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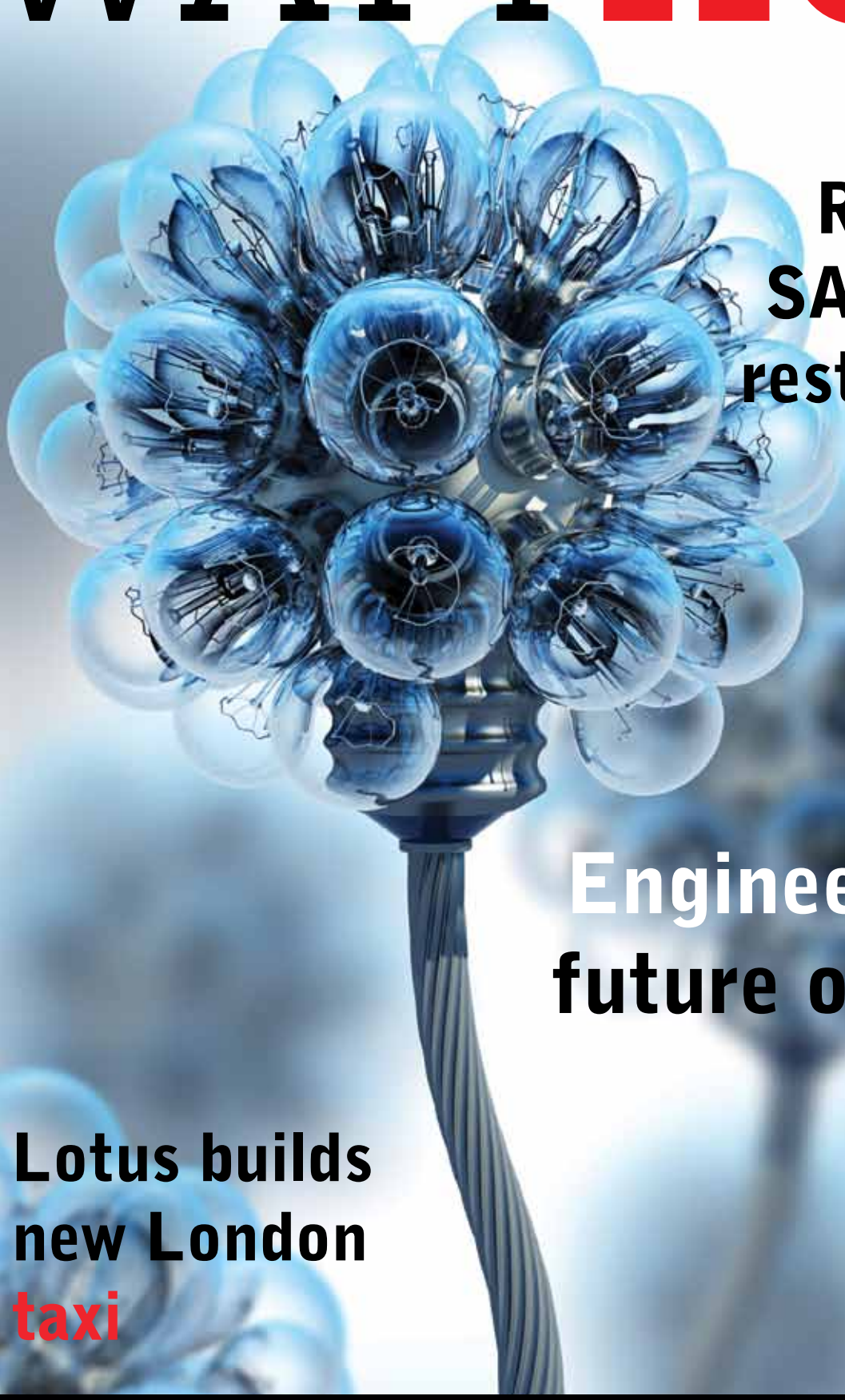

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Science, engineering, technology – so where is the weakness?

South Africa is the top research and development country in Africa and is producing volumes of research work that is focused, highly authoritative and credible among other world scientists.

It also has a substantial scientific infrastructure with some state-of-the-art facilities in government-funded institutions and in the private sector. Everything from medical research to new materials and even nano-technology.

So where, or what is the weakness?

The reality is that the schooling system that we have in this country is not supporting the enormous capacity that we have to improve and grow the scientific achievements that are synonymous with South Africa. You might say that the very fact that we have some of the top science, engineering and technology researchers working and thriving in this country is due to the education system that got them there in the first place.

The simple fact of the matter is that these scientists and researchers were all educated under the previous education system prior to the introduction of outcomes-based education in 1998.

So that old schooling system must have been doing quite a lot that was right. Then it was shelved – for exactly what reasons remain a mystery to me – in favour of a new system and, while a generation of children had to suffer through it, it has now been abandoned as a failure. So the sad fact of the matter is that, perhaps, South Africa's scientific capacity in years ahead might be eroded.

Fortunately most of the university academics that I have spoken to reassure me that the cream of the brainiacs emerging from schools around the country are still there and, regardless of the weaknesses in the previous education system, they are still able to thrive in a university environment.

That may be so but ideally South Africa needs to double or triple the number of graduates that are moving through those hallowed halls of tertiary education. So while the cream of students are able to cope with university study, we do not have sufficient other students to increase the number of scientists and engineers in our country.

And that is where the system is, in my opinion anyway, falling down.

I have no doubt that there will be a ever-present stream of particularly bright youngsters coming from our schools. I'm not interested in them. What I'm looking at are the not-quite-so-bright youngsters who need to be moulded, encouraged, mentored and developed so that they can play a real role in growing and building our country.

You see there is almost always a team of people that play a role in scientific or engineering achievements and my fear is that the poor level of schooling over the past 12 years and more has eroded that base to such a degree that we no longer have enough people for these teams.

I have said, for some years now, that the need to reintroduce artisan training in South Africa is fundamental and I have yet to be convinced that there is no need for it. Similarly, we need technologists and technicians who are capable of supporting the engineering profession.

We all know that the education system is now being revised and I do hope that this is being done in a way that will foster an interest in science and engineering rather than dumbing-down the education system to a level where it's a one-size-fits-all process.

That won't work – and our scientific achievements over the years have proven this.

What we must do is maintain the standards set before outcomes-based education was introduced and then we must rapidly get back to that standard so that we can continue to produce quality scientists and engineers who are worthy of their professional standing in our community.

And perhaps, our teachers and policy-makers should apologise to an entire generation of school children too.

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Design & Layout
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Published monthly by
Crown Publications cc
2 Theunis Street
Bedford Gardens
Johannesburg
Tel: (011) 622-4770
Fax: (011) 615-6108
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Circulation and Subscriptions:
Norma Massey
normam@crown.co.za
R240 (incl. Vat) per annum
Postage extra outside RSA

CROWN PUBLICATIONS

All enquiries for WattNow:
P O Box 140
Bedfordview, 2008

All enquiries for SAIEE:
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South African Institute of Electrical Engineers

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ISSN: 1991-0452

Printed by: Shumani Printers, Cape Town

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Total Paid Circulation 19, Total Free 4574, Total Circulation 4593
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People yakking for hours on mobile phones

One-in-six people in South Africa admit that they spend at least half a day talking on mobile phones, according to a Dial Direct survey of South African's cell phone habits.

Surprisingly about 18 percent of respondents say that they spend more than five hours a day on mobile phones and just over 25 percent estimated that they yakked for more than four hours a day.

Of course all you need to do is look around you in any traffic jam and see the enormous numbers of people chatting into the mouthpiece or nattering away like goldfish in a fishbowl for hours on end.

Almost 60 percent of respondents say that they spend up to two hours a day nattering on the phones. Apart from receiving or making calls, sending text messages was the next most important function of the cell phone and 58 percent of respondents use the text message services.

For about 30 percent of users, e-mail services were considered to be an important functionality in the mobile phone environment. Surprisingly, very few people actually use their phones to take photographs.

Within the social environment, 63 percent of respondents admit that the mobile phone is used mainly for social purposes while 37 percent conceded that they use it for social and business calls. Moreover, 72 percent of the respondents concede that they prefer talking on their phone to sending SMS messages.

Given the many millions of users in South Africa, it's hardly surprising that more and more cell phone calls are being dropped and more and more frustrated users are cursing the network operators and the handsets they own for the poor level of connectivity that seems to prevail in South Africa.

If all those social callers, nattering away about some or other nonsensical bit of information were to stay off the line then maybe the more serious users (like you and me) could get on with the business of making 'that call'.

But that's a subjective view I guess – after all, only my calls are important, aren't they?

SA producing world-class security vehicles

A South African company has developed a mobile surveillance vehicle (MSV) that will patrol the country's borders and help to prevent illegal immigrants from entering the land.

The MSV is equipped with gadgets that include automatic target movement detection, long range 360 degree surveillance, a camera with a 36 times zoom lens, high-resolution thermal imager and a laser range finder for target location.

It was developed by an affiliate of Carl Zeiss Optronics in partnership with local company Afrisec.

The vehicle's sensors are mounted on a mast that extends from the roof and any suspicious activities are displayed on a digital map inside the vehicle. To cut down on operator fatigue, the MSV uses sensor automation, automatic target movement detection, target tracking and situational recording.

For some reason that remains a mystery, the first MSV is to be delivered to the Nelson Mandela Bay Metro, thousands of kilometres from the nearest border post (unless it is intended for use on board ship).

In a separate development, another local group, Virleo is to supply 180 multi-purpose security vehicles to the China Special Automotive Group at a cost of R72-million.

According to Virleo's Craig Savides, a sample unit and 30 pilot units will be delivered by the end of November as knocked-down-kits weighing eight tons each.

Once the sample unit and the first 30 vehicles have been delivered, Virleo will make the next 150 units. However, from unit 100, the vehicles will use a hybrid diesel-electric drive train.

Each vehicle is about 5,5 metres long and is assembled from a range of parts made by different original equipment manufacturers and put together at a plant in Pretoria.

Once all the units have been delivered, Virleo will provide China Special Automotive Group with a licence to build similar vehicles in that country for the Asian markets.

Siemens, Pandor and technology investment

In celebrating its 150-year association with South Africa, Siemens has announced that it will spend a billion rand on various southern African projects, having built a sustainable business base in the region.

Stuart Clarkson, chief executive officer of the company says that Siemens, as the world's largest supplier of environmental technologies is ideally placed to help South Africa achieve its renewable energy goals.

The country intends to have 13 percent of its total electricity output coming from renewable energy resources within the next year, and wind projects worth about R10-billion have apparently already been identified.

Government is investing almost R800-billion in infrastructure development projects that involve a whole gamut of sectors including hospitals and clinics, schools and community facilities, the roads infrastructure and, of course, housing. Siemens' long association with South Africa dates back to 1860 (rather obviously as that's 150 years ago) when it installed the first telegraph line in the country between Cape Town and Simonstown. This was followed by the commissioning of South Africa's first hydro-electric power station in 1892 and the Brakpan power station in 1897.

Siemens was responsible – among many other notable achievements – for constructing the Cableway at Table Mountain that opened in 1927.

With a string of different achievements under its belt, Siemens is using South Africa as a springboard for further ventures into Africa and has set aside E200-million to expand its business and improve its sales structures on the continent.

Company president, Peter Loscher says that Africa offers vast opportunities for growth with large-scale wind and solar projects being developed in different parts of the continent. Moreover, Morocco plans to invest $9-billion and Tunisia a further $2-billion in renewable power generation.

And Siemens believes that it is the ideal partner for any of the technology and power generation projects that might be undertaken on the continent. Loscher points out that there are currently 50 countries being targeted through the Siemens' Cluster Africa division, which already has more than 3 000 employees. He says that by fiscal 2012, Siemens will have a sales volume in Africa of E30-billion a year. Minister of Science and Technology, Naledi Pandor, was invited to speak at the company's 150th anniversary celebrations held in Johannesburg and was quick to point out that South Africa has a sustained legacy of innovation and scientific ability.

She cited Sasol and its oil from coal processes as one example along with the Pebble Bed Modular Reactor (now unlikely to ever be produced unless government or other investors come up with more money) as two examples of scientific innovation.

She did choose several better examples such as the SALT and MeerKAT telescopes and South Africa's growing commitment to winning the bid to erect the Square Kilometre Array telescopes in the North Cape too.

Of course there are many examples of surprising innovation that Pandor did not mention but one just needs to look at the work done by scientists and researchers in the fields of engineering, medical and veterinary sciences, computer programming, astronomy and many others to find examples of the pioneering scientific ability of South Africans.

There are a number of initiatives underway aimed at fostering new ideas and greater technological innovation. For instance, the Department of Science and Technology has its Innovation Fund that was set up in 1999 to promote technological innovation through investing in locally developed technologies. It is part of the Technology Innovation Agency.

There are various industry-specific technology nurseries aimed at providing people with a means to take a great idea and bring it to market with the necessary funding from one of several government departments that is prepared to back technology development and research.

One of these is the Cape Biotech Trust, a Biotechnology Innovation Centre that is funded by the Department of Science and Technology with the specific goal to promote and develop a biotechnology industry in the Western Cape through project investments and capacity development.

It is part of a national network of organisations that collaborate to develop this sector. Brian Goemans, head of a company called MD2M (Medical Devices to Market), another initiative by the Department of Science and Technology also sets out to assist in commercialising projects dreamed up by inventors and innovators.

MD2M's primary objective is to support the development of medical devices and bring them onto the market in South Africa and in other parts of the world. It provides the resources, guidance and support that is needed to take an idea from concept to reality and sell it at a profit in the highly competitive medical field.

MD2M has helped companies such as GeoAxon Holdings to market products such as the KUDUwave 5000 audiometer. MD2M has also been involved in commercialising a negative pressure wound therapy device, a cervical cell sampling device used to screen for cervical cancer and many more.

So while Siemens, a giant in the world of technology, commits itself to investing in South Africa, a number of other initiatives are underway that underpin the fundamental need to grow the technology ability that exists in this country. There is the role that Siemens plays with its resources, technology, skills, experience and expertise. There is the role that the Department of Science and Technology plays through its policy frameworks, its funding assistance and its technology hubs. And, of course, there are the universities where so much of the real research work is done and where so many of the embryonic ideas are first hatched. Most importantly, it is this kind multi-facetted investment that will help South Africa to maintain its position as the leading science and technology community on the continent of Africa.

BMW goes electric with its MegaCity Vehicle

The BMW Group is planning to launch its new MegaCity Vehicle (MCV) in 2013 and is claiming that it will be the world's first volume-produced electric vehicle with a passenger cell made from carbon. Klaus Draeger, member of the board of management for development at the company, claims that the LifeDrive architecture will open a new chapter in automotive lightweight design.

The electrification of a vehicle requires new concepts in vehicle architecture and body construction in order to exploit the potential of the new emission-free drive system to optimum effect. With the LifeDrive concept, the BMW Group engineers are developing the car's architecture from scratch and adapting it to the demands and conditions of future mobility.

The goal: to offset the additional weight of an electric vehicle – typically 250 to 350 kilograms. To this end, BMW is focusing on the innovative carbon fibre reinforced plastic (CFRP).

The new vehicle consists of two horizontally separated, independent modules. The Drive module integrates the battery, drive system and structural and crash functions into a single construction within the chassis.

Its partner, the Life module, consists primarily of a high-strength and extremely lightweight passenger cell made from CFRP. Furthermore, the new vehicle architecture opens the way to totally new production processes, which are simpler, more flexible, and use less energy.

BMW is also hoping to produce one of the best drive systems, providing efficiency, performance and smoothness, using electricity rather than fossil fuels for propulsion.

To this end, BMW is developing its own electric powertrains that will offer zero-local-emission and low-noise propulsion while maintaining driveability. Like all motor manufacturers, BMW is hoping to achieve wonders but the real test will be when the first cars are delivered and how the market reacts to them.

There are too many stories of failures in the automotive world to believe everything that motor manufacturers claim – so rather let's wait and see what BMW can come up with, and only then decide if we actually want it.

Infrastructure deficit of $1,5-trillion

Africa's infrastructure deficit amounts to about $1,5-trillion according to African Development Bank vice-president and chief economist Mthuli Ncube who says the continent cannot possibly afford to finance infrastructure re-development from its own resources.

He says that much of the investment in infrastructure projects will have to come from abroad or will have to emerge as a private-public partnership. According to Ncube, in the late 1960s it was possible to travel from Cape Town to countries such as Uganda in the north by rail but nowadays its simply impossible.

He says that political conflicts have done much to destroy Africa's infrastructure including its ports, railways, roads, electricity generation and distribution, its dams and its water purification works.

Added to this is the fact that, for Africa to develop, it needs to have an efficient infrastructure and without it economic growth and future sustainability are just not possible. Moreover, the farming community has declined, and certain countries are no longer self-sufficient when it comes to food production.

He says that high-quality infrastructure exists in South Africa, Egypt and Tunisia but the infrastructure in the rest of Africa is hopelessly inadequate even though many of the countries have excessive mineral wealth and a great deal of capable human capacity.

The South African government has stated that it will spend about R800-billion on infrastructure expansion projects as part of its Industrial Policy Action Plan that is aimed at revitalising manufacturing, creating sustainable jobs and developing new industries.

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IDC – a big helping hand in this land

South Africa's Industrial Development Corporation intends to invest about R100-billion in the domestic economy by 2015 even though its funding approvals reached just R9,4-billion last year.

Chief executive of the IDC, Geoffrey Qhena says that the organisation spent R1,4-billion helping distressed companies that faced financial hardship during South Africa's first recession since independence. The financial aid apparently helped 8 000 people to keep their jobs.

According to Qhena, the IDC supported 28 companies deemed to be in distress and helped 60 others to restructure so that they could remain in business. The IDC had set aside R6,1-billion in financial aid packages for struggling firms with strict criteria for assistance that included a moratorium on retrenchments, dividends and executive bonuses.

In total, Qhena claims, more than 25 000 jobs have been saved or created through the IDC's support for distressed companies in the last 18 months. Some 65 percent of the IDC funding had gone into economic expansion or had flowed to new start-up ventures or for expansion programmes for existing organisations.

The IDC's own revenue dropped by 48 percent in the past year and its profits were 60 percent lower at R2,2-billion.

There has been some speculation that the government is considering recapitalising the IDC to strengthen its balance sheet to allow it to take greater levels of risk when funding major projects.

However, the government has refused to comment on this speculation with Trade and Industry Minister, Rob Davies, questioning whether it was appropriate for the IDC to be using a balance sheet that had "been bequeathed to it by [a former South African Prime Minister] Jan Smuts".

Schools entrepreneurship competition finalists at expo

This year's Business Opportunities and Franchise Expo is offering nine secondary schools that excel in entrepreneurship education an opportunity to exhibit their projects or services at the most comprehensive, four day expo in the country, which is dedicated to developing entrepreneurship in South Africa. It will be held from 16 to 19 September at the Coca Cola dome in Johannesburg.

The 2010 Eskom Enterprise Education Simama Ranta schools competition and Eskom Business Investment Awards competition will announce their winners at the Business Investment Awards on September 15 and the entrepreneurship project selected as the "best in its class" will be awarded a cash prize of R25 000, with an exhibition stand at the Business Opportunities and Franchise Expo along with the other finalists, who each receive R10 000.

Says Haylene Liberty, CEO of the Eskom Foundation: "Simama Ranta means empowering the South African economy through entrepreneurship education and the competition aims to identify, honour and showcase those South African secondary schools that represent exemplars in entrepreneurship education.

"These schools are addressing a principle of the South African government's economic development policy in preparing learners to consider entrepreneurship as career choice – and become job creators rather than job seekers."

The goal of the 2010 Simama Ranta competition is to highlight the variety of comprehensive, quality entrepreneurship education in South Africa's education system and to showcase the winning schools as leaders in mentoring other schools.

A panel representing the Department of Education, the private sector and experts in entrepreneurship education, adjudicates the finalists, selecting distinctive models that offer demographic variety in areas such as geographic location, socio-economic status, and grade levels covered.

Schools interested in entering the 2010 Eskom Enterprise Education Simama Ranta schools competition should contact Arie Bouwer on (058) 623 0104/0123/0649 or email him at ewet@ewet.org.za.

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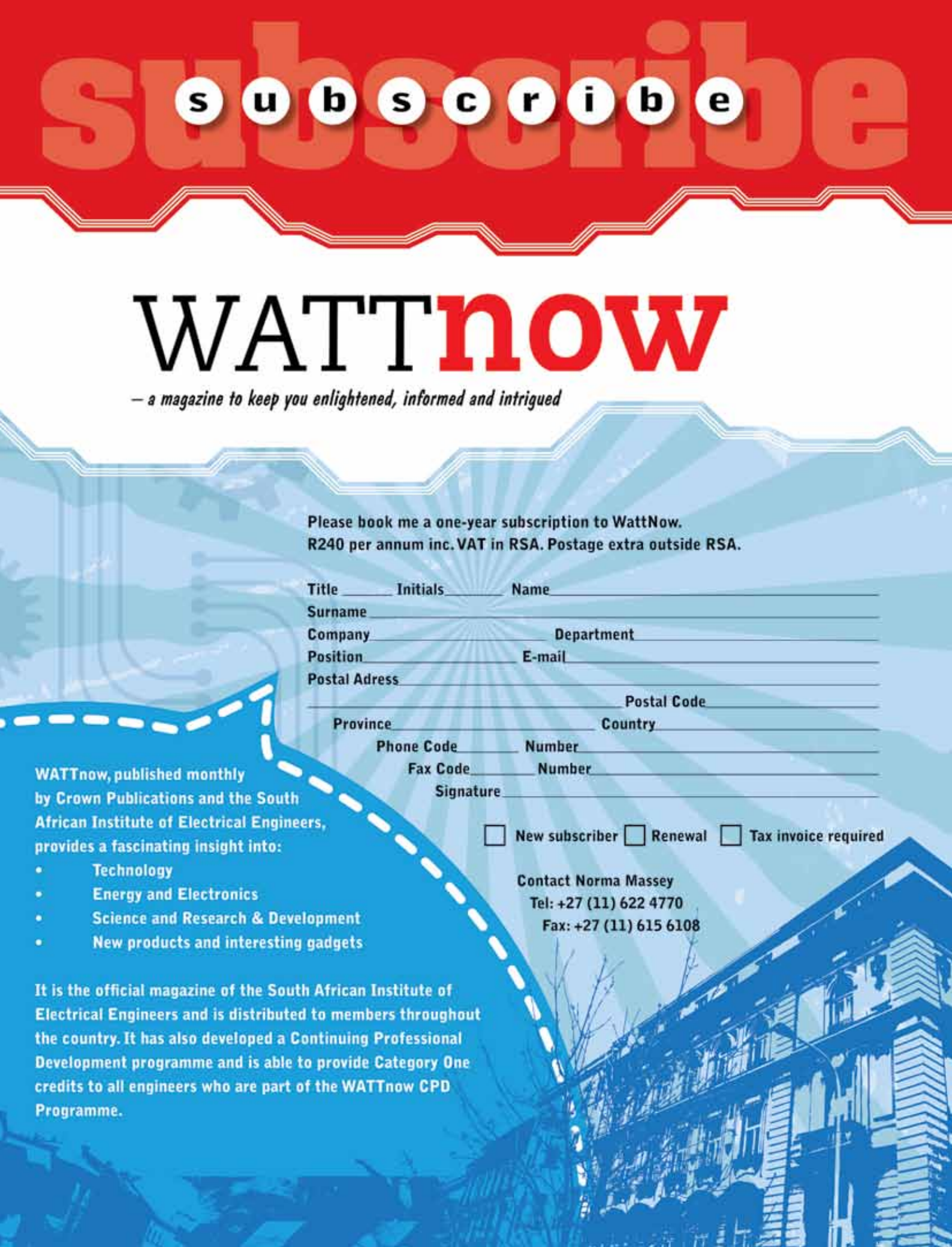

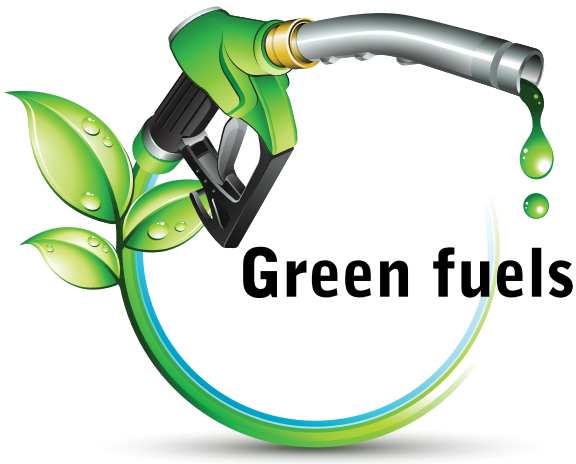

Green fuels create green jobs

Projects that convert biomass into fuels, energy and chemicals could contribute about $230-billion to the global economy by 2020 according to a report by the World Economic Forum. The report, entitled The Future of Industrial Bio-refineries was produced by Sir David Kind of Oxford University.

King says that by 2020, the biofuels market is expected to triple with combined sales of $95-billion and bio-based products will account for $15-billion in revenues and produce about nine percent of chemicals used in the world.

The report further estimates that the demand for biomass products used to generate heat and electricity will more than double in the next ten years. Farms throughout the developed world are likely to contribute about $90-billion through biomass projects.

King says that the United States, as an oil-based economy is at a competitive disadvantage because of its huge reliance on oil, which sees it consuming about 20 percent of global production each year.

According to the WEF report, the US has the world's largest reserves of biomass products available for use as feedstock and currently has about 70 percent of all second-generation bio-refineries in the world.

At this stage biomass products have the potential to replace about 10 percent of the United States' oil imports, significantly reduce its carbon dioxide emissions, create new revenue streams for farmers and provide a diverse number of new jobs in different states around the country. According to Steen Riisgaard, chief executive of Novozymes, data compiled in the US shows that already 40 000 new jobs have been created and commercialisation of cellulosic biofuels will lead to a further 800 000 jobs (190 000 direct 'green' jobs and 610 000 indirect new jobs) being created over the next 12 years.

Broadband services – prices must drop sharply

With mobile voice subscriber growth starting to slow in many emerging markets, service provider attention is shifting to data services, with a particular focus on the broadband access opportunity, according to Angel Dobardziev, practice leader, emerging markets at Ovum, an international consulting group.

Dobardziev claims the lion's share of broadband growth is shared between providers offering DSL, HSPA, and WiMAX. The company recently published its study, entitled Broadband pricing in emerging markets: a comparison of DSL, WiMAX, and HSPA, which examines the comparative prices and affordability of broadband services in 15 selected emerging markets. It concludes that broadband services are expensive, especially in Africa and Asia, and this is one of the key reasons for the low demand and relatively slow uptake.

Dobardziev says the study found that average broadband prices in emerging markets are two to three times higher than their developed market equivalents, primarily as a result of a relatively muted competitive environment which enables providers to 'skim' the market.

Considering the low gross domestic product per capita in most emerging markets (particularly those in Africa, Asia, and parts of South and Central America), broadband is unaffordable to most consumers other than those at the very top of the socio-economic pyramid.

For example, Ovum says, the research showed that the average cost of entry-level HSPA services in the sample of countries was $381 a year, with an average 1 GB usage cap. WiMAX services cost on average $432 a year, making WiMAX the best-value broadband option overall, considering the far higher usage caps available compared with HSPA alternatives. The average price of an entry-level DSL service in the sample was $542 a year, which is the highest among the competing technologies.

Dobardziev says the research shows that there are surprisingly large price differences between similar services across different markets. For example, a 512kbps WiMAX service costs $123 a year in Pakistan, but it costs almost ten times more at $1 296 in South Africa. In India, a 512kbps DSL service costs $197, compared with $2 118 in Nigeria. Even HSPA services vary wildly: a 2 GB capped service costs $223 in Poland, but $2 924 in Colombia.

According to the research, emerging market consumers are highly price sensitive, and the research suggests that they make careful purchasing and usage decisions based on price, or (more specifically) affordability.

There is little doubt that affordability will improve across all emerging markets, driven by both income growth and reduced broadband prices but, in the short term, Ovum expects substantial broadband price declines as competition within each market intensifies.

In addition, greater pricing innovation in the form of sachet pricing such as low usage caps, shorter contract periods and prepaid packages will further boost broadband affordability.

However, the underlying cost drivers within each key service and technology will set the benchmark for further price reductions – particularly factors such as economies of scale, cost of equipment, and incremental cost per customer.

Dobardziev says the company expects to see HSPA services drop dramatically in price in emerging markets. This is likely to be driven by a rapid increase in competition as mobile operators focus on driving up data usage through more mobile broadband services.

WiMAX prices are likely to remain relatively flat on the price curve as there is limited scope for further price reductions.

Engineering the future of wheels

In Blackstone Tek, South Africa boasts the world leader in carbon fibre technology for motorcycle wheels. The company's unparalleled investment in process equipment and its unique manufacturing patent make the BST brand the choice for bike racers, aftermarket customisations of almost every superbike and, increasingly, for elite new models from motorcycle OEMs. Peter Middleton takes a tour of the company's North Riding facility.

Blackstone Tek set out to create a motorcycle wheel that, while meeting all of the standard requirements, was lighter and stronger than anything else on the market. Bike magazines report that changing to carbon fibre wheels is the biggest performance improvement that you can make to a bike for that money. "You don't need to modify the engine, or change it or adapt it to a new fuel or anything else – you simply replace the wheels with ours of carbon fibre," says Terry Annecke, operations and marketing director.

The gain is described as a virtual 10 HP (7,3 kW) – significant (3-4%) when you consider that superbike power is in the 200 HP range. "You don't really change the power, but you change the dynamics of the bike so that it feels more powerful," she points out. The lighter wheels are easier to manoeuvre and result in less rider fatigue.

The key advantage of carbon fibre wheels, however, is on the inertial side – the weight is all shifted towards the hub in the centre. The spokes are hollow and the rim is very light. By removing weight from the outside of the wheel, you significantly reduce the inertia, which makes it much easier to spin the wheel. "We are interested in where the power is going, into driving the wheel or into the performance of the bike," adds Annecke. "With carbon fibre wheels, you are able to get better acceleration, better handling and later braking."

The handling is also improved due to the reduced gyroscopic effect associated with lower inertia – hence the better handling. You are able to manoeuvre the bike into and out of corners a lot more easily because lower moments of inertia result in lower gyroscopic coupling forces.

Carbon fibre is a very stable material – very light but very strong – and presents no shelf life problems. "Our competitors are forced to use aluminium or magnesium to reduce the wheels' weight, but both of these options carry way too much risk for us. A magnesium racing wheel cannot withstand ordinary road use and race track wheels will not last more than two seasons," Annecke claims. Also, carbon fibre will outperform magnesium of the same weight because magnesium still has circumferential weight distribution.

"The limiting design factor for carbon fibre is impact," says Craig Goodrum, BST's technical manager. In order to achieve the required impact strength for carbon fibre wheels, the compressive strength is significantly higher than that required by standards and that of competitive materials. "Our wheels outperform our competitors. They are lighter, stronger and have longer life. Because we can engineer with the material, we can get our spokes and rims much lighter without compromising strength in any way," he adds.

The strength comes from the orientation of the fibre, so different strengths can be designed into the different parts of the wheel by optimising the placement and orientation of every carbon fibre layer. The initial engineering for this task was done using extensive finite element analysis. Every piece of carbon fibre used on a BST wheel has an exact orientation and an exact strengthening purpose. "It's all about the fibre lines," says Annecke, "We make up the wheels using layers of multidirectional and unidirectional pre-impregnated fibre materials of different weights to achieve optimal strength for the amount of material used. That is what you call composite engineering."

Key to the company's success, however, is its unique and patented production cycle. "Our process enables us to produce volumes of identical wheels according to an identical process. We are managing to make perfect wheels in volume," claims Annecke. "The GP standard is a run-out of less than 0,1 mm out-of-true and all our wheels are better than that."

The production cycle starts in the cutting room. Sheets of pre-impregnated carbon fibre of specific weights and orientations are cut into very specifically shaped and oriented pieces. Each different wheel and each component of each wheel has its own cutting plan, a nested pattern of shapes programmed into the CNC machine to cut each piece to the exact orientation with minimum waste. Every piece that is

Craig Goodrum, BST's technical manager and Terry Annecke, operations and marketing director.

cut is also printed with a number so that kits of component pieces can be put together. Each kit needs to be cut from three different sheets, two different weights of woven carbon fibre fabric and a unidirectional fabric. Packets of pieces for a particular component – spokes, rims, and outer layer components – are then assembled, labelled and returned to a cold room at -18˚C. "Pre-preg material has a working life of around 30 days at room temperature. If you chill them, this can be extended to a year," explains Goodrum.

The next stop on the tour is the clean room: "We train our lay-up specialists from scratch," says Annecke. "These are not skills you can buy." Moulds, manufactured in-house from steel tooling, are used as formers. We see a specialist stripping off the backing of pieces of pre-impregnated fabric and pasting them down into position on the mould. "Fikile is taking numbered pieces out of her kit and laying them according to an exactly defined set of process instructions. She is currently laying unidirectional carbon fabric coming out from the spokes between woven fabric layers underneath, and then fanning them out to join onto the rim," Annecke explains.

She points to a vacuum-packed mould on the layout table. "Because you need to use multiple layers, it is important to debulk after a number of layers," she explains. Every station has its own vacuum pressure and moulds are placed into vacuum bags for 30 minutes, twice or three times during the layout process.

The wheels are made in two halves. Then intensifiers – made out of silicon rubber with Shore A hardness of 40 – are inserted into the spoke cavities along with an inside layer of carbon fibre. The two halves are then joined together. "The rims will be created by wrapping layers of carbon fibre of different weights and strengths around the circumference," Annecke explains.

Then the whole mould is again vacuum wrapped, this time with a temperature resistant plastic,

Unidirectional carbon fabric – fanning out from the spokes to join onto the rim – is being laid onto woven fabric layers underneath.

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ready to be placed onto an autoclave at 125˚C for four hours under six bars of pressure. This is completed in batches overnight.

Annecke takes us to some wheels recently removed from the autoclave. The market that BST serves demands a class A finish, "Pressure from the autoclave is vital to give you both a perfect surface finish – one without fish eyes, holes or uneven surfaces and a structurally sound product. If a wheel comes out with a surface defect, it could be an indication of an underlying structural defect."

Each wheel then goes onto a CNC machine, to profile the tyre bead on the rim. The finished weight of the carbon part is around 2,0 kg for the superbike-types.

Blackstone's expertise is not limited to carbon fibre. They have invested very heavily in the CNC machines required to make the many different styles of hubs for different motorcycles. "We used to outsource the hubs, but we found we could not get the precision required," says Goodrum. "Now we do the design and manufacture of the hubs."

Annecke points out the variety of different hubs being machined: Harley-Davidsons for the American aftermarket; a number of Ducati designs; and hubs for the new Norton Signature Series, a UK motorcycle only just released to the market.

We see Norton hubs being assembled to wheels in the assembly bay. An aerospace adhesive is applied between the hub-halves and the carbon fibre wheel. Inserts are glued into position on the inside of holes drilled into the wheel. One side of the hub is bolted on. A spacer is passed right through the centre to hold the two sides perfectly inline and the other side is bolted on. The wheel is then ready for final machining on its own hub to guarantee each one runs true.

Finishing and painting with a clear automotive layer follows and a final pass through an inspection room where every product made gets re-measured and inspected for cosmetic quality. The wheels are then packaged, along with a full set of documentation detailing every aspect of its design and history.

"It's a complex business and with lots of technological challenges," says Annecke. "To make perfect wheels, we monitor the process at every single stage."

The price? Around US$3,700/R30 000 a pair, less than the magnesium wheels against which they compete and much less than the cost of an alternate performance enhancement.

Perhaps one day, more wheels will be made this way. Goodrum sees advantage in applying the technology to trucks – payload, fuel efficiency, lifecycle and perhaps safety advantages too. With some R&D support, this could also become a niche South African competence.

Moulds are placed into vacuum bags for 30 minutes, twice or three times during the layout process to compress/debulk the carbon fibre layers.

Wheels fresh out of the autoclave already have a very high quality finish.

A motorcycle wheel, destined for UK for use on the new Signature range of Norton motorcycles.

A view on Cloud Computing

by Dr David H. Jacobson, Advisory Services, PricewaterhouseCoopers,

Cloud Computing is a way of structuring computing to enable on-demand network access to computing resources. Other key features include scalability, location independence, and use metering and use-based billing.

The key to understanding and using Cloud Computing effectively is to realise that it is ultimately a bi-directional service; valuable data, information and knowledge must flow easily and securely to and from the user and these valuable assets must be saved securely and be adequately backed up and protected from disasters.

There are several types of Cloud Computing. Software-as-a-Service (SaaS) is any application which is delivered over a networking platform such as the Web to users who access it, usually via browser. Examples of this would be Google Apps and Salesforce.com.

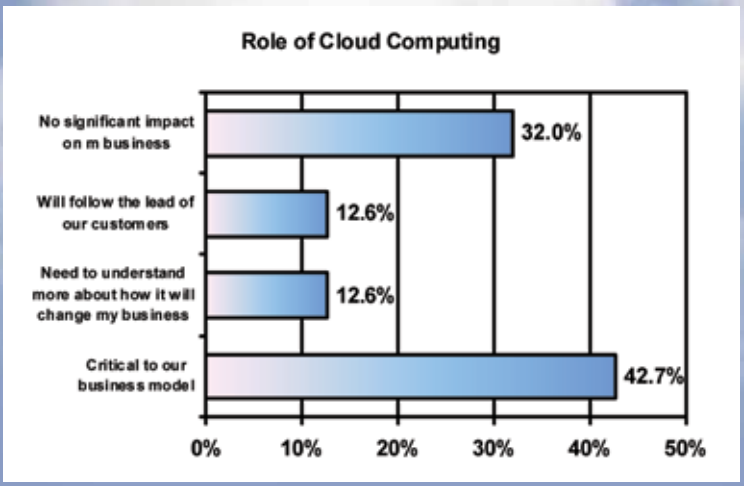
Platform-as-a-Service (PaaS) casts a much wider net; this may incorporate application development and configuration management, interface development and tailoring, database structuring, storage and testing for, and by, the developer and/or business owner. This type allows users to define, build, deploy and run applications directly from remote servers. Rightscale and Amazon's EC2 are two companies which have grown in this space.

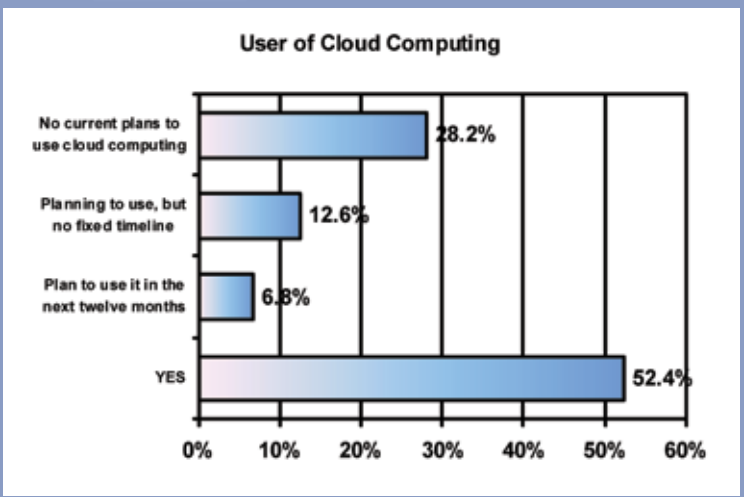
Infrastructure-as-a-Service (IaaS) provides users with remote access to data centres. The difference between IaaS and the first two types is the fact that IaaS enables access to a 'virtual world' of machinery and software residing either internally or external to the user's premises, which may themselves be distributed over a wide geographical area.

Cloud Computing technology is still considered to be relatively new and in the early adopter phase for both providers and consumers. Some, like Lew Tucker, chief technical officer of Cloud Computing at Sun Microsystems, see it as merely a service provider trend and not really a new breakthrough concept.

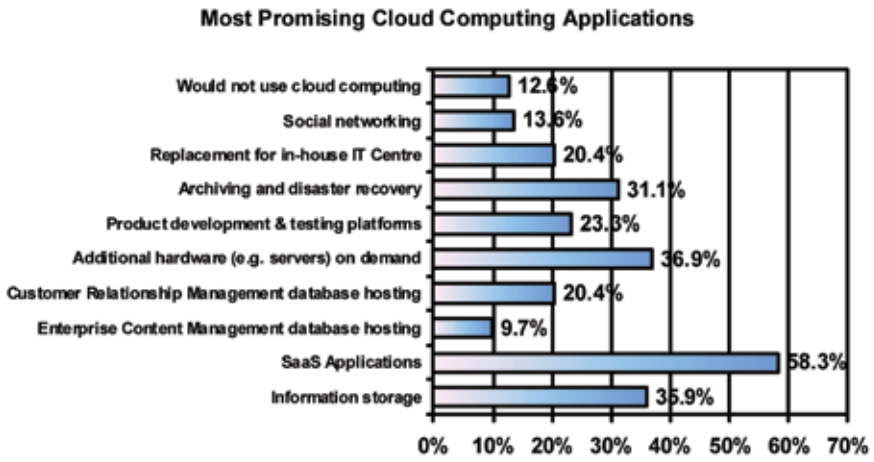
Others, however, see it as a paradigm shift in how increasingly the world will use and value Information Technology. Nicholas Carr, author of IT doesn't matter, likens the growth of Cloud Computing to energy generation a century ago. It used to be that manufacturers built and used their own dedicated power source.

In the 20th century, that function is performed by an electricity utility and companies pay per use. But that analogy may not be very strong; Cloud Computing is a two-way street with sensitive business data flowing in both directions and being stored in the Cloud. This is hardly the case in electricity provision.





Cloud Computing has the business world divided on its importance to existing business models. The 2010 PwC Survey of Canadian Software Company CEOs shows that 42,7 percent of business leaders believe that Cloud Computing is critical to their model while 32 percent find the Cloud provides no significant impact on the way they operate or their bottom line. Those straddling the middle believe that there is a need for further understanding of the changes which Cloud Computing could bring, and if it will be a major attraction for their customers.



The Survey also indicates that in spite of the uncertainty, 52,4 percent of respondents are Cloud users.

Cloud users are, not unexpectedly, as diverse as the web landscape out of which it operates. Financial services firms have been testing and deploying customer relationship management tools using public clouds such as Amazon's or Google's; Vivek Kundera, the now-CIO of the United States, switched 38,000 employees within the District of Columbia (while he was the incumbent CTO) to web-based applications, claiming to save millions of dollars in software licensing fees; the Treasury Board of Canada in February 2010 received endorsement for the Government of Canada Cloud Computing Roadmap, one that can be compared with countries such as the UK, the US, Australia and New Zealand.

In Gartner's global annual CIO survey of 1,600 IT leaders, a noticeable trend was the modest increases in IT budget dollars. US respondents expected an increase of 2,5 percent from 2009 numbers (an average drop worldwide of 8,1 percent from the previous year). Because these financial challenges are likely continuing into 2010, CIOs are approaching priorities with caution. This stimulates a change in focus to Virtualisation and Cloud Computing, as well as modifying IT departments into more agile, highly productive organisations. This involves, among other things, a change from owner-sourced technologies (which often require heavy initial investment) to lightweight, easy-to-implement, easy-to-use platforms, systems and services.

Consequently, IT professionals are experimenting with and piloting new technologies, seeking to gain experience, and develop skills in new Cloud Computing products, platforms and services to keep pace with the changing computing environment.

In keeping with the growing interest in Cloud Computing by the private and public sectors, to respond to requirements for skilled Cloud Computing professionals, and to encourage cross-organisational co-operation, the IBM Cloud Academy was launched in November 2009. This was described as a "global forum for educators, researchers and IT personnel from the education industry to pursue Cloud Computing initiatives, develop skills and share best practices for reducing operating costs while improving quality and access to education." Furthermore, CompTIA, a global IT association, is now working towards "building certification programmes to release in 2010 and get in front of growing demand."

According to a survey of Wall Street IT leaders conducted by SIFMA and IBM in June 2009, the number of respondents predicting that Cloud Computing would bring significant business change more than doubled from 21 percent in 2008 to 46 percent in 2009, implying it to be the top disruptive computing technology.

Some 58,3 percent of the Survey respondees believe that SaaS is the most promising application for the cloud due in part to the savings it offers to both providers and consumers. From a consumer standpoint, less money is likely to be spent on servers and licensing. From a provider standpoint, costs are lower compared to conventional hosting, because resources can be used more fully.

At 36,9 percent, respondents agree that additional hardware on demand (eg servers) is a service that also makes the Cloud promising. Amazon.com's EC2 now provides increased hardware on demand, making it easier for IT professionals to increase computing power and storage capacity as required. According to Geir Ramleth, CIO of Bechtel, a cloud services provider, the savings while using a pay-per-use service such as EC2 will enable a company spending from $800 to $1000 monthly to reduce its costs through time-of-use charges of only 10 to 15 cents per hour. More organisations are moving their computing from their own data centres to the Cloud as this provides greater flexibility, allowing IT Managers to dispense with tedious approval processes.

Quite simply, the Cloud requires and enables an IT organisation to be agile and adaptable to changing technology and business circumstances. According to Charles Babcock of InformationWeek Analytics, faster approvals, increased collaboration, advanced architecture planning and building vendor relationships are key skills for success in the Cloud.

Cloud storage accounts for 35,9 percent of respondents' votes. Hardware for data storage has become increasingly cheaper but vastly greater storage requirements, both concentrated and distributed, make storing information in the cloud attractive.

In spite of indications that only 9,7 percent of the Survey respondents feel that Enterprise Content Management (ECM) database hosting will thrive in the Cloud, we believe that this trend will likely increase. The successes of Salesforce.com and SugarCRM, point in this direction.

Social networking is low in the Survey respondents' priorities, garnering only 13,6 percent of the votes. This is not surprising as social networking has up until now been primarily a priority on the consumer side with relatively low use in business. However, PwC

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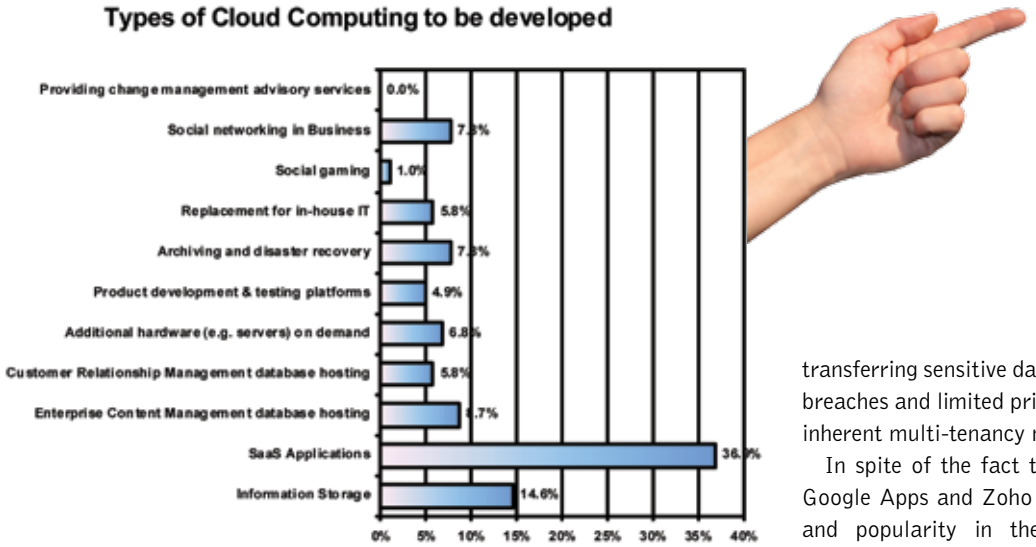
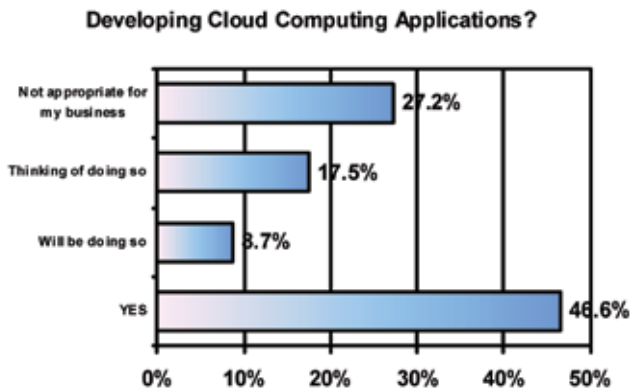


has observed that consumers and employees alike want to play a participative online role both at work and in leisure time. And the tools of social networking are becoming increasingly powerful, easy and fun to use. So social networking is now a business strategic issue. Social networking needs to be coupled into the thinking and operations of the entire organisation; it is not merely a passing fad. Not only will businesses increasingly embrace social networking as a part of their communications strategy and in their day-to-day operations, but they will also gain greater skills in marketing to, and collaborating with, customers and partners.

Current Developments in the Cloud

Some 46 percent of Survey participants are already developing cloud computing applications for their clients' use, while another 8,7 percent are planning to do so. Of those in this sphere, 36,9 percent are developing SaaS applications while, by far in second place, at 14,6 percent, some will use it for information storage.



None of the respondents, however, are planning to provide Change Management services to assist their customers to shift to Cloud Computing.

Currently, some firms are using the cloud selectively and with a little hesitation. According to wallstreetandtech.com, some financial giants have been using public clouds for application testing and for basic applications such as CRM tools. They have been reluctant in transferring sensitive data to the cloud, fearing security breaches and limited privacy, due in part to the Cloud's inherent multi-tenancy nature.

In spite of the fact that productivity tools such as Google Apps and Zoho Office are gaining momentum and popularity in the SaaS space, worries over reliability, availability and security still keep them from being fully used. Some unplanned outages of Google's Gmail and Workday's human resource applications ended up being perceived to be a significant performance problem, with no quick solution, due to the fact that the hardware was remote and controlled by the service provider.

According to an InformationWeek Analytics survey, 46 percent of companies interviewed said that they would use Cloud CPU storage, or other infrastructure services in 2009, an increase from 31 percent in 2008. In addition, 56 percent of respondents indicated that they would use, or would likely use, SaaS in 2009.

For those organisations contemplating moving some or all of their computing to the Cloud, it is important to note that this requires significant planning and understanding of the organisation's business and architectural computing requirements. Increased collaboration at the outset between the company's C-suite, system administrators, network managers, developers and information security officers will help eliminate potential strategic and operational errors surfacing after implementation and will mitigate mishaps in contracting services from Cloud providers.

Security remains the main concern for those contemplating a move to the Cloud (34,0 percent of respondents). As Cloud Computing is still in the early adopter phase for providers and users, best practices and guidelines have not yet been set. Security and reliability issues will have to be resolved in order to capture more users.

Users are warned to read the fine print when signing provider contracts. The Cloud Security Alliance (CSA) especially has indicated that it is prudent for businesses to perform a risk assessment before signing a Service Level Agreement (SLA) so that both parties are aware of, and agree to, their own responsibilities with regard to the information exchanged with and in the Cloud.

In the United States, electronic data has been governed by the Electronic Communications Privacy Act (ECPA) since 1986. The Digital Due Process Coalition is lobbying for an update to the privacy rules. The coalition, made up of technology companies such as Google and Microsoft, and special interest groups, has expressed concern that the current regulations don't protect personal data sufficiently and this could prevent companies from adopting the cloud computing model.

Indeed, the Digital Due Process website (www.digitaldueprocess.

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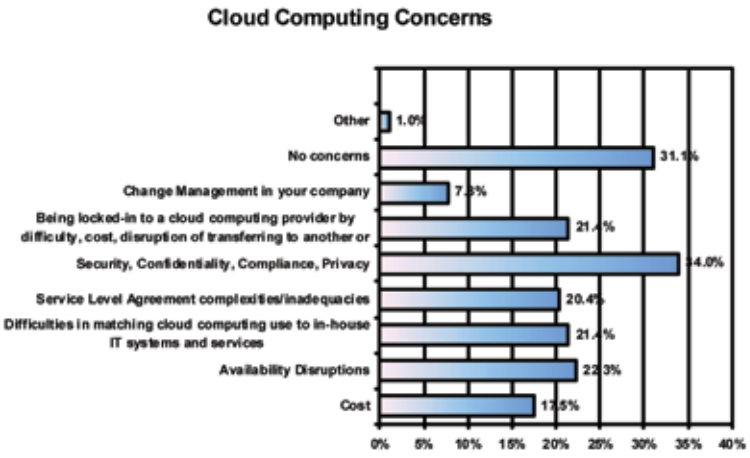


org) states that the "ECPA is a patchwork of confusing standards that have been interpreted inconsistently by the courts, creating uncertainty for both service providers and law enforcement agencies." The coalition therefore warns the public to be aware of the limitations of the ECPA in relation to cloud migration, especially in the realm of email storage.

Reliability and availability disruptions are also concerns top of mind with respondents to PwC's Survey (22,3 percent). Owing to the fact that users work on virtual machines, the causes of outages may be hard to diagnose. This likely puts the users fully in the hands of their service providers who may or may not be able to fix problems in a timely manner. There is a risk of significant revenue loss, productivity decline and loss of data, as a result of even one hiccup in availability of the service.

Another concern around the use of Cloud Computing is its limited portability. Depending on the amount of a company's data and number and complexity of applications already in the Cloud, it may be difficult and costly to transfer to a new Cloud provider, should the need arise.

Planning and implementing a move to the Cloud and putting in place appropriate new procedures and backup plans to mitigate unwanted disruptions of services requires an organisation to adapt itself to new ideas, network architectures and responsibilities. This requires significant re-education and training of its workforce at all levels.

The Survey results show, however, that Change Management is low on the list when it comes to concerns regarding the Cloud. But in fact there is no doubt that Cloud Computing brings with it new ways of working, new risk profiles, new IT Centre structures and requirements for new IT skills and experience and that companies and organisations will have to adapt to accommodate these new things.

This requires Change Management at all levels of the organisation and more often than not, the C-Suite will have to seek the assistance of outside Advisory Services to guide their Change Management plans and train the personnel who will be handling their move to the Cloud and its use. Joel Cawley, IBM's vice president of corporate strategy, suggests that because all 'disruptive' technology is fast moving and risky, best practice "is to develop business processes and strategies along with a business culture that takes massive change as a given."

As the world economies and their technology industries continue to recover, major technology companies are reporting improving financials and forecasts. But a number of analysts are predicting that only modest increases in consumer and enterprise IT spending will occur during the period 2010 - 2011.

Accordingly, companies are looking further than cost cutting and containment, to new projects to enhance their competitive advantages. Very high-speed wireline and wireless services are greatly enabling the use of software as a service (SaaS) and, more generally, the use of participative rather than mere passive digital media services available in the Cloud.

Indeed, the use of digital media is a C-suite priority and a better understanding of the collection and use in the Cloud of "unstructured information and knowledge" is being seen as a new competitive advantage in several industries.

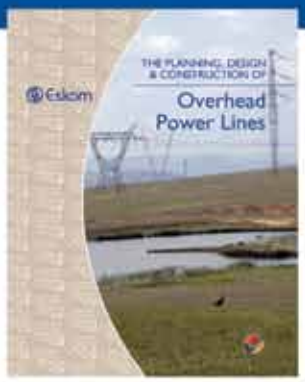
In February 2010, the PwC Technology Sector Cloud Computing team met in the US to discuss Cloud Computing trends and the advisory services that the firm provides to clients.

The consensus was that large companies were moving cautiously and likely to move to private Clouds (those created by the client and containing only the client's data) before moving to public Clouds (created and managed by others such as Amazon, Google, AT&T and so on).

Many companies have already started down the path with virtualisation and SaaS but they have done so without a broader Cloud strategy - they have not defined why they need to move to the/a Cloud; they are perhaps thinking of this too narrowly solely as an IT event rather than what it truly is, a platform for business transformation, higher productivity and innovation.

PwC views this disconnect as likely to reduce quickly – but only if company C-Suites put their minds to adopting appropriate Cloud strategies in the next year or two. Such Cloud strategies must be driven by business requirements rather than purely by technology. Increasing emphasis will have to fall on security and governance issues but most companies have not yet come to terms with these quite complex matters.

The 're-platforming' of applications into appropriately stable and dependable Cloud structures will be an important challenge and opportunity for large, medium-sized and small companies alike.



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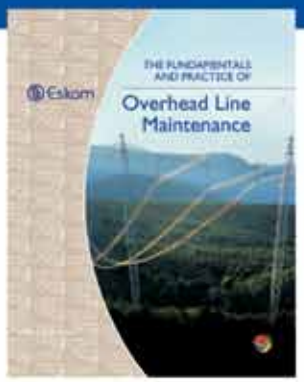

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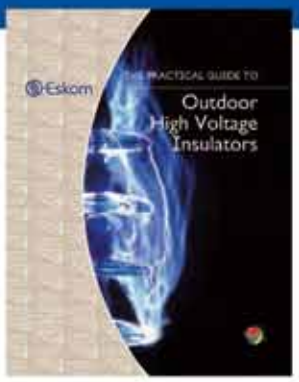

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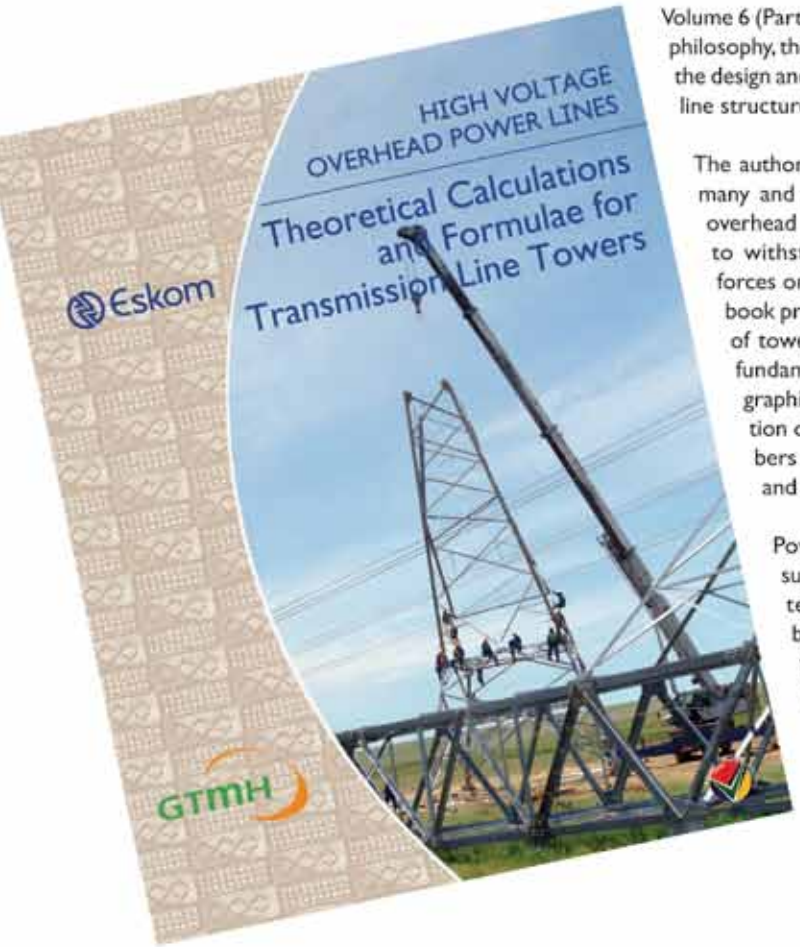
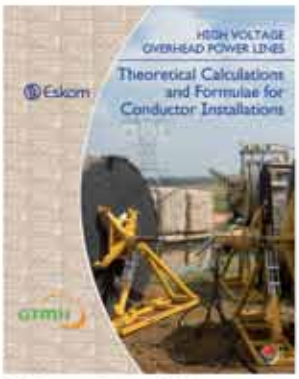


Volume 6 (Part 2) takes the reader through the philosophy, theory, principles and practices of the design and fabrication of overhead power line structures.

The author begins with an analysis of the many and varied mechanical forces that overhead power line towers are required to withstand. Once the nature of the forces on the towers is understood, the book proceeds to discuss the geometry of towers. It moves on to discuss the fundamentals of force diagrams and graphical techniques for the calculation of the forces in the tower members and introduces finite elements and computer methods.

Power line towers are routinely subjected to full scale mechanical testing and the book concludes by describing the procedures followed at major test stations around the world.

Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers



Volume 6: High Voltage Overhead Power Lines: Theoretical Calculations and Formulae of Conductor Installations

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Greater use could be made of 'Hybrid Clouds', ie, the combination of internal Enterprise Clouds and Public Cloud offerings. Not only could this enable the Enterprise to make best use of, and achieve highest flexibility in linking, internal and external Clouds, but also this could enable Enterprise IT Services to contribute revenue to the Enterprise by providing innovative off-peak Cloud services to external clients.

'Cloud Brokers' could stitch together disparate Cloud service offerings, thus enabling greater ease of delivery to, and use of Cloud applications by clients.

On the Cloud provider side, partnerships with clients rather than merely supplying loosely-structured services will likely have to receive high attention, especially in terms of on-going services innovations and adaptations to meet changing circumstances. Contractual, availability and reliability terms of reference will become more dynamic and will depart from the "once and for all contract" of the past.

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Unmanned combat plane unveiled in UK

The British Ministry of Defence and BAE Systems have developed the Taranis long-range unmanned combat stealth air vehicle that has taken more than a million man-hours to produce. The aircraft will undergo flight trials next year.

Named after the Celtic god of Thunder, this craft is the first step in the development of unmanned strike aircraft that are capable of penetrating into enemy territory. Unmanned aircraft carrying weapons are used in service but these are only suitable when the airspace is under allied control.

According to BAE's group managing director, Nigel Whitehead, the company was responsible for the overall development programme and for many of the technologies used on the craft including its stealth and low observability, systems integration and system control infrastructure.

The integrated systems technologies comprise the computers, command, control, communications, intelligence, surveillance, target acquisition and reconnaissance support functions. He says that there is at least ten years of research and development that has gone into creating these modules.

The specifications for this vehicle are still under development but the model that was shown at Warton has a height of four metres and a weight of eight tons. It has a range sufficient to use on inter-continental mission and an engine thrust of almost 3 000 kilograms. The wingspan is 9,1 metres or about the same size as a Hawk.

Photo above: Taranis was unveiled July 12, 2010 in a formal ceremony held at the anechoic test chamber at Warton. Photo: MOD

A close-up on the forward elements of Taranis, showing the stealthy 'beak', with contours leading to the dorsal air intake, and jagged panelscovering the landing gear, maintaining low radar cross-section of the belly. Photo: MOD

Leica's 37,5 megapixel flagship in South Africa

Leica, one of the world's most famous manufacturers of cameras, has launched its new S2 system that is probably the most advanced system in the world today.

Boasting a resolution of 37,5-megapixels, a dual shutter system and an aspect ratio of 3:2 (nearly 60 percent larger than a traditional 35 mm format) the Leica S2 is one of the most advanced cameras on the market.

It uses its own Maestro image processor, has a rugged design and is apparently also incredibly easy to use. Kodak developed the 30 x 45 mm image processor for the S2 range and in order to preserve image sharpness, the camera does not use a low-pass filter.

Instead Moiré effects are detected and eliminated using the camera's internal processor. A special micro-lens pattern allows for angled light rays on the image periphery to be captured and this is particularly significant when using the camera in low-light situations. With sensitivity up to ISO 1250, low-noise images can be captured under marginal lighting conditions.

The Leica S2 is appreciably smaller than other single-lens reflex cameras. The Maestro image processor chip allows for up to 1,5 images-a-second to be captured at maximum resolution. The S2 range of lenses is manufactured to extremely narrow tolerances and each lens is centred by hand.

The bayonet-mount on the lenses ensures rapid and precise digital exchange of data and commands (from the camera to the lens) and at the moment the range is restricted to 35 mm, 70 mm, 120 mm and 180 mm lenses all at F2,5. Leica plans to rapidly increase the range of lenses available for the S2.

The S2 has a metal focal-plane shutter with a maximum speed of 1/4000 of a second and a flash synchronisation speed of 1/125 of a second. However, lenses will have a leaf-shutter system as well that can be activated via the camera. The integrated leaf-shutter system allows for flash synchronisation up to 1/500 of a second.

Each S lens has its own Leica-designed autofocus microprocessor for precise auto focus and iris diaphragm control. The integrated focusing drive uses silent gearing that is proprietary to Leica. The lenses have apparently been extensively weather-proofed to withstand exposure to rain and dust.

ATMs spit out their money to hackers

In South Africa, criminals get their hands on some explosives, attach them to an automated teller machine (ATM) and blow the machine to kingdom come before hurriedly picking up whatever notes have survived the blast. In Las Vegas, a security hacker breaks into the machine using software codes and forces it to spit out all its cash.

The hacking routine was demonstrated to a cheering crowd by Barnaby Jack (he even sounds like a criminal, though he isn't one), director of research at security consulting firm IOActive Labs.

He carried out his demonstration using equipment that was freely available via the Internet.

Apparently Jack spent years learning how to break into stand-alone ATMs that are typically found at petrol stations, bars and retail outlets in the United States.

Jack showed delegates at the Black Hat hackers' conference how he could upload his software (called Dillinger after the famous bank robber) to the machine and, having infected it, force it to dish out all its notes.

He says that all ATMs are vulnerable to these types of attack but so far none of the banks in the US were prepared to let him experiment on their machines. He had hacked into ATMs made by Tranax Technologies for the demonstration.

More than 6 000 hackers and security professionals attended the Black Hat conference that is aimed at demonstrating the vulnerabilities of all devices that use software, from computers and mobile phones to advanced systems that control the US electricity grid.

The purpose of the conference is, apparently, to help security experts highlight vulnerabilities in various systems so that developers can better protect the systems that are being hacked with apparent ease.

Get an iPad lookalike for $35

An Indian company has developed a touch screen solar powered computing device that costs a mere $35 and is designed for students. India's Human Resource Development Minister, Kapil Sibal, who is now in talks with global manufacturers to commercialise it, unveiled the device.

It was made by students at the Indian Institute of Technology using standard components from original equipment manufacturers. It uses Linux as the operating system and has an Internet browser, a PDF reader and video conferencing functionality.

It uses standard parts that are freely available on the market. Sibal hopes to introduce it in various higher learning institutions from next year. He says that economies of scale should allow the price to drop even further to about $20 and maybe even less.

The device resembles an iPad and is equipped with OpenOffice, a media player, has multimedia input and output interface options and a touch screen. It can be fitted with an option that allows it to use solar power to recharge its batteries.

While the prototype model has been demonstrated in India the technical specifications for this device remain sketchy. Of course it's hardly likely to have the performance levels of the $500 iPad but then is all that technology really necessary?

India spends a huge amount of money on its education system and the investment has seen its literacy rates improve to 64 percent of the 1,2-billion population.

Some people say the iPad's worth every penny of the $500 that it costs while others say, "What do you want to spend all that money for?" At $35 I might buy one of India's new devices just to read my newspapers.

Kapil Sibal, India's Minister for Human Resource Development, unveils a prototype tablet on Thursday. Five years in development, the cheap device is being called India's answer to Nicholas Negroponte's OLPC laptop.

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3-D camcorder for the home market

Japanese electronics company, Panasonic has launched the first 3-D camcorder for the consumer market. It will be available from September and will cost £1 300.

Known as the HDC-SDT750, this camcorder has two lenses side-by-side, mounted in a single case but it only works on subjects that are between one and three metres away so it is limited in its functionality. There is no zoom function.

Panasonic believes that it's likely to be used for recording important moments such as a child's first tentative steps, but with the proliferation of video streams like YouTube it won't be long before some imaginative people find many, many more uses for this technology.

In addition to the 3-D function, the camera is capable of recording full 1080-pixel high definition footage when using a normal lens. Panasonic Hollywood Laboratory developed a professional 3-D camera and then used this as the basis to create the new camcorder for the consumer market.

Panasonic has also included a time-lapse function in this new model and by setting the recording interval to a predetermined time the viewer can watch a long recording in reduced time.

The company has also included a 5.1 channel audio recording sound system that uses five microphones so that when voices are recorded from the front, right, left or rear, they can be played back on a 5.1 system and be heard to come from that direction.

The new camera uses a high-sensitivity 3MOS System that provides 7,59-million effective motion image pixels and separates the colours into the red, green and blue channels and processes each one independently. This allows it to provide rich colour quality, detail and gradation.

It uses the large diameter F1.3 Leica Dicomar lens and the Crystal Engine PRO high-speed processing unit.

Robots to help older folk

Japanese researchers are developing robotic wheelchairs, mechanical arms and even humanoid waiters to assist the country's rapidly expanding population of old people. Japan currently has the highest life expectancy rate in the world.

These technologies are aimed at making life easier for the elderly and the disabled and for their care-givers too.

The robotic wheelchair was designed and developed at the Saitama University near Tokyo and it does not need to be pushed as it automatically keeps pace with the person walking alongside it.

It is equipped with a camera and sensors that detect the caregiver alongside it and any obstacles in front of it and will automatically manoeuvre around the obstacle it sees. It has a joystick to stop it that can be operated by the person using it.

The system allows multiple wheelchairs to follow a single caregiver.

Another innovation is the Rapuda robotic arm that has been developed by Woo-Keun Yoon of the National Institute of Advanced Industrial Science and Technology. It is aimed at partially paralysed people who can move a part of their body such as a fingertip, a toe or their head. The arm is attached to wheelchairs, a table or other objects and can extend for up to one metre and pick up an object and transfer it to the user.

Yoon says that the arm can be used to allow a paralysed person to have a cup of tea when they want to and to drink it all by themselves without the assistance of a caregiver.

Japanese people live longer than any others elsewhere in the world and the life expectancy is now 86,44 years for women and 79,59 for men.

High heels shorten calf muscles

Women (or men for that matter) who wear high heels often find it painful to walk in flat shoes because the calf muscles in both legs gradually get shorter. In fact scans show that the muscle fibres in the legs of people who frequently wear high heels are 13 percent shorter than those who avoid high heels.

Moreover, the tendons in the calf tend to be stiffer. As a result women are advised to spend more time wearing flat shoes and to do stretching exercises to keep their muscles in shape.

Professor Marco Narici, from Manchester Metropolitan University says that since the 1950s, women who wore high heels often complained that they struggled to walk in flat shoes but no one had examined why this was happening.

So he and a team of researchers selected a team of 11 volunteers from a group of 80 women who had worn heels of five centimetres for two years or more and who felt uncomfortable walking flat-footed.

A magnetic resonance image scan showed that there was no difference in the size of the calf muscles in heel wearers compared with a control group of women who wore flat shoes. But an ultrasound scan revealed that the muscle fibres were shorter in the women who wore heels.

When the women were asked to lie on their tummies on the couch the researchers noticed that the angle of the heel in women who wore high heels was greater because of the shortened calf.

Asked if you thought his research might cause some women to stop wearing high heels, Narici said that he doubted it because "fashion is intended to be uncomfortable".

He advised women to do stretching exercises such as standing on tip-toes on a step and, using the handrail for balance, to lower their heels as far as possible before raising them up again.

Asbestos still widely used around the world

Anyone who thinks that the use of asbestos has been banned throughout the world is completely wrong: Asbestos is still used in China, India, Russia, Brazil and many other developing countries despite the fact that it can cause severe health problems.

The use of blue or brown asbestos is banned throughout the world but white asbestos or chrysotile is still permitted in a range of applications most notably as a cheap and effective building material.

The Jeffrey asbestos mine in Quebec, Canada is producing tons and tons of white asbestos amid a rising crescendo of opposition to mining the mineral in that country. And many scientists say that the use of white asbestos will prolong the global epidemic of asbestos-related illnesses as it is apparently a known cause of human cancers including mesothelioma. The mineral is banned or restricted in some 52 countries around the world but there are many more that do not have any restrictions on its use at all.

According to statistics compiled by the World Health Organisation, 125-million people encounter white asbestos in the workplace while the International Labour Organisation estimates that about 100 000 workers die every year from asbestos-related illnesses.

In 2009 Jeffrey mine exported 153 000 tons of white asbestos and more than half of that went to India while the rest was sold to Indonesia, Thailand, Mexico, Sri Lanka, Pakistan and the United Arab Emirates.

More than two million tons of asbestos was mined last year and much of it was used in asbestos-cement products, which are durable, fireproof and cheap. It is also used to make roofing materials and water pipes.

And the Chrysolite Institute – a lobby group that has spent about $100-million on supporting asbestos sales in Canada, India and Brazil alone – insists that the material is safe if it is used correctly.

But critics claim that the Chrysolite Institute has simply tried to create doubt about the truth of the medical findings that condemn its use, rather than contest these claims in the courts and to delay regulations pertaining to its use.

The American Public Health Association has joined forces with the World Federation of Public Health Organisations, the International Commission on Occupational Health and the International Trade Union Confederation in calling for a global ban of all asbestos products.

South Africa banned the use of asbestos in 2008.

Brother 'shakes-up' the remote market

A Japanese electronics firm has developed a generator that harvests vibrations and it soon hopes to use this technology to replace standard batteries. The Vibration Energy Cell batteries deliver power after being vigorously shaken.

Brother Industries – better known for developing printers than for advance electronic devices – claims that the devices could be used to replace the AA or AAA-sized batteries in some devices.

The company demonstrated the cells in a TV remote control, a remote switch for a lamp and in an LED torch. (I'm not sure why this is so new considering that torches such as this have been freely available in South Africa for a number of years).

Brother says the device works in much the same ways as a bicycle dynamo using a coil, a magnet and condenser that charges electricity. These components are embedded inside the battery.

Apparently the company is seeking to reduce the number of toxic rechargeable batteries and other disposable batteries that harm the environment. So far, two of the AA-sized prototypes are able to produce 3,2 Volts, which is enough to provide power for a TV remote control.

The cells are the same size as AA batteries and just by walking around with the device in your pocket provides enough of a vibration to keep the batteries fully charged.

Meanwhile an American company, TenXsys is working on its Kinetic Energy Scavenging technology and in Britain, mobile operator Orange revealed the Power Wellies technology that uses a power generating sole in boots to convert heat from the wearer's feet into electrical current.

Brother says at this stage there are not plans to commercialise the batteries – but given the decline in the dot-matrix printer market it's possible that might change quite soon.

Laser weapons system a reality?

American firm Raytheon has developed an anti-aircraft laser weapon that has successfully shot down an unmanned aerial vehicle. The Laser Close-In Weapon System (CIWS) can be used on its own or in conjunction with normal anti-aircraft guns.

The solid-state fibre laser produces a 50 kW blast sufficient to demolish small aircraft, unmanned air vehicles, rockets and mortars and even small surface ships.

The notion that lasers could be used as weapons is not new and has been around since the first laser was invented in 1960. However, the early lasers needed a significant quantity of toxic chemicals to create the beam making their use in military applications extremely limited.

Solid-state lasers use glass or ceramic materials to generate the beam but still do need a large amount of energy to shoot down a craft. According to Mike Booen, vice president of Raytheon Missile Systems, the tests in a maritime environment indicated that laser technology could now be successfully deployed in a range of military applications.

However, there are some problems that do trouble weapons developers when it comes to using lasers. The first is that damp maritime air can absorb much of the laser's energy before it reaches the target and the second is that mirrors (or any reflective surface for that matter) can negate much of the laser's effectiveness. Booen says that while every material does reflect, this can be overcome by increasing the power of the laser beam. Once you get beyond that power threshold then the laser can do what it is designed to do – destroy a target.

Earlier this year Raytheon blew a number of UAVs out of the sky during tests at the US Navy's test range on San Nicolas Island off the coast of California.

Booen would not give details about the height, speed or range of the targeted UAVs but he did say that the tests were designed to be as realistic as possible, implying that the UAVs were probably behaving as they would under battle conditions.

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JOJEN SUPPLIES

Scientists create malaria-resistant mosquito

Scientists have engineered a malaria-resistant mosquito by introducing a gene into the insect's gut that prevents the malaria parasite from developing. The gene also reduces the insect's lifespan in what might be termed a biologically-assisted suicide.

The scientists hope to introduce malaria-resistant mosquitoes into the environment. Professor Michael Riehle from the University of Arizona and principal investigator on the project says it will be necessary to give the genetically modified malaria-resistant mosquitoes some kind of competitive advantage over the disease-carrying insects.

In the study, the researchers altered a gene that codes for a signalling molecule, which is a protein that enables the mosquito's cells to communicate with each other and is crucial for parasite development inside the mosquito.

The genetic tweak artificially increases its production, disrupting the genetic process and shortening the insect's lifespan. The team added a fluorescent tag to the gene to ensure that the mosquito larvae had successfully expressed it.

Apparently the modified mosquitoes have been tested using the Plasmodium falciparum parasites and found that these do not develop inside the modified mosquitoes. It has not yet been tested on the Anopheles gambiae mosquito responsible for the huge numbers of deaths in Africa where the disease is most prevalent.

The study was a collaborative project between the universities of Califonia Davis and Georgia and was funded by the National Institutes of Health.

Phantom Eye will stay aloft for four days

Boeing claims it has built a hydrogen-powered unmanned spy plane that can fly non-stop for up to four days at an altitude of 20 000-metres. The Phantom Eye is currently being shipped to NASA's Dryden Flight Research Centre in California where it will be prepared for its first flight next year.

Boeing says the plane will be able to carry out persistent intelligence and surveillance missions. The plane is the brainchild of the company's highly secretive Phantom Works research and development arm.

Apparently the plane is capable of sustained endurance flights because it uses a lighter and more powerful hydrogen fuel system. Chris Haddox of Boeing's Phantom Works says that, using aviation fuel, the maximum time that a plane can remain aloft is 60 hours but with hydrogen the limit is about 96 hours.

Two 2,3-litre four-cylinder engines provide 112 kW each to get the Phantom Eye off the ground and keep it in the air for four days. The aircraft has a wingspan of 46 metres.

New rocket designed but where's the cash?

Roskosmos – the Russian space agency – has designed a new spacecraft to ferry its cosmonauts into space and will eventually replace the 40-year-old Soyuz vehicle that has been used so successfully.

According to officials at RKK Energia, the chief contracting company for Russian's manned spaceflight programmes, the new architecture for the craft will be finalised within the next few months.

The preliminary designs were finalised in April this year and provoke criticism from international space agencies because the spacecraft relies on solid-propellant engines for landing the capsule and its six cosmonauts.

Until now, all previous Russian spacecraft have used parachutes to provide a soft landing of the capsule once it returns to Earth. RKK Energia has made an experimental propulsion system as a proof-of-concept exercise to show that it will be possible to land the craft safely using this solid fuel.

While the prototype is unable to fly, it sets out to demonstrate that it is possible to use solid fuel and control it sufficiently to land the craft. The new capsule does have the option of a parachute that will be used in emergency landings only.

The capsule will be fitted to the new generation Rus-M rockets that were approved for development by the Russian government last year.

However, the new rocket requires that it can only be launched from the Vostochny launch centre, which has still to be built.

Apparently Russian Prime Minister, Vladimir Putin has promised to provide funding for the construction of Vostochny.

Buckyballs found in space excite researchers

The largest molecules ever seen in space – and thought to be a third type of carbon – have been found using Nasa's Spitzer infrared telescope. Known as buckyballs they consist of 60 carbon atoms arranged in a three-dimensional sphere.

The atoms are linked together in alternating patterns of hexagons and pentagons that, on the molecular scale, look like a football and belong to a class of molecules known as buckministerfullerenes.

They were named after an architect, Richard Buckminister-Fuller, who designed the geodesic dome that these molecules closely resemble. Professor Jan Cami of the University of Western Ontario in Canada discovered the buckyballs.

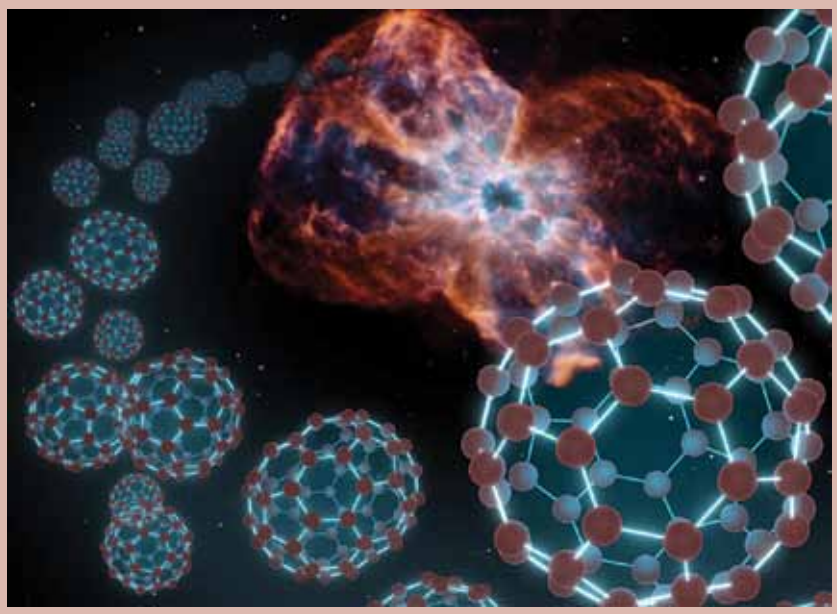
He says he was particularly excited by the discovery because these molecules have special properties that make them important for many of the other physical and chemical processes that are going on in space.

The researchers also found an elongated variation of the buckyballs, known as C70, for the first time in space. These molecules have 70 carbon atoms and they are arranged in an oval, resembling a rugby ball.

The molecules were found, unexpectedly, in the planetary nebula named Tc 1. Planetary nebulas are the remains of stars like our Sun that have shed their outer layers of gas and dust as they age. A compact, hot star, or white dwarf, at the centre of the nebula illuminates and heats the clouds of material.

The buckyballs were found in these clouds, perhaps reflecting a short stage in the star's life when it throws off a puff of material that is particularly rich in carbon.

Cami and his team used Spitzer's spectroscopy instrument to analyse infrared light from the planetary nebula and record the spectral signatures of the buckyballs. The molecules need to be at the equivalent of room temperature to give off distinct patterns of infrared light that can be detected by Spitzer.



'Super Star' emerges from the deepest realms

A new super star has been found by scientists in Chile. It is estimated to be about 300 times more massive than the Sun in our universe and its discovery has effectively doubled the previously accepted limits of solar mass.

The new star was found in two young clusters NGC 3603 and RMC 136a. A researcher at the University of Sheffield discovered the monster using the European Southern Observatory's Very Large Telescope in Cerro Paranal, Chile.

It is about 10-million times more luminous than the Sun and if it replaced the Sun at the centre of the solar system it would outshine our Sun by as much as the Sun currently outshines the Moon.

The team of researchers was led by Paul Crowther, Professor of Astrophysics at the University's Department of Physics and Astronomy. He says that the star is clearly quite young as stars are "born heavy and lose weight as they age".

He estimates that the star is about a million years old and has undergone an intense weight-loss programme, shedding about 20 percent of its initial mass over that time.

With the huge mass of this star, it would reduce the Earth's year to about three weeks and it would bathe the planet in incredibly intense ultraviolet radiation that would make all life on Earth impossible to sustain.

The Very Large Telescope uses four 8,2 metre and three 1,8 m movable auxiliary telescopes providing 8 Nasmyth, 4 Cassegrain and 1 incoherent combined focus plus a variety of interferometric options.

What this means is that, together, they provide for

- Direct imaging in wide fields;
- Diffraction limited imaging with adaptive optics and interferometry;
- Polarimetry;
- Long slit, multi-object and integral field spectroscopy at resolving powers ranging from a few hundred to ten-to-the-power-of-five.

To put this into English, the Very Large Telescope (what an imaginative name) comprises four optical telescopes (Antu, Kueyen, Melipal and Yepun) organised in an array formation, complemented by four auxiliary telescopes.

The seven telescopes work together in interferometric (working together) mode to achieve an angular resolution of around one milli-arc-second (enough to accurately determine the gap between the headlights of a car on the Moon).

And it was this Very Large Telescope that found a Very Large Star.

Zooming in on the most massive stars ever found. Star R136a1 (far right) is in a dense cluster of stars 165,000 light years from earth

Startling statistics condemn OBE

Startling statistics contained in a report by the Solidarity Research Institute (SRI) show that only 7,6 percent of the 1,44-million students who started their school careers in 1998 qualified for tertiary study.

Moreover, while the matric pass rate increased from 58 percent to 65 percent between 1994 and 2007, the admissions to university fell from 18 percent to 15 percent.

Johan Kruger, head of the SRI says that these figures show that three out of every four pupils who leave school are inadequately equipped to enter the labour market or to move on to the tertiary degree of their choice.

The report forms part of Solidarity's South African Transformation Monitor that focuses on the transformation of the education sector in this country. Its findings come on the back of a recent announcement by the Minister of Basic Education, Angie Motshekga that the Outcomes Based Education system is to be changed.

When making the announcement she conceded that the old curriculum had major problems and as a result the department was reviewing the design and methodology of the OBE system. (I think that might be funny-speak for "we will drop the system because it's not working").

According to the SRI report, access to school education has increased with 70 percent of Africans, 79,7 percent of coloureds, 92 percent of Indians and 99,2 percent of whites completing schooling to a Grade Seven level or higher.

However, competence in mathematics and science subjects was poor and in 2009, only 45,9 percent of the small group of students who wrote the maths paper passed. The pass rate for science dropped from 67,3 percent in 2006 to just 36,8 percent in 2009.

The report says that only 20 percent of the matriculants qualified for a tertiary education in 2009. Moreover, 51,8 percent of the estimated 138 000 first-year students who enrolled at universities did not complete the first year and only about 30 percent of them actually completed a degree.

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Exploding star blinds satellite

The explosion of a star that happened about five billion years ago was so bright that it temporarily blinded the satellite that had been set up to witness it according to astronomers responsible for the Swift orbiting observatory.

The gamma-ray burst and the explosion of X-rays that followed happened when the star died more than five billion years ago and it took this long for the radiation to be observed by Swift.

The explosion was so bright that the software in the observatory's instruments simply ignored it thinking that it was an anomaly rather than a real event.

According to Neil Gehrels, Swift's principal investigator based at NASA's Goddard Space Flight Centre in Maryland, the intensity of the gamma rays and X-rays was both unexpected and unprecedented.

When the blast erupted it was so intense the data-analysis software actually shut down. There were so many photons bombarding the detector each second that it couldn't count them quickly enough.

Phil Evans, a researcher at the University of Leicester who was monitoring the data, says the explosion was so bright it was like trying to use a rain gauge and a bucket to measure the flow rate of a tsunami.

When a star explodes, the radiation travels at the speed of light in all directions and the gamma rays are the first to reach Earth followed by X-rays.

The scientists were able to measure the gamma ray burst by detecting the photons a distance away from the centre of the explosion because the centre itself was too bright to measure.

The exploding star was about 140 times brighter than the brightest continuous X-ray source in the sky, a nearby neutron star.

Blue Straggler is hurtling through space

A hyper-velocity star that is travelling at the equivalent of 25,7-million kilometres an hour may have been hurled from the Milky Way by a super-massive black hole.

Scientists have been observing the star HE 0437-5439 through the Hubble telescope and it is these observations that have allowed astronomers to definitively trace the star's origins to the heart of the Milky Way.

It is travelling at the speed that is twice as much as it needs to escape the gravitational pull of the black hole. The astronomers suggest that about 100-million years ago, it was a member of a triple-star system that veered too close to the super-massive black hole in the Milky Way.

One member of the trio was captured by the gravitational pull and its momentum was transferred to the remaining binary pair of stars, which were then hurled from the Milky Way at huge speeds. As time passed, say the researchers, the large star evolved into a Red Giant and devoured its partner as it merged into a massive Blue Straggler that was eventually observed via the Hubble telescope.

Apparently the star looks extremely young but the merging of the two stars into a Blue Straggler would make it appear to be a lot younger than it actually is. Its youthful appearance led some scientists to contend that this star came from a neighbouring galaxy, the Large Magellanic Cloud.

All octopus species are venomous

Four new species of octopus have been found in Antarctica and each of them has a venom that works at sub-zero temperatures. Scientists are studying the venom to see if it has potential medical uses for human beings. Last year Dr Bryan Fry of the University of Melbourne revealed that all octopuses are venomous and he and a team of scientists started work on the huge task of collecting and studying the venoms used by octopuses all over the world. At the same time he was working on understanding how Antarctic octopuses had adapted to living in the freezing conditions and it was this that led to the discovery of the four new species.

He says that natural selection appears to have changed the way these species of octopus hunt their prey and use their venom. The octopus drills a small hole into larger shelled prey and then injects its toxins into the creature before consuming it.

So far the analysis has revealed that the Antarctic octopus venom harbours a range of toxins, two of which have not previously been described. Fry says that the venom is effective at sub-zero temperatures and the explanation for how it works will be unravelled after further investigations have been conducted to establish what biochemical tricks are used to keep it efficacious.

An understanding of the structure and mode of action of venom found in octopuses may help in the design of drugs for various human ailments. Hypertension drugs such as ACE inhibitors are structured in a similar way to snake venom while certain diabetes drugs are derived from the saliva of a Gila monster.

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Afridoctor application for remote diagnosis

A group of South African programmers created a pocket doctor for people who can afford to buy and use a smart phone. The Afridoctor site is a virtual health clinic created by Blueworld Communities, which is based in Cape Town.

It offers a snap diagnosis service that allows patients to send photographs of their ailment or injury to a panel of doctors who will reply with a diagnosis within 48 hours.

According to Werner Erasmus, the propeller-head who created the program, it is intended for external ailments, such as skin diseases, a bee sting or snake bites (although if it takes 48 hours to diagnose a puff-adder's bite then the patient could be dead by then). However, let me not detract from the intrinsic value of the application: it has other features such as find a doctor and distress as well as a host of first aid tips and a symptom checker.

The find a doctor module uses Google Maps to locate nearby health services, doctors, hospitals and emergency clinics. The distress feature allows users to contact a family member or a friend at the touch of a button (although how this is different to speed-dialling is beyond me).

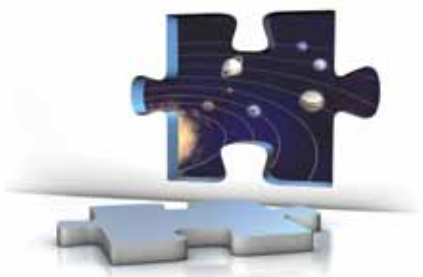
Erasmus says that so far the application has been downloaded more than 20 000 times and most of these have come from locations outside of Africa. Afridoctor was apparently developed in just three weeks and won a competition organised by Nokia for new cell phone programs.

Although the program currently runs on smart phones only, the company is working on a version that will run on more basic cellular phones and hopes that this will draw more interest (and users) from Africa where most users have second-generation phones as their handsets.

Competition to choose the next big (space) idea

The European Space Agency has called on scientists throughout Europe to come up with ideas for the next great space mission and it will provide funding to the tune of several hundred million Euros for the winning concept.

According to ESA's science director, Professor David Southwood, the bids must address fundamental questions about the universe and our place within it. The future science missions form part of a programme called Cosmic Vision. Apparently the agency is in the process of selecting what it calls two medium class ventures to launch in 2017/18 and three concepts are competing for the two launch slots.



The first is Euclid, a project to study the dark universe; the second is Plato, a sophisticated telescope that hunts for planets and the third is the Solar Orbiter, a satellite that orbits close to the Sun and monitors it for a sustained period.

The agency also has what it calls a large class competition that demands more expensive and more complex missions that will be ready to launch by 2020. Many scientists in Europe are already working on projects for this competition. Ideas hatched so far include missions to comets and the outer planets, plans to study the auroras and a project to examine particle acceleration on the Sun.

Dr Andrew Coates from the Mullard Space Science Laboratory is working on an entry known as FAME-P for the Fast Auroral Mars Explorer, a multi-purpose, multi-probe mission to the planet that would image auroras, study surface weather and other atmospheric activity.

Japan hopes mirrors will stop probe frying

The Japanese Aerospace Exploration Agency is to launch a mission to Mercury – the hottest planet in our solar system – and believe that, using a system of mirrors, they will be able to preserve the spacecraft for long enough for it to send meaningful data back to Earth. Temperatures on the surface of Mercury are a scorching 450°C.

According to Seiichi Sakamoto, head of the JAXA team, by reflecting the intense heat of the sun using mirrors, the craft's temperature can be kept at about 160°C while inside the spacecraft where the observation equipment is housed, it will be possible to keep the temperature below 60°C.

The craft is octagonal in shape and is 1,8 metres wide. It is powered partly by solar energy collected by panels wrapped around its body. It is designed to constantly rotate to prevent one side or the other from overheating. Tests on how the probe will react when encountering extreme temperatures will be simulated in the Netherlands using an artificial sun that discharges extremely strong, magnified sunlight and heat. These tests will help to determine if the probe will be able to survive the extreme heat encountered around Mercury.

The other technical challenges include the fact that Mercury has a hugely different revolution speed compared with Earth and its mass is much smaller. As a result the Mercury probe will need to have a high level of thrust. Orbiting Mercury, the sun will appear to be at least 11 times larger than it is here. The surface temperature is sufficient to melt lead and the infrared radiation from the surface is high. For these reasons high technology anti-thermal techniques are required to protect the probe and its instruments from frying. JAXA is confident that it will be able to launch the probe by June 2014.

CPD Overview

WATTnow, in conjunction with the South African Institute of Electrical Engineers (SAIEE), has launched this programme for engineers who need to meet their professional development commitment by securing Continuing Professional Development (CPD) credits. In terms of the renewal of registration requirements, all professional electrical engineers must earn five CPD credits a year. Failure to certify CPD credits could jeopardise renewal of their registration.

WATTnow publishes articles in each issue that qualify readers for Category One CPD credits, which require engineers to respond to in-depth questions posed on articles that are specially designed and validated to provide CPD. Engineers using the system will accumulate between 0.1 and 0.3 CPD credits if all the questions are answered correctly. Ten such articles are published annually so at least one CPD credit can be obtained by this method. The articles in **WATTnow** are independently validated by the SAIEE, which determines the exact value of each credit applicable to each issue of the magazine.

In future, **WATTnow** will produce a series of video broadcasts of up to six lectures annually on topics that have been validated for CPD by the SAIEE. These lectures will be filmed and edited by a **WATTnow** production team and converted to either CD or DVD disks before being distributed free-of-charge to members of the **WATTnow** CPD Programme.

A series of appropriate questions will be included on the CD or DVD and members of the programme can submit their answers directly to **WATTnow** by e-mail, on-line or by fax. The filmed presentation will qualify the user to claim credits in the Category One section, which makes attendance of a conference at least once a year mandatory.

The SAIEE will issue each member with an official certificate recording the exact number of credits gained by each individual in any given year.

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.

This 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 for sufficient credits to meet the ECSA requirements.

For further information visit www.wattnow.co.za

Science, engineering and technology – SA leads the rest of Africa

Science, engineering and technology – SA leads the rest of Africa

South Africa may have been riding the crest of its fast receding Football World Cup wave but there are indications that business is really rapidly getting back to normal. And that normal doesn't paint a particularly pretty picture either.

For instance, the levels of acidic mine water from old mine shafts is likely to spew into the streets of Johannesburg unless certain emergency measures are put in place.

Eskom has warned of probable load-shedding in 2011 and 2012 so our electricity supplies are anything but stable. And, of course, the price of electricity will increase from April as well.

Tolls on the Gauteng highways will be introduced in April next year, pushing motor costs even higher and this is exacerbated by the fact that an emissions tax on all new vehicles comes into effect later this year.

The Gautrain will start running between Johannesburg and Pretoria and, depending on fares and service may help to get many thousands of cars off the roads.

The levels of corruption and crime remain an ever-present conundrum but then there are signs that at least our courts are still working: Jacquie Selebi, former police commissioner was sentenced to 15 years in jail and while his appeal may drag on the record books show that he was found guilty as charged.

Glen Agliotti denied indemnity in the Selebi trial and, in the murder of Roger Kebble trial, it seems that several other witnesses will also be denied indemnity from prosecution.

Yes, things have got back to normal pretty quickly indeed.

But then if you scratch just beneath the surface you start to find that there are some truly amazing things unfolding in South Africa. Many of them are seldom reported and many more discussed at a board meeting, a council meeting or, if you're lucky, at a conference.

In April this year, ahead of the football madness, Reuters published its Global Research Report on Africa and it highlights the leading role that South Africa plays in the research and development arena internationally. It also shows just how poor research and development resources are in the rest of Africa.

For the purposes of this report, the African continent is divided into the northern region comprising Egypt, Tunisia, Morocco, Algeria and Sudan, the central region that includes Nigeria in the west and Kenya in the east and the southern region made of members of the Southern African Development Community.

The report shows conclusively that Egypt, Nigeria and South Africa dominate scientific research on the continent. In order to measure scientific research, the report examines the number of papers produced over the period 1999-2008.

The figures are interesting: Egypt produced 30 000 papers, Nigeria produced 10 000 and South Africa produced 47 000. In Reuters Essential Science Indicators' database, South Africa is ranked first or second in 20 of the 21 main fields that include subjects as diverse as biology and biochemistry or space science. South Africa's most highly-cited papers pertain to climate change and its effects on plant propagation. South Africa's share of the geosciences section is in keeping with the country's mineral richness.

However, as the researchers point out, the volume of published papers is just one indicator of research activity and of the research capacity in each region. Moreover, the bigger countries, with larger economies are likely to produce more papers than the smaller and poorer countries.

To overcome this imbalance, the researchers compared the number of published papers with the gross domestic product of each country, reasoning that the proportionate investment in the knowledge economy is a good indicator of the government's commitment to resource development through science and research.

The leading countries using these measurement criteria are South Africa, Egypt,

Note: Voluntary associations registered with ECSA can apply to the SAIEE to allow their members to gain credits at the reduced rate.

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Nigeria, Tunisia, Algeria and Kenya. However there are some surprising anomalies: Zimbabwe, for instance, is a highly productive country in research terms despite its collapsed economy and its very low gross domestic product.

The reason for this is apparently that Zimbabwe has a long legacy of quality research that is still widely used. Another example of the research quality is that of Malawi that has just a tenth of the annual research output of Nigeria but the quality of Malawi's research is higher than the world average benchmark.

There is no doubt that South Africa is the outstanding research leader on the African continent, has by far the greatest research output of any country, well ahead of Egypt in second spot, and the research output has a high impact within the international scientific community.

Perhaps this is not surprising given the widespread support that exists for scientific endeavours in South Africa. There are a huge range of resources that are available to academics, entrepreneurs, existing companies and specialised research organisations.

Consider, for instance, the Department of Science and Technology's role in supporting science, engineering and technology at all levels from primary school to doctoral research projects.

There is not an overall estimate of South Africa's total investment into research in the science, engineering and technology fields. However figures from 2003/04 show that the country spent R10,1-billion on research and development initiatives.

And the diversity of the projects being supported through the Department of Science and Technology (DST) and the many research foundations, specialised organisations and private sector initiatives is just as huge.

This department invests close to R5-billion annually in various different programmes and the main focus of its leadership activities focus on:

- Space science and technology;
- Hydrogen and energy;
- Biotechnology and health innovation;
- Innovation instruments and planning;
- Supporting the National Advisory Council on Innovation.

Added to this is the work that is done through other organisations such as the National Research Foundation (NRF) and the Council for Scientific and Industrial Research (CSIR), which has as its sole shareholder the DST.

Much of the research work done by the CSIR is in collaboration with other organisations and in its most recent set of figures, the CSIR says that the value of contract research work that supports national strategies increased from R373,5-million in 2008 to R450-million in 2009 while the value of contract research and development increased from R707-million to R847-billion.

Moreover, its royalty income grew from almost R23-million to more than R40-million over the same period and is likely to keep growing in the future as more and more research and development projects are commercialised. Clearly the CSIR is a big business.

In 2009 the CSIR's income was just more than R1,5-billion and R480-million of this was via a government grant, while the balance was generated from its own commercial activities. Its operating expenditure was sufficiently lean to allow it to generate a modest net profit of R59,2-million.

Where is the focus of the CSIR's activities? There are numerous, highly innovative and sometimes quite astonishing research and development activities in the following fields:

- Health, with a focus on nutrition and affordable, novel treatments;
- Natural environment with a specific focus on using the existing resources wisely and in a sustainable fashion;
- Energy with a focus on alternative and renewable technologies;
- The built environment including issue of transportation and sustainable human settlements;
- Defence and security
- Industry, focusing on advanced manufacturing and mining.

Added to this is the CSIR's own objective of building the research infrastructure that can be used and shared by other organisations around the country, including tertiary educational institutions and private sector industry. Some of the projects that have been developed or are being researched include:

- In the health sector, the CSIR has developed a novel, economically-competitive manufacturing process that will reduce the production costs of thymidine, a valuable intermediate in the preparation of AZT and stavudine used in first and second-line HIV therapy. A patent application has been filed on this technology and the commercial rights to exploit its use have been granted to an independent company.
- Other activities in the health sector include:

o Developing research on two new antimalarials; Establishing GreenPharm to produce, from plants, a neutralising antibody for the rabies virus; Recording 250 claims by traditional healers for

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 that you have the time and interest to help mentees, please contact Ansie Smith on smitha@saiee.org.za or 011 487 9050,

In addition you gain CPD credits, for when you are required to re-register.

the use of medicinal plants in traditional remedies. Already 15 of these have demonstrated positive results. Formulation of a new bioceramic material with attached bone morphogenic properties to be used in craniofacial applications such as those caused by tumour resections. Developing a technology based on a proprietary micro-organism that has been genetically engineered for the expression of therapeutic peptides. Development of an injectable, minimally-invasive dermal filler, known as Dermapearl that has a long-lasting effect and may help with tissue regeneration. The technology consists of hollow, ported polymer micro-particles fabricated through an emulsion process and used in conjunction with a carrier such as hyaluronic acid. Dermapearl can be used in cosmetic and facial reconstruction procedures. Development of a faster, more reliable way to genetically transform plants.

- In the natural environment sector, the CSIR has compiled a comprehensive picture of mercury in the natural water systems throughout the country and has identified fresh water conservation areas. These projects are being done through the South African National Biodiversity Institute. Other projects include:
  - Proclamation of the largest marine-protected areas in the world off Prince Edward Island in the sub-Antarctic; A comprehensive study of sand-mining in the estuaries and riverine sections of Durban's rivers. Improving management of the trans-boundary river basins through the Transboundary Waters Opportunity analysis developed by the CSIR. Development of a trialogue model to link science, government and society in safeguarding existing ecosystems. Development and commercialisation of the GasCAM camera that is capable of detecting sulphur hexafluoride (SF6) gas leaks on electrical switch gear. SF6 produces up to 24 000 times the global warming impact of carbon dioxide. Using soya bean and sunflower solids (after oil extraction) for use as a food for farming Mozambique Tilapia and Dusky Cob. The development is significant as no similar plant-based feed exists on the market except for expensive products used to feed ornamental fish. Implementation of the South African Earth Observation Strategy led to the use of the Data Information and Management System that will maintain a remote sensing archive and create new products for accurate imagery on energy, climate, water, weather, ecosystems, agriculture and biodiversity.

In these sectors alone, it's evident that the value of research and development in South Africa is not only viable in commercial terms but also has a tremendous impact on the quality of lives of people all over the continent. But this is just the tip of the iceberg.

There are many other organisations that are similarly involved in research that relies heavily on science, engineering and technology. And the resources are in place to back-up South Africa's scientific efforts.

As a country, the National Research and Development Strategy set out to increase innovation through technology and to strengthen science and engineering knowledge and research. Added to this, the country's National System of Innovation advises government on policy and funding.

In terms of science councils, the government is able to directly commission research that is in the national interest. Moreover, the National Research Foundation is the key public entity responsible for supporting the development of the human resource capacity for research, technology and innovation in all fields.

The CSIR is widely known and respected but there are other similar organisations such as the Agricultural Research Council, Mintek, the mineral research organisation, the Human Sciences Research Council, the Medical Research Council and the Council for Geoscience.

Added to this are organisations such as the Biotechnology Partnership for Africa's Development and the National Health Laboratory Service with 240 laboratories countrywide.

South Africa's scientific infrastructure is, in African terms, awesome and, for a developing country, impressive but there is little doubt that much more needs to be done to foster the student population to enter the fields of science, engineering and technology.

And if there is one area where South Africa has failed it is in its provision of basic education. So much so that the Outcomes-based Education system is largely being abandoned and replaced with a new curriculum that will focus on improving the standard of basic education throughout the country.

The research infrastructure for the scientific community exists and there are numerous innovations funds and tax incentives that have been set up to encourage greater investment in research and development.

So, while the infrastructure and investment incentives are there, the question is, are these facilities being used properly and productively? In this regard the answer must be a slightly hesitant, but nevertheless resounding yes.

Lotus taxi for London's streets

Lotus has developed a hydrogen-powered taxi for the London Olympics and hopes to have the vehicle operating around the streets of the city by 2012. It is the first of several zero exhaust emission vehicles being developed for the spectacle.

The taxi looks exactly like any other London cab but it is completely different when it comes to the engineering efficiencies. It accelerates from 0-100 km/h in 15,5 seconds, which is seven seconds quicker than the current diesel-powered taxis on London's streets.

The back wheels of the Lotus taxi are powered by two electric motors than run on a lithium polymer battery. It also has a stack of fuel cells that convert the energy from hydrogen – stored in a tank under the bonnet – into electricity. The electric motors are powered either by the battery or by the fuel cell system or both. During braking, the battery, located under the floor in the middle of the cab, is recharged using kinetic energy captured during braking.

The taxi does not have an exhaust pipe because it emits water vapours. The fuel cells are recharged using gaseous hydrogen that is pumped into a tank under the bonnet and it takes about five minutes to fill. On a full tank of hydrogen it has a range of at least 260 kilometres and, if driven carefully, this can be extended to almost 400 kms. London's mayor, Boris Johnson wants all taxis operating in the city to have zero emissions by 2012.

IDC to throw money at Africa's green projects

The Industrial Development Corporation is to invest almost R12-billion in 11 wind-power projects, seven solar ventures, two biomass plants and one hydro-electric scheme over the next five years. It is part of the R100-billion investment in Africa planned by the IDC before 2015. The IDC has committed R924-million to the Turkana wind project in Kenya and R33-million has been earmarked for the feasibility study for a 450-MW solar park in the Northern Cape using both thermal and photovoltaic technologies.

In addition to these projects the IDC is funding the continued development of the Joule electric motor car and is involved in a feasibility study to produce large-cell lithium ion batteries in South Africa.

It is also considering building a plant to recycle fluorescent light bulbs and has set aside R16,5-million to help build a facility to produce organic composted products.

The investment bonanza is apparently aligned to the Department of Trade and Industry's industrial action plan that hopes to create about 300 000 jobs in South Africa over the next ten years.

World is warming slowly but surely?

The world is set to record its hottest year since 1880 after record-breaking temperatures in the first six months of this year according to meteorologists at the United States National Oceanic and Atmospheric Administration. In the northern hemisphere, the June temperatures are the highest ever recorded and the fourth consecutive month for record high temperatures.

The scientists say that the January-to-June period registered the warmest combined global temperatures since 1880 when record keeping began in the United States.

The combined land and ocean temperature for the first six months of 2010 were 14,2°C, which is 0,68 of a degree above the 20th Century average for the January-to-June period.

In June the combined land and ocean temperature was 16,2°C and this was also 0,68 of a degree higher than the 20th Century average of 15,5°C. Arctic ice is melting faster than normal and is likely to shrink to less than it was in 2007, its smallest area ever recorded.

Meteorologists blame climate change and the proliferation of greenhouse gases for the rising temperatures and are predicting that without stringent reductions in carbon dioxide emissions the global temperatures could rise by about six degrees.

The hotter-than-average 2010 temperatures in the northern hemisphere are due in part to the El Nino phenomenon, which does tend to disrupt weather patterns in the equatorial Pacific.

June was the 304th consecutive month when global surface temperatures were above the 20th century average (which is curious because 304 months is more than 25 years).

Apparently the last time that the average surface temperature dipped below the 20th Century average was in February 1985. It seems the researchers are using the 100-year term as from 1880 to 1980 to provide the average temperatures on which they base their calculations.

Energy theft is costing SA billions

Energy Minister, Dipuo Peters has confirmed that Eskom and the country's municipalities are each losing about R3,6-billion a year through electricity thefts. In reply to a parliamentary question she said that 5 850 GigaWatt hours appeared to be the result of theft.

She says the assumption is that most of these losses take place among residential customers who buy electricity at an average of 62 cents per kilowatt hour and it is this that provides the figure of between R2,5-billion and R3,6-billion.

The irony is that many of the people who are apparently relying on illegal connections for their electricity supply are not receiving any of the free basic electricity that they are entitled to receive. (No they are receiving all their electricity for free so what would they do with that allowance anyway? – Editor).

Eskom has blamed illegal connections for system overload and instability and has said that these connections contributed to higher electricity prices because the losses had to be built into the tariff application. (Surely it would be cheaper and more effective to stop illegal connections completely through an efficient policing and prosecutorial system. Or is that a dumb question? – Editor)

In a separate development, Public Enterprises Minister, Barbara Hogan has confirmed that local, provincial and national government owes Eskom about R190-million in electricity arrears.

Eskom has been threatening to cut electricity to defaulting municipalities but so far has failed to do so. Meanwhile, AfriForum has lodged a complaint with the Public Protector based on its contention that poor municipal management was to blame for the non-payment of Eskom's bills.

AfriForum spokesman Cornelius Jansen van Rensburg says that in almost all the incidents, residents had paid their respective local authorities and yet the councils had not paid Eskom.

He contends that if Eskom cut the electricity supply to a particular town then those residents and businesses that had paid their bills would be unfairly prejudiced.

Electricity improvements for EAPP and WAPP

The United States Agency for International Development is to provide $2,5-million to the East African Power Pool for capacity building and technical assistance in the power generation sector.

According to Sindiso Ngwenya, secretary-general of Comesa (Common Market for Eastern and Southern Africa), Africa's energy is not only scarce but expensive and is a serious impediment to competitiveness and is hampering economic growth.

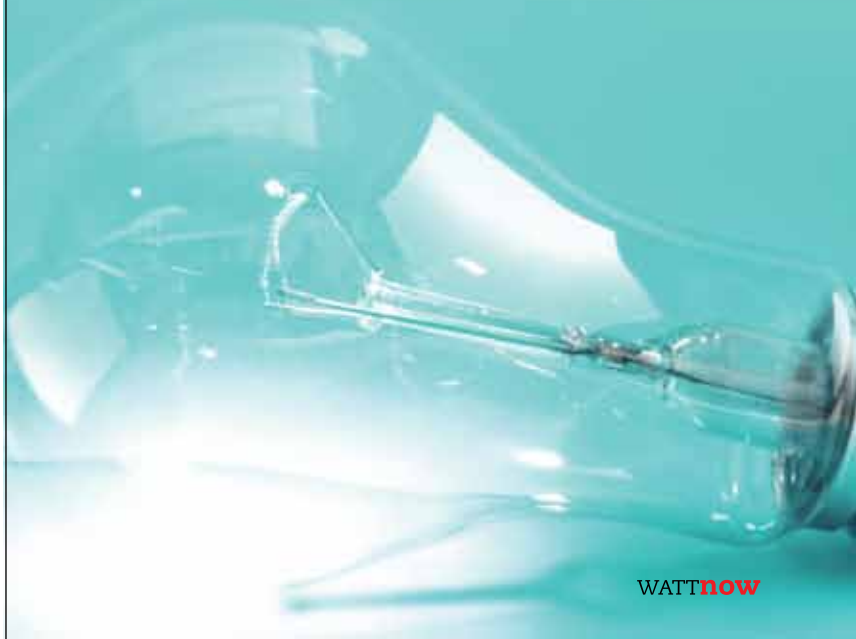
He says Comesa has about 38 000 MW of generation capacity and 73 percent of this is from thermal sources and the balance is hydro-electric power. Worryingly though, the effective generation is more than 20 percent less than the installed capacity because of a lack of maintenance and rehabilitation.

However, on the other side of the continent, member states of the Economic Community of West African States is planning to erect a 330 kV coastal transmission backbone that will be used by members of the West African Power Pool to improve power transfer between Ghana, Togo, Benin and Nigeria.

This project is being implemented in two phases and is being funded by the Kuwait Fund, the European Investment Bank, the World Bank and the International Development Association. Some funding will also come from the African Development Bank.

The Ghanaian components of the project also include reinforcement of the 161 kV northern transmission network and the Ghana-Burkina Faso interconnection project.

The coastal transmission backbone will comprise a 330 kV from Sakete in Benin to Ikeja West in Nigeria; a 330 kV line from Aboadze to Volta in Ghana; a 330 kV line from Kumasi-Prestea to Aboadze in Ghana and a 330 kV line from Volta in Ghana to Mome Hagou in Togo and on to Sakete in Benin. To control the lines, various control centres will be upgraded in Togo and Ghana.



Ghana power and water prices sharply up

If South Africans believe that they are getting the thin end of the wedge when it comes to electricity and water prices then they should consider what the Ghanaians have to put up with instead. Ghana has increased electricity prices by 42 percent and water tariffs by 135 percent.

The Public Utilities Regulatory Commission approved these increases. In the lowest consumption category among residential users the price has been set at between 12 and 17 pesewa per kiloWatt-hour (kWh), (up from 9,5 pesewa) for those consuming between 51 and 300 units.

For those people using between 301 and 600 units, the price is set at 21 pesewa per kWh and for 600 units and above the tariff is 23 pesewa. The water prices are up from 66 to 88 pesewa per cubic metre for consumers using 0 to 20 cubic metres a month and for those who use more than 20 cubic metres, the tariff is now 120 pesewa. For companies the price is set at 150 pesewa, up from 110 pesewa per cubic metre.

The last time that electricity and water prices were increased was in 2007. The increase in water tariffs is apparently necessary so that the public utility, Ghana Water Company and Aqua Vitens Rand (which manages the water company) can meet key operational expenditures including water treatment, replacement of old equipment and maintenance of existing facilities.

Similarly the electricity price increases were justified because the Electricity Company of Ghana, the Ghana Grid Company and the Volta River Authority can now do essential maintenance work on the distribution grid, the transmission lines and the power generation plants.

The price increases have angered Ghanaian consumers who have been struggling with spiralling inflation over the past three years, coupled with lower-than-expected economic growth.

The consumer group known as the Committee for Joint Action claimed that the government was being reckless by allowing these price increases and warned that demonstrations as well as aggressive industrial action may result unless the prices are adjusted.

To add to the woes facing consumers in Ghana, the electricity supply is intermittent and unreliable. Most companies have apparently been forced to purchase their own power generators because they cannot rely on a steady and clean power supply via the national grid.

Solar Impulse sets new record

A solar-powered light aircraft has been flown for 26-hours non-stop around Switzerland and marks the longest and highest solar-powered flight so far undertaken. The carbon-fibre plane, and its pilot Andre Borschberg, proved that solar power can be used in aviation by flying the craft non-stop for 26 hours and reaching an altitude of 8 564 metres.

The aircraft is not a midget when it comes to specifications: it has a wing-span of an Airbus A380 and it weighs about the same as a small car at 1 600 kilograms and its four engines each produce just six kilowatts.

It is packed with electronics and is the result of extensive research among the top engineering, electronics and aerospace and solar energy researchers from several different Swiss universities.

The beige and silver-grey prototype is designated as the HP-SIA and it has 12 000 ultra-thin solar cells spread across its wing area of 200 square metres. The solar energy is fed to a 400 kg load of lithium polymer batteries.

Each of the four electric motors used to propel the craft develops six kilowatts – and each one is barely more than the power of the engine that helped to get the Wright Brothers off the ground in 1903.

The 3,5-metre propellers rotate slowly compared with more traditional aircraft. A Swiss watch-making group made the precision instruments used to measure the slightest change in the tilt of the aircraft. The instrument was rigged up to the sleeves of the flight jacket so that the pilot would be aware of any changes in the angle or altitude of the craft.

It took seven years to plan, design, build and refine the Solar Impulse.

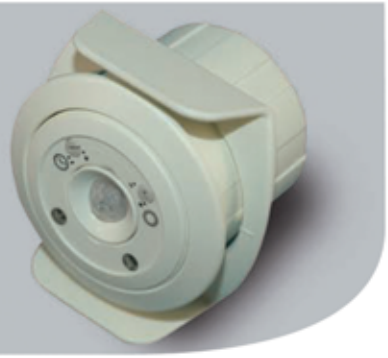
Always the perfect light. Guaranteed!

How intelligent controls combine savings and comfort

- Lighting consumes an astonishing 19% of the world's electricity generation. The resulting CO_2 is equivalent to 70% of global emissions from passenger vehicles and is three times more than emissions from aviation.
- However, lighting offers various opportunities to reduce your energy bill.

3 efficiency solutions for your building:

1 Light only when you need it
– Occupancy Sensing

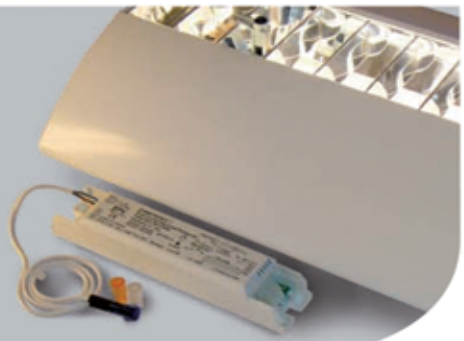


Have you ever noticed how often the lights are left on when a room is not in use? Major improvements in sensitivity and reliability have transformed the primitive "Motion Sensing" approach into a high-comfort Occupancy Sensing.

Occupancy Sensors automatically turn lights on when a room is occupied and off when a room is vacant. Saving energy could not be easier.

Typical applications include offices, conference rooms, bathrooms and storage areas.

2 Use only as much light as required
– Dimming, especially Daylight Dimming



In most buildings the lights are on at full intensity all day even when plenty of daylight is available. This is a waste of energy and causes unpleasant overlighting.

Daylight Dimming is the answer to this problem. When sufficient daylight is available the artificial light will gradually dim down. A constant guaranteed illumination level is maintained in each room at all times.

DAYTRONIC ballasts are an easy and affordable Daylight Dimming solution - for retrofits and new buildings.

3 Replace inefficient lamps
– For example: LED Emergency Exit Signs - Zero maintenance over lifetime

In addition to high energy costs standard Emergency Exit Signs cause significant maintenance costs: The lamps, ballasts and batteries in these signs require regular maintenance and replacement.

HELIOS LED Exit Signs eliminate 100% of these maintenance costs and reduce electricity costs by over 80%.

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Main benefits

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- **Quick and easy installation**
- **Suitable for retrofits and new buildings**
- **Short payback times.**

EPV

EVECTO ENERGY

The SAIEE supports the Science Week for good reason

By Stan Bridgens

The SAIEE over the last few years has become increasingly concerned about the poor educational pipeline to tertiary institutions for the training of engineers in general and for electrical engineering in particular.

It has therefore decided to put energy into influencing the many scholars visiting the Science Week EXPO at the SAASTA premises in Observatory during the National Science Week 02 t0 06 August 2010 initiative.

Shown above are Grade 12 pupils who were told about the exciting opportunities in electrical engineering and Sue Mosely and Zanele Gumede were explaining the broad spectrum of the discipline that could virtually satisfy any ambition of any scholar seeking a career in engineering - provided of course they concentrated on maths and science for good grades.

Basically the four careers starting at the most needed electrician and technician career paths to the technologists and engineers was explained in detail by the SAIEE staff.

Then they were tested in the bicycle generator to see who could produce the highest watts output by pedalling the fastest. Sipho, a Grade 12 pupil, attained the maximum 440 watt output and here he is seen achieving this feat to the delight of those not quite so athletic but never the less good material for electrical engineers of the future.

Southern Cape AGM and invitation lecture

The 2010 AGM was held in the Conference Room of the George Civic Centre and the outgoing Chairman, Les Stuart, welcomed the guests, members and the speaker Frans Lindeque.

The Chairman gave a brief résumé of his annual report which is available as a separate document. Les Stuart announced the composition of the new Committee and Office Bearers for 2010 before handing over to Lindo Hauptfleisch, the newly elected Chairman for 2010.

For the introduction to the evening's Invitation Lecture, Lindo requested that Les introduce Frans Lindeque as he has known Frans for a number of years , having worked with him in the communication industry. Les enumerated the various projects that Frans had been associated with and why he was the ideal person to present the lecture.

The title of the lecture was: The Evolution of Television, and the Challenging Road Ahead and was given in Powerpoint format with many interesting videos and animations.

It started with a video clip of a typical rocket launch of a communication satellite and the subsequent operations of placing and maintaining such a device in geosynchronous orbit.

It continued with the history and the early establishment and introduction of TV and outlined the current status of the medium, the complexity of both satellite and terrestrial digital distribution and interconnection.

It concluded with a discussion on the exciting challenges that lie ahead, including the developments and issues surrounding IP TV and 3D TV.

After the presentation of the paper, Frans dealt with questions from the floor and discussed the various items raised. In conclusion, Lindo thanked Frans for taking the time to make the presentation in George.

ENGINEERING THE FUTURE - School Group Project Report

By the SAIEE Western Cape Correspondent, Larry Kuvutlu

Engineering skills shortages have been identified as one of the aspects that might hinder economic growth in South Africa. The paper compiled by Allyson Lawless entitled Engineering Institutes looks at the skills shortage that threatens to affect the economic growth of South Africa, and suggests increasing the number of high calibre graduates from South Africa`s tertiary institutions. This can be done by increasing the number of engineering trained graduates through our tertiary institutes.

A specific concern for the South African Institute of Electrical Engineers is the shortage of electrical engineers. The SAIEE needs to stimulate the appeal for electrical engineering among younger students so that they choose electrical engineering as a career.

The SAIEE needs to be the authority in providing all information relating to studying electrical engineering in South Africa. This information needs to be packaged in a manner to appeal to the young students. The SAIEE Western Cape approached the MTN Sciencentre for an enrichment or informative learner experience specifically geared to promoting careers in electrical engineering. This will be done via a programme of school group visits to the MTN Sciencentre. Among the schools that this programme targets are the Dinaledi schools, which were formed in 2001 to improve participation and performance in mathematics and science, particularly among previously disadvantaged learners. To address the skills shortage will require intervention measures at high school level. For this reason the SAIEE Western Cape Centre has embarked on a project that aims to:

- Encourage learners to take electrical engineering as a career
- Improve the appreciation of engineering, science and technology among educators
- To market the SAIEE as the authority in providing any details regarding studying electrical engineering in SA

With the School Group Project, the SAIEE made it possible for 11 schools to be taken into the MTN Sciencentre at Canal Walk, Cape Town. Each school group consisted of 55 learners and five educators. The MTN Sciencentre contains a floor of science and technological exhibitions. These exhibitions explore science and technology such as, wave propagation, gravity, forces, hydraulics, electricity, magnetism and so forth. They even have the largest working cellphone in the world, as confirmed by the Guinness Book of World Records.

Each school was given an opportunity to spend an hour on the MTN Sciencentre floor and interact with the Science and Technology exhibitions. The school group was then separated into two groups. The one group participated in a workshop to build an electric motor, while the other group engaged in science and technology activities at the centre; this lasted for an hour then the two groups swopped activities. After this, both groups congregated at the MTN Sciencentre auditorium and were shown a video on electrical engineering followed by a talk from one of the SAIEE members (an electrical engineer) on what electrical engineering is about.

In the motor building workshop the school learners, including the teacher, were introduced to concepts in magnetism, electromagnetism, working in teams, communication and following instruction.

The kids were working in small groups of two or three and they built a small direct current electric motor from kits that were provided by the MTN Sciencentre.

More than 50 percent of the students successfully managed to get the small motors to work. It was great joy to see the smiles in the learners' faces when their motors started running. Another lesson for the students was that it is essential to work in teams, communicate and follow instructions because unless they do so the electric motors will fail because they do not follow instructions or communicate clearly with each other.

The video and talk by an electrical engineer covered the following:

- What is Electrical Engineering?
- What is the work of an electrical engineer?
- Where do you study Electrical Engineering?
- What do you study?
- What are the criteria?
- Where can I go if I need assistance? - SAIEE

The learners were given an opportunity to ask questions. Most of their questions were around the tertiary institution's entry levels; whether electrical engineers are well paid; and study bursaries. After all was done, the learners were treated to some lunch and taken home. More than 600 learners from 11 schools participated in this project in the months of April, May and June (before the World Cup). The list of such schools is available below:

A project like this would not be possible without the excellent partnership between SAIEE, MTN Sciencentre and UCT SAIEE/IEEE Student Chapter.

MTN Sciencentre

- Busi, Ryan and Carmen put this together. John (a retired electrical engineer and part of MTN Sciencentre staff), Fikiswa and Michael facilitated the workshop and looked after the learners.

UCT SAIEE/IEEE Student Chapter

- Ragesh, big thanks for arranging UCT electrical engineering students to come and assist with the facilitation of building the electrical motor. The involvement of the students makes the learners realise that with hard work their dreams of going to tertiary education can be made real.
- Michael Nyarko, Francis Masuabi, Benson Chan, Eric Chen, Denis Wong, Ragesh Pillai, Leen Remmelzwaal, Chris Fourie and Derrick Marumo, for taking the time from your hectic varsity lives to facilitate the workshops, many thanks. Your contribution will go a long way in the minds of the young learners.

SAIEE Western Cape Members

- The Western Cape branch put the programme together and special thanks are due to Wilfred Fritz, Jaime Mabota (SAIEE WCC Chairman) and Unati Nombakuse, for facilitating and giving the talks.

From lowly beginnings to a senior engineering position

By Hermann Broschk, Chairman SAIEE Bursary Committee

In 1997 the South African Institute of Electrical Engineers (SAIEE) awarded Vincent Nkosinathi Buthelezi a bursary to study electrical engineering at the Technikon Northern Gauteng – later to become the Tshwane University of Technology.

Nkosinathi was born in 1976 in Madadeni near Newcastle, a small, impoverished rural town in KwaZulu-Natal. He was the fifth son of a family of seven children.

His father worked in the construction industry and his mother was a domestic worker.

The lack of money to provide for a family posed serious financial problems as both parents earned meagre salaries.

Theirs was a typical poor rural village environment. Nkosinathi's life was tough and uneventful but he coped well with dreams of a brighter future – his only recreation was playing soccer with a home-made football.

He attended the local primary school and in 1990 was enrolled at the Mziwethu High School. He was well liked by the teachers who inspired him to concentrate on mathematics and science, which resulted in him being promoted directly from Grade 8 to Grade 10. For him the commercial subjects were delegated to second place.

Nkosinathi excelled in grades 10, 11 and 12 and matriculated in 1994.

His wish to study electrical engineering could not be fulfilled because of the extreme financial constraints at home and so he had no choice but to get a job and try to save enough money to go to university.

He did this by doing 'piece work' as a labourer on building sites and working as a gardener within the suburban community. He recalls this time well – as it gave him an insight to the 'real world' around him and strengthened his resolve to study engineering.

By 1996 he had saved enough money to pay the required registration fee to enter university. He managed with the help of this mother to successfully complete the first semester.

In 1997 with the award of the SAIEE bursary he was able to complete the 2nd and 3rd semesters (S2 + S3). The bursary was awarded on the basis of the results he achieved in the first semester and took account of the severe financial constraints that face him at home.

The bursary covered his tuition fees, books and assisted with the accommodation costs as well. Nkosinathi is adamant that bursars who are serious about their studies should 'help themselves' and earn some money to contribute to the overall costs of a university education.

In 1998 he completed the 4th semester (S4) and then applied to ABB Powertech for practical training on transformer design, manufacturing and high voltage testing. He was selected with another applicant from 156 original applicants.

During this training period he continued his studies for a Bachelor of Technology degree on a part time basis which included Saturdays.

He completed the degree in May 2000. The SAIEE also provided a bursary for these B-Tech studies as well.

After the completion of the practical training period he joined Rotek Engineering, a subsidiary of Eskom, as a transformer technologist responsible for transformer failure investigations, analysis, testing and recommendation as to the scope of repairs required.

At the same time he also worked in the circuit breaker and isolator sections of Rotek Switchgear Services. In December 2000 he was promoted to lead a transformer section in Eskom Transmission Division at Megawatt Park.

During that period he was responsible for power transformer specifications, site failure investigations with the help of international renowned transformer experts, condition monitoring as well as working closely with the TSI research laboratory on transformer projects.

He is proud to have specified for the first time a new non-standard size transformer for a new substation Lulamisa (Orion) near Kyalami, which was first tested at ABB Powertech Transformers in July 2003.

This type and size of transformer has now become a standard for Eskom Transmission and was unique as it required a very special impedance gradient to be able to survive the fault levels of the station as requested by system planning.

In 2005 he was seconded to a new procurement department called Sesonke meaning working together. Nkosinathi has received extensive training in reputable overseas factories on large power transformers (up to 2000 MVA, 800kV) and shunt reactors (up to 400 MVA, 800kV) mainly on designs, specifications and high voltage testing which has prepared him for his dealings with power transformer manufacturers worldwide as well as the local transformer industry. His present title is Senior Consultant.

He has to date completed his modules for his Masters degree at the University of KwaZulu-Natal and he is currently finalising his research project and is also currently completing a Management Development Programme (MPD) at Unisa.

Nkosinathi is extremely grateful that the SAIEE assisted him by providing a bursary, which enabled him to study and to reach the senior position he now holds. He has since been able to assist his family and the community of Madadeni in KwaZulu-Natal.

The SAIEE provides assistance for students to obtain loans to finance or complete their studies. It also offers companies or organisations who do not have the facilities to administer a bursary scheme a full selection and administration service. For more information on the bursary, loans and services provided by the SAIEE please contact Esther Manne on 011-487-3003 or via e-mail at mannee@saiee.org.sa.

Cape engineers visit desalination plant

A recently commissioned water desalination plant at Sedgefield has attracted a great deal of interest as this technology is becoming viable for wider implementation.

The project arose from the current severe drought in the Eden District, where Sedgefield was one of the first towns to be affected. The problem has since spread to a much larger region, eventually resulting in an emergency being declared in the District.

A combined visit by the SCC with the Institute of Municipal Engineers (IMESA) took place on Friday 26 February 2010 in Sedgefield. It started at 10:00 at the Sedgefield sports centre and comprised a number of presentations on the implementation and technical aspects of the project.

The presentations detailed the various problems and options faced by the project team and why the specific technology, capacity, location and associated reticulation method were chosen.

Thereafter attendees visited the water desalination plant close to the shore and were able to view the complete installation in operation, including having a taste of the output fresh water.

The plant has been designed and implemented in a duplicated modular fashion comprising standard containers and plastic water tanks that can easily be installed, placed or even moved if need be.

Salt water is pumped directly from the sea close by and then stored and subsequently processed via special pumps and reverse osmosis filters. Concentrated brine solution is returned to the sea. The whole plant is automatically controlled by a computerised system that monitors and manages all stages of the process.

Presentation on Regulation of the Engineering Profession 6 May 2010

This presentation by Rod Harker was held on 6 May 2010 in the Conference Room of the George Civic Centre. The meeting was attended by SCC members as well as persons from other engineering disciplines.

Rod is a Council member of ECSA and has been a key driver of this issue for many years. The presentation was very comprehensive and covered the following key aspects:

- ECSA - its formation, role and status
- Registration of Engineering Professionals
- Continuing Professional Development
- Identification of Engineering Work

In explaining the role of ECSA, Rod pointed out that it is a statuatory body that is responsible for, among other things, evaluating educational standards and engineering programmes at tertiary institutions, identifies engineering work reserved for registered professionals and can act against any engineer guilty of improper conduct.

In terms of the Registration of Engineering Professionals, Rod explains what is entailed in the process and how best to apply for registration and the reasons for remaining registered with ECSA.

On the question of Continuing Professional Development, Rod pointed out that the programme is a systematic process for maintaining, improving and broadening the knowledge and skills of all engineers in the country. This is necessary to ensure that the professional and technical ability of engineers in maintained.

ECSA is responsible for administering the CPD credits that each engineer must obtain in order to keep his or her status as a professional. CPd will run on five-year cycles and 25 credits are needed over the period to retain registration, although there must be a minimum of three per year. Additional credits in one year may be carried over to the next year.

Rod explained that each registered engineer must record their CPD activities annually, either manually or electronically, not later than 30-days after the end of their own cycle. Records must be kept in case there is an audit requested.

In terms of the Identification of Engineering Work, Rod says that ECSA has established a steering committee that is widely representative and it will formulate a framework document that will set out an approach to identifying work and establish categories of work. All documents will be widely distributed for coment and all voluntary associations are encouraged to study them. Once the work has been identified it wil be submitted to the Council for the Built Environment for incorporation into the regulations.

TELECOMMUNICATIONS RESEARCH GROUP

POWER LINE COMMUNICATIONS:
University of Johannesburg

Our Research Interests

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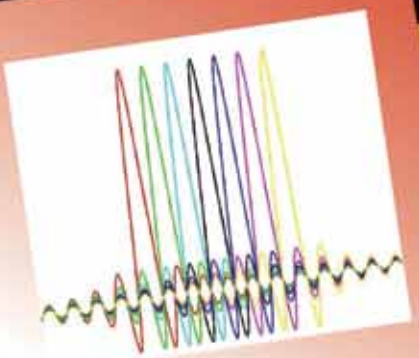
Digital Communications
Coding Techniques
Information Theory
Video Communications
Networks



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