Physics Comment

A Southern African Physics Magazine

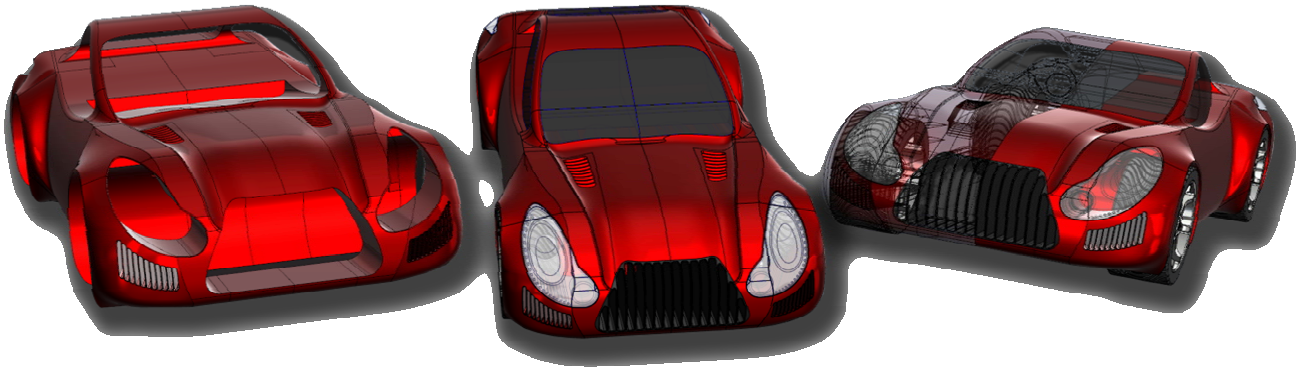
Published by the South African Institute of Physics

Vol. 2, Issue 4, December 2010

http://www.saip.org.za/PhysicsComment/

PhysicsComment@saip.org.za

UKZN Innovation Automotive Portfolio



Editor: Jaynie Padayachee

Physics Comment – Vol. 2, Issue 4 – December 2010

Cover Image

Courtesy of Charles Freeman

One of the concept cars developed in software by the Automotive Portfolio of the UKZN Innovation Company. Read more about the work of the Automotive Portfolio on Page 3.

Editor's Note: So long and thanks for all the…

Jaynie Padayachee

After two years of editing Physics Comment, it is time for me to say goodbye. Each of the 8 issues I have edited have had their share of panic, when I thought that there would not be any articles, but fortunately something always turned up. I would like to thank all contributors over the past two years who have made this job very easy and also thank the readers (I have been led to believe that you there are some of you!) without whom there would be no point to putting this magazine together.

Have a restful and recuperative holiday season and all the best for 2011.

UKZN Innovation Company Automotive Portfolio

Charles Freeman

The UKZN Innovation Company (Pty) Ltd was formed by the University of KwaZulu-Natal to deal with the commercialization of intellectual property. The Automotive Portfolio was started after the company recognised the commercial importance of many automotive innovations within the University. The task was to continue to develop these technologies as well as advertise the portfolio and attract new projects.

Birth of the Automotive Portfolio

There were a few projects that led to the formation of the Automotive Portfolio. One was an Early Warning Brake Light, essentially an additional electronic controller in a vehicle that determines if the vehicle is undergoing emergency braking, and provides effective warning to the following driver. The other was a non-electric hybrid engine. Freeman recognised that the cycle of the electric hybrids were not very efficient and thought of an alternative method of regenerative braking. This method uses compressed air as an energy storage mechanism, through an electronically controlled Compressed Air Engine / Air Compressor. Another project developed, was a Traction Enhancing System for vehicles undergoing emergency braking. Currently, ABS offers the optimum method of obtaining the best braking deceleration, only because it prevents loss of traction between the tires and the road. This braking force is only due to friction. Freeman recognised the need for a system that provides an additional adhesive force between the tires and the road during braking.

Developments within the Portfolio

Figure 1 - Early Warning Brake Light installed on an AC Cobra Replica. (L to R) Principle Inventor - Charles Freeman, Owner of TR Tec – Tony Martin, Mechanical Engineer for the Automotive Portfolio - Ryan Lipke.

A collaboration with TR Tec was formed. TR Tec manufactures AC Cobra replicas, from the cutting and welding of the steel to form the chassis to the moulding of the fibreglass bodies and to the assembly of the mechanical and electrical systems. The purpose of the collaboration was to combine TR Tec's factory space, practical experience and workforce to manufacture a wide range of new technologies with UKZN Innovation's innovative thinking and design skills to develop new technology. The aim was to inject technology into TR Tec to promote both TR Tec and UKZN Innovation through the commercialisation of the technology.

The first pilot project was the commercialisation of the Early Warning Brake Light. This device, inspired by Billy Forrest and developed by Charles Freeman, potentially reduces rear-end collisions by up to 31%. In the USA, this represents approximately $11.1 billion reduction in loss to the economy annually. The device contains a small electronic sensor and processor that determines if the car is undergoing emergency braking, subsequently flashing the emergency light brightly to warn the following driver of a probable collision. Under normal conditions, it illuminates as a normal third brake light. There have been many failed attempts by various people over the last 3 decades at a reliable solution to determine emergency braking in a cost effective manner, and this product is a successful implementation. The product is protected by a patent application drawn up by the UKZN IP TTO. Various organisations are looking into ways to assist in taking the product forward to consumers, which will ultimately save lives on our roads. This product is a perfect opportunity to boost the local economy as it has a wide international market.

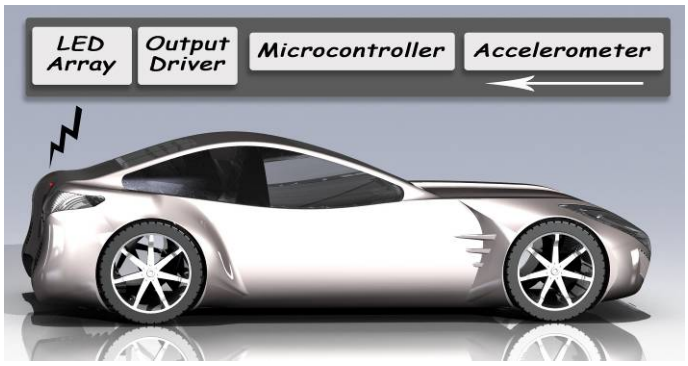


Figure 2 - Breakdown of the electronics inside the Early Warning Brake Light. Software in the microcontroller determines if an emergency braking condition exists.

The collaboration with TR Tec also involves the Compressed Air Hybrid engine. Currently the valve system, the most critical part of the design,

is being prototyped. The valve system is rather complex as it needs to be able to provide fully variable valve timing in order to be efficient. A system has been developed that allows the inlet and outlet valves to be operated completely independently. This is not only critical for the efficiency of the system, but also allows the Compressed Air Engine to be converted to an Air Compressor "on the fly".

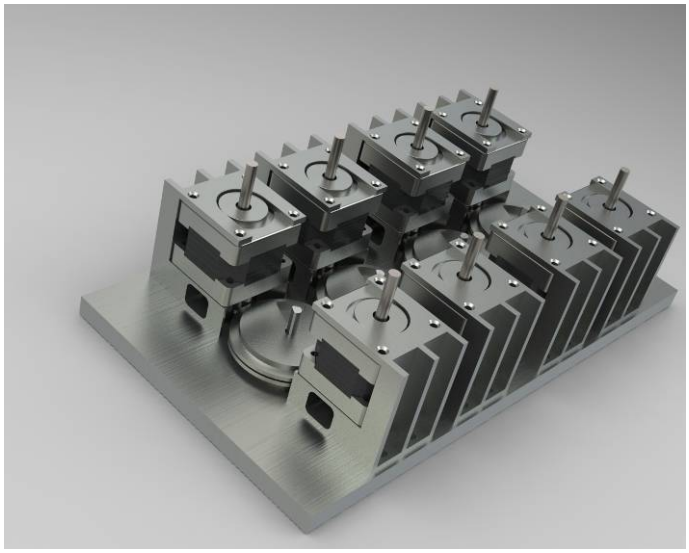


Figure 3 - Photo-Rendering of the valve system for the Compressed Air Engine / Air Compressor.

The basic principle of the hybrid system is that during braking of the vehicle, the Air Compressor will pump ambient air into a small storage tank. During subsequent acceleration of the vehicle, the Air Compressor switches over to its Compressed Air Engine mode and assists in propelling the vehicle. The designed system has the benefits that it does not contain any hazardous materials such as lithium, which batteries contain, and overall weighs less than a comparable electric hybrid system for the same output power.

The Traction Enhancing System is currently in its commercial prototype stage so that it may be tested in an AC Cobra replica. There were two major challenges in this project, one was the development of the electronics to determine if emergency braking with the possibility of a front-end collision was taking place, the other was the mechanical system to deploy the adhesive onto the tires in a rapid manner, and in the correct thickness. The adhesive used is a resin-based, biodegradable substance that is effective for only a few kilometres of driving, perfect for preventing collisions that would otherwise take place. Freeman says, "It is vitally important that consumers do not have the opportunity to push their vehicles into a state where this system will engage, unless there is a high probability of a collision". Results from the first prototype showed an increase in the apparent coefficient of static friction between the road and the tires from 0.89 to 1.21, certainly a remarkable improvement! The effect of this product means that the braking distance of vehicles in emergency conditions could be shortened by significant amounts, saving lives and preventing damage to vehicles.

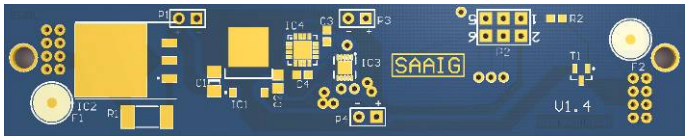


Figure 4 - PCB of the electronic controller for the Traction Enhancing System

The aim is that all of these innovations will be installed in an AC Cobra replica at TR Tec, for promotional purposes. A goal is to create awareness of the talents within South Africa, and to encourage investment in Science and Technology, particularly in the Automotive field. A further goal is to extend TR Tec's product range, and develop a concept car that houses all of these technologies. Freeman comments, "There is so much potential for design and manufacturing in KZN, people just need to be inspired to realise that they really can challenge the norms that society imposes, and truly create world-leading products. I welcome anyone to contact me if they feel they could get involved in any way, whether it be with new ideas, investment or infrastructure".

Author Biography: Charles Freeman has a BSc in Electronic Engineering and an MSc in Quantum Physics. He is currently the Portfolio Manager for the Automotive Group at UKZN Innovation Company (Pty) Ltd. He is also the Principle Inventor for these three projects. He is eager to challenge the norms that society accepts, and is particularly interested in a project when everyone says, "It can't be done". He can be contacted at charles.l.freeman@gmail.com

SAIP Constitution and By-laws Change

The South African Institute of Physics has been in the process of re-writing the Institute's constitution and by-laws. The proposed documents were voted on by the membership during November 2010. The ballots have been counted and were unanimous in favour of changing the constitution and the by-laws. The new documents will be put forward at the next meeting the Council for adoption. The new constitution and by-laws may be found at: http://www.saip.org.za/DraftConstitution.html

Minister Opens Space Weather Centre

Msizi Khathide

The Space Weather Centre of the Hermanus Magnetic Obervatory (HMO) was officially opened by the Minister of Science and Technology, Naledi Pandor, on Friday 10 December 2010 at 12h00.

Space Weather refers to the energetic events of the sun that affect the earth's geomagnetic field and upper atmosphere, rendering technologies inaccurate, inoperable or unreliable. It involves measurement, analysis, interpretation and modelling of changing environmental conditions in the Earth-Sun system. Technologies that are affected by space weather include high frequency radio systems, satellites and long-distance power lines.

Minister of Science and Technology, Naledi Pandor.

The HMO is also the Space Weather Regional Warning Centre for Africa under the International Spce Environment Service.

As the Space Weather Regional Warning Center for Africa, the HMO needed to organize its capabilities to provide forecasts, predictions and warnings, as well as educate academia, industry, policy makers and the general public on the need for Space Weather. In addition, structured research into unanswered questions regarding Space Weather events needed to be undertaken for the African region, and HMO is well positioned to lead this.

With the launch and establishment of the South African National Space Agency (SANSA) taking place in 2010, as well as the launch of the National Space Strategy it is imperative that South Africa has the capabilities within its science infrastructure to provide a good understanding and knowledge of the hostile Space Environment. Therefore, Space Weather has taken a key role and position within the HMO's vision 2015, and as part of the new HMO strategy initiated from 1 April 2010, a Space Weather Unit was formed within the HMO structures.

Minister Pandor opening the Space Weather Centre at the Hermanus Magnetic Oberservatory. Next to her is the mayor of Hermanus, Nicolette Botha-Guthrie with the CEO and President of the National Research Foundation, Dr. Albert Van Jaarsveld at the back. Director of the HMO, Dr. Lee-Anne McKinnell, has her back to camera.

Author Biography: Msizi is the Communications Officer at HMO in the Department of Science Outreach and can be emailed at mkathide@hmo.ac.za.

The 2007 geomagnetic jerk as observed at the Hermanus Magnetic Observatory

Pieter Kotzé

1. Introduction

The main geomagnetic field as observed at the surface of the Earth exhibits a wide range of non-periodic variations with time resulting from mechanisms driven by a self-sustaining dynamo in the fluid outer core of the Earth. These changes with time, called secular variation (SV), can give rise to abrupt and sudden changes in linear patterns, and have been called geomagnetic jerks or secular variation impulses [1]. In general the secular variation of the core field is non-linear and not predictable.

The southern African and south Atlantic regions have shown a particularly striking geomagnetic field behaviour over the last decades [2,3].

Between 1980 and 2010 the field intensity in this region, called the South Atlantic Anomaly, decreased by up to 12%, much faster than the global dipole moment decrease which declined by 9% over the past 170 years. Modern global field modelling, making extensive use of low-Earth orbit satellites, like Ørsted, CHAMP and SAC-C, revealed a growing patch of reverse magnetic flux at the core-mantle boundary that is responsible for the South Atlantic Anomaly and probably also plays a significant role in the global dipole moment decay [4].

A geomagnetic jerk is generally accepted as a sudden change in the slope of the secular variation (i.e. the first time derivative of the Earth's magnetic field), and in general occurs on a timescale of a few months to a few years. Therefore secular variation can be thought as a series of straight-line segments separated by geomagnetic jerks. An analysis of global jerks, particularly those that occurred around 1970 and 1982, showed that these jerks do not occur simultaneously everywhere. Of particular interest is the fact that these jerks first occurred in the Northern Hemisphere, followed a few years later in the Southern Hemisphere. At present, the hypothesis of an internal origin for geomagnetic jerks is generally accepted. A geomagnetic jerk can be considered as the result of a sudden acceleration of the metallic fluid flow at the boundary of the Earth's outer core.

2. Data used in the investigation

Quiet time monthly mean geomagnetic field values collected at Hermanus (HER) were used in this study. Data were selected complying with K-indices less than 4 in order to eliminate disturbed and noisy conditions. This selection restriction provided the best compromise between quiet time data and the amount of data left to derive mean monthly values. The next step was to remove an annual variation resulting from magnetospheric and ionospheric currents, including the resulting induction effects. This was achieved by applying a 12-month running mean to the observed first differences of D and Y. This amounts to calculating the value at time *t* as the difference between those at time *t* + 6 months and *t* – 6 months.

3. Results

Shown in figure 1 are the monthly mean differences of the Y and D components at Hermanus between 2006 and 2009. Both components show an abrupt change in the secular variation trend during 2007. For the Y-component in particular, the secular variation changes from -15 nT/y at 2006.0 to -2 nT/y at 2007.4, and then starting to change back to -10 nT/y at 2009.0, corresponding to an acceleration change of about 15 nT/y^2 in 2007. This is about three times larger than the acceleration change recorded during the 1982/3 jerk. A similar pattern can be observed for D during 2007. The current jerk seems to be strongly concentrated in western Africa and the South Atlantic Ocean [5].

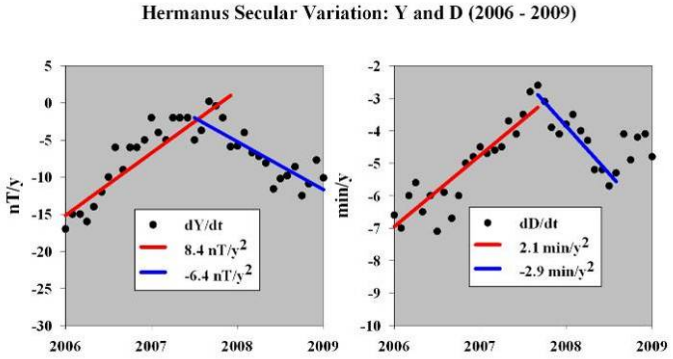


Fig 1: Plots showing the occurrence of a geomagnetic jerk during 2007 as observed at the Hermanus Magnetic Observatory in the secular variation patterns of both the Y and D field components.

References

1. Mandea, M. and Olsen, N. (2009): Geomagnetic and Archeomagnetic Jerks: Where do we stand?, *Eos, Transactions, American Geophysical Union*, **90**, 24, 208-208.
2. Bloxham, J. and Gubbins, D. (1985): The secular variation of the Earth's magnetic field. *Nature*, **317**, 777-781.
3. Mandea, M., Korte, M. Mozzoni, D. and Kotzé, P. (2007): The magnetic field changing over the southern African continent - a unique behaviour, *South African Journal of Geology,* **110**, 193-202.
4. Bloxham, J. and Jackson, A. (1992): Time-dependent mapping of the magnetic field at the core-mantle boundary, *Journal of Geophysical Research*, **97**, 19,537-19,563
5. Chuliat, A., Thébault, E., and Hulot, G. (2010), Core field acceleration pulse as a common cause of the 2003 and 2007 geomagnetic jerks, Geophys. Res. Lett., 37, doi:10.1029/2009GL042019

Author Biography

Pieter Kotzé is a research physicist at the Hermanus Magnetic Observatory (HMO). His research activities focus on the time-varying characteristics of the geomagnetic field of southern Africa, as well as geomagnetic storms resulting from the solar wind's interaction with the Earth's magnetic field, using data from both ground surveys and satellite observations. He currently holds the position of Research Manager at HMO and serves as the chair of the International Association for Geomagnetism and Aeronomy (IAGA) Working Group on Magnetic Observatories. Email: pkotze@hmo.ac.za

Hermanus Magnetic Observatory World Space Week Activities

Msizi Khathide

The United Nations declared World Space Week (WSW) runs annually from 4 – 10 October. The purpose of celebrating this week every year is to encourage, educate and commemorate space exploration across the world through various programs and events centred at a specific theme. World Space Week has been considered as an International Celebration of Science and Technology.

The theme for World Space Week 2010 is "Mysteries of the Cosmos." The theme is selected to increase the impact of World Space Week on all humanity. Further, by using a uniform theme globally, World Space Week demonstrates unprecedented global cooperation in space. The theme is selected by the World Space Week Association Board of Directors in close coordination with the UN Office of Outer Space Affairs.

It has become somewhat tradition for WSW celebrations to be held at the Hermanus Magnetic Observatory (HMO). What would seem common knowledge to some people is a mystery to learners: that there are varied satellites orbiting the Earth, how they are put in Space and the conditions in which they function under once in orbit. The mission of the 2010 WSW programs at HMO was to make learners aware of satellites and how they are affected by the environment in Space and influenced by the sun.

Part of the program was to take the learners through lessons on Space weather and fortunately the HMO Space Weather Centre was functional during the week and the learners could see firsthand live conditions in Space and see the sun through different filters. HMO Space Officers, Kobus and Mpho explained to the learners what they were seeing and answered many interesting and exciting questions from the enthusiastic young minds.

HMO is fortunate in that some of the resident scientists lecture to students at the Cape Peninsula University of Technology in the F'SATI program. This program is a joint venture with France in which masters engineering students design and build what they call CUBESATS. These are satellites that are 10cmx10cmx10cm. Some of these students explained the details of building, costs involved and deploying a satellite. The learners enjoyed this experience very much and found it very inspiring to see a young person from a similar background such as theirs to be building satellites and involved in high level science. And this is what the week is about, this is what the job is about, to inspire and give learners something to dream about and work towards too.

F'SATI Students Demonstrates CubeSAT

The last Public Lecture of the year was held on the Wednesday and it was well attended. Kobus, the Space Weather officer gave a presentation on Space weather, how it relates to Earth and the importance of studying and knowing what it is all about. The audience enjoyed the presentation very much and asked many questions, with one particular audience member fearing that the sun would soon destroy the Earth as we know it, but those fears were aptly quashed by our seasoned officer.

Learners Enjoying Foxhunting

The Open Day, on that Saturday included foxhunting, which was combined with a GPS "track and find" game and a "radar navigation" game, both of which were thoroughly enjoyed. There were also launches of water rockets, but the highlight of the day was the Lalela Balloon Launch. This balloon is launched with a GPS onboard that constantly transmits back its location as it fly through the air, which allows the audience to view on a map where the balloon is.

Author Biography: Msizi is the Communications Officer at HMO in the Department of Science Outreach. Email: mkathide@hmo.ac.za

HMO Signs MoU with IAP of the Czech Republic

Lee-Anne McKinnell

On October 24 2010 the Hermanus Magnetic Observatory (HMO) signed an MoU with the Institute of Atmospheric Physics (IAP) of the Academy of Science of the Czech Republic. In addition to the MoU an agreement was signed for the hosting of a High Frequency (HF) Doppler Radar, which was installed in the Western Cape in May 2010. These 2 agreements were signed by Dr Lee-Anne McKinnell, Acting Managing Director of HMO, and Dr Dalia Buresova, Deputy Head of IAP, during a joint visit to San Juan in Argentina in early October 2010.

The IAP is part of the Academy of Science of the Czech Republic. The main research focus of the Institute has always been on the processes in the troposphere. However, further collaborations expanded this research area, and as a result it now includes the whole atmosphere from the boundary layer up to interplanetary space. The institute also serves as the Regional Warning Center for Space Weather in central Europe. HMO is the Regional Warning Center for Space Weather in Africa, and so the institutes are closely linked through the International Space Environment Service (ISES). In addition, both Dr Buresova and Dr McKinnell are members of the International Reference Ionosphere (IRI) Working Group, and through this group regularly contribute to improvements in global ionospheric modelling.

Drs. McKinnell and Buresova have been involved in a joint collaborative research project since 2007. This project includes the study of the variability of the ionosphere at mid latitudes and the ability of global models to predict the mid latitude ionosphere, thereby providing added value to space weather predictions and forecasts. The exchange visits for this project have been funded by an NRF grant under the Key International Science Capacity (KISC) program. A significant advantage of this project is the involvement of postgraduate students, who through their own research contribute to the project and accompany their supervisors on the exchange visits. These students are therefore exposed to the science being undertaken in other countries, and have made contacts with international students.

In May 2010, HMO hosted four visitors from IAP in the Czech Republic, who assisted the HMO's Research Support Unit in the installation of the HF Doppler Radar. This Doppler Radar is producing new data that is currently being used together with other collocated radar data from Hermanus to establish the pattern of ionospheric irregularities in the Southern African region. Already HMO has a MSc student working on this project who will publish her first paper jointly with the Czech Group before the end of 2010.

This collaboration has been very productive and fruitful, and the signing of the MoU will hopefully ensure that the two institutions will work together for a long time in the future.

Dr Dalia Buresova (IAP) and Dr Lee-Anne McKinnell (HMO) signing the two collaboration agreements at the ICATE institution in San Juan, Argentina.

Author Biography: Dr. Lee-Anne McKinnell was appointed in January 2010 as acting Managing Director of HMO. Email: mkathide@hmo.ac.za

Waves and Packets

Waves and Packets is a joint publication of the African Physical Society, the National Society of Black Physicists (NSBP) and the South African Institute of Physics. The newsletter is distributed weekly. For more information or to subscribe visit the NSBP website at: http://www.nsbp.org/

Techtrack: Email revolutionising the occupational health and safety function

Kelvin Kemm

Way back in 1840, the postage stamp was invented. Its advent dramatically changed a way of life.

Before the invention of the postage stamp, a person just posted a letter and the receiver had to pay for it on arrival. If the receiver did not want the letter, or had no money, the postman did not get paid and the letter was not delivered.

The creation of the postage stamp changed all that. When the sender was required to pay for delivery, all that the postman had to do was hand the letter over to the receiver or drop it in a post box.

The amount of letter writing increased dramatically and changed a way of life.

Email and the Internet have had a similar impact on the way that we live life, both privately and in business.

Once society has a new vehicle, such as the Internet and email, all sorts of applications become adaptable to the new medium.

One interesting Internet application that I have just encountered is related to the fields of occupational health and safety (OHS) and compensation for occupational injuries and diseases (COID).

Both these areas of activity are usually regarded as grudge purchases. I suppose that it is something like insurance – it is seen as an expense until you really need it.

It has always been assumed that companies have to carry out their own COID and OHS functions entirely internally. In my travels, to many companies, I have seen some systems that work very well and others that are just the opposite.

One major snag with COID and OHS is keeping up to date so that the system operates as a helpful predictive tool, rather than just as a record of last year's figures, which one could, perhaps, build into next year's planning.

I have come across a system in which a company can outsource its COID and OHS operations to an institute that operates a Web-based scanning, monitoring and reporting system, called the Integrated Intelligence Web, or I2Web.

The beauty of this approach is that it uses the modern technology for which it is best suited – communicating rapidly over a wide area; in fact, from one country to the next if need be.

Of course, the human element is still very important. What happens is that the client company starts by appointing a staff member, known as the 'champion'. He or she is then trained in how to use the program, at no cost to the company. The service provider assigns one of its employees to work with the selected champion, this person being called 'the supporter'.

The supporter then assists the champion in the use of a fundamental computer-based setup that is housed on the Internet.

There is no expense for the client company, as it is not necessary to buy any expensive equipment or to embark on a major training programme.

How the whole system works is that the client company regularly uploads its data onto the Internet, where the service provider immediately captures it. Then, say some incident is detected, the service provider assigns the incident a rating on a severity list, such as 'moderate' or 'severe'. An email is then immediately sent to any number of recipients at the client company, depending on whom the client company has designated to receive the emails. If, for example, a rating of 'severe' is assigned, the computer program will shift the response message up a notch to include a higher-ranking person.

The emails cannot be deleted because they are password protected. So nobody can later claim that they were not informed, or did not get the message from some subordinate. Thus, a legal 'electronic paper trail' is created, relating to the COID or OHS incident, in addition to very rapidly informing everyone who needs to know.

There is a whole range of additional optional modules that are built into the system, and a client company can buy any number of the modules that best suits its needs. Additional modules can be added later, if an extra need is determined.

Basically, any reporting system that a client company requires can be generated, and the results and data, at any time, are automatically emailed to different designated people, depending on the rating of the response required.

Dr Ricky Montalbano, chair- person of Sheq Development Institute (SDI), which operates the system, explained all this to me. SDI is continuing to develop new additions to the platform that already exists, and is supplying the service to a wide spread of clients.

It is always an eye opener for me to see how new technology developments lead to innovation in day-to-day operations that seem so obvious in hindsight.

Techtrack appears each week in Engineering News (www.engineeringnews.co.za). It has been reprinted here by permission of K. Kemm. This Techtrack appeared in Engineering News, Vol 30 No 47, 26 November -2 December 2010).

Dr. Kelvin Kemm is a business consultant and can be emailed at stratek@pixie.co.za.

Appointments of SAIP Presidents

SA Council for Space Affairs

The current South African Institute of Physics President, Dr. Peter Martinez has been appointed as Chairperson of the 15-member South African Council for Space Affairs. The appointment was made by the Minister for Trade and Industry, Rob Davies. The Council comprises members from different sectors of government, academia and industry and the appointments were in line with the Space Affairs Act No 84 of 1993. Nomfuneko Majaja (Department of Trade & Industry) was appointed as vice-chairperson. Remaining members of the Council are Kim Victor Gorringe, Advocate Patrick Phethole, Dr Sandile Malinga, Pontsho Maruping, Valerie Matlou, Andiswa Mlisa, Wabile Motswasele, Dr Valanathan Munsami, Ron Olivier, Linden Petzer, Hennie Rheeder, Jo-Ansie Van Wyk and Themba Tenza.

The Council covers legal, policy, scientific, technical and advocacy matters related to space and has the responsibility to take care of space related South African interests in compliance with international agreements, conventions and treaties.

Astronomy Desk at the Department of Science and Technology

The Minister of Science and Technology, Naledi Pandor, has appointed Prof. Manfred Hellberg, a past SAIP President and Emeritus Professor of Physics and Senior Research Associate at the University of KwaZulu-Natal, to head the Astronomy Desk at the Department of Science and Technology (DST). Prof. Hellberg's appointment, which is for six months, began on 1 October 2010. The Astronomy Desk was established to advise on policy and strategic matters regarding the development of astronomy and related sciences, as well as pertinent matters related to South Africa's bid to host the Square Kilometre Array (SKA) radio telescope. The reference team of senior scientists that will support Prof. Hellberg with technical and expect advice consists of Professors Sunil Maharaj, George Miley, George Ellis and Harm Moraal and Renée Kraan-Korteweg.

Notes from the SAIP Treasurer

J.A.A. Engelbrecht

Due date for Membership fees

Members of the SAIP should kindly note that, according to a recent decision by Council, membership fees are due by 31 December of a particular financial year. In addition, the membership of members who are more than 2 years in arrears, is terminated at the end of the next financial year. Such ex-members will then have to re-apply for membership of the SAIP in the normal manner.

Tax implications for Post Docs

According to our information, the tax threshold is not R 180,000 as long as the post doc contract indicates that the post docs are doing research, and that any reference to “work” does not appear in the contract.

Unassigned payments

There is currently a list of unassigned deposits that were made into the SAIP bank account. Members should ensure that when their membership fees are paid, in many instances by the Finance department of their respective institute, that either their NAMES or the ACCOUNT NUMBER (found on the membership invoices) are reflected on the bank deposit slip/electronic transfer of funds. A bank statement entry such as “HMO”, “UoJ”, etc. cannot be linked to individuals. (Apologies to the two institutions used as examples).

Physics 500

The Physics 500 Project aims to identify and track physicists in Industry. The purposes of the project are to:

- Identify industries in South Africa that employ physicists,
- Identify physicists working in South Africa,
- Use this information to promote physics,
- Promote collaboration between the SAIP and industry.

For more information, visit the project website at: http://www.saip.org.za/physics500/login.php

Charles Freeman (Durban)

Qualifications

BSc Eng (Electronic) in 2004 from UKZN, MSc Physics *Cum Laude* in 2006 from UKZN, "Design of a Single Photon Source for Application in Quantum key Distribution".

Career

Started formally in 2009 as Portfolio Manager for the Automotive Portfolio for UKZN Innovation Company (Pty) Ltd. The purpose of the portfolio is to develop automotive products and encourage research in that field within UKZN. The portfolio was started with 3 of my own inventions that had developed of the previous 3 years.

Survey

Why did you originally choose to study physics at university?

Originally I chose Electronic Engineering over Physics actually! The reason for this was mainly because of the needs within industry. Having a background in engineering and continuing in Physics provides a very different view on how to research and analyze things.

Did you enjoy your university physics? What inspired you about physics?

Very much so, the thing I loved the most was the way Physicists would question every bit of what other people would consider normal. Most of it had no immediate industrial sense, but this is where the training from Engineering helped me. This shaped the first 3 products, which essentially created the Automotive Portfolio within UKZN Innovation Company.

What did you do after graduating from university with your highest physics degree?

I continued with a PhD in the same group, designing a Single Photon Detector for Application in Quantum Key Distribution.

What made you choose a career in industry rather than a career in academia?

I would say that I'm very fortunate to still be in the University system as such, as UKZN Innovation is a company owned by the University. Being an Engineer at heart, the questions in my head generally lie around "How can we make a new and novel product out of this knowledge" rather than "Lets develop a new theory around 'xyz' ". I feel most alive when engaging with organizations and companies that participate in forming the products that my children might consider common place one day!

When did your industrial career really take off?

I would say that March 2010 would be a momentous turning point. An automotive safety product I had been working on for the past 3 years had finally flourished. I'd been through the provisional patent stage, with prototyping and then a PCT application. The PCT application returned showing my patent application clashed with one in France, which had been patented only in France. This posed a huge problem as we had to make a deal with the French patent holder and

then still only had protection in France. Every hugely depressing moment can be turned into success if you try to remain positive; shortly afterwards I had a stroke of "serendipity" and found a new method of solving the particular problem which circumvented previous patent applications, and also worked better! Currently the product is ready for manufacture and there are discussions with a few major international vehicle manufacturers, as well as the South African Department of Transport. The Technology Innovation Agency are keen to support the project right through to manufacture, in KZN, so this looks like a wonderful opportunity to change the face of automotive safety.

If you consider yourself no longer a physicist, what made you give up physics to pursue your career?

The long delays in procurement of equipment and the unreliability of funding made it difficult to continue to study or to consider academics as a career. In South Africa I firmly believe there are lots of opportunities waiting if you work hard, but if you work a little bit harder, you can create your own opportunities.

Is there a particular contribution in industry that you are especially proud of and that you attribute to your training in physics?

Currently the first product in the portfolio is not exactly "in" industry yet, so I'm afraid I cannot really answer that question, speak to me again in 6 months!

How does your physics training help with your career?

I would say that it has helped me try to be more objective about the education I have. To use it as a framework to continue, not a rigid set of rules. I would say it has softened my engineering way of thinking into a slightly more philosophical view!

What advice do you have for physics students thinking of embarking on a similar career?

I would advise to engage with engineers, artists, government and industry as early on as possible. Ask lots of questions, don't take what you have learned for granted, and most of all recognize that the academic way of thinking alone will not allow great success in industry; knowledge is one part of it, knowing what to do with it is another. And the latter part is often something someone cannot teach you, it is something that needs to develop with experience. Innovation is a difficult road, and you make more mistakes than anything else because you're in unchartered territory. In order to succeed, you need to be focused and persistent!

What advice would you give to university departments to make their physics teaching and research programmes more useful for industry?

This is really a question with an answer that could fill a whole research paper! There is a place for physicists and a place for people working in industry. I think the only thing that should be stressed each semester in Physics courses is that it is just that, a Physics Course. They generally provide KNOWLEDGE, but don't aid in any experience that you would obtain while working in industry. That being said, the courses in Engineering Departments are also just knowledge courses, they just have a smaller barrier to entry in terms of experience into industry. I would advise University Physics Departments to stick to what they should be doing, Physics, and to make sure their students don't have the wrong idea about what they will emerge with at the end of their degree. In a nutshell, Physicists have a use in Industry, but not in the same areas as Engineers or Artists or Businessmen. It should be the task of University Physics Departments to identify which industries they would like to target (if any) in each teaching stream and find a way to contribute to Industry, which will then shape the teaching process.

What are your perceptions about the importance of physics in present-day society?

Physics is vitally important to society. Most advanced products mankind has the use of today, started as a thought by a Philosopher a thousand years ago, then was formalized by a Mathematician a few hundred years ago, then experimented with physically by a Physicist decades previously, then developed into a product by Engineers for society. There is an important role for each of these disciplines, and the Physicist is no exception. However, in my mind, it is critical that in order for this system to continue to work, Physicists must still have a firm grasp on understanding the mathematics from the Mathematicians, and having an idea of what the Engineers could do with their results!

Deadline for submissions for the March 2011 issue of Physics Comment is 28 February 2011.

Opportunities

National Institute for Theoretical Physics Bursaries 2011

The National Institute for Theoretical Physics (NITheP) offers bursaries to students studying Theoretical Physics (or a closely related discipline) at the Honours, Masters and Doctoral levels. These bursaries are available at ALL South African tertiary institutions. In cases where there is no formal program in Theoretical Physics, NITheP endeavours to support graduate projects which qualify as being of a theoretical physics nature by involving co-supervisors from institutions which do host Theoretical Physics programs. More information available at:

http://www.saip.org.za/documents/opportunities/20101115_nithep.pdf

NITheP - Chris Engelbrecht Summer School 2012: Call for proposals

Proposals for the 23rd Chris Engelbrecht Summer School on Theoretical Physics, to be held in January 2012, are hereby invited. All members of the South African Physics community affiliated to a South African institution may submit a proposal. The proposal must contain a short title for the school, a brief description of the topics to be covered and its relevance to current research trends in Theoretical Physics as well as its relevance to the South African Physics and Theoretical Physics community. A list of at least five speakers and a possible organizing committee must also be provided. In addition NITheP will nominate a representative to serve on the organizing committee.

Proposals must be sent to renekotze@sun.ac.za before or on the 3rd of January 2011. Proposals will be screened in January 2011. Financial and logistical support will be provided by NITheP.

The Google Anita Borg Memorial Scholarship: Europe, the Middle East and Africa

The Scholarship

Dr. Anita Borg **(1949–2003)** devoted her adult life to revolutionising the way we think about technology and dismantling barriers that keep women and minorities from entering computing and technology fields. Her combination of technical expertise and fearless vision continues to inspire and motivate countless women to become active participants and leaders in creating technology.

As part of Google's ongoing commitment to furthering Anita's vision, we are pleased to announce The Google Anita Borg Memorial Scholarship: Europe, the Middle East and Africa. Through the scholarship, we aim to encourage women to excel in computing and technology, and become active role models and leaders.

Multiple scholarships will be awarded based on the strength of candidates' academic performance, leadership experience and demonstrated passion for computer science. A group of female Bachelor's, Master's, and PhD student finalists will be chosen from the applicant pool. The scholarship recipients will each receive a €7,000 (or equivalent) scholarship.

Eligibility requirements

Candidates must:

- Be a female student enrolled in a Bachelor's, Master's or PhD programme (or equivalent) in 2011/2012.
- Be enrolled at a University in Europe, the Middle East, or Africa. Citizens, permanent residents, and international students are eligible to apply.
- Be studying Computer Science, Computer Engineering, Informatics, or a closely related technical field.
- Maintain an excellent academic record (e.g. a First Class Honours degree).

How to apply

Please complete the online application and submit all requested documents by 1st February 2011. All application documents must be in English. Scholars and Finalists will be notified in April 2011.

You will be required to submit the following:

- Up-to-date copy of your CV

- Answers to the following short essay questions
- (suggested word count is 400-600 words per question):
- Describe a significant technical project you have worked on. If you have worked on a major independent research project (such as research for a Master's or PhD programme), please describe that work here. Give an overview of the problem and your approaches to the key technical challenges. If this was a group effort, be sure to specify your individual role and contributions.
- Give one or two examples of your leadership abilities. Explain how you were influential and what you were trying to achieve. These need not be demonstrated through formal or traditional leadership roles. Feel free to think broadly and examine the many ways you impact members of your technical community.
- Suppose someone gave you the funding and resources for a 3- to 12-month project to investigate a technical topic of your choice. Write a short version of a proposal, including a description of the project, your planned methodology, and your expected results. Please pick something other than the project you described for the first question.

Transcripts

- Bachelor's: A copy of your current academic record.
- Master's and PhD: A copy of your previous and current academic records.
- Enrolment confirmation for 2011/2012 or confirmation of graduation date
- Please include with your application an official enrolment confirmation or a confirmation of your graduation date issued by an official authority of the university e.g. your departmental administrator or a professor.

Recommendation letters

Two strong referral letters from individuals who are qualified to evaluate your academic and leadership accomplishments, e.g. from a professor, adviser or supervisor.

For specific questions not answered on this page or in the FAQ section, please e-mail anitaborgscholars-emea@google.com. The subject field of your email must include "Anita Borg Question". We look forward to receiving your application!

Upcoming Conferences & Schools

2011

40th South African Chemical Institute Convention, January 2011, South Africa

SACI 2011, the 40th South African Chemical Institute (SACI) Convention incorporating the 3rd Federation of African Societies of Chemistry (FASC) Congress will be held from 16 to 21 January 2011 at the University of the Witwatersrand in Johannesburg, South Africa. The biannual SACI Convention will be organised by the Gauteng Coordination Committee of SACI. The local organising committee is putting together a full, multi-session programme that will address the conference theme: Chemistry – the key to Africa's future. The event will celebrate the UNESCO International Year of Chemistry, IYC 2011 (an IUPAC event)

The event will showcase research activities in all traditional branches of chemistry (Organic, Inorganic, Physical, Analytical, Environmental) as well as interdisciplinary areas (such as Materials chemistry, Bio-organic chemistry etc.). The programme will provide a platform for presenting work going on in the African continent, as well as in the rest of the world.

The 3rd FASC Congress will be hosted at the Convention on Friday 21st January 2011. The day will be set aside for a FASC Programme on Green Chemistry

23rd International Workshop on Weak Interactions and Neutrinos (WIN'11), January 2011, Cape Town

WIN'11 will take place from 31 January to 5 February 2011, at the Graduate School of Business of the University of Cape Town, co-chaired by Kai Zuber (Dresden) and Raoul Viollier (Cape Town). The goal of WIN'11 is to initiate new international research collaborations.

WIN'11 will be the first of the WIN workshops, at which the LHC data from CERN will be discussed and interpreted. There are plans to publish the proceedings of WIN'11 in World Scientific.

There will be in total 4.5 workshop days including eight theoretical and experimental introductory plenary lectures, setting the stage on the first day.

WIN'11 happens just ahead of the 22nd Chris Engelbrecht Summer School on the Standard Model of Particle Physics and Beyond takes place at the Stellenbosch Institute of Advanced Studies from 20 to 29 of January 2011. This is an excellent opportunity to prepare our graduate students for an active participation at WIN'11.

The 8 tutorials, lasting about two hours each, will be given by local postdoctoral fellows and senior graduate students. There will be also a class test and a final exam of two hours each, marked by postdoctoral fellows under the supervision of local academic staff.

There will be a one-day preparatory course on field theory and the standard model, consisting of 5 lectures and a two-hour tutorial, based on the lecture notes "From simple field theories to the standard model" by Richard C. Slansky. This preparatory course will be taught by local academic staff and postdoctoral fellows on 19. January 2011.

4th IUPAP International Conference on Women in Physics, Stellenbosch, South Africa, 5 to 8 April 2011

The 4th IUPAP International Conference on Women in Physics (ICWIP 2011) will be held in April 2011 in Stellenbosch. This triennial meeting is organized under the auspices of the International Union of Pure and Applied Physics and will be hosted by the South African Institute of Physics and Women in Physics in South Africa. ICWIP 2011 will provide a forum for both scientific presentations and for discussion of issues related to attracting, retaining and improving the status of women in physics. More information is available from the conference website: http://www.acitravel.co.za/icwip2011/

MEARIM-II: the 2nd Middle-East and Africa Regional IAU Meeting, Cape Town, South Africa, April 10-15, 2011

The astronomical community of the Middle-East and Africa will meet in Cape Town in 2011 to explore the advancement of the astronomical capabilities in the region. Details can be found at the conference web site:

http://mearim2.saao.ac.za

4th South African Conference on Photonic Materials (SACPM2011), 2-6 May 2011 at Kariega

SACPM2011 will take place at the Kariega Game Reserve in the Eastern Cape, chaired by Prof Hendrik Swart (UFS) and co-chaired by Ernest van Dyk (NMMU). The purpose of the conference is to bring together scientists from Africa and abroad who are working on various issues related to photonic materials, and follows the successful 3rd SACPM Conference at Mabula in 2009.

A group of international speakers, all experts in their fields, will present invited lectures on topics related to the theme of the conference. As the number of delegates will be limited to 60, it is hoped that the conference will encourage much interaction, especially between local and international delegates. We would particularly welcome the participation of senior (Ph.D.) students and will offer a reduced conference registration fee to full-time bone-fide students.

For more info, please visit the website http://sacpm2011.ufs.ac.za

South African Institute of Physics 56th Annual Conference, 12-15 July 2011, Pretoria

The Department of Physics at the University of South Africa (UNISA) invites you to the annual SAIP conference during the winter of 2011. Participants will be warmly welcomed to SAIP2011, where we will provide a platform for sharing the latest developments in Physics.

The conference will be held at the St Georges Hotel and Convention Centre, Pretoria (35 km north of O R Tambo International Airport) The venue provides conference and accommodation facilities for the convenience of participants. For more information visit

www.saip.org.za/events/saip2011

Physics Comment Editorial Policy

Physics Comment is an electronic magazine for the Physics community of South Africa, providing objective coverage of the activities of people and associations active in the physics arena. It also covers physics-related ideas, issues, developments and controversies, serving as a forum for discussion. It is not a peer review journal.

Physics Comment publishes innovative reports, features, news, reviews, and other material, which explore and promote the many facets of physics. Physics Comment endeavours to:

- support and inform the physics community
- promote membership of the South African Institute of Physics
- promote the understanding of physics to interested parties and the general public
- represent the readers' point of view
- focus on issues and topics of importance and of interest to the physics community

We accept submissions on any physics-related subject, which endeavours to inform readers and to encourage writers in their own researches. We aim to be politically, socially and geographically inclusive in the articles, which we commission and receive. Therefore we shall not discriminate according to political or religious views. Physics Comment does not support or endorse any individual politician or political party. However, contributions, which are being published, may contain personal opinions of the authors.

It is our desire to present unfettered the opinions and research of our readers and contributors. All articles submitted for publication are subject to editorial revision. Such revisions, if necessary, will be made in cooperation with the author.

The views expressed in published articles are those of the authors and are not attributed to the Editorial

The Editor will make the final determination of the suitability of the articles for publication.

Declaration by Author

When an author submits material for publication, this means:

1. The author(s) assures the material is original, his/her own work and is not under any legal restriction for publication online (e.g., previous copyright ownership).
2. The author allows PC to edit the work for clarity, presentation, including making appropriate hypermedia links within the work.
3. The author gives PC permission to publish the work and make it accessible in the Magazine's archives indefinitely after publication. The author may retain all other rights by requesting a copyright statement be placed on the work.

Authors should respect intellectual integrity by accrediting the author of any published work, which is being quoted.

Publication Deadlines

Physics Comment is published four times a year.

Issue	Closing Date	Publication Date
Issue 1	28 February	15 March
Issue 2	31 May	15 June
Issue 3	31 August	15 September
Issue 4	30 November	15 December

Specification and Submission of Content

Editorial Tone. As the voice of the physics community, the magazine will create a provocative, stimulating, and thoughtful dialogue with the readers; and provide a variety of perspectives that reflects the dynamism of the physics community.

Article types. The magazine is devoted to articles, reports, interesting facts, announcements and recent developments in several areas related to physics:

Manuscripts. Solicited manuscripts will be judged first for reader interest, accuracy and writing quality. The editor reserves the right to request rewrite, reject, and/or edit for length, organization, sense, grammar, and punctuation.

Re-use. The publisher reserves the right to reuse the printed piece in full or in part in other publications.

Submission and Format. Manuscripts must be submitted to the editor on or before the designated due date Manuscripts must be submitted electronically, on the prescribed Microsoft Word template available for download from http://www.saip.org.za/PhysicsComment/. Manuscripts are to be submitted directly to the editor: PhysicsComment@saip.org.za.

Style. AP style is followed for punctuation, capitalization, italics and quotations.

Photography and Illustration. All solicited photography and illustration should be part of an article and will be judged first for technical quality and editorial appropriateness. The editor and art director reserve the right to request revision or reject any material that does not meet their criteria. The publisher reserves full rights to all solicited photography and illustration, including the right to reprint or reuse graphic material in other publications.

Categories of Content Contributions

Technical articles and reports: These are generic articles of about 1 500 words plus diagrams and pictures. A technical article covers a relevant feature topic. Articles are authored by the writer and publishing a 40-word resume of the author could enhance its credibility. By submitting an article that has been previously published the author confirms that he/she has the right to do so, and that all the necessary permissions have been received. Acknowledgement must be made within the article.

News: These are short editorial items usually not more than 250 words. Full colour pictures must be clearly referenced on the editorial submission and on the picture or picture file.

Advertorials: Advertorials could be published when supplied by the client. We recommend a maximum of 500 words plus one or two pictures for maximum impact. A PDF file of the laid out advertorial should be emailed by the client along with an MS Word file of the text and separate image files of the pictures. It is the client's responsibility to ensure that the advertorial is correct as it is in fact a paid for advert page.

Letters to the Editor: Letters to the Editor are encouraged. The Editor reserves the right to edit for length and format. The Editor will not change the political position of the initial letter. Physics Comment does not publish anonymous letters.

Advertising Policy: The Editorial Board will determine advertising prices for Physics Comment, subject to approval by SAIP Council. The objective will be to obtain revenue to maintain and develop the magazine. Physics Comment offers classified advertising to subscribers of the magazine for free. The advertisements must be a maximum of 60 words including the telephone number, and there is a limit of three free classifieds per subscriber, per issue. Advertisements may include a photo, which may be reduced in size or resolution by the editor to optimize loading time. All items or opportunities, which are being advertised for free, should be physics-related. The Editor reserves the right to refuse any advertising, which does not conform to the objectives of the magazine.

Submission of Articles

All articles must be submitted on the prescribed template available for download from http://www.saip.org.za/PhysicsComment/