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PHASE

Medical Physics Group of the Institute of Physics

Tesla Makes Magic

Born at the stroke of midnight during an electrical storm, Nikola Tesla's life was always going to be an interesting story.

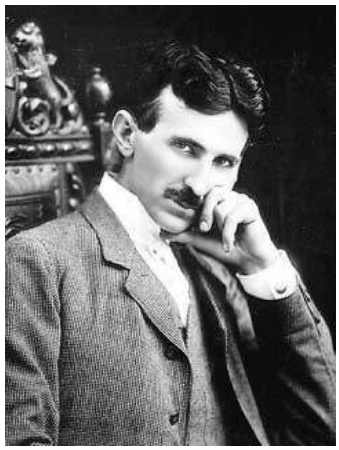
BY REBECCA QUEST

Scientists don't often feature in films and when they do they are either very strange but vastly intelligent or extremely attractive and courageous, often saving the world and falling in love in between discovering the likes of cold fusion or time travel. The Prestige (2006), a film about two rival magicians, Angier and Borden, trying to perform the ultimate magic trick, is no different. In his hunt to be the best, Angier commissions Nikola Tesla to make a fantastic teleportation machine to pull off a most amazing trick: The Transported Man.

Yet how many people watching the film realise that Tesla is not just fiction and was actually a real life inventor, physicist and engineer? Not only that but he was also a remarkable man.

Played in the film by David Bowie, Nikola Tesla comes across as a somewhat quirky character, slightly camp with an accent that can only be described as a sort of Scottish Borat. However in real life, Tesla was in fact born into a Serb family in a region of the Austrian Empire which is now part of Croatia.

Tesla had the amazing gift of having a photographic memory which allowed him to memorise whole books. However he also suffered from a form of synesthesia where on hearing the name of an item he would sometimes involuntarily experienced detailed hallucinations connected to word. This is often called 'picture thinking' but as an inventor this enabled him to visualise an invention in precise, detailed form before even beginning on it's construction.



Nikola Tesla 1856-1943

(Continued on page 3)

- The Prestige (2006) starring Hugh Jackman, Christian Bale, Michael Caine, David Bowie and Scarlett Johansson
- Nikola Tesla, a Serb-American inventor, physicist and engineer proclaimed as "The Genius who Lit the World"

Inside this issue:

A Word from the MPG Chair

First, congratulations to Rebecca on an excellent relaunch of our newsletter, and hearty thanks to Jeff Jones for editing the Newsletter since the Medical Physics Group was formed ten years ago. Jeff has done a fine job of conjuring up relevant and readable articles and we thank him.

In those 10 years, we've grown to become one of the largest groups of the Institute of Physics with over 600 members. We work closely with IPEM, and have three IPEM representatives on our committee. If you are a member of IPEM, remember to take advantage of the membership arrangement which we negotiated at the start of 2006: 25% off membership of both institutes, and a "fast-track" route to MIPEM for appropriately qualified IOP members. See www.ipem.ac.uk or www.iop.org

We have also arranged for IOP to use some of IPEM's excellent careers material, and worked together on IPEM's "Spotlight" papers, the educational teaching packs, and various policy matters such as the campaign against the EU directive which threatens the use of MRI. See www.senseaboutscience.org.uk

We also traditionally hold a session at IPEM's Annual Scientific Meeting. Next year at the ASM in Cardiff, our session will be on Simulation and Modelling in Medicine. We hope to see you there!

Adam Gibson
MPG Chair

Orcas, a Near-Perfect Climate and Cylindrical Blood Vessels

2006 Nuclear Science Symposium and Medical Imaging Conference; San Diego, USA; 29 Oct-4 Nov 2006

"the first published images of a PET insert operating inside a whole-body MRI system"

Meeting Report

BY DANIEL RODRIGUEZ

The 2006 IEEE Medical Imaging Conference was held in San Diego, California. Plenty of attractions (the orcas at Seaworld are truly amazing!) and restaurants, and perfect weather, make San Diego an excellent venue for conferences.

MIC was part of a wider programme also consisting of the Nuclear Science Symposium, the International Workshop on Room-Temperature X and Gamma-Ray semiconductor detectors, and numerous other satellite workshops. The single-track format of MIC ensures that no interesting talks are missed through timetable clashes. There was a good representation of British research, with 52 of the nearly 600 presentations (oral and poster) from the UK. My own attendance to MIC was made possible thanks to partial funding from the Medical Physics Group. Since most of the work for my PhD so far has been in MR, it was a great opportunity for gaining exposure to current research in other imaging technologies.

The conference kicked-off with a plenary talk by Jan Schnitzer, from the Sydnet Kimmel Cancer Centre in San Diego. He described the important role that imaging has in investigating proteins involved in transport across different blood-tissue barriers. This inspiring research aims towards the delivery of endogenous molecules and targeted drugs to reach specific tissue and tumor cells. He stressed the importance of a closely knit multi-disciplinary team of chemists, biologists, and imaging specialist amongst others to succeed in such complex effort. The second plenary talk by Ron Nutt (Molecular Imaging, Siemens Medical Solutions) reviewed the history and development of PET, and its successful integration with CT, causing much change in the practice of medical imaging. He finished by presenting the first published images of a PET insert operating inside a whole-body MRI system, using new solid state radionuclide detectors that allow simultaneous PET and MRI.

Although most of the emphasis of the conference is traditionally on emission and transmission tomography, there were several poster presentations on MRI. However, keeping in line with the second plenary talk, most of the MR presentations were on PET/MR, which even had its own separate workshop. One of the main topics at the conference was PET/CT, with a large volume of work on attenuation and motion correction. As ever, reconstruction algorithms also featured strongly, with an outstanding talk by Andrew Reader (The University of Manchester) proposing an iterative reconstruction algorithm that uses all acquired data (4D) and showing a marked reduction in the variance of voxel-level time-activity curves, and improved accuracy for kinetic parameter estimation.

Downtown San Diego at night

This year, our group submitted five papers on aspects of medical imaging such as artefact correction in scintimammography, digital autoradiography using CCD and CMOS sensors, Ultra Low Dose CT Attenuation Correction Maps for PET/SPECT, and Partial Volume correction.

My work for this conference was a poster presentation entitled "Partial Volume Correction for Image-generated Arterial Input Functions". Regions of interest (ROIs) on blood vessels are likely to present partial volume effects. We proposed a method for Partial Volume correction and intensity recovery that models blood vessels as small cylinders of known diameter. We used a Bayesian classifier that explicitly models the effects of the point spread function on these cylinders. Although the method requires prior knowledge of the cylinder/arterial width, there is no requirement for any registration. A further advantage is that ROI definition can be limited to only 2 axial slices, thus minimizing time averaging. Furthermore, ROI selection requires only approximate placement around the target artery, so that recovered data values are not dependent on expert ROI selection. We presented results for classifier performance on simulated and experimental PET data. The work was well received, addressing an issue highly relevant to the extensive work on MicroPET and Wrist-PET presented at the conference.

Daniel Rodriguez works in the Centre for Vision, Speech, and Signal Processing at the University of Surrey, UK. He was awarded an MPG travel grant to help him go to this conference.

Those Who Can, Teach Medical Physics

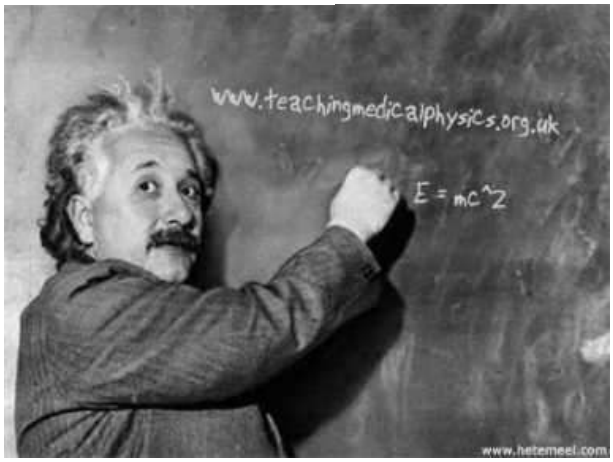
Now when I was at school we had chalk and a black board. We considered ourselves lucky if we were in one of the new classrooms with the roll round boards. We rarely tired of writing jokes or drawing pictures then hiding them at the back just waiting for the teacher to roll it round.

Nowadays however, presentation methods in the classroom are much more technologically advanced, as too I imagine are the practical jokes. A group of physicists led by Dr Adam Gibson have developed a teaching pack for schools to help teach science and explain medical physics by using Powerpoint presentations and high resolution images.

The lessons include The electromagnetic spectrum, Radioactivity and Ultrasound. Each lesson includes a Powerpoint presentation with teachers' notes for each slide. There is a little textbook to explain each concept in more depth and more images for the ultra-keen. There are even some brightly coloured glossy posters to brighten the place up a bit.

What more could you ask for? I know what you're thinking but they thought of that too, there's a website supporting the teaching pack. Once you've stopped staring at the hypnotically appearing and disappearing skeleton you'll find you can download pretty much everything although you'll have to provide your own glossy paper to print the posters on to.

The project is aimed at GCSE level but the advanced bits mean it can be used for A-level teaching. There is also a 'little' version of the lessons and notes for primary school level.



Einstein at his blackboard

Check it out, it's almost as much fun as dropping a tube of Mentos into a bottle of Diet Coke.

www.teachingmedicalphysics.org.uk

Rebecca Quest

Tesla Makes Magic

(Continued from page 1)

Tesla's education started with school in Croatia followed by electrical engineering in Graz, Austria. After a short spell at the University of Prague he moved to Budapest in 1881 to work for a telegraph company where he made his first invention, the telephone repeater. He then used the principle of rotating magnetic fields to develop plans for an induction motor, laying the groundwork for his work on alternating current. He moved to Paris in 1882 to join the Continental Edison Company which got him an introductory letter to the great Thomas Edison's US company in 1884.

Arriving in New York with only 4 cents, he began working for Thomas Edison to sort out problems with his DC system of electricity. However Edison reneged on a financial promise then Tesla quit creating a bit rift between the two.

By 1887 Tesla had established his own laboratory in New York City where he would play his own 'magic' trick on visitors. He would light lamps without using wires by allowing AC electricity to run through his body. Pearson's magazine in 1899 described him as "*literally a human electric live wire*".

In the late 19th and early 20th century, Tesla's work on electricity and magnetism began to bring him fame. He invented the Tesla coil in 1891 then demonstrated wireless communication for which in 1943 he was awarded the first patents for the radio and was acknowledged as it's primary inventor.

Tesla made his most important discovery in Colorado Springs in 1899-1900 and it is this time of his life that is shown in The Prestige. He discovered that the earth could be used as a conductor and would be responsive to vibrations of a certain pitch. He lit 200 lamps without wires from a distance of 40km and created man-made lightning flashes of up to 41m. He even claimed to have received signals from another planet although there appears to be no proof.

In addition to electromagnetism and engineering, Tesla contributed to the fields of robotics, ballistics, computer science, nuclear physics and theoretical physics. However in his later years, Tesla was regarded as a mad scientist and became noted for making bizarre claims about possible scientific developments.

Tesla allowed himself few close friends, although one was the humorist and author, Mark Twain. He died, impoverished at the age of 86 but with many patents to his name. His contribution to electromagnetism was recognized posthumously in 1960 when the SI unit of magnetic flux density was named in his honour. Convenient really because a 1.5 newton-second per coulomb-metre MRI scanner does not trip off the tongue quite so easily as a 1.5 Tesla scanner.

"lighting lamps without wires by allowing AC electricity to run through his body"

Chairman's Report: Scottish Sonoporation Symposium

Aug 2006, Dundee, Scotland

Meeting Report

BY PAUL CAMPBELL

It is almost 80 years since the pioneering observations of Loomis and co-workers heralded the field of therapeutic ultrasound. Whilst progress since has been punctuated by some hiatus, the last decade has seen a somewhat renewed excitement emerge in this area, most obviously driven by the ultimate promise to deliver truly non-invasive clinical applications. A focus for activity relates to the observation that exposure to ultrasound (insonation) in the presence of ultrasound contrast agent (UCA) micro-bubbles, can significantly enhance molecular uptake [of therapeutic agents] and also elicit distinct bio-effects such as apoptosis. This has stimulated a vigorous new research effort aimed at both quantifying the measurable indicators of biological response, and achieving highly refined microscopic characterisation of the affected systems. Advances in this field were recently reported and discussed by over 50 attendees at the Scottish Sonoporation Symposium, a half-day event which was held in August 2006 at the University of Dundee. Several highlights from some of the symposium speakers are outlined below.

"controlled application of ultrasound could deliver drugs and genes to targeted tissues"

Professor Mark Prausnitz (Chemical and Biomolecular Engineering, Georgia Tech, Atlanta), gave a fascinating and instructive opening talk that focused on his work to elucidate the microscopic mechanism whereby ultrasound permeabilises the cell membrane and more particularly, the biochemical dependence or molecular uptake. The procedure used was to expose cells to pulsed ultrasound in the presence of fluorescently tagged species of distinct molecular weights, and then analyse the cell populations using flow cytometry and parallel electron and fluorescence microscopies. It was shown that cavitation generated by ultrasound facilitates direct cellular incorporation of macromolecules of up to 28 nm in radius through self-repairing micron-scale disruptions in the plasma membrane. Both superficial, and also deeper disruptions, were clearly evident in electron and fluorescent micrographs of the sonicated cells. Dynamically, these 'sonopores' exhibited lifetimes on the order of about 1 min. Interestingly, this timescale is comparable with the kinetics of membrane repair after mechanical membrane wounding: an observation that formed the basis of a follow-up investigation to identify the critical biochemical determinants for the subsequent cellular processes (focusing on ATP, Ca2+ and K+) [1]. Here, data supported the hypothesis that cells actively reseal membrane disruptions using a native healing response related to endogenous vesicle-based 'patching'. In related activity, it was shown how controlled application of ultrasound could deliver drugs and genes to targeted tissues in a highly optimised fashion, minimizing side effects and improving efficacy [2]. A more clinically-relevant extension of this work using excised arterial tissue was also reported, with penetration and uptake highlighted via confocal microscopy observations.

Continuing on the theme of acoustically stimulated microbubble activity **Dr Eleanor Stride** (Mechanical Engineering, University College, London) gave an inspiring presentation on some of her recent research geared towards the tailored engineering of coated microbubbles that offer enhanced capabilities for both diagnostics, and therapeutic targeting. Of particular interest was the need to address bubble behaviour in vivo, and to corroborate that with finely controlled laboratory based observations. One critical objective over the longer term will be to facilitate a more rigorous assessment of the safety of ultrasound contrast agents, and also the development of more effective ultrasound therapies.

Experimental results using an ultra high speed imaging system capable of framing at rates of over a million frames per second were presented, and these showed not only the response of single microbubbles to ultrasonic stimulation, but also that of bubble doublets. A full computational analysis had been undertaken that managed to reconcile the observations in terms of their fundamental cavitation driven behaviours in each context [3].

Dr Stride ended her talk with an important new demonstration of her rapid production process for the generation of monodisperse microbubble populations. This technology, which relies on ink-jet printer style bubble projection, has significant potential for implementation to generate targeted drug-delivery agents, particularly for the treatment of cancer. The research element is part of a wider programme of related work funded by EPSRC.

The exploitation of ultrasound to drive microfluidic flow in micro-engineered lab-on-a-chip style devices was discussed at length during a fascinating talk

(Continued on page 5)

Professors Sandy Cochran (Paisley University (right)) and Sascha Hilgenfeldt (Northwestern University , Illinois (middle)) chew the fat with Dr Eleanor Stride (back to camera) during the symposium dinner at Scotland's oldest distillery at Glenturret.

Chairman's Report: Scottish Sonoporation Symposium

(Continued from page 4)

by **Professor Sascha Hilgenfeldt** (Northwestern University, Illinois). Here the phenomenon of 'acoustic streaming' was proposed to account for the directional control of flow using multiple bubbles attached to the vessels internal wall [4]. The possibility of developing highly parallelized constructs that can actively manipulate and sort biological material was advocated, the most important inference being that such devices could compete with conventional microfluidic technologies but at a fraction of their cost.
A critical observation with acoustic streaming in the context of sonoporation was also discussed by Professor Hilgenfeldt. Here again, the behavior of small bubbles (10-50 mm radius) adhered to the wall of a cuvette and stimulated by an ultrasonic field were analysed. Observationally, microscopic lipid vesicles present in the environment were seen to become entrained in a steady streaming flow around the bubble and gravitate towards it. The magnitude of the shear force on approach can be sufficient to breach the lipid membranes [5], thus underscoring the possibility that such a mechanism could also operate to permeabilise real cells and thus be exploited for drug delivery and indeed gene transfection in real treatment scenarios.

The latter stage of the symposium was dedicated to open discussion, led by the eminent key-hole surgeon, Professor Sir Alfred Cuschieri. Here, the focus was to identify those strategic requirements and future research directions that will best exploit sonoporation (and therapeutic ultrasound in general) and promote translational realisation into useful clinical contexts. A distillation from this discussion will appear as a letter to the editor of *Ultrasound in Medicine and Biology* in early 2007.

The symposium ended with a tour and dinner at Scotland's oldest whiskey distillery at nearby Glenturrett (see figure below).

I would like to add a final note of thanks to all those who took the time to come to Dundee for this, the first *Scottish Sonoporation Symposium* (SSS1). I especially thank the speakers, who also included Dr Michiel Postema (Ruhr-Bochum) and Mr Duncan MacLennan (Paisley), for their expert, and often inspirational talks. A follow-up event is planned for late summer 2007, and will follow the half-day format established with this initial meeting. Any researchers interested in participation, or indeed presentation at the next event, should contact Paul Campbell by email at the address below in order to automatically receive email notification of the next event.

Dr Paul Campbell
Chairman, Scottish Sonoporation Symposium
Electronic Engineering and Physics, Ewing Building
University of Dundee, Dundee DD1 4HN. Scotland, UK
E: p.a.campbell@dundee.ac.uk

[1] Schlicher RK et al. (2006) *Mechanism of intracellular delivery by acoustic cavitation.* Ultrasound Med Biol. 32(6) : 915-24.

[2] Zarnitsyn VG and Prausnitz M. (2004) *Physical parameters influencing optimization of ultrasound-mediated DNA transfection.* Ultrasound Med Biol, 30: 527-538.
Also see http://www.che.gatech.edu/drugdelivery/

[3] Stride E & Saffari N (2003) *Microbubble ultrasound contrast agents*: A review. Proc. Inst. Mech. Eng. 217, 429 (Part H: Engineering in Medicine). Also see http://www.mecheng.ucl.ac.uk/staff/?staff_id=es

[4] Marmottant P & Hilgenfeldt S. *A bubble driven microfluidic transport element for bioengineering.* PNAS (2004) 101, 9523.

[5] Marmottant P & Hilgenfeldt S. (2003) controlled vesicle deformation and lysis by single oscillating bubbles. Nature 423, 153.

"the phenomenon of 'acoustic streaming' was proposed"

Jeff Takes a Bow

After many years of heroic service, Jeff Jones has decided to stand down as the Editor of the MPG Newsletter.

The initial aim of the newsletter was to exchange information and ideas between active members of the medical physics community and Jeff has done a fantastic job over the years keeping it informative but readable. He combined meeting reports with lighthearted articles, all with some spin on medical physics.

Jeff's Editors Ramble was always a welcome diversion, tripping lightly between fascinating trivia, perplexing conundrums and up to the minute news. The "Where am I?" series was particularly popular with many entrants trying to work out not only where Jeff was but also how he managed to go to so many exotic places. Perhaps it's an Editor's perk.

In a recent interview with Jeff, he stated "*My favourite screen scientist is Beaker, of whom I do a passable impression in moments of stress*". Not that stress should be wished on anyone but that's one impression many would like to see.

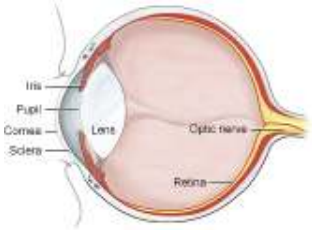
In his spare time when he's not writing the newsletter, Jeff works in the Medical Physics Department of the Royal Free Hospital, London.

If you would like to see Jeff's "Where Am I?" signature series continued then please e-mail rebecca@physics.org and perhaps he can be persuaded. That's if he can be found of course, now where is he this time...?

Rebecca Quest

Beaker: Dr Bunsen Honeydew's scientific assistant (and victim)

Is Flashing a Good Thing?



Cycling is one of the best ways of getting and staying healthy, however to be safe on the roads you must be as visible as possible to other road users. Dr Rebecca Longbottom explains the reasons behind the change in legislation allowing flashing lights on bicycles:

Flashing lights are a commonly used warning signal in many circumstances, from a flashing light on an answer machine alerting you to a message, to collision warning lights on aircraft and lighthouses warning approaching ships (dating back to ancient Egyptian times). However, it has only very recently (23rd October 2005) been deemed legal to have a flashing, rather than a steady light on a bicycle as a form of illumination.

So why is it that flashing lights are better detected than those of a steady light? Phototransduction is the term given to light detection in the eye. The absorption of photon energy by photosensitive proteins within the photoreceptors (rods or cones) results in an action potential being propagated across the retina. This is transmitted via the optic nerve to the visual cortex which is the area of the brain that interprets the signals from the retina.

"flashing lights were found to increase detection distance but not recognition"

The Blondel-Rey law of visual integration (1911) is at the heart of all warning system design. It relates intensity and duration of flash to the threshold of detection i.e. how long and bright the flash is required to be before it is visible.

Studies have shown that flashing lights are five times more conspicuous than steady lights. In actual fact it is the contrast of the flashing light to background light levels (noise) that we are actually detecting.

Indeed some individuals are very sensitive to flashing lights, people with photosensitive epilepsy; where frequency (15-20 flashes per sec most likely to cause a seizure), duration and intensity all influence the probability of causing a seizure. Seizures are thought to be caused by the neurological systems that process visual signals all firing synchronously, rather than in a coordinated manner.

On bicycles, flashing lights were found to increase detection distance but not recognition, whereas "biomotion" reflectors (leg or pedal reflectors) increased recognition. Gunnar Johansson reported 40 years ago that the motion of a person is rapidly perceived when lights are attached to major joints. So a number of factors influence the detection of lights on cyclists. Cyclists accounted for 5% of road traffic fatalities in 2005, lets hope allowance of flashing lights will reduce the number of cyclists killed on the roads in future.

Rebecca Longbottom is a post-doctoral researcher in the Department of Cell Biology at the Institute of Ophthalmology, London, UK

MPG Mutterings

Keeping you up to date with the MPG

Teaching materials: Education packs for GCSE level were sent to every school in the UK and a large number to Ireland. There have been over 2400 visits to the website since it went live six months ago and feedback has been very positive. Extra packs and multiple copies of the textbook have been requested.

Scientific Meetings: MPG organised a meeting,

'Biomedical Applications of Nanotechnology & MEMS', as part of the IPEM ASM in Cambridge, Sep 2006. The next MPG organised meeting will be *'Simulation and modelling in Medicine'* as part of the IPEM ASM in Cardiff, Sep 2007.

Budgets: In August, a proposed budget was drawn up for the new system being introduced group-wide in 2007. MPG requested additional funds to increase the number of conference bursaries awarded. Additional funds were also sought for increasing the group's involvement in outreach activities, such as the development of medical physics teaching material.

On the web: IOPP have created a new medical physics site, containing research reports and commercial product information:

www.medicalphysicsweb.org

Biological Physics Group: MPG committee members attended the launch event for this new IOP group. The MPG looks forward to working with BPG on areas of interest to both groups.

Want to have your say? Contact Colin, MPG Secretary

Colin Baker

Auntie Matter's Column

Before you've had chance to recover from your New Year hangover you can be sure that the advertising moguls will be bombarding you with new ways to lose weight. The question being, do we really want to? My answer to that would be no, well at least not until after the skiing holiday. Apparently big people go faster on skis and speed is, of course, good.

> **"skiing with a rucksack full of muffins"**

The physics of skiing is all to do with gravity, surface friction of the snow and aerodynamic body drag. Heavier people can get more potential energy and using Galileo's square-cube law it can be seen that air resistance slows a big person down less than a small person. Bigger people also have larger skis which generally go faster due to the weight being spread out and less force being applied per unit of snow. The skis then glide over the top of the snow on a thin layer of water which is why we wax skis to get them even faster.

Of course there are many complications to be considered. For example heavier people may have more trouble turning, especially if the increased weight is not due to muscle in the right places.

So, should we be dieting before skiing? Well if you feel the need for speed then no, I think not. So you will find me happily zooming down the sun-kissed piste with a rucksack full of muffins to accompany the glüwein stops. Mind you, after a couple of glüweins my turning probably isn't that great anyway. Then again the falling over doesn't hurt as much either ... particularly if I land on the muffins.

MPG Co-sponsored Meetings

International Workshop on Monte Carlo codes

26-27 March 2007, National Physical Laboratory, Teddington, UK

A two-day workshop devoted to some of the most popular Monte Carlo radiation transport codes in use (EGSnrc, Geant4, MCNPX, PENELOPE). Each code session will include presentations by a key developer covering the important features, capabilities and recent developments of each code, as well as one or more demonstrations of real applications. There will also be several introductory lectures on general Monte Carlo techniques for novice users. At the end of the first day, there will be an open-house session enabling delegates to demonstrate their own applications and problems.

The cost for the workshop will be £200 (incl VAT). This will include lunch and light refreshments on both days, an evening meal on the Monday evening and a set of notes covering the lectures.

http://www.npl.co.uk/ionrad/training/montecarlo

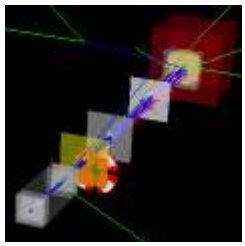
13th UK Monte Carlo User Group Meeting (MCNEG 2007)

28-29 March 2007, National Physical Laboratory, Teddington, UK

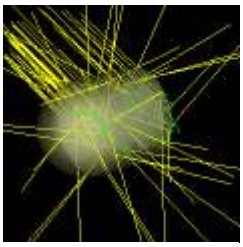
A two day meeting aimed at users of all radiation transport codes. The MCNEG 2007 meeting provides delegates with the opportunity to present and discuss their applications and recent developments of Monte Carlo in radiotherapy, radiation protection, radioactivity, the nuclear and other industries.

The cost for the MCNEG 2007 meeting will be £150 (incl VAT). This will include lunch and light refreshments on both days, a £10 subsidy for the evening meal on the Wednesday evening and a book of abstracts.

http://www.npl.co.uk/ionrad/training/montecarlo



Monte Carlo simulation of the Clatterbridge proton beam line



Monte Carlo simulation of an ionization chamber

IOP Institute of Physics

Medical Physics Group of the Institute of Physics

c/o Institute of Physics
76 Portland Place, London, W1B 1NT, UK

Events Diary

25 Jan 2007
IPEM

Human Shape: How can measurements and modelling improve outcomes for patients with profound abnormalities of posture?
York, UK
http://www.ipem.ac.uk

13 Feb 2007
IPEM

Advances in treatment planning system algorithms
Manchester, UK
http://www.ipem.ac.uk

17-22 Feb 2007
SPIE

Medical Imaging 2007
San Diego, USA
http://spie.org/conferences/programs/07/mi

27-28 Feb 2007
IPEM

Biennial Ultrasound
Birmingham, UK
http://www.ipem.ac.uk

19-21 Mar 2007
BNMS

BNMS Spring Meeting 2007
Manchester, UK
http://www.bnms.org.uk/bnms.htm

4-7 Jun 2007
ICCR

ICCR 2007: International Conference on the use of computers in radiation therapy
Toronto, Canada
http://www.iccr2007.org

If your meeting is relevant to MPG members and you would like it to be mentioned here, please contact rebecca@physics.org

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Contribute

Send articles for inclusion in the next newsletter by 30 Mar 2007 to rebecca@physics.org

Membership

Join your first IOP group for free. Contact the IOP office:
T: +44 (0) 20 7470 4800 or E: membership@iop.org
Enquiries about joining the MPG committee to Adam Gibson
T: +44 (0) 20 7679 0279 or E: agibson@medphys.ucl.ac.uk

We're on the web!

The Institute are currently trying out new, snappier links so don't worry if this one isn't instantly memorable

http://www.iop.org/Our_Activities/Groups_and_Divisions/Subject_Groups/Medical_Physics/page_2075.html

Money Makes the World Go Around

Or rather we can give you money to help you go round the world. Basically, we have a bit of spare money that could do with a happy home so we've decided to use it to help you get to overseas conferences.

Of course there are a few things you have to do for us. First you have to be within 12 years of starting your research career, with suitable allowance for career breaks. Then you have to have a presentation (oral or poster) accepted at the conference you want to go to. You also have to have at least a bit of other financial support.

Finally, and some might say this is the best bit, you have to write a report of the meeting for publication in this very newsletter.

Recent bursaries have helped people go to Seattle, Hong Kong and San Diego.

If you are interested then be nice to Kate. She'll let you know if you fit in with the other official blurb.

kate.isaak@astro.cf.ac.uk