers). There are two components to this approach, fixed aisle and carousels/vertical lift modules. Think of it as an extremely large and complex vending machine. ASRS is for sub-pallet storage. Where pallet-sized volumes are stored, semi-automation is still possible with conveyor belts travelling and visual displays indicating to staff what needs to be moved from storage onto the conveyor.



Kiva Systems, an American company, produces such order fulfilment systems for Staples, Walgreens, Zappos and GAP, amongst others. "The beauty of our system," says Raffaello D'Andrea an engineer who designed Kiva's control systems, "is that you don't have to walk over to the shelves to get things, the shelves come to you."

Technological innovation here feeds into the fledgling autonomous logistics field where various devices would hand off from warehouse to end-user without human intervention.

The ultimate result is a 'lights-out' factory where only machines operate, transferring components to an automated warehouse, then extracting from that warehouse for automated assembly and packaging before autonomous vehicles run it up to your front door.

FANUC, a Japanese robotics company, has a robotics factory that builds other robots. "Not only is it lights-out," says FANUC vice president Gary Zywiol, "we turn off the air conditioning and heat too."

Volvo recently successfully tested an autonomous road train system known as 'platooning'. Vehicles line up behind a lead car and then automatically monitor distance, speed and direction of the car immediately in front of themselves. "Platooning offers the prospect of improved road safety, better road-space utilisation, improved driver comfort on long journeys and reduced fuel consumption and hence CO_2 emissions," says

Tom Robinson, the road-train project co-ordinator for Ricardo UK, one of the seven companies behind the project.

The entire mundane process of making, selling, distributing and post-sales support is becoming more and more autonomous. It is more complex than automating agriculture but it is just as inevitable.

So what will all the new unemployed be doing? Well someone has to design, build and maintain all the robots we're creating. And then there are all the new industries still to be developed that we can barely even imagine.

Although, certainly, someone is imagining it right now.

Who will watch the watchers?

by Gavin Chait

"Quis custodiet ipsos custodes?" asked Juvenal in his Satires from the first century.

Juvenal was writing about his wife, "I hear always the admonishment of my friends: "Bolt her in, constrain her!" But who will guard the guardians? The wife plans ahead and begins with them!"

He asked his question to comic effect. Plato, in 'The Republic', places his more considered answer in the mouth of Socrates, that the guardians will be manipulated into guarding themselves against themselves.

The question is being asked ever more widely as technology imposes pseudo voyeurism on the just and unjust alike. Backscatter x-ray devices penetrate clothes at the security checkpoints at airports around the world making unwilling nudists of us all. Surveillance cameras monitor public and private spaces. Military surveillance drones in the air have been joined by commercial street view services provided by Google and Microsoft. Not to mention the unending stream of information about themselves uploaded by individuals onto Facebook, Twitter, Youtube and other social media sites. The British government has spent over R5 billion installing more than a million surveillance cameras across the UK. In 2009, Detective Chief Inspector Mick Neville admitted that only 1 000 crimes were solved throughout 2008 as a direct result of CCTV cameras. Or, as one wag on Fark.com put it, about two crimes for every 1984.

The claim that such erosion of privacy is important to combat crime is hard to justify given these statistics. And even where there is a clear and present threat, such as after the terror attacks of 11 September 2001, the degradation of civil liberties would appear to go significantly beyond any justifiable point. In October 2001, the US Bush administration signed the Patriot Act into law. This empowered the National Security Agency to intercept communications into the US and listen in on conversations. They required no court order or even prior suspicion. They could simply eavesdrop at will. These warrantless wiretaps became a clarion call for US civil liberties activists but the rules are still in place.

Governments around the world have tremendous access to information; both through our interactions with the state (taxes, border controls, licences and state services) and through the legislation of the activity of private companies (such as demanding the ability to listen in on mobile phone conversations). If private companies won't play ball then, as in China, the state can simply block access to those services.

And sometimes private companies get it wrong. In 2010 Google was forced to admit that its Street View vans, ostensibly engaged in photographing the street where you live, were also collecting emails and other web activity over unsecured wireless networks as they drove past.

According to Google executive, Alan Eustace, "It's clear from those inspections that while most of the data is fragmentary, in some instances entire emails and URLs were captured, as well as passwords. We want to delete this data as soon as possible, and I would like to apologise again for the fact that we collected it in the first place."

They can't delete it, though. Even as courts investigate and demand remedy, governments are rather interested in what may be in that trove of data.

All of this is rather nerve-wracking for those of us who fear the demagoguery of an unaccountable state. The South African government's China-like determination to implement its Protection of Information Bill to give it an excuse to lock up journalists investigating corruption comes to mind.

None of this is to take away the sheer inventiveness of the technology.

Automatic number plate recognition is a mass surveillance technique. The ANPR system used to manage traffic congestion into London reads between 8 and 10 million car number plates a day. These plates can be matched against a police database and flagged. Some two percent are highlighted for police follow-up.

The first ANPR was invented in 1976 at the Police Scientific Development Branch in the UK. The technology was licensed to EMI Electronics and Computer Recognition Systems. The Optical Character Recognition (OCR) software converts the image into alphanumeric data.

The Dutch introduced a similar system in 2002 and also adjusted the font used on their licence plates to ensure easier machine reading. New systems are being installed on police vehicles around the world to scan oncoming and following traffic. Consider that the processor must be fast enough to accommodate oncoming traffic speeds of up to 160km/h while being small and energy efficient and you get a sense of the challenge.

Shutter speeds of 1/1000 of a second are required, as well as licence plates that increase the contrast between the characters and the plate itself. Many regulators now require the plates be retro-reflective; returning the light source back to the camera.

Average speed cameras have been set up which make use of ANPR. A stretch of road is monitored and your average speed to complete the route is calculated. Complete too fast and you've been caught speeding. The longest monitored road is the 51 kilometres between Glasgow and Ayr in Scotland.

ANPR is really just a special implementation of general machine recognition systems. The most complex of these are facial recognition. This doesn't have to be good to be effective. Many current digital cameras identify a face so that they can ensure these are in focus. Some even have smile and eye detection to retake a picture if the subject had their eyes shut.

Google's Picasa allows you to search for pictures of the same person. Facebook is now doing something similar.

One of the early pioneers of automated face recognition was Woody Bledsoe. "This recognition problem is made difficult by the great variability in head rotation and tilt, lighting intensity and angle, facial expression, aging, etc. Some other attempts at facial recognition by machine have allowed for little or no variability in these quantities. Yet the method of correlation (or pattern matching) of unprocessed optical data, which is often used by some researchers, is certain to fail in cases where the variability is great. In particular, the correlation is low between two pictures of the same person with two different head rotations," he said in 1966.

By 1997, face recognition systems were outperforming skilled humans. Christoph von der Malsburge at the University of Bochum in Germany, along with the University of Southern California, had produced software "robust enough to make identifications from less-than-perfect face views. It can also often see through such impediments to identification as moustaches, beards, changed hair styles and glasses—even sunglasses".

This computer vision can be used at borders to monitor for known terrorists, or at casinos where the corporations behind gambling monitor known card counters.

Again, not all of this is used for surveillance. Augmented reality applications on Google's Android smartphone and Apple's iPhone use GPS and image recognition to place text information directly over a live view through your phone camera. These applications are still very limited in their scope. PresseLite has an app for travelling around the Paris Metro subway. Panoramascope labels mountain peaks on the horizon. HPSC has created a version of Pac-Man where you run around eating dots in the street while avoiding the ghosts that pop out of side streets. Elipse Ad allows friends to leave you electronic gifts in set locations. When you view the area with your phone you can see the gift and unlock, for instance, a digital video message.

Biometric recognition technology can even be used to aid travellers. EU passport holders can use face recognition border controls to pass swiftly through immigration checkpoints. The system compares their face to a stored image in an RFID chip in their passports.

The UK's Iris system is even more sophisticated. Iris recognition software allows British travellers to pass into the UK without even taking their passports out of their pockets.

Into the sky where the success of surveillance drones – autonomous flying vehicles – operating over Afghanistan has intrigued police. Defense Advanced Research Projects Agency, the US military innovation organisation behind so much new technology, has just unveiled a competition to design an unmanned aerial vehicle that costs less than $10 000 and can be carried in a rucksack. Project UAVForge, "aims to produce a small, affordable, and easy to operate unmanned air vehicle capable of persistent perch and stare surveillance. The successful offeror will empower a diverse community of innovators and emergent design teams by providing manufacturing capabilities and assessments and producing up to 15 units of the winning design," says DARPA.

In the UK, aerial surveillance is gaining popularity amongst police services. In Feb-

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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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ruary 2010, Merseyside police used an unmanned drone to track two men suspected of stealing a car, and thermal imaging to track them even after they abandoned the vehicle.

With police helicopters costing millions of dollars to operate and drones costing only in the tens of thousands, it is easy to see why they are more interesting.

Various universities, including MIT and Stanford, have autonomous helicopter research projects. These devices use everything from lasers to 3D cameras to accelerometers. MIT's Air Vehicle is able to successfully map out an unknown maze, including find and navigate through narrow windows.

Such systems are very useful for exploring disaster areas, like earthquakes, in order to speed up and automate the discovery of casualties needing attention.

Not all surveillance takes place in the physical world. DARPA is concerned that military analysts are overwhelmed by too much information arriving from mobile phone and email interception as well as from drone and video surveillance. Their $13 million Deep ISR Processing by Crowds project aims to crowdsource such information analysis.

First that information has to be gathered.

Van Eck phreaking – a core plot-point in Cryptonomicon by Neal Stephenson – was developed by Dutch computer researcher Win van Eck in 1985. The information passed from a computer to its video display results in high frequency electrical signals. Such radiation is in the radio frequency range and can be picked up by a detector and analysed even from hundreds of metres away. In 2004 it was demonstrated that $2 000 of equipment could permit eavesdropping on an LCD screen. Van Eck himself demonstrated how he could compromise electronic voting secrecy in Brazil.

The US government's TEMPEST program offers countermeasures to spy-proof digital equipment used by the state. The rest of us are on our own.

AT&T and Verizon, the two largest telecommunications companies in the US, provide searchable records to the FBI on all their customers' telephone and internet habits. Police in the UK and US can remotely activate the microphones in mobile phones to listen in on conversations taking place nearby. Mobile phones can also be used to locate the user on a map.

Skyhook Wireless provides heatmaps of mobile phone users as part of their location positioning services. They're the folks who support Google's Android and Apple's iPhone location awareness software. The information is being used by businesses to target the behavioural patterns of consumers. Their new service is called SpotRank.

Listening in on such volumes of calls is impractical. While speech-to-text programs convert conversation into something machine-readable, companies like Verint and Narus use statistical analysis and simple look-up tables to identify conversations and topics that analysts may want to take a closer look at.

Such capability is also used by businesses to monitor internal emails to look for potential liability or corporate espionage or merely to track online news sources in search of market trends.

Social network analysis is used to monitor the relationships between people using social media like Facebook and Twitter. Various government agencies collect information on people's personal interests, friendships, social affiliations, thoughts and activities.

And before you think that the governments of the world are alone in such behaviour, Google will also know more about the customer - because it benefits the customer to tell Google more about them. "The more we know about the customer, the better the quality of searches, the better the quality of the apps. The operator one is 'required', if you will, and the Google one will be optional. And today I would say, a minority choose to do that, but I think over time a majority will ... because of the stored values in the servers and so forth and so on ..." said Google CEO Eric Schmidt at the 2010 Mobile World Congress.

The culmination of all this surveillance is DARPA's Information Awareness Office and its Total Information Awareness project, 'enormous computer databases to gather and store the personal information of everyone in the United States, including personal e-mails, social networks, credit card records, phone calls, medical records, and numerous other sources, without any requirement for a search warrant.'

The sadness is that, while one can argue as to the legitimacy and nobility of European and US actions, the technology and approach is being used by governments everywhere. Governments like those in Russia, China and Iran, who are very much opposed to civil liberties and very experienced at torture and sudden disappearances.

As so often, our technology runs ahead of our ability to behave responsibly.















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Two unnamed elements added to periodic table

Two new elements have been added to the periodic table after a three-year review by the governing bodies of the fields of chemistry and physics. The elements have not yet been named but both are highly radioactive and exist for less than a second before decaying into lighter atoms.

The periodic table is the official compendium of known elements, organised according to the properties of their atomic structure. The review of the elements was conducted by a joint working party of the International Union of Pure and Applied Chemistry and the International Union of Pure and Applied Physics.

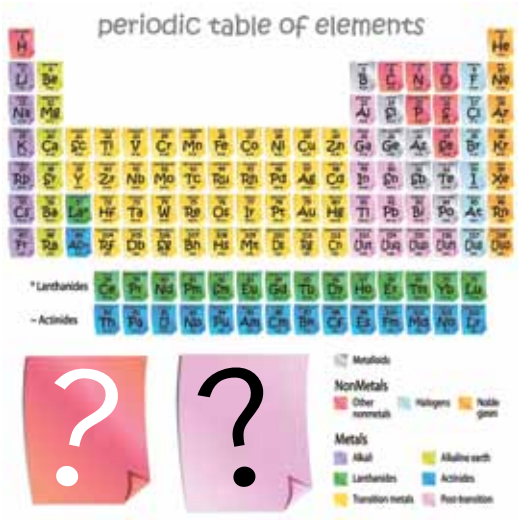
There have been several claims by laboratories of the discovery of new chemical elements at positions 113, 114, 115, 116 and 118 on the periodic table. The working parties concluded that elements 114 and 116 fulfilled the necessary criteria.

The new elements have been given the temporary titles of ununquadium and ununhexium respectively but their final names have not yet been decided.

The discovery of these elements has been credited to a collaborative team of researchers working at the Joint Institute for Nuclear Research in Dubna, Russia and the Lawrence Livermore National Laboratory in California, US.

Scientists at the Dubna facility bombarded atoms of plutonium with ions of calcium and this produced ununquadium-289, an isotope with a half-life of just 21 seconds. It decays into copernicium-285 through alpha decay.

Scientists at Livermore produced ununhexium by bombarding atoms of curium-248 with ions of calcium-48 to produce ununhexium-292 an isotope with a half-life of about 0,6-milliseconds and four free neutrons.



Ununhexium's most stable isotope, ununhexium-291 has a half-life of about 18 seconds and decays into ununquadium-287 through alpha decay.

Rosetta put to sleep until 2014

A comet-chasing spacecraft, Europe's Rosetta, is heading for a rendezvous with a comet in 2014 and has been put into hibernation by its controllers. The command was sent from Germany instructing the probe to enter a 'deep sleep' with only heaters and an 'alarm clock' running on the craft.

Nothing will be heard from the spacecraft until it 'wakes up' at 10h00 GMT on 20 January 2014. Assuming that it does reawaken, it will be a few months away from its crucial appointment with Comet 67P/Churyumov-Gerasimenko near Jupiter.

The plan is for the spacecraft to orbit the four kilometre wide ball of ice and dust and then to land a small probe on its surface.

The European Space Agency's head of planetary science, Dr Gerhard Schwehm says that while the spacecraft might be sleeping the scientists here on Earth have a busy time ahead of them in preparation for the landing.

Rosetta's scientific instruments have been switched off for the past few months and the craft has now been swivelled so that its solar wings are pointing towards the sun. It has been put into a gentle spin so that it does not need to use thrusters to maintain a stable course.

The onboard computer has been left running to monitor the clock system that will eventually wake Rosetta and a pair of heaters is operating to ensure that the spacecraft does not freeze as it moves through space: it has to maintain a safe temperature for the scientific instruments that are on board. The 31 months of 'sleep' will see Rosetta fly an arc of about 660-million kilometres from the Sun out to a distance of 790-million kilometres and then back again. The probe is the most distance spacecraft to operate on solar power and putting it to sleep will allow it to draw even less.

Rosetta was launched in 2004 and has made a number of fly-bys of inner planets en route to its comet target. It has been using gravity from these planets to increase speed so that it can intersect with and orbit the comet in 2014.

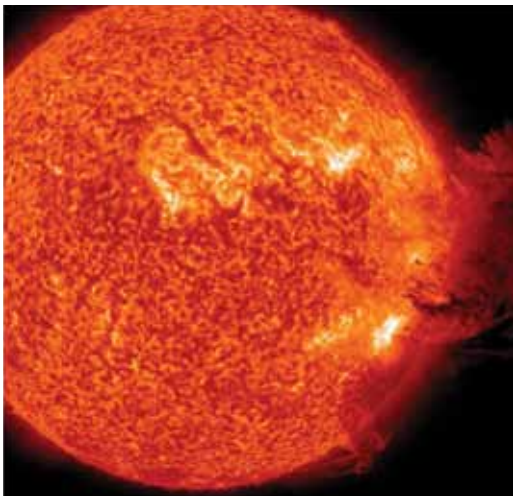
Comets are mostly giant snowballs and contain materials that are believed to have hardly changed since they were formed about 4,6-billion years ago. Researchers hope that information from the comet will improve their understanding of how space has evolved over time.

Artist's impression of the Rosetta Spacecraft (Credit: ESA - C. Carreau).

Unusual solar flare reported by NASA

An unusual solar flare observed on the Sun by NASA is likely to cause some disruptions to satellites, communications and power on Earth.

The firestorm of radiation was the largest witnessed since 2006 and indicates that the Sun is again starting to produce significant coronal mass ejections after being relatively quiet for the past few years.



According to Bill Murtagh of the National Weather Service's Space Weather Prediction Centre, the initial flare was not that big, but then the eruption occurred, energy particle radiation flowed in and there was a big coronal mass ejection.

NASA's solar dynamics observatory, launched in 2010, provided high-definition pictures and a video of the event that was described as "visually spectacular". Because the eruption was not directed at Earth, its effects were expected to be reasonably small.

Murtagh said that space weather analysts were watching the fallout of this explosion closely to see what effect it would have if the magnetic fields of the Sun and the Earth collided.

He said the predictions were that it would cause a moderate or minor geomagnetic storm on Earth. The frequency of geomagnetic storms increases and decreases according to the Sunspot Cycle and are more common during the maximum of the solar cycle.

A geomagnetic storm causes a temporary disturbance of the Earth's magnetosphere. The increase in the solar wind pressure compresses the magnetosphere and transfers increased amounts of energy into it.

During the main phase of a storm, electric current in the magnetosphere creates a magnetic force, which pushes out the boundary between the magnetosphere and the solar wind.

In 1989 a geomagnetic storm energised ground-induced currents that disrupted electrical power distribution in Quebec and spread as far south as Texas, leaving nine million people without power for nine hours.

In July 2000 another huge coronal mass ejection, observed by Voyager1 and Voyager II, occurred, but no electrical power failures were reported.

SA to invest billions in R&D

South Africa needs to invest heavily in research and development within the science and technology sectors and the Department of Science and Technology has confirmed that it has received a R4,4-billion injection to develop human capital and expand the necessary infrastructure in research and development.

DST Minister Naledi Pandor says that funding for science and technology needs to be increased and that post-graduate students and senior researchers should be given considerably more support for the work they are doing.

Pandor conceded in her budget speech presented to Parliament that the DST's biggest problem was finding suitably qualified people to fill the many vacancies that exist within the department.

She says that the department will establish an additional 62 research chairs to focus on technology missions, priority research areas, science and technology initiatives that focus on poverty alleviation and to improve engineering and applied technology within the country.

The expansion of the South African Research Chairs Initiative means that the country will have a total of 154 research chairs by 2014 and they will receive about R428-million in government support.

She says the DST will ensure that an additional 25 post-doctoral fellowships, each worth R180 000 a year for three years, will be created.

The department also intends to invest R1,43-billion in research equipment and infrastructure over the next three years and one of the important objectives of this project is to ensure that all public university campuses have broadband Internet connectivity that links them to the South African Research Network.

The DST was allocated just R4,1-billion in the adjusted estimates for 2010/2011 of which it managed to spend 98% of its budget. The amount of money allocated to the DST is miniscule when compared with other national budgets for health, education and defence.

Beatrix mine is home to special worms

A tiny multicellular organism known as *Halicephalobus mephisto* has been discovered at Beatrix gold mine near Parys in the magisterial district of Matjhabeng. Geoscientist Tullis Onstott of Princeton University, working with colleagues from South Africa, Belgium and the Netherlands, says it is less than half a millimetre long and belongs to a vast and diverse phylum of nematodes.

The worm appears to tolerate temperatures exceeding 37°C and feeds on sub-surface bacteria. The researchers studied soil and water samples from the mines to identify the nematodes.

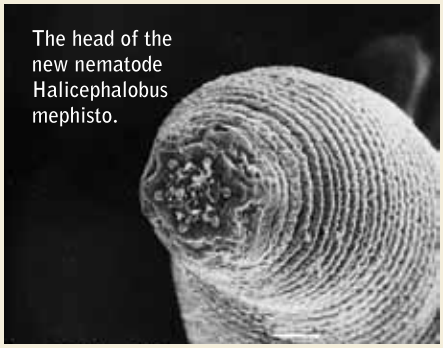
The samples indicated that while the nematodes live in the deep fracture water of the mines, they do not inhabit surface-level mining water. The researchers say that scientists searching for signs of life on other planets should take note of their findings.

This is not the first surprise to come from South African mines. A group reported finding a single bacterial species in samples taken from more than three kilometres beneath the ground. There is growing evidence that bacterial communities can form on surface cracks in the rock and survive in high temperature in high salt concentrations that would kill most surface organisms.

The researchers opened up boreholes from the mine and started filtering water from one of them. A sample of a nematode was found and its DNA analysed. A second sample yielded a worm that refused to reproduce in a laboratory.

A known species of nematode, *Plectus aquatilis* was found in one water sample but a different water sample yielded the *Halicephalobus mephisto*. The researchers then had to set out to prove that the nematode could really live permanently at these depths.

Fortunately, the boreholes had been sealed off for months prior to work, which meant that anything the researchers found had to be able to survive in these conditions. The water in which they were living contained small amounts of carbon-14, a radioactive isotope that is only produced in the atmosphere. The low levels of this isotope indicated that it hadn't been in contact with air for thousands of years.


The head of the new nematode Halicephalobus mephisto.

Moreover, bacteria found in the same samples as the worms indicated that they are the same as those found in sub-surface communities, leading the researchers to conclude that their samples had not been contaminated.

The bacteria also gave them an indication that there was enough life underground for the worms to survive.

Nematodes and bacteria have frequently been found in remote places that include caves and deep sea vents indicating that there is a link between sub-surface communities and ones that live in extreme conditions underground.

Using carbon fibre to store electricity

Scientists at the Imperial College in London are working on a battery-powered model car that has been modified to increase the amount of electrical energy it can store by using body components that double as capacitors to hold an electrical charge.

According to Dr Emile Greenhalgh, the amount of energy provided by these capacitors is modest but experiments have shown that the material can be used to smooth demands on a battery, thus enhancing its life.

Designers of full-size vehicles are using his research to increase battery reserves and so increase the range of the vehicle. Larger batteries are not necessarily the best solution and reducing the mass of a vehicle does not completely solve the problem either.

Engineers are developing car frames and bodies made of carbon fibre reinforced composites that can be 50% lighter than steel but provide better strength and rigidity. However, carbon composites are mostly too expensive for mass market vehicles. By using carbon composites that double-up to store energy some of the problems facing designers should be resolved.

To allow the carbon composite to hold energy, the resin used to bind the carbon fibres is laced with lithium ions, which serve as conductive electrodes to create the charge-holding capacitors.

It is different from a battery that produces electricity from a chemical reaction.

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Shipload of rubbish

A boat that was built entirely from recycled plastic bottles and other bits of rubbish, including old advertising banners, has set sail in Taiwan to raise awareness of the marine environment there.

The trimaran, named Polli-Boat, has a main flotation system that uses a series of interlocking plastic bricks made from recycled plastic bottles and is strengthened using polyethylene terephthalate (PET), the most common plastic in use today.

The seven metre boat has a flotation pontoon made from 804 of these plastic bricks that, once locked together, allow it withstand the pressures caused when sailing.

According to Arthur Huang, the founder and managing director of Miniwiz Sustainable Energy Development, the trimaran is powered by wind as well as solar energy to run a small engine and keep various instruments on board operating smoothly. It has six solar panels on deck and each panel is capable of producing 72W for the electric motor used by the boat when there is no wind around or to help it moor in the harbour.

The boat is set to tour the whole of Taiwan and is one of the competitors in a friendly creative boat competition being held throughout the country. It has been sponsored by the National Geographic Channel of Taiwan who paid for contestants to build ten of the boats – from more than 200 entries – that were submitted to it. One of the novel ideas was a vessel built in the shape of an endangered black-faced spoonbill. This boat is aimed at promoting wetlands protection.

Microbes power a light bulb

Scientists may start using microbes to generate electricity after discovering how they let off tiny electrical charges. The bacteria were found to contain microscopic 'wires' that stick through the cell walls. These microbes might also be used to clean or spills or curb uranium pollution.

According to scientist Tom Clarke of the University of East Anglia in England the discovery of the exact structure of the bacteria and their atom-sized wires would allow researchers to design electrodes with better contacts to pick up the charges let off by microbes to avoid a build-up of electricity.

Clarke says this would mean that electricity could be harvested from bacteria. He says that until now it has been a bit like trying to build a radio when you do not know what type or size of battery you will use.

Now, he says, the scientific community has a blueprint for the wiring of the bacteria. Every living creature uses electricity: in humans, for instance, electricity keeps hearts pumping and brains thinking. The bacteria use their wires to discharge excess electricity. "If they get a build-up of charge then everything else stops, from feeding to respiration," he says.

Clarke believes that it could take up to ten years to develop and use the bacteria that are of a type called *Shewanella oneidensis*. These bacteria would be able to live in an oxygen-free environment and could be used as a power source for everything from light bulbs to mobile phone chargers. He says that existing uses of such bacteria would have to become about a hundred or possibly a thousands times more efficient than they currently are.

However, Clarke says that the findings could help to speed-up development of microbe-based agents that could be used to clean up oil spills, or in fuel cells that are powered by sewage or compost.

Clarke points out these bacteria do not need energy-rich fuels to thrive as they can survive inside an oil slick or even degrade used oil and produce energy at the same time. He says that bacteria could be used in nuclear plants to separate uranium from waste water and could be useful in helping to clean up after an accident like the one that occurred at Japan's Fukushima Daiichi plant earlier this year.

Autonomy in court:
who is liable when the robots are amongst us?

by Gavin Chait

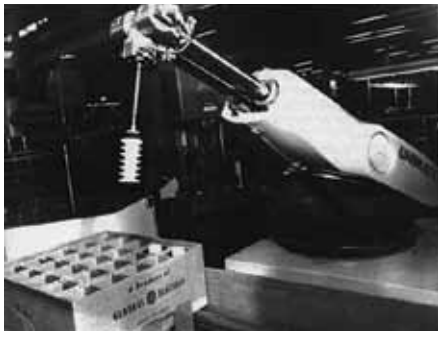
"The marketing division of the Sirius Cybernetics Corporation defines a robot as 'Your Plastic Pal Who's Fun to be with.' The Hitchhiker's Guide to the Galaxy defines the marketing division of the Sirius Cybernetics Corporation as "a bunch of mindless jerks who'll be the first against the wall when the revolution comes," with a footnote to the effect that the editors would welcome applications from anyone interested in taking over the post of robotics correspondent. "

This excerpt from Douglas Adams' eponymous series is only partly in jest.

Robots are now used routinely for dangerous processes or where the job requires high accuracy but tremendous repetition. These environments are either defined – like a factory, a mine or even a farm – or they are remote from humanity – like the bottom of the ocean or in the aftermath of a major environmental disaster.

Robots do not necessarily have to be intelligent. They are devices programmed to perform simple, repetitive tasks. Increasing robotic sophistication will lead to robots that are able to perform an ever wider variety of tasks.

The first company to produce an industrial robot was Unimation, founded by Joseph F. Engelberger in 1962. Unimation robots were also called programmable transfer machines since their main use at first was to transfer objects from one point to another, less than a dozen feet or so apart. They used hydraulic actuators and were programmed in joint coordinates, that is, the angles of the various joints were stored during a teaching phase and replayed in operation.



In 1969 Victor Sheinman at Stanford University invented the Stanford arm, an all-electric, six-axis articulated robot designed to permit an arm solution. This allowed the robot to accurately follow arbitrary paths in space and widened the potential use of the robot to more sophisticated applications such as assembly and arc welding.

Interest in industrial robotics swelled in the late 1970s and many companies entered the field, including large firms like General Electric, and General Motors (which formed joint venture FANUC Robotics with FANUC LTD of Japan).

The first general service robots performed some of the worst jobs then undertaken by people. That displacement will continue. In October 2000 the UN estimated that there

were 742 500 industrial robots in use worldwide. More than half of these are being used in Japan.

In April 2001 the Global Hawk robotic spy plane charted its own course over a distance of 13 000km (8 000 miles) between California, US, and Southern Australia. A decade later, where would the war in Afghanistan be without attack drones and automated reconnaissance craft?

Robots are also moving into defined professions, like mining, farming and medicine.

Rio Tinto, one of the largest mining companies in the world, is preparing its Australian operations to become robotic. They are developing automated tunnelling machines, driverless trucks, trains and drilling rigs. Other robotics aim to lay explosives. The objective is to remove people from an extremely hazardous environment.

In agriculture Vision Robotics Vineyards Products has created Snippy, which is designed to prune as much as 400 acres of grapevines per season. Dairies have introduced robotic milking machines. Combine harvesters drive themselves.

Lost in the noise surrounding the BP disaster in the Gulf of Mexico were the inordinate numbers of remotely and autonomously operated underwater robots used to seal the oil spill.

Each of these technologies enables dangerous and repetitive tasks to be safely isolated from people. The next domain, though, is where non-professionals come into contact with machines.

Microsurgery places the instruments on tiny probes that are operated by a surgeon who doesn't even have to be in the same room as the patient.

The Roomba robotic vacuum cleaner is about the size of a frizbee and only slightly higher than a thick book. Manufactured by iRobot, it is an artificially intelligent device that does exactly one thing: it vacuums your house. It empties and recharges itself at its base station and tries not to scare your cat.

These classes of devices, both professional and consumer, now meet ordinary people. Inevitably, when things go wrong, someone has to be held accountable.

Intuitive Surgical, a California-based firm, produces the Da Vinci remote-controlled laparoscopic surgical robot. A surgeon views a stereoscopic image and controls the robot's probes via specially designed wrist and finger controllers. At the patient, a four-arm robot enters the patient through tiny incisions.

The objective is to minimise the level of invasive surgery, reduce the potential for excessive bleeding and peripheral damage, and speed up healing.

This is not an extension to existing surgical techniques, it is something entirely new. Surgeons who are not adequately prepared can get themselves into heaps of trouble.

And so two surgeons at the Wentworth-Douglass Hospital in New Hampshire are being sued for accidently severing a woman's urethras during surgery. According to the Wall Street Journal, the hospital says that the training it requires of its surgeons on the robot—a two-day course operating on human and pig cadavers followed by four live cases supervised by a proctor—is adequate and that its Da Vinci complication rates are below rates published in recent studies. Which highlights the dangers.

Where a human being performs a task unaided and fails at it – despite his or her best efforts – we, society, are willing to chalk that up to experience and try again. The first recipients of heart transplants didn't live long, but neither did they sue their surgeons who went on to become celebrities for pushing back the boundaries of what was possible.

Place a semi-autonomous machine between the human and the task and suddenly liability turns up.

Google is currently struggling to introduce even a pilot for its autonomous vehicle project, this despite the obvious need to find ways to reduce car accident fatalities.

The US, with a population of almost 400 million, suffers some 40 000 car accident fatalities a year. South Africa, with a population eight times less, suffers over 13 000 traffic-related fatalities a year – 2.6 times more per capita than does the US.

Despite this, automated vehicles – no matter how safe – are illegal. Google is

asking the Nevada legislature to relax restriction on its vehicles so that it can run road tests there. According to the New York Times, "Enabling the development of driverless cars will require squadrons of lawyers because a variety of state, local and federal laws presume that a human being is operating the automobiles on our roads. No state has anything close to a functioning system to inspect whether the computers in driverless cars are in good working order, much as we routinely test emissions and brake lights. Ordinary laws change only if legislators make those revisions a priority. Yet the mundane political issues of the day often appear quite pressing, not to mention politically safer than enabling a new product that is likely to engender controversy."

Seven Google autonomous vehicles have already clocked up 140 000 miles driving around California. To overcome legal complications, each vehicle had a passive driver sitting bored – and immobile – behind the wheel to override the vehicle should anything untoward happen.

In the UK, two of the tube lines are operated autonomously, the Victoria and Central lines. Despite this, the Rail, Maritime and Transport Union has ensured that a person sits at a button to enable and disable the vehicle. The Union's claim is that drivers are necessary to ensure smooth operations, yet the train network is ideal for automation. Trains run on defined routes. Switching isn't handled by the driver, but by a central control system. Instead of controllers telling drivers to slow down, start or stop, this can easily be done automatically.

Recent labour union activity by the unions has accelerated discussions about automation, especially considering the R1.5 billion a year that could be saved by doing so. Expect lawsuits from the unions.

Transport is only one area of development. During 2011 four telepresence robots are due to be launched: AnyBots QB, Gostai's Jazz Connect, Mantaro's Bot and the VGo. Think a computer running Skype and a webcam on a wheeled robot.

AnyBots QB

Gostai's Jazz Connect

VGo

This permits remote engineers to visit your factory in Guatamala and Australia during the course of a set of morning meetings. However, what happens if the device gets hacked and runs amok, or steals and transmits proprietary technical knowhow? In a 2009 paper published by the Institute of Transportation Studies at the University of California, the Liability and Regulation of Autonomous Vehicle Technologies, the authors consider the legal implications for manufacturers.

"The decrease in the number of crashes and the associated lower insurance costs that these technologies are expected to bring about will encourage drivers and automobile-insurance companies to adopt this technology ... manufacturers' products liability is expected to increase, and this may lead to inefficient delays in the adoption of this technology."

This paper, and others—including Liability for Autonomous Agent Design, a paper from Stanford University—fully expect mass lawsuits aimed at manufacturers of autonomous devices. Their offered solution is that governments create a legal framework in which a consistent approach to evaluating risk is agreed.

Economists are already dusting off tomes on opportunity cost to highlight ways in which lawsuits penalise innovation. If a single automated train misses a station once it will receive far more news focus than would any number of such misses by human operators. The first robotic car accident will trigger demands from a terrified public that such vehicles be banned despite hundreds of human-related accidents taking place simultaneously.

All of this harks back to ex-president Thabo Mbeki complaining that anti-retroviral medication caused headaches and nausea so he preferred that AIDS victims die than suffer side-effects.

The likelihood is that lawyers will not stop the introduction of this technology. Lawsuits will simply increase liability insurance premiums and increase the cost of the technology.

The robots are still coming.

Wimbledon final broadcast in 3-D

Anyone with access to a 3-D television set was able to watch the finals for both the men and women in live 3D via the BBC's first live 3-D broadcast. The broadcaster's Danielle Nagler said that it was the first attempt by the company to provide a live broadcast of this nature.

About six million people from all over the world watched the matches, but how many of them were viewing the 3-D broadcast is a matter of conjecture.

BBC's executive sports producer Paul Davies said the transmission was a first for the corporation. The BBC first experimented with a 3-D broadcast in 2008 when England played Scotland in a Six Nations rugby union championship. The broadcast was streamed to about 200 industry insiders who were able to experience the match played at Murrayfield.

The broadcast was limited to a cinema theatre where viewers were given special 3-D glasses. Apparently once the game started the experience was "totally immersive" with scrums just feet away while the sense of depth in the crowds gave the viewers a feel of sitting right inside the stadium.

Since then the technology has improved by leaps and bounds and the broadcast of the Wimbledon finals was regarded by the BBC as a huge and resounding success and an indication of what lies ahead for future broadcasts of major sporting events.

PneuDrive Challenge 2011 open for submissions

The PneuDrive Challenge 2011 is officially open to receive entries from 30 June 2011. The final closing dates for submissions are 15 October 2011.

The competition, an engineering design competition, aims to show the functionality of the sponsors' products—SEW Eurodrive and Festo—in the workplace. The theme for this year's competition is the Food and Beverage industry.

The submission date for the competition has changed. "This," says Rene Rose, GM Communications at SEW Eurodrive and member of the PneuDrive Team, "is so that more universities have the opportunity to participate.

"We understand that universities have a set curriculum and delighted that certain universities have been able to fit the competition into their year planning. But, we do understand this is not the case for everyone and we wanted to give students more opportunity to fine-tune their submissions before handing them in."

The competition takes up a lot of time and engineering students who are already pressed for hours find it hard to fit in a project of this nature. By extending the deadline, the competition organisers have allowed those universities who have the design curriculum as part of their second semester the opportunity to incorporate the competition into their course work while also allowing students who want to participate more time to work on the project.

The national competition, in its fourth year, is open to all South African third and fourth year university students in the fields of mechatronic, electronic or mechanical engineering. Students are encouraged to enter in groups of four as this helps them to share the workload and the knowledge. The project is essentially mechatronic and designed to give students a sense of what projects in the workplace might entail.

There is a strong focus on business acumen in this competition. "We want to give students a taste of what business is about. They need to design something with a client in mind, being aware of cost, timing, practicality and total cost of ownership. Nowadays everyone is focused on energy efficiency and the long term benefits of a solution. This competition places heavy emphasis on these issues as well," says Rose.

The judges for the competition are being finalised and will include leaders in industry. According to the competition organisers, there will be two international judges from the sponsors' parent companies in Germany.

PNEUDRIVE CHALLENGE 2011

More information about the competition can be found on www.pneudrive.co.za Universities who would like to participate are welcome to contact the PneuDrive team on info@pneudrive.co.za or rrose@sew.co.za.

Cyber attack could be 'an act of war'

The Pentagon is expected to declare than any cyber attack from a foreign nation is an act of war. Several administration officials have suggested that President Barack Obama could consider a variety of responses to a cyber attack, including economic sanctions or a military strike.

The new military strategy emerged after years of debate and is modelled on efforts in the 1950s for the United States to come up with a plan for deterring nuclear attacks. It now says that a concerted cyber attack from a foreign source should be viewed as an act of war.

The Pentagon says that any computer attack that threatens widespread civilian casualties – for instance, by shutting down the electricity supply or halting hospitals or emergency services – could now be treated as an act of aggression.

American military officials have admitted that the strategy is deliberately ambiguous and is there as a deterrent. The strategy says nothing about how the US might respond to such a cyber attack from a terrorist group or from a private individual or company.

It also fails to establish a threshold for what level of cyber attack is required to warrant a military response. However, critics say that almost everything that the US military learned from the Cold War in the 1960s, 70s and 80s does not apply to cyber attacks.

Moreover, White House officials have said that any response from the government would constitute a "last resort" to halt cyber attacks. The US has called for international co-operation to improve computer security and neutralise possible threats.

Apple introduces iCloud services

Apple has introduced iCloud, a service that will allow users of any device to seamlessly have access to their content whether music, video or documents of any kind.

The iCloud service is, at its most simple, a means of synchronising data. However, the document syncing and device backup services offered by iCloud are big issues for enterprises because they allow personal and company information to be stored outside of a controlled infrastructure.

Risks have existed for some time because any user is able to back-up personal or company information on another device and transfer business information away from the controlled environment of an enterprise. Essentially the difference is that the user has to choose to back up the information whereas the iCloud service will do this automatically as soon as the user has a registered account with Apple's servers.

The iCloud platform is a means for all users to synchronise their data from different devices and to provide access to that data anywhere in the world. At this stage Apple will only automatically synchronise data from its own applications, such as Pages, Numbers or Keynote, but third-party applications are being developed to automatically synchronise the data from other software applications as well.

Each user is given an initial 5GB chunk of space to work with on the Apple servers but this can be increased at a cost. The new software includes a feature called Photo Stream that will automatically import up to 1 000 pictures from a computer running the mobile iOS system software and store them in iCloud.

Similarly, music files can be stored on iCloud and automatically synchronised with an iPhone or iPod. However, streaming music from iCloud is not possible so the music must be downloaded to individual devices. There is no limit to the amount of music or pictures that can be stored on a computer.

Apple has not said if any users will be able to merge the information from its existing MobileMe platform with the iCloud platform at this stage.

Graphene circuit made by IBM

Researchers at IBM have created high-speed circuits made from graphene, an ultra-thin material that has been used for a host of promising applications for high-bandwidth communications systems and a new generation of low-cost smartphone and television applications.

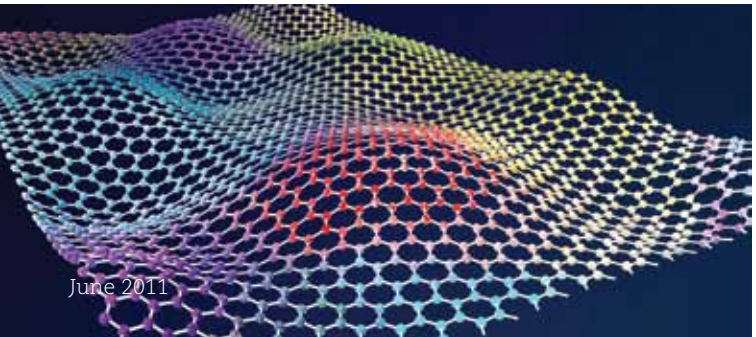
The IBM circuit is built on a wafer of silicon that shifts signals from one frequency to another. What the researchers did was to deposit several layers of graphene onto a silicon wafer and then create circuits based on graphene transistors and components known as inductors. They demonstrated that the technology could be used for frequency mixing up to speeds of 10GHz. In the past IBM created standalone graphene transistors but could not complete the electronic circuit.

Graphene is an atomic-scale lattice of carbon atoms and was first made as a flake in the 1970s. Researchers have gradually refined the manufacturing process to produce films of the material that are just one atom thick. The film arranges itself in a hexagon-shaped array of carbon atoms and has the advantage of being flexible, transparent and inexpensive.

However, IBM researchers say that it is not yet suitable to replace the CMOS transistors that are the basis of microprocessors and memory chips used in consumer electronic goods. Graphene does not have the physical properties of other semiconducting materials and cannot be used to switch 'off' or 'on' in the way that logic transistors do. Companies in the European Union and in South Korea have already invested $1,5-billion in building industrial-scale plants using graphene as the next generation of display materials. Singapore has also started to manufacture the material.

Manufacturers of displays – used for computer terminals and television sets – are particularly keen to use the material because the current displays are based on organic light-emitting diodes that have a limited lifespan.

IBM says that while it is now able to build complete circuits using the material, it is still working on ways to produce the material in large quantities. It says that by heating a silicon carbide wafer to 1 300°C, the silicon atoms on the surface evaporate and the remaining carbon atoms rearrange themselves into the hexagonal graphene shape. However, there is a high cost for using silicon carbine wafers and IBM is searching for other ways to make the material.



A kidney for an iPad

A young man in China chose to sell one of his kidneys in order to buy an iPad 2. The 17-year-old, identified as Zheng, told a Chinese television station that he had arranged the sale via the Internet.

The story hit the headlines after the boy's mother became suspicious. It highlights the extent of the black market for organ trafficking in China where the scarcity of organ donors has led to a flourishing trade.

Apparently the high school student responded to an advertisement offering money to organ donors. Illegal agents organised a trip to hospital for the teenager and paid him $3392 to undergo an operation to remove his kidney. He didn't tell his family he was planning to sell it.

Zheng used the cash he received to buy an iPad 2. However, his mother became suspicious that he had enough money buy the product and demanded to know how he had received it. He showed her the scar on his back and admitted to what he had done.

Organ trafficking has been banned in China since 2007 and the authorities there have set up a voluntary donor scheme in an effort to stop the trade in illegal organs.

The operation was performed in the Chenzhou No. 198 Hospital in Chenzhou City and hospital officials have admitted that they had rented out a part of the urology department in the hospital to a Fijian businessman.

The case is being investigated by the Chinese authorities who are hoping to bring charges against the man involved. The teenager has since suffered medical complications from the operation and says that he now regrets selling his kidney.

British Library makes 60 000 books available for iPad owners

The British Library has launched a special application for iPad owners that will provide them with access to more than 60 000 19th Century books that they will be allowed to browse through or read free of charge.

The application is being sold by the British Library but once installed there is no charge for accessing the thousands of volumes. The organisation says that it gives readers the "very best way" of accessing thousands of old volumes that were produced the way the authors originally intended.

The application allows for full viewing of pull-out maps and original illustrations.

The application was developed by the British Library in association with Bibliolabs, a development company that specialises in distributing old books on a digital platform.

According to Bibliolabs' founder, Mitchell Davis, the iPad allows for a level of intimacy with antiquarian books that evokes a sense of engagement and curiosity not possible in a browser-based environment.

The British Library says the application is part of a larger effort to make more of its historic collections available to a wider audience. Caroline Brazier, director of scholarships and collections at the British Library says that the books provide a wealth of historical, scientific and cultural content for researchers and general enthusiasts alike.

The library is considering making the application available for other platforms including the Android and the Kindle.

Lockheed, RSA Security are victims of cyber attack

Lockheed Martin, one of the United States' largest and most strategic companies is trying to determine how hackers managed to access its computer network and gain remote access to its systems.

Lockheed and RSA Security, which supplies coded access tokens to millions of corporate users and government officials, said that they were trying to establish if any of the data used by hackers had been stolen from RSA in March or if they had simply exploited another weakness in the security systems.

The attack occurred in May and was said to be significant and tenacious. Lockheed officials said they managed to halt the attack shortly after hackers got into the system and no customer or company data was compromised.

Lockheed Martin is the country's largest military contractor and is just one of a host of military companies that have been attacked by hackers who are seeking national security data.

Officials at Lockheed and at RSA Security – which supplies the SecurID brand of electronic access tokens – are working with federal officials to investigate how the attack occurred and who was behind it.

Both companies say that they have increased their network security and that all the SecurID tokens made by RSA have been upgraded by resetting user data and passwords. Lockheed has switched from four-digit codes to eight-digit codes in response to the attack.

Moreover, Lockheed has added an additional password for users who want to access the secure network run by the company.

Federal officials say that China, Russia and other countries are sponsoring hackers who try to ferret out American military and corporate secrets. Industry officials specialising in network security say that many companies have been forced to increase levels of network monitoring because of constant attacks from hackers trying to gain access to company computers.

Another cancer risk warning for mobile phones

Cellphone users have again been warned that extensive use of mobile phones could cause brain cancer. As a result, users are encouraged to use text messaging or a hands-free kit. The warning comes from the World Health Organisation.

The radio frequencies used by mobile phones generate electromagnetic fields that are possibly carcinogenic to humans according to the International Agency for Research on Cancer (IARC).

Delegates attending an eight-day meeting of experts in Lyon, France, said that they had "reached this classification based on a review of evidence coming from epidemiological studies" that pointed to an increase in the incidence of glioma, a malignant type of brain cancer.

Jonathan Samet, president of the working group of experts, said that two studies, conducted over the past ten years, showed a higher risk in those people who used mobile phones intensively.

Some of the users tracked in the study had spent about 30 minutes a day on the phone over a period of around ten years. Samet said the experts simply did not know what might happen if people used their phones over longer periods.

There are currently about five billion mobile phones registered in the world today and the number of phones and the average time spent using them has increased dramatically in recent years.

The IARC warned that current scientific evidence showed a possible link – although not a proven one – between the use of wireless devices and an increased risk of cancer.

The IARC stopped short of issuing a formal warning but Samet said that users were advised to send text messages or use hands-free devices rather than a mobile phone.

The warning is not limited to cellphones but applies to those cordless devices that are linked to an ordinary landline as well. About a year ago the IARC said that there was no direct link between the use of mobile phones and brain cancer but it now says that the data used for that report was "out of date".

The new review was conducted by a panel of 31 scientists from 14 countries and was reached after full consensus from the group. The panel has stressed that there is a need for more research and that technology should be improved to lower emissions.

Cellphones are grouped with fibreglass wool and petrol exhaust fumes in Group 2B as "possibly carcinogenic".

Smartphone sales to rise by 55% this year

Demand for smartphones throughout the world is expected to increase by 55% this year according to research firm IDC. It says the sales growth is being fuelled by lower prices, cheaper data plans and growth in emerging markets.

IDC's Kevin Restivo says that mobile phone users are exchanging their talk-and-text devices for smartphones that allow users to perform daily tasks which include shopping and banking from anywhere in the world.

IDC expects Google's Android smartphone operating system to become the leading operating system worldwide – it surpassed Nokia's Symbian system last year – to hold about 40% of the smartphone market by the end of this year.

Nokia has recently announced that it is ditching its own operating system and switching its new phones to run on the Microsoft Windows Phone software instead.

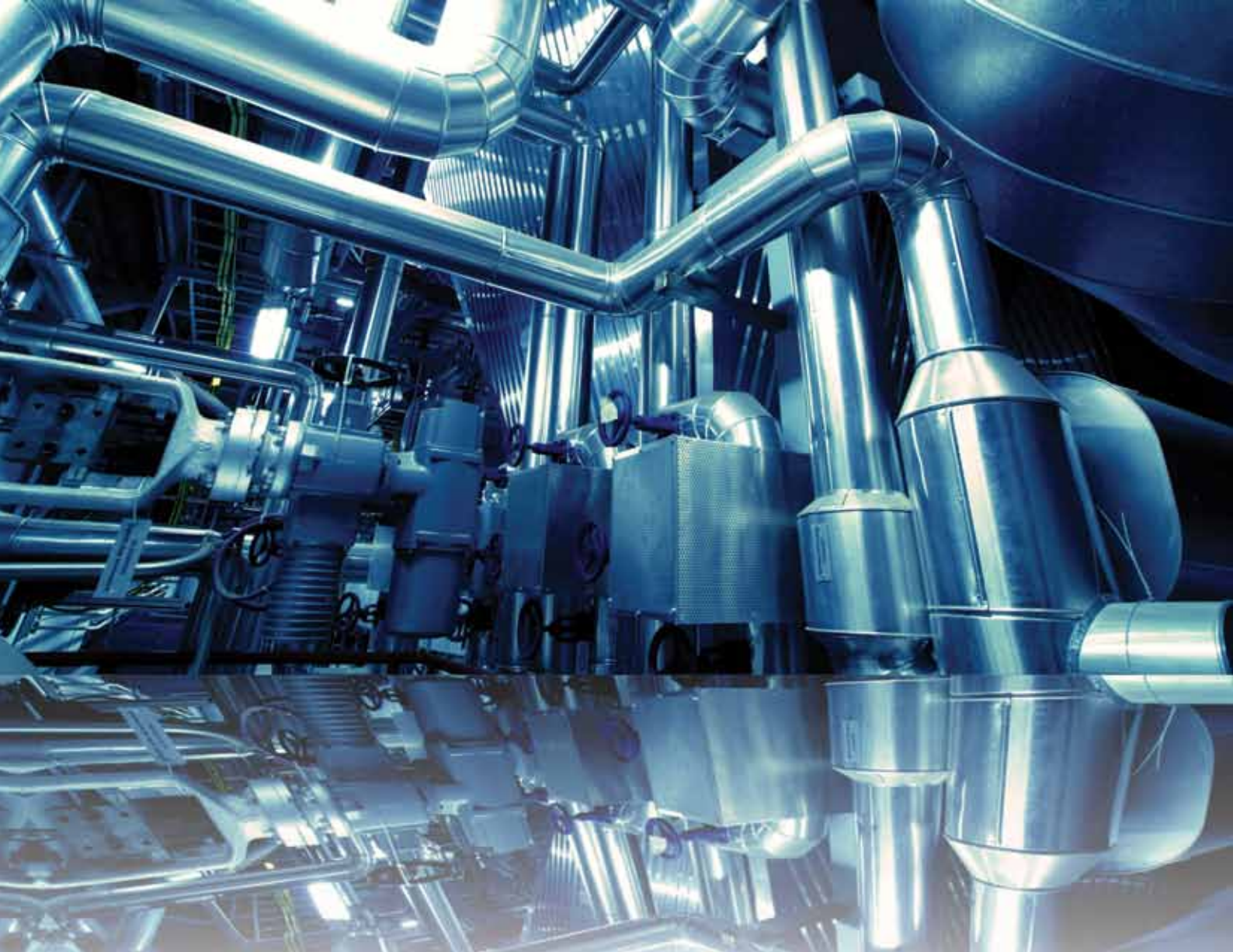
IDC predicted that the Nokia Windows phones were likely to capture about 20% of the smartphone market by 2015 if the Nokia-Microsoft integration process goes smoothly.

Meanwhile Samsung Electronics says that its smartphone shipments in Taiwan will double this year from last year on the back of higher-tier phones that are being introduced by the company.

The company says it will unveil its new phones – that use the Android operating system – in the second half of this year. The next largest smartphone device is Apple's iPhone, which has a market share of about 16%

BlackBerry, the dominant smartphone used in the South African market with about 1-million users, will be the smallest of the smartphones being sold worldwide by the end of this year with a market share of just 15% according to the IDC report.

In 2010 iModerate Research Technologies predicted that 52% of people planning to buy a new device said they would purchase a smartphone rather than a regular cellphone.



The importance of electrical energy

How we landed in this mess and the challenges facing us

by Koos Holtzhausen

In Greek mythology, Prometheus a champion of mankind known for his wily intelligence, stole fire from Zeus and gave it to mortals. Zeus punished him for his crime by having him bound to a rock where a great eagle ate his liver every day only to have it grow back to be eaten again the next day. It has been said that the Prometheus myth is presently being re-enacted with the over-exploitation of Earth's resources by mankind who, having overstepped his mark, is now being punished by the gods.

Once upon a time, I suppose, man lived in utopian balance with nature: initially only eating plants and fruit, later hunting wild animals and sometimes falling prey to them. At some stage his intellect enabled him to invent techniques and equipment to simplify everyday life: lighting a fire, making stone tools, and creating the bow and arrow, the plough, the lever and the wheel. Later he would harness the forces of nature to replace his muscle power; wind and water power for tasks such as grinding seeds and driving saw mills. One day James Watt noticed that steam from a kettle could be used to cause rotation of a wheel, similar to a water wheel. At that point, the stage was set for the Industrial Revolution.

Fuel in the form of wood or coal (fossilised wood) was used in boilers to produce power for flour mills, saw mills and cotton weaving machines. It was also during this time that Michael Faraday and others observed that electricity is generated when a magnet moves past a copper wire. Mechanical power, produced by steam can be used to generate electricity. The reverse process was also demonstrated: electric current flowing in a

copper wire near a magnet experiences a mechanical force. Everything was now in place for the use of electrical transmission networks: electricity, generated in regions with abundant coal was transmitted over high voltage lines to centres where it was used to drive electric motors and supply heating and electric lights. In countries with large rivers, such as the USA, dams and hydro-electric power stations were constructed instead of coal fired power stations.

The advantages of these developments included employment, which lead to vibrant economies, the elimination of smoke from chimneys and the use of electric lights, electric stoves and heaters. Apparently, the associated negative effects were not realised at that stage, but included: air pollution near power stations, although often in areas remote from residential areas, acid rain, damage to the environment near coal mines, water pollution and last but not least global warming. Further disadvantages were the exploitation of workers and the use of child labour.

The effects of the Industrial Revolution were initially confined to Great Britain, Central Europe and the USA. South Africa was also subjected to industrialisation, due to the discovery of diamonds and gold, and Kimberley acquired street lights shortly after New York. The developments had a huge impact on the well-being of the industrialised nations and, aided by developments in science, medicine and notably the availability of pure water, resulted in a general increase in life expectancy. These advantages were unfortunately not shared by all nations and all sections of the community. However, it remains an ideal for many, as expressed locally by the Electricity for All slogan of the ANC. After the Second World War large scale industrialisation took place in Eastern countries, China being the latest example.

Can such development continue unabated? In the fifties and sixties of last century the so-called 'population explosion' was a major concern globally. In a research paper, Theodore Steck pointed out that in developed and undeveloped nations the number of births is cancelled out by an approximately equal number of deaths. The reason for this is that in undeveloped communities tradition favours a high birth rate, while the high mortality is caused by the absence of medical care. In developed communities both the birth and death rates are low due to the effects of industrialisation, medical science and birth control. However, during the transition from undeveloped to developed, traditions still play a role while medical services become available, resulting in a high birth rate and diminished mortality, i.e. a population growth. It would seem that South Africa falls into the latter category. According to the United Nations the world population growth rate reached its peak of 20 per thousand in 1970 and has since declined to the present 11 per thousand.

In countries with established energy consumers the main concern is not the population growth but the exorbitant per capita rate of energy usage. Another concern is the awakening of countries such as China, India and some in Africa whose citizens yearn for an American lifestyle and in the process take up their share of the global energy sources.

According to the IMF the world economy grows at a rate of between 4 and 5 per cent. Such growth is necessary to ensure an acceptable standard of living for everyone. However financial growth must be underpinned by growth of available energy. Where will this energy come from? In 2007, the main sources of energy for electricity generation were: oil (5%), coal (42%), gas (21%), nuclear (14%), renewable (solar, wind, hydro; 18%). Oil, gas and coal are non-renewable sources in the sense that they are fossil materials that were formed long ago and will run out at some time. These three are also known as culprits with regard to global warming. Uranium sources are limited but only relatively small quantities are used. Nuclear power is regarded with distrust in many countries—a sentiment reinforced by the Chernobyl, Three Mile Island and more recent Fukushima incidents— even though countries such as France rely heavily on nuclear power and their safety record is excellent.

The other sources are renewable in the sense that they cannot be depleted: the sun will shine, the wind will blow and it will rain. Some African rivers, notably the Congo River, have considerable potential for new hydro-electric schemes. However, political stability remains elusive. If developed successfully, these schemes could supply power over high voltage power lines to South Africa and even to Europe. Nowadays, harnessing of the wind and solar radiation is high on the agenda but it remains to be seen if these sources can supply the large constant base load required by industry. At present this function is served by coal-fired or nuclear power stations. The recent disasters at Japanese nuclear plants, following the earthquake and tsunami will strengthen the anti-nuclear lobby and will impede the construction of new nuclear power stations.

How much energy are we using presently and how much do we need in future? It is interesting to compare the per capita power consumption of various countries. Installed generating capacity can be used as an indication of dependence on energy and in the accompanying table the installed generating capacity per capita is given for various countries. The table only includes domestic and industrial electrical energy and excludes other sources such as petroleum used for transport.

CPD Overview

WATTnow, in conjunction with the SAIEE, launched this programme for engineers who need to meet their professional development commitment by acquiring Continuing Professional Development (CPD) credits in Category One (10). In terms of the renewal of registration requirements, all registered professional electrical engineers, technologists and technicians must earn CPD credits so that after five years they have acquired at least a total 25 CPD credits in all categories and at least five credits in Category One (1). The **WATTnow** CPD Programme provides a convenient and cost-effective way for engineers to acquire the Category One (1) CPD Credits. Failure to certify CPD credits could jeopardise renewal of their registration (CPD credits in the other Categories Two (2) and Three (3) must be acquired by other means – see the ECSA Rules on this aspect).

WATTnow publishes CPD articles in each issue that entitle subscribers to the scheme to claim for Category One (1) CPD credits. The programme requires engineers to respond to set questions posed on articles that are specially designed and validated to provide CPD credits. Engineers using the programme can accumulate 0.1 CPD credits per month if all the questions are answered correctly. **WATTnow** is published monthly so a total of 1.0 CPD credits can be acquired annually by this method. The articles and questions set are independently validated and reviewed by the SAIEE to which Validation numbers are allocated and should be recorded by subscribers.

Each year, **WATTnow** will supply a series of DVDs of lectures/conferences on topics that have been validated for CPD by the SAIEE. These DVDs can be ordered via the **WATTnow** website by subscribers to the CPD Programme.

Questions relating to the DVDs will be available on the **WATTnow** website and members of the programme can submit their answers online. Correctly answering the questions on the presentations in the DVD will entitle the subscriber to claim credits in Category One (1). These credits are in addition to the credits acquired by answering the questions to the CPD articles.

The SAIEE will provide subscribers with a certificate that records the exact number of credits gained for his or her records.

The **WATTnow** CPD Programme is based on a subscription service that will cost non-members of the SAIEE R2 400 a year while members of the Institute will pay an annual subscription fee of R1 000. The programme offers all members of the **WATTnow** CPD Programme a one-stop-shop to participate in and comply with the professional development criteria laid down by ECSA and ensure that all professional engineers can maintain their status without having to search around and pay significantly more to attend CPD courses or conferences in order to acquire sufficient credits for Category One (1) to meet the ECSA requirements.

For further information visit www.wattnow.co.za

Installed generating capacity per capita for various countries (2007).

Country	Installed generating capacity (gigawatt)	Population (millons)	Watt per capita
Switzerland	19.2	7	2541
UK	84.5	60	1390
RSA	42.7	43	971
China	715.5	1321	541
Egypt	22.6	80	281
India	15.9	1129	14
Uganda	0.3	30	10

The table shows clearly the unequal division of the energy pie. Interestingly, South Africa compares favourably with the Western nations of Europe. Despite their massive generating capacity China still has some way to go. Furthermore, it is clear that Mother Earth will have difficulty in providing sufficient resources to bring everyone to the level of the Western nations who, including South Africa, benefited during what I call the energy picnic, from cheaply mined coal and hydro power.

What about the road ahead? There are at least three reasons why I think it is on the dark side.

- Firstly, even at a growth rate of 3% half a Koeberg must be built annually. The implications of continued exponential growth are terrifying. One can imagine a scenario with no room for people among all the wind farms, solar farms, nuclear power stations and power lines. Even if eco-friendly options were used, it would be difficult to meet the required rate of expansion in a sustainable way. No matter how great the need for energy, most people have the 'Not in my backyard, please' attitude. The message is quite clear: We will have to reduce our energy consumption. In Switzerland there is a movement afoot to reduce the hourly energy consumption (including all forms of energy, averaged over a year) from the present 5000 watt to 2000 in 2050 (the 2000-watt-society).
- Secondly, as mentioned above, the number of energy users will increase not only due to population growth, but also due to the millions that are desperate to improve their living standards. The only way to achieve this is by utilising energy resources. During the heyday of the growth of the South African economy the installed generating capacity increased from 4 000MW in 1960 to 40 000MW in 1990 – a tenfold growth in 30 years.
- Thirdly, a large portion of generating, transmission and distribution show signs of ageing. This came about by the tremendous expansion of networks during the sixties and seventies, worldwide, necessitating replacement in these days. Less capital will thus be available for expansion.

Doomsayers contend that we have already reached the point of no return and that Planet Earth will eventually turn to a state of desolation without any technology, allowing nature to take over again. Let's hope that they are too pessimistic and have forgotten the human capacity to adapt and to come up with ingenious solutions. Hopefully we will see the writing on the wall and curtail our energy usage drastically. Being an optimist and incurable technophile I believe that the engineers and scientists who could put a man on the moon and design computers and cell phones will come forth with renewable solutions and may even imitate the sun's fusion process. Meanwhile we have to pull our energy teeth ...

Dr. Holtzhausen is a retired lecturer of Electrical Engineering in the Department of Electrical and Electronic Engineering of Stellenbosch University and is presently a part-time researcher.
(A version of this article appeared on Litnet in Afrikaans)

Sources:

[1] Theodore L. Steck, Human population explosion, http://www.eoearth.org/article/Human_population_explosion, consulted 20/12/2010.

[2] World Electrical Installed Capacity by Type, 1980, 1990, and 2007, www.eia.doe.gov/aer/txt/stb1117.xls, consulted 20/12/2010.

[3] Population 2007 Country Ranks, http://www.photius.com/rankings/population/population_2007_0.html, consulted 20/12/2010.

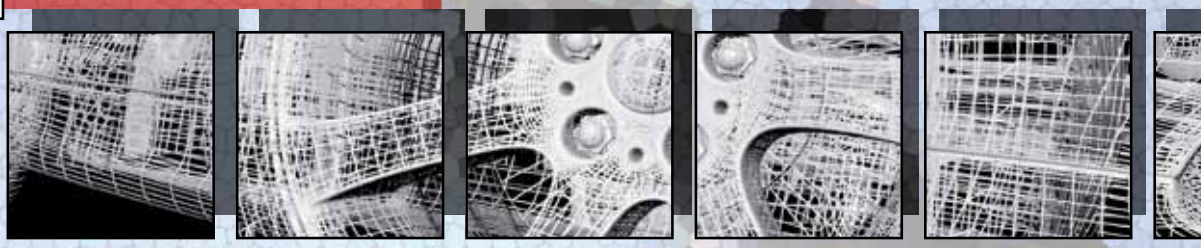
[4] World energy resources and consumption, http://en.wikipedia.org/wiki/World_energy_resources_and_consumption, consulted 20/12/2010.

[5] World economy, http://en.wikipedia.org/wiki/World_economy, consulted 20/12/2010.

[6] 2000-watt society, http://en.wikipedia.org/wiki/2000-watt_society, consulted 20/12/2010

[7] http://webbshop.cm.se/System/TemplateView.aspx?p=Energimyndigheten&view=default&cat=/Broschyrer&id=e0a2619a83294099a16519a0b5edd26f
Derived from EIA, International Energy Statistics database (as of November 2009), web site www.eia.gov/emeu/international. Projections: EIA, World Energy Projection System Plus (2010).

Enrol for the WATTnow CPD programme



1. Monthly articles, published in **WATTnow** and validated by the SAIEE CPD provide credits for Category One (1) by answering appropriate questions.

2. A series of DVD recordings of lectures/conferences held throughout South Africa also provide CPD credits by answering appropriate questions.

4. A simple, quick and efficient online answering system via the **WATTnow** website for subscribers to submit answers to CPD questions makes this method of acquiring credits easy and convenient.

5. A complete administrative system to ensure that credits acquired are correctly recorded and available to all subscribers.

6. Subscribers to the **WATTnow** CPD Programme receive an annual certificate from the SAIEE detailing credits obtained in a calendar year.

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SA to lead nuclear power in Africa

The South African government is determined to go ahead with its nuclear plan, bucking world reticence on nuclear power after the Japanese disaster at Fukushima, and is backing a shared continental approach to new nuclear power generation.

European countries, including Germany and Switzerland, have announced plans to cut back sharply on nuclear power and German authorities have said that they will stop all nuclear power generation within the next 11 years. At least seven of the country's oldest power plants have been taken off the grid and the remainder will no longer be generating power by 2022.

At a conference on nuclear energy, Dipuo Peters, Minister of Energy, said it was important to note that nuclear power and renewable energy would make a significant contribution to South Africa's generation mix in the years ahead.

She said that nuclear power should not be viewed as a quick-fix to South Africa's many power generation problems as it was a long-term solution that would address the potential energy crisis facing this country from 2023.

Peters claimed that South Africa had a balanced power plan for the future that would "responsibly use energy sources, including gas, biomass, nuclear, coal and imported electricity". She pointed out that African countries had rich uranium deposits and that security of electricity supply and nuclear fuel were key to the future of nuclear power.

The Minister argued that nuclear power had important political ramifications for the continent claiming that it would mean that it could rely on its own power generation capacity and its own nuclear fuel sources in the future. The new power stations would help in job creation efforts for the continent as a whole and would benefit all Africans, she said.

However, she emphasised that partnerships with trade unions and private suppliers and stakeholders had to form a key part of nuclear energy on the continent. She said that the disaster at Fukushima highlighted the need to be fully prepared for emergencies because Africa was not immune to the devastating effects of earthquakes or tsunamis.

She said that we all had an enormous task ahead of us to ensure that nuclear power plants could be operated safely and we that we had to trust of the people of Africa when it came to using this source of energy.

Peters paid tribute to Eskom for successfully operating its Koeberg power station, the only nuclear power plant in Africa, for 40 years without a hitch. "Without it" she said, "the Western Cape would not have had a sustainable or stable electricity supply and would have suffered losses if it had had to rely on the long transmission lines running from the Highveld where most of the coal-fired power stations are situated."

'E-Ship 1' takes to the seas

'E-Ship 1', the innovative wind power-propelled ship owned by Enercon, relies fully on automation equipment and engineering from Siemens, Industry Automation Division. The decisive factors for Enercon were the high reliability, redundancy capability and the marine certification of the Siemens systems.

The unusual sailing ship features unconventional wind rotors based on the Flettner principle and sets new standards in terms of environmental protection, efficiency and sustainability on sea.

The challenge for Siemens was to configure all automated systems to meet the specific demands of operation on sea. Consistent redundancy throughout all components of the ship automation systems applies from the field and control level to the visualisation level.

The integrated system with its redundant setup ensures maximum system reliability and availability: a must when it comes to ensuring smooth interaction between the sail propulsion and the E-Ship's conventional drive system.

With these automation systems, Enercon optimises the combined use of wind and oil as energy sources to fulfill its cargo shipments with minimum fuel input. A relatively small crew is able to transport three times more wind power plants as conventional comparably sized cargo ships. Intermediate decks, similar to the ones in car transporters, can be adjusted to any cargo that needs to be transported, be it blades, towers or other parts of a wind power plant. Loading capacity is thus increased.

The rotor sailing ship relies on four Flettner rotors. They use wind to generate compressive and suction forces, which help the E-ship's thrust and propulsion, thereby saving fuel. The ship features an aerodynamically designed hull and a special paint coating which minimises friction resistance in water.

Refit tariffs due out in June?

The National Energy Regulator of South Africa (Nersa) says that it will release its revised tariffs for renewable energy sometime in June even though these tariffs were expected in May this year.

Energy Minister Dipuo Peters says that the preparation of the procurement documentation under the Renewable Feed-In Tariff (Refit) will only be completed by December this year when government completes its procurement process.

However, she says the review of Refit tariffs will only affect the second phase of renewable energy procurement. Nersa's decision to revise the tariffs was announced in 2009 and has been widely criticised by the renewable energy sector.

Last year, the Development Bank of Southern Africa and the National Treasury released a request for information document for developers. Nersa said that it needed about R12-billion for the purchase of renewable energy between 2010 and 2013.

The request for proposals was intended to stimulate the procurement process through the use of, among other things, a standardised power purchase agreement and standardised agreements that cover transmission and connection to the national grid.

Eskom is the buyer of electricity and, once Nersa has finalised the tariffs, purchases could start possibly as early as the end of June.

However, the standardisation of agreements has not been completed although Eskom has apparently established a purchasing office that will be responsible for buying power from other producers. It has already started purchasing electricity from Sasol and Sappi as well as from various municipal power stations.

Electricity regulator, Thembani Bukulu, says that delays in the revised tariffs are the result of the many inputs that the regulator has received from a number of different sources. He says that once Nersa has analysed all this information the tariffs will be finalised so that they will 'stimulate investment' in the renewable energy sector.

Developers, however, warn that without clarity on price, procurement processes or the selection criteria to accompany the purchasing of power, there is a lot of uncertainty in the sector.

Mark Tanton of the South African Wind Energy Association says that they have been waiting for more than two years to get clarity from the regulator and warns that the purchase prices and the processes are a "crucial piece of the puzzle" for energy producers.

These fears are echoed by Pancho Ndebele, chairman of the Southern Africa Solar Thermal Energy Association, who warns that developers are "still in the dark" when it comes to selection criteria or tariffs that will be paid.

He says that developers are under the impression that only those bids underwritten by a financial institution will qualify for selection and warns that banks are unlikely to underwrite a project that does not have a power purchase agreement in place that is binding and bankable.

Ndebele says that developers will probably have to provide a proviso that the underwriting is subject to securing a signed power purchase agreement prior to raising the necessary capital for a renewable energy project.

Climate change, clean development mechanism (CDM)

This three-day course will cover, *inter alia*, climate change agreements, basics of CDM, methodologies and tools, verification and issuances, accounting and neutralisation of carbon foot-printing, and the functionality and exchanges of carbon markets.

Time will be allocated to discuss the challenges faced with regards to project viability and registration, as well as to evaluate delegates' current distressed projects, DSM projects for CHG ER eligibility, and assist with identifying viable new CDM projects.

The course will be presented by Energy Cybernetics in association with international award-winning General Carbon.

Date:
26-28 July 2011

Venue:
Emperors Palace Convention Centre, Gauteng

Registration:
christina@eventstraining.co.za
or contact Christina den Heijer on 082 334 0923.

NMMU to build solar car for challenge

The Nelson Mandela Metropolitan University's (NMMU) Advanced Mechatronic Technology Centre is to design and build a solar car that will compete in the biennial South African Solar Challenge next year. Sponsorship for the project has been secured from Volkswagen South Africa.

The challenge sees participants from all over the world descending on this country to compete in a two-week race which involves driving solar-powered vehicles across the country. The 2012 event will be the third challenge to take place in South Africa. So far it has been dominated by Japanese entrants who have won all the races.

The university says that engineering students will be exposed to many facets of using renewable energy through their entry in the Solar Challenge next year and will have a 'green platform' from which to conduct future research for post-graduate study.

A team of engineering students has been assembled to take part in the project and has begun researching and developing concept designs for the car in preparation for the solar vehicle manufacturing process, which will be undertaken at the university.

The Volkswagen Group has already agreed to make a financial contribution to the project and to provide assistance in sourcing components required by the team.

The Solar Vehicle Project is a multi-disciplinary project, and will include students from the engineering, business and arts faculties.

According to VW's head of production, Tom du Plessis, renewable energy is expected to play an increasingly important role in the automotive industry. He says that innovation has been identified as a key driver in manufacturing within the VW Group and that this is the reason for assisting the university to train students in the field.

Estelle Gathercole of the Automotive Industry Development Centre in the Eastern Cape says that the alignment of initiatives and thinking to support greening technologies is essential for developing the metropolitan region into a hub for research and commercialisation in the field of renewable energy.

She says the challenge is to adapt an existing approach to learning or doing business in a way that supports innovation and research and development, particularly in the renewable energy field.

Gathercole says this project will develop competencies in engineers and other students that will equip them with skills outside the pure engineering disciplines.

Government committed to gas in future

South Africa's Energy Minister, Dipuo Peters, has backed government's strategy to encourage households to use gas rather than electricity, particularly for their cooking needs. This will mean that the country will start importing large amounts of natural gas via a pipeline from Mozambique.

Peters said that diverting households from electricity to gas could delay the building of at least one new power station. She says there will be incentives in place for households to switch to gas for cooking and heating requirements.

Her department has proposed that gas should be offered to the poor as a substitute for the free basic energy quota that they receive from government.

At the same time Peters reiterated that the government remained committed to building at least one new nuclear energy plant, which would provide about 22,6% of the new energy requirement for the country.

The South African Nuclear Energy Corporation will be given R586-million for the 2011/12 budget to undertake nuclear research and development projects. The nuclear project is expected to begin soon so that the first power station can be commissioned by 2023, in line with the proposals contained in the Integrated Resource Plan 2010.

Coal-fired electricity is expected to contribute about 14% of new power generation with open-cycle gas turbines contributing another 9,2%, closed-cycle gas turbines 5,6%, hydroelectric power stations contributing 6,1% and wind turbines generating 19,7%. The government remains committed to generating 42% of its power from renewable energy resources from 2030 and photovoltaic solar power will contribute about 19,7% with solar power generating another 2,4%.

She said that her department had committed R18,6-million to a feasibility study for the creation of a solar park. Referring to power generated by private power suppliers, Peters said that the documentation had been completed and the procurement processes were likely to begin by December this year.

Already private developers were offering about 20 000MW of power to the government but at this stage, Peters said, the government would only buy about 1 000MW of power from these producers.

She said the Energy Department was sticking to its objective of installing one million solar heaters in homes by 2014; so far only about 115 000 of these have been installed, which means that almost 900 000 must still be done to reach that target.

Mentorship

The SAIEE is offering mentorship and advice to young engineers.

The offer comes at a time when our country is suffering a shortage of skills, and we believe that mentoring is an essential requirement in the training and development of the next generation of engineers.

If, as a member of SAIEE, you believe that you need a mentor you can request a mentorship service from the Institute.

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.

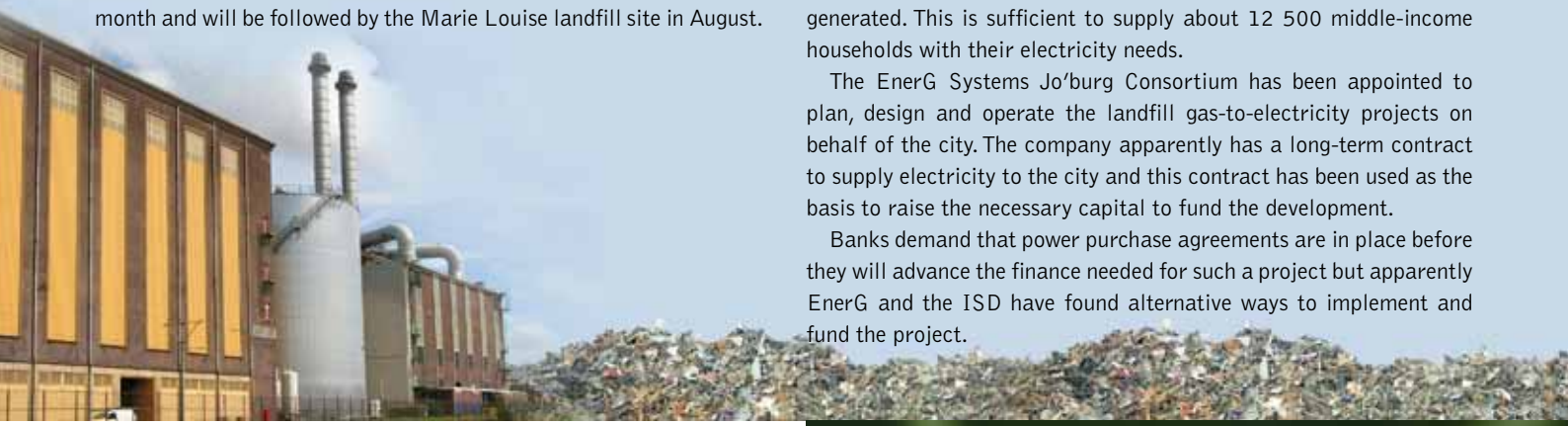
So if you feel that you would benefit by talking to a mentor, please contact Ansie Smith on the number below. She has a database to match the profiles of mentors and mentees.

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.

Joburg's project to build five landfill electricity sites

Johannesburg has commissioned the first of five landfill gas-to-electricity projects though the Infrastructure and Services Department and the Clean Development Mechanism. The gas-to-electricity projects will operate at the city's landfill sites at Marie Louise, Robinson Deep, Ennerdale, Linbro Park and Goudkoppies.

The Robinson Deep landfill project will be fully operational this month and will be followed by the Marie Louise landfill site in August.



The rest of the projects will be completed by June 2012. The electricity generated at these sites will be fed into the municipal grid, off-setting the use of Eskom's electricity from its coal-fired power stations.

According to Palesa Mathibeli, Johannesburg ISD representative, the gas-to-electricity landfill projects will be the largest projects of their kind in South Africa and an estimated 19MW of power will be generated. This is sufficient to supply about 12 500 middle-income households with their electricity needs.

The EnerG Systems Jo'burg Consortium has been appointed to plan, design and operate the landfill gas-to-electricity projects on behalf of the city. The company apparently has a long-term contract to supply electricity to the city and this contract has been used as the basis to raise the necessary capital to fund the development.

Banks demand that power purchase agreements are in place before they will advance the finance needed for such a project but apparently EnerG and the ISD have found alternative ways to implement and fund the project.

Wind energy coming to Cookhouse

Global wind-energy equipment supplier, Suzlon Energy, has signed a contract with African Clean Energy Developments to supply an initial 76 turbines for a project at Cookhouse in the Eastern Cape.

An engineering, procurement and construction contract has been concluded. There is an option in this contract to supply an additional 124 turbines for the Cookhouse site.

ACED is a joint venture between Macquarie Capital and African Infrastructure Investment Managers, a company affiliated to the Old Mutual Investment Group. It plans to develop the Cookhouse project that will be situated close to the new Coega industrial development hub. Cookhouse is believed to have received its positive record of decision for the environmental impact assessment that was done on the site.

There are a number of impediments to the project that still have to be resolved, including the fact that the National Energy Regulator of South Africa is likely to cut its renewable feed-in tariffs for wind energy when they are announced later this month.

If there are severe price cuts in the tariffs paid for wind energy then the project may no longer be viable.

Suzlon's chairman Tulsi Tanti says that the company is optimistic about the future of wind energy in South Africa and points out that the wind farm at Cookhouse could be completed within 12 to 15 months of a power purchase agreement being finalised.

South Africa has the potential to generate about 30 000MW of wind power and the country's commitment to using wind power is reinforced in its Integrated Resource Plan 2010, which incorporates

plans for about 10 000MW of wind power by 2020.

Suzlon set up a local company last year, which is headed by Silas Zimu, former head of City Power in Johannesburg.

Tanti says that the current focus for the company is on vendor development and staff and supplier training, which is already underway in India and Germany.

Suzlon is the world's fifth largest wind turbine supplier and has plants operating predominantly in India, one of the largest users of wind power. The company will supply its 2MW S88 turbines and will build the associated infrastructure to feed electricity into the grid. It will be responsible for maintenance of the wind farm.

Installation of the wind turbines at Cookhouse could begin later this year or early in 2012.

Tsitsikamma Power Station

The power station at the Boskor sawmills of MTO in the Tsitsikamma forest area uses pine off-cuts as furnace fuel to generate steam for the turbines that provide electrical power for the mill and for a number of residential units in the staff village, as well as steam for the kilns used for treating the processed pine timber.

The annual output of the sawmill is about 100 000m^3 of timber and, with approximately 50% wastage, an awful lot of timber off-cut is available for wood chips to feed the boilers of the power station.

Three low pressure boilers provide steam at 10 bar mainly for the drying kilns, while four high pressure 20 bar boilers drive the turbines for electricity. These boilers vary in age, having been installed between 1950 and 1972.

The steam turbines drive three main alternators, two Metropolitan Vickers rated at 3MW and 1 565MW respectively, and a Siemens of 1,2MW. While Eskom power is also available on site, it is used only as a maintenance contingency, and there is no provision for synchronous operation.

Les Stuart, FSAIEE

Boskor water tower.

3MW Alternator.

Timber for processing.

One of the boiler furnaces.

Vickers turbine.

President's Invitation Lecture

The SAIEE had the pleasure of welcoming leading South African economist Dr Azar Jammine to give a presentation on his thoughts of the liquidity boom and its impact on commodity prices and South Africa. Dr Jammine is the Director and Chief Economist at Econometrix (Pty) Ltd, the country's leading independent economic research, consulting and forecasting company.

The lecture, held at the Kerzner building at the University of Johannesburg's School of Hospitality and Tourism, Bunting Road campus, was well attended. The event commenced with warm welcomes by SAIEE President Andries Tshabalala and the University of Johannesburg's Faculty of Engineering and the Built Environment, Prof Johan Meyer.

Dr Jammine's synopsis highlighted the impact of enormous additions of liquidity into the global financial system that have been as a result of attempts to rebuild the world economy from the 2008/2009 recession. The high levels of growth from the BRIC nations as well as other emerging economies could rocket commodity prices, most notably that of energy.

The inflationary ramifications of this could prove global and domestic economic forecasts of sturdy and positive growth unduly optimistic. He demonstrated a strong correlation between South Africa's economy and the rest of the world, which could have considerable implications for the South African economy in future. It could affect the exchange rate, inflation and interest rates, and notably the country's ability to generate the kinds of jobs envisaged in the Government's new growth plan.

If the global economy stays intact and remains afloat, Africa, along with South Africa, could benefit in what is emerging as a commodities super cycle.

The lecture was enjoyed by all as was evident in the highly interactive Q&A session that took place after the presentation. Andries Tshabalala thanked Azar Jammine, while past President Ian McKechnie thanked the University for hosting the event and invited everyone for refreshments in the reception area.

Great Brak plaque unveiled

The SAIEE plaque at the historic Great Brak River hydroelectric power station was officially unveiled on 11 May 2011 by the Mayor of Mossel Bay, Alderlady Marie Ferreira, assisted by the Southern Cape Centre chairman, Willie du Toit.

The function was well attended by local councillors and municipal staff, and SAIEE members. This is the first such plaque in the Southern Cape, and it was fitting that it should be at this unique facility, which is still in operational condition.

WWF International Energy Report

On 24 May 2011, members and guests of the SAIEE attended a presentation by Richard Worthington at Wits University on 'The Energy Report (2011)', launched earlier this year. The lecture provided an overview and some detail of the report, which was commissioned by WWF International and undertaken by the highly regarded consultancy, Ecofys, and which examines the prospects and challenges for a transition to 100% renewable energy by 2050, including a global scenario with costing.

Richard's presentation discussed the relevance of this and other scenarios for South Africa, particularly for the electricity supply industry and R&D challenges and imperatives. He also reflected briefly on the Special Report on Renewable Energy by the IPCC.

Left to right: Mike Cary, SAIEE President, Andries Tshabalala and Richard Worthington.

CPD COURSES

ELECTRIC POWER CABLE TUTORIAL
JOHANNESBURG: 7 July 2011
Presented by Dick Hardie
Cost: R1850 (incl. VAT) 20% discount for active SAIEE members. 1 CPD credit

ELECTRIC POWER CABLE TUTORIAL
EAST LONDON: 12 July 2011
Presented by Dick Hardie
Cost: R1850 (incl. VAT) 20% discount for active SAIEE members. 1 CPD credit

REPORT WRITING FOR ENGINEERS
EAST LONDON: 13-14 July 2011
Presented by Malcolm Haffner
Cost: R3565 (incl. VAT) 20% discount for active SAIEE members. 2 CPD credits

PROJECT MANAGEMENT
JOHANNESBURG: 19-22 July 2011
Presented by Malcolm Haffner
Cost: R7500 (incl. VAT) 20% discount for active SAIEE members. 4 CPD credits

BUSINESS CONTINUITY MANAGEMENT
JOHANESBURG: 10-11 August 2011
Presented by Mark Penberthy
Cost: R3565 (incl. VAT) 20% discount for active SAIEE members. 2 CPD credits

LV VARIABLE FREQUENCY CONTROLS
JOHANNESBURG: 24-25 August 2011
Presented by Chris Conroy
Cost: R3565 (incl. VAT) 20% discount for active SAIEE members. 2 CPD credits

For further information and booking forms please contact:
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or Craig Smith
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(craigs@saiee.org.za)

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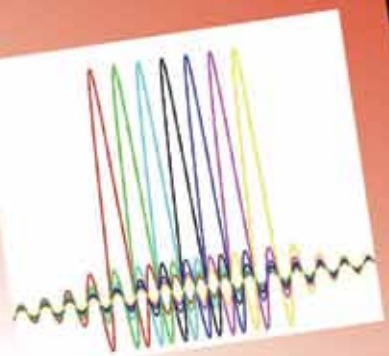

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