MACQUARIE UNIVERSITY | MQ PHOTONICS RESEARCH CENTRE

NEWSLETTER

Issue 22 – 2 September 2009

MQ Photonics Newsletter is an informal internal publication of the ***MQ Photonics Research Centre*** <http://web.science.mq.edu.au/groups/mqphotonics/>.
We aim to distribute it by e-mail every 3 weeks. Please send copy to <lizb@physics.mq.edu.au> by 9 a.m. every 3rd Tuesday. **Next due date: Tue 22 September '09.**

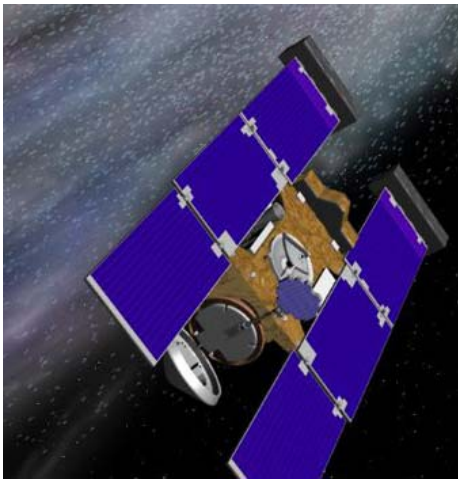
Focal Points

The Meaning of Life, the Universe and Everything (≠ 42 !)

Two weeks ago, NASA announced that the encounter in January 2004 of its Stardust probe with the comet Wild 2 had led to the confirmed discovery of glycine, the simplest amino acid and a supposed building block of life, in the cometary medium. NASA spokesmen explained: "Our discovery supports the theory that some of life's ingredients formed in space and were delivered to Earth long ago by meteorite and comet impacts" and "it strengthens the argument that life in the universe may be common rather than rare."

This news item seemed quite momentous to me when I read about it in the *SMH* on 20 August. Not many of my colleagues seem to have picked up this news, which spans the 'astro' and 'bio' extremes of our interests within *MQ Photonics*. Moreover, it involves some neat sensing instrumentation: a clever collection grid filled with aerogel to capture samples of the comet's gas and dust; a return capsule that detached from the spacecraft and parachuted to Earth two years later; and some ultra-careful chemical analysis to guard against the possibility of terrestrial contamination. Isotopic ratio analysis finally resolved that last issue for NASA scientists, who "discovered that the Stardust-returned glycine has an extraterrestrial carbon isotope signature, indicating that it originated on the comet."

Read more at: **http://www.jpl.nasa.gov/news/news.cfm?release=2009-126**



Artist's concept of Stardust spacecraft passing through gas and dust around comet Wild 2 (represented by the white area). The collection grid is the tennis-racket-shaped object extending out from the back of the spacecraft. Credit: NASA/JPL

National security – a role for *MQ Photonics*?

One of the easiest ways to stay sane while preparing this *Newsletter* every three weeks is simply to editorialise whatever happens to be on one's mind. This time around, I have been pre-occupied with the release early last week of information about RSNS (Research Support for National Security) program grants, managed by the National Security Science and Technology (NSST) Branch of the Office of National Security within the Dept of the Prime Minister and Cabinet. Read more at: **http://www.pmc.gov.au/nsst/research_support.cfm** and **http://www.pmc.gov.au/nsst/** . Five months have elapsed since my last comments on this subject (*Newsletter*, issue 15, 1 April 2009) and some of us have been waiting and watching patently ever since.

By good fortune, I had already arranged to be in Canberra last week and so was able to have a useful meeting on Wednesday with NSST and, on Thursday, with some government agencies involved in national security. (I was surprised to find that there is apparently much less interest in detection of pathogens and bio-agents than of explosives and narcotics.) I'd be happy to share my detailed impressions with anyone who needs to know.

In the meantime, I can report that some of the opportunities in the previous round of NSST Research for Counter Terrorism grants have now been withdrawn. For instance: "The 2009–10 call will not address the Chemical, Biological, Radiological, Nuclear (CBRN) capability area as a successful 2008–09 CBRN-specific round resulted in seven new projects being approved for funding." The RSNS priority area that seems most relevant to our interests within *MQ Photonics* is "Stand-off Detection for Explosives" – the provisions for which appear to be interpreted quite liberally by the NSST people and their potential end-users.

I conclude by repeating what I wrote five months ago: "... it could be advantageous for many of us in *MQ Photonics* to be looking towards NSST ... for some of our future R&D applications. The potential outcomes (utility, service to the community, research grants, linkages and partnerships with government agencies and other bodies, relevance to possible major research centre bids, ...) should make it worthwhile. However, it will be important (as in most applied research) to avoid a 'Here is your answer – now what was your problem?' attitude. Just because we have a particular distinctive capability and research interest does not necessarily make it useful without a lot of adaptation and serious effort."

Brian Orr

Fresh vistas

Research funding opportunities – internal schemes

- MQ Strategic Infrastructure Scheme (MQSIS) – Research Infrastructure Block Grants (RIBG) ... due 23 Sep
- MQ Research Innovation Fund (MQRIF) ... due 28 Oct

Research funding opportunities – external schemes

- NSST Research Support for National Security (RSNS) grants ... due 2 Oct
- ARC Linkage Projects (Round 2) for funding commencing July 2010 ... due 21 Oct
- ARC Centres of Excellence – *next round still to be announced* ... due late 2009?

AINSE Awards are offered to assist researchers from member universities to gain access to ANSTO and other AINSE facilities. Awards are available for one year commencing in January. **Closing date: 15 September**

More information: **http://www.ainse.edu.au/ainse/for_academic_researchers/ainse_awards.html**

Upcoming conference – Light in Life Sciences (abstract submission due 16 September)

More information: **http://www.physics.mq.edu.au/research/fluoronet/LILS09/**

Upcoming conference – ACOLS/ACOFT 09 (earlybird registration due 12 October)

More information: **http://www.plevin.com.au/acoftacols2009/**

Upcoming OSA Topical Meetings

OSA®

Three Collocated Topical Meetings will be featured in an OSA Optics and Photonics Congress on "Lasers, Sources and Related Photonic Devices" on January 31-February 3, 2010 in San Diego, California:

- **Advanced Solid-State Photonics (ASSP)**
- **Applications of Lasers for Sensing and Free Space Communications (LS&C)**
- **Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)**

Submission Deadline: September 22, 2009, 12:00 p.m. noon EDT (16.00 GMT)

More information: **http://www.osa.org/meetings/topicalmeetings/**

ICONN 2010 - call for abstracts – submission 18 September 2009

Just a reminder (from Deb Kane) that the call for papers for ICONN 2010 (22-26th February 2010) is open. Deadline is currently 18th September. Note an abstract of up to two pages is requested but a one page abstract is acceptable (template attached). An IEEE proceedings CD will be published (E1 papers) and a minimum 3 pages will be implemented for manuscripts to appear there. **http://www.ausnano.net/iconn2010/abstracts.php**

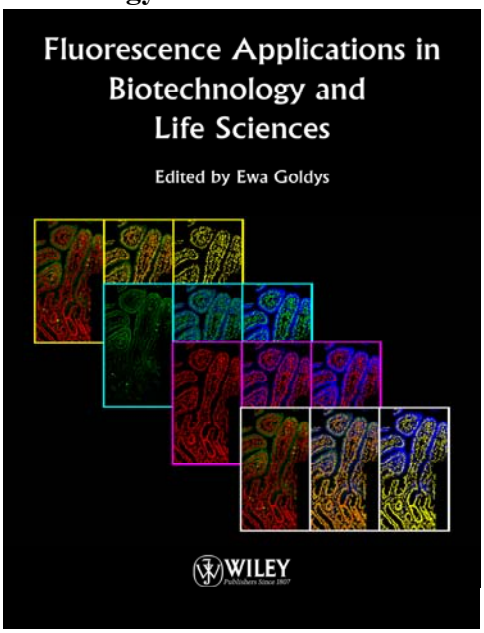
Publications

A newly published book edited by Ewa Goldys ...

"Fluorescence Applications in Biotechnology and Life Sciences" edited by Ewa M. Goldys (Wiley-Blackwell; August 2009; ISBN: 978-0-470-08370-3; 367 pages)

A self-contained treatment of the latest fluorescence applications in biotechnology and the life sciences ...

http://au.wiley.com/WileyCDA/WileyTitle/productCd-0470083700.html



This book focuses specifically on the present applications of fluorescence in molecular and cellular dynamics, biological/medical imaging, proteomics, genomics, and flow cytometry. It raises awareness of the latest scientific approaches and technologies that may help resolve problems relevant for the industry and the community in areas such as public health, food safety, and environmental monitoring.

Following an introductory chapter on the basics of fluorescence, the book covers: labeling of cells with fluorescent dyes; genetically encoded fluorescent proteins; nanoparticle fluorescence probes; quantitative analysis of fluorescent images; spectral imaging and unmixing; correlation of light with electron microscopy; fluorescence resonance energy transfer and applications; monitoring molecular dynamics in live cells using fluorescence photo-bleaching; time-resolved fluorescence in microscopy; fluorescence correlation spectroscopy; flow cytometry; fluorescence in diagnostic imaging; fluorescence in clinical diagnoses; immunochemical detection of analytes by using fluorescence; membrane organization; and probing the kinetics of ion pumps via voltage-sensitive fluorescent dyes.

With its multidisciplinary approach and excellent balance of research and diagnostic topics, this book is an essential resource for postgraduate students and a broad range of scientists and researchers in biology, physics, chemistry, biotechnology, bioengineering, and medicine.

The following chapters of this book have been contributed by members of *MQ Photonics*:

- Chapter 4: **"Nanoparticle Fluorescence Probes"**, pp. 87–112
  by **Krystyna Drozdowicz-Tomsia** and **Ewa M. Goldys**
- Chapter 12: **"Flow cytometry"**, pp. 285–312
  by **Russell E. Connally**, Graham Vesey and Charlotte Morgan
- Chapter 15: **"Immunochemical detection of analytes by using fluorescence"**, pp. 359–380
  by Evgenia G. Matveeva, Ignacy Gryczynski, Zygmunt Gryczynski and **Ewa M. Goldys**

Recently published articles:

Sobhan, M.A.; **Ams, M.**; **Withford, M.J.**; **Goldys, Ewa M.**, "Formation of colloidal gold nanoparticles by using femtosecond laser ablation," *International Journal of Nanoscience* **8** (1–2), 209–212 (2009).

Abstract: Colloidal gold nanoparticles were produced by irradiating a gold disk with a femtosecond laser beam in pure deionized water. Variation of laser fluence between 38 and 330 J/cm2 was used to control the nanoparticle size distribution. The nanoparticles produced were spherically shaped with av. diam. between 9 and 10 nm. The effect of ablation time on the nanoparticle prodn. efficiency and size distribution was also studied.

Anwer, A.G.; Sandeep, P.M.; **Goldys, Ewa M**.; Vemulpad, S., "Distinctive autofluorescence of urine samples from individuals with bacteriuria compared with normals," *Clinica Chimica Acta* **401** (1–2), 73–75 (2009).

Abstract: A variety of fluorophores are present in normal human urine. Alteration in the autofluorescence of urine could result from physiological or patholol gicalchanges. This study investigates the differences in the autofluorescence of 45 normal urine samples from 25 individuals with bacteriuria. Excitation at 290 nm showed good discrimination between these 2 groups. Principal Component Analysis (PCA) of the data revealed statistically significant differences between the fluorescence spectra for samples with bacteriuria as compared to the control group. The findings indicate the potential of the fluorescence spectrum of urine to be developed as a simple and rapid diagnostic tool.

Deng, Wei; **Drozdowicz-Tomsia, Krystyna**; **Jin, Dayong**; **Goldys, Ewa M**., "Enhanced Flow Cytometry-Based Bead Immunoassays Using Metal Nanostructures," *Analytical Chemistry* **81** (17), 7248–7255 (2009).

Abstract: While the principle of fluorescence enhancement of metal nanostructures is well-known, the utility of this effect in practical methodologies used in analytical labs. remains to be established. In this work, the authors explore the advantage of fluorescence enhancement for flow cytometry. The authors report observation of metal-enhanced fluorescence emission of fluorophores located on the surface of silica beads coated with nanostructured silver, suitable for flow cytometry detection. The fluorescence enhancement was investigated using a model Alexa Fluor 430 IgG immunoassay and Alexa Fluor 430 labeling. Approximately 8.5-fold and 10.1-fold higher fluorescence intensities at 430 nm excitation were, respectively, observed from silvered .approx.400 nm and 5 μm silica beads deposited on glass as compared to the control sample. The 400 nm and 5 μm beads were compatible with the flow cytometry readout, although lower enhancement factors of 3.0 and 3.7 were obtained. The authors show that such values are consistent with less favorable overlap of the plasmon resonance in silver nanostructures with 488 nm excitation wavelength used in the flow cytometry experiment. The authors, thus, demonstrated that the silvered silica beads are able to provide intensified fluorescence signals in flow cytometry which can improve the sensitivity of flow cytometry-based bioassay systems.

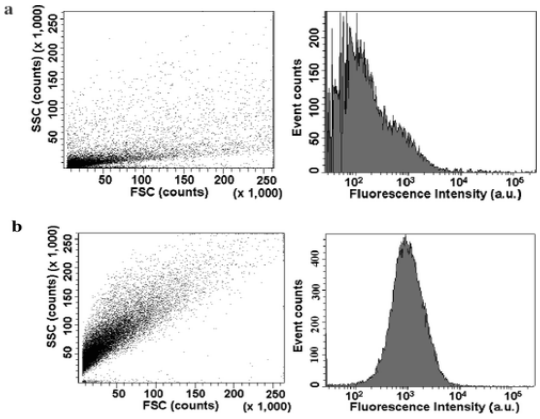


Figure 8. Flow cytometry scanning for AlexaFluor 430 labeled-silica beads (400 nm) without Ag enhancement (a) and with 3 min Ag enhancement (b). Left, forward scattering vs side scattering. Right, fluorescence histogram.

Katrina Y.T. Seet, Timo A. Nieminen and **Andrei V. Zvyagin**, "Refractometry of melanocyte cell nuclei using optical scatter images recorded by digital Fourier microscopy," *Journal of Biomedical Optics* **14** (4), 044031 (July/August 2009); published online August 28, 2009; DOI: 10.1117/1.3207141.

Abstract: The cell nucleus is the dominant optical scatterer in the cell. Neoplastic cells are characterized by cell nucleus polymorphism and polychromism – i.e., the nuclei exhibits an increase in the distribution of both size and refractive index. The relative size parameter, and its distribution, is proportional to the product of the nucleus size and its relative refractive index and is a useful discriminant between normal and abnormal (cancerous) cells. We demonstrate a recently introduced holographic technique, digital Fourier microscopy (DFM), to provide a sensitive measure of this relative size parameter. Fourier holograms were recorded and optical scatter of individual scatterers were extracted and modeled with Mie theory to determine the relative size parameter. The relative size parameter of individual melanocyte cell nuclei were found to be 16.5±0.2, which gives a cell nucleus refractive index of 1.38±0.01 and is in good agreement with previously reported data. The relative size parameters of individual malignant melanocyte cell nuclei are expected to be greater than 16.5.

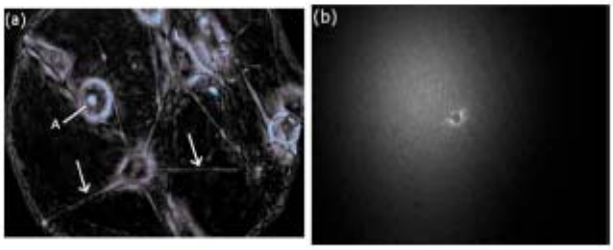


Fig. 8 Image of the melanocyte cells (arrows show cell dendrites) obtained by (a) auxiliary imaging device (CCD_2) using the configuration shown in Fig. 1. The image aperture appears as a circular outline. (b) The recorded Fourier hologram of cells.

Yabai He and **B.J.Orr**, "Self-adaptive, narrowband tuning of a pulsed optical parametric oscillator and a continuous-wave diode laser *via* phase-conjugate photorefractive cavity reflectors: verification by high-resolution spectroscopy," *Applied Physics B* **96** (2–3) 545–560 (2009) – see *Newsletter* issue 17 for details.

Recently accepted / in-press articles:

Carlo Bradac, **Torsten Gaebel**, **Nishen Naidoo**, **James R. Rabeau** and Amanda. S. Barnar, "Prediction and Measurement of the Size-Dependent Stability of Fluorescence in Diamond over the Entire Nanoscale," *Nano Letters* **xx**, xxxx (2009); 10 journal pages on the web at http://pubs.acs.org ; DOI: 10.1021/n19017379.

Abstract: Fluorescent defects in noncytotoxic diamond nanoparticles are candidates for qubits in quantum computing, optical labels in biomedical imaging, and sensors in magnetometry. For each application these defects need to be optically and thermodynamically stable and included in individual particles at suitable concentrations (singly or in large numbers). In this Letter, we combine simulations, theory, and experiment to provide the first comprehensive and generic prediction of the size, temperature, and nitrogen-concentration-dependent stability of optically active N-V defects in nanodiamonds.

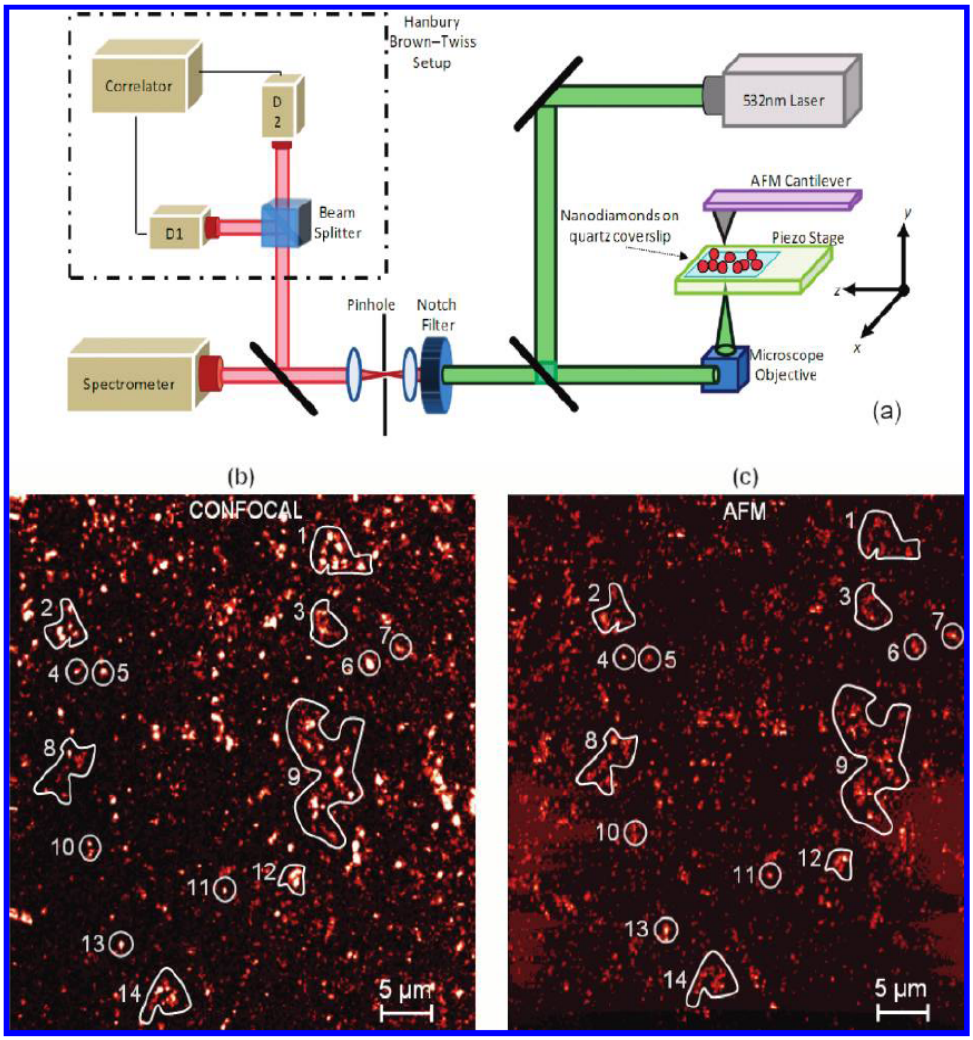


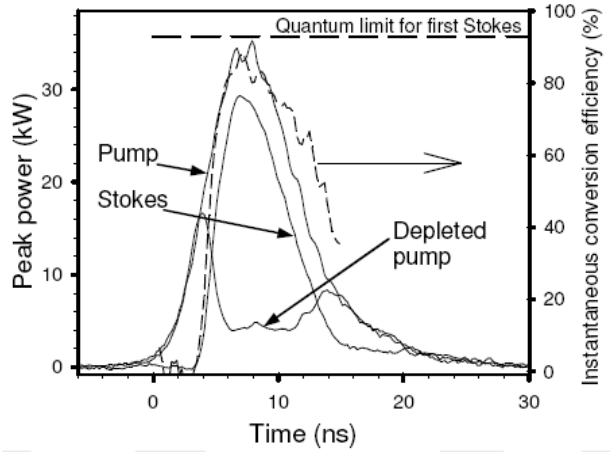
Figure 4.

(a) Combined confocal/AFM system setup.

(b) Confocal system image: bright fluorescing spots indicate emission from N-V center(s) in nanodiamond crystals.

(c) Corresponding atomic force microscope (AFM) image of nanocrystalline diamonds deposited on quartz substrate: the brightness of the spots is directly proportional to the height of the crystals themselves.

R. Mildren & A. Sabella, "Highly efficient diamond Raman laser," *Optics Letters* (accepted 12 August, 2009).



Abstract: We report an efficient 532 nm-pumped external cavity diamond Raman laser generating output chiefly at the 573 nm first Stokes. At a pulse repetition rate of 5 kHz, the Raman laser generated 1.2 W output with conversion efficiency 63.5%, slope efficiency 75%, and pulse peak instantaneous conversion efficiency 85% and peak photon conversion efficiency 91%. The laser generated a maximum output energy of 0.67 mJ by increasing the pump beam size and pulse energy. The efficiency is commensurate with the highest previously reported for other Raman materials pumped by q-switched lasers.

C.I. Pakes, D. Hoxley, **J.R. Rabeau**, R. Kalish and S. Prawer, "Scanning Kelvin-probe study of the hydrogen-terminated diamond surface in ultra-high vacuum," *Applied Physics Letters* (accepted 18 August, 2009).

Abstract: Atomic-force and Kelvin-probe microscopy were employed in ultra-high vacuum to image the surface topography and contact potential of the hydrogen-terminated and un-terminated surfaces of diamond. A variation of about 25 meV in the contact potential was measured on a length scale of 20 nm and ascribed to differently orientated surface domains resulting from hydrogen-plasma processing of the sample. Shifts in the work function arising from sample heating in vacuum and the adsorption of C_{60} were measured. For the hydrogen-terminated surface only, a rapid increase of 0.7 eV in work function was observed following deposition of a single monolayer of C_{60}.

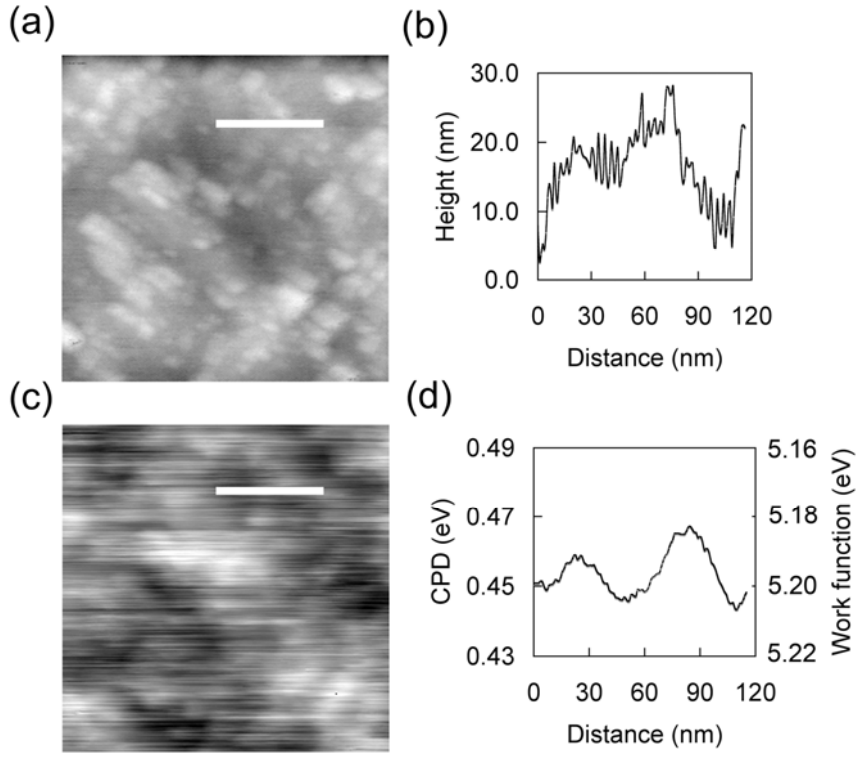
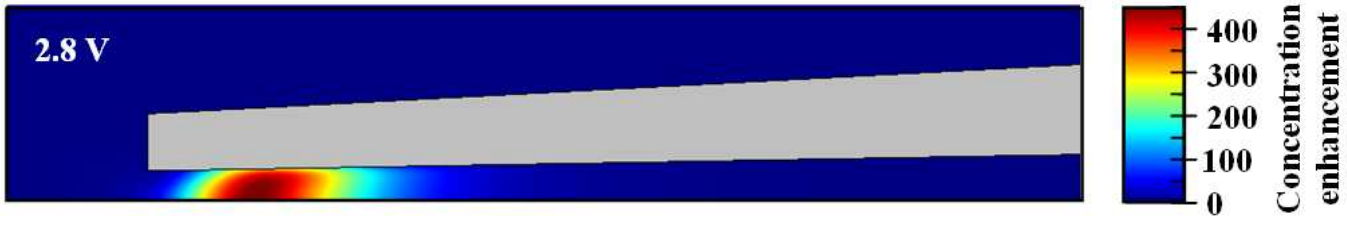


Figure 1.

Non-contact atomic force microscopy (a) and Kelvin-probe (c) images obtained for the same area of the polycrystalline sample (Sample I), obtained immediately after insertion into UHV. (b) and (c) show scans of surface topography and contact potential difference along the lines indicated in the corresponding images.

Nils Calander, "Analyte concentration at the tip of a nanopipette," *Analytical Chemistry* (accepted 28 August).

Abstract: Concentration of molecules within the tips of nanopipettes when applying a DC voltage is herein investigated using finite-element simulations. The ion concentrations and fluxes due to diffusion, electro-migration, and electro-osmotic flow, and the electric potential, are determined by the simultaneous solution of the Nernst-Planck, Poisson, and Navier-Stokes equations within the water solution containing sodium and chloride ions, and negatively charged molecules. The electric potential within the pipette glass wall is at the same time determined by the Poisson equation together with appropriate boundary conditions, and accounts for a field effect through the wall. Fixed negative surface charge on both the internal and external glass surfaces of the nanopipette is included to together with the field effect through the glass wall, account for the electric double layer and the electro-osmosis. The inclusion of the field effect through the pipette wall is new compared to previous modeling of similar structures and is shown to be crucial for the behavior at the tip. It is demonstrated that the concentration of molecules is a consequence of ionic charge accumulation at the tip screening the electric field, thereby slowing down the electrophoretic motion of the molecules, further slowed down or stopped by the oppositely directed electro-osmosis. It is also shown that the trapping is very sensitive to the properties of the molecule, i.e. its electrophoretic mobility and diffusion coefficient, the properties of the pipette, the ionic strength of the solution, and the applied electric field.



MQ Photonics Seminars:

Time: 11am, Mon 7th September Place: C5C 498 **Prof. Cornelia Denz**, Institute for Applied Physics, Westfälische Wilhelms-Universität Münster, Germany

TOPIC: Structuring, Manipulating, and Controlling Light by Light - Nonlinear Photonics in Information Processing and Life Sciences

ABSTRACT: Photonics has become a major player in the field of information storage and processing as well as in applications in biology and medicine.

The vision to realized functional systems in an all-optical way requires to control light in all its features. This requirement can only be achieved if nonlinear optics is used. Among the effects that are well-suited for controlling light by light, dielectric materials that control light by a period modulation of their refractive index are especially suited because they can manipulate the speed of light, localize light, and tailor its amplitude and phase features and a complex way. In this presentation, I will demonstrate that nonlinear refractive index changes can on the one hand slow down, guide and route light using photonic lattices, and on the other hand allow to realize novel microscope tools as well as manipulation of particles and fluid.

Time: 1pm, Thu 10th September Place: C5C 498 **Dr. Martin Booth**, Dept. for Engineering Science, University of Oxford, UK

TOPIC: Adaptive optics for microscopy and photonic engineering

ABSTRACT: The image resolution and contrast of a microscope are often detrimentally affected by aberrations that are introduced when focusing deep into specimens. These aberrations arise from spatial differences in optical properties of the specimen or refractive index mismatches. Similar problems affect the resolution and efficiency of three-dimensional optical fabrication systems, such those used for the manufacture of photonic crystals or optical waveguides. In this case, significant aberrations are introduced when focusing deep into the fabrication substrate. We report on the development of adaptive optics systems for these applications and show aberration corrected images of biological specimens and fabricated photonic structures.

Time: 12Noon, Wed 16th September Place: C5C 498 **Luke Stewart**

TOPIC: Functionalising Opals

ABSTRACT: Opal gemstones are a naturally occurring photonic crystal. The brilliant colours that they display are a direct consequence of the photonic stop-gap that they possess. Opals can also be made in the laboratory, through a process called self-assembly.

In this talk, I will discuss results from my PhD research in this field. Emphasis will be placed on recent findings involving the infiltration of these opal photonic crystals with diamond nanocrystals. These diamond nanocrystals contain a crystallographic defect known as a nitrogen-vacancy centre, which gives the nanocrystals a well defined photoluminescence spectrum. The emission characteristics from nanocrystals emitting from inside the opal will be discussed.

Time: 12Noon, Wed 23rd September Place: C5C 498 **Zhen Song**

TOPIC: Characterization of optical properties and skin permeability of ZnO nanoparticle

ABSTRACT: ZnO nanoparticle (NP) is widely used in cosmetic formulations as efficient UV light absorber. The possibility that topically applied NPs penetrating the stratum corneum into deeper layers of human skin and diffuse further into the circulatory system have raised public concern. Since the capability of routine metabolic process of human being won't be sufficient to get rid of those NPs, uncertain hazardous will present. ZnO sized 30nm or larger have been claimed to stay mainly in the upmost layer of human skin or hair follicle. In our investigation, ZnO NPs of a broader size range, 3nm-100nm and different modification were applied to human and porcine skin, their permeability was studied by means of fluorescence scanning confocal and two-photon excitation microscopy. Meanwhile, SEM/EDX analysis system was applied to determine the elements concentration at different layer of NP treated skin. In order to quantify ZnO signal on the autofluorescence background of skin and second harmonic signal of collagen, the linear and nonlinear optical properties of ZnO NP were characterized. A blue shift due to the quantum confinement effect of the ZnO NP was observed. The linear and nonlinear absorption cross-sections and quantum yield of ZnO NPs were determined by its quantitative comparison with the tabulated parameters of the organic laser dyes.

Time: 12Noon, Wed 30th September Place: C5C 498 **Wei Deng**

TOPIC: Enhanced Flow Cytometry Based Bead Immunoassays by Using Metal Nanostructures

ABSTRACT: While the principle of fluorescence enhancement of metal nanostructures is well known, the utility of this effect in practical methodologies used in analytical laboratories remains to be established. In this work we explore the advantage of fluorescence enhancement for flow cytometry. We report the observation of metal-enhanced fluorescence emission of fluorophores located on the surface of silica beads coated with nanostructured silver, suitable for flow cytometry detection. The fluorescence enhancement was investigated using a model AlexaFluor 430 IgG immunoassay and AlexaFluor 430 labeling. Approximately 8.5-fold and 10.1-fold higher fluorescence intensities at 430 nm excitation were, respectively, observed from silvered ~ 400 nm and 5 µm silica beads deposited on glass as compared to the control sample. The 400 nm and 5 µm beads were compatible with flow cytometry readout, although lower enhancement factors of 3.0 and 3.7 were obtained. We show that such values are consistent with less favourable overlap of the plasmon resonance in silver nanostructures with 488 nm excitation wavelength used in the flow cytometry experiment.

Physics Colloquia Series:

Time: 12Noon, Mon 31st August Place: E6A 102 **Dr Amanda Karakas**, Research School of Astronomy and Astrophysics, Mt Stromlo Observatory

TOPIC: Nucleosynthesis in Red Giant Stars

ABSTRACT: For low and intermediate-mass stars (with initial masses between about 0.8 to 8 solar masses) the most important nucleosynthesis occurs when stars evolve off the main sequence to the giant branches. It is during the asymptotic giant branch (AGB) phase of stellar evolution that the richest nucleosynthesis occurs. This is driven by thermal instabilities of the helium-burning shell, the products of which are mixed to the stellar surface by recurrent mixing episodes. Heavy elements can be synthesized during the AGB by the slow neutron capture process and is responsible for about half of all elements heavier than iron. In this talk I will describe the evolution and nucleosynthesis of AGB stars, with a focus on current problems and uncertainties surrounding the production of heavy elements. I will present new results comparing theoretical predictions to the heavy element composition of planetary nebulae and metal-poor Halo stars. I will finish with a discussion of uncertainties and future work.

Time: 12Noon, Wed 2nd September Place: E6A 102 **Dr Sue Law**, Physics and Engineering Technical Team Manager. Macquarie U

TOPIC: Sue Law's rambles through Physics

ABSTRACT: Sue is the Department's new Technical Manager. Prior to this appointment she has worked for over 15 years as a contract research associate or assistant. She will talk about some of the recent research in which she has been involved:

- Development of Fibre Optic Dosimeters for Radiation Oncology
- A novel technique for measuring the mechanical properties of tooth enamel
- The material science of cleaving microstructured polymer optical fibres
- Aspects of photonic packaging

People and Progress

Mick's hard work for NCRIS ...

Not everyone will be aware of the hard work that Mick Withford has devoted to preparing a submission to increase support, *via* NCRIS's Education Investment Fund, for the Optofab Node of the Australian National Fabrication Facility.

This will, we hope, come to fruition as this issue of the *Newsletter* goes to press on 1 September and Mick presents the Optofab case to the NCRIS interviewing panel on behalf of a multi-institutional consortium.

The submission states that: "Optofab has identified 4 new micro-fabrication themes that will transform Australian science. These are i) ultrafast laser microfabrication, ii) functional nano-particle fabrication and micro-assembly, iii) integrated nano-photonics and iv) surface functionalised optical materials and fibres. Major new facilities based on these 4 themes will enable breakthrough research in key research areas such as biomedicine, photonics, astrophotonics, plasmonics, optical quantum science."

For more information about NCRIS, see: **http://ncris.innovation.gov.au/Pages/default.aspx** .

... and hoping for success in the Engineering Excellence Awards

By the time that the next issue of the *Newsletter* goes to press, we shall know the outcomes of the 2009 Engineering Excellence Awards, sponsored by Engineers Australia (Sydney Division). These will be announced at a dinner on Friday 18 September. As previously recorded in issue 16 of the *Newsletter*, we have two shortlisted teams from *MQ Photonics*, led respectively by Judith Dawes and Mick Withford. Good luck!

For more information about EEA, see: **http://www.eea-sydney.org.au/welcome.html** .

Brian Orr

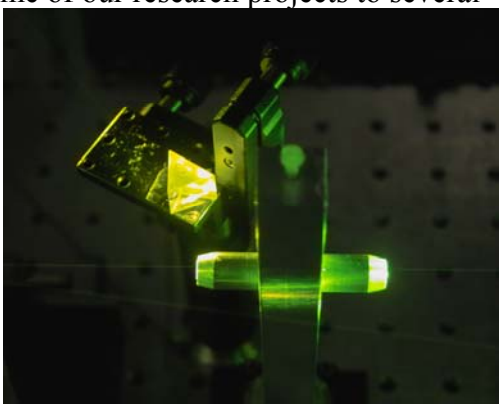
Philipp Stark (exchange scholar, September '09 – March '10)

Please welcome Philipp Stark, who is a student at the University of Applied Science in Ulm, Germany, in the Department of Medical Engineering. He will be working on opals during his 6 month internship finishing in March 2010.

Judith Dawes

Welcome back, Eduardo ...

Helen and I had a great time at the University of Strathclyde in Glasgow from the 22nd of June until 3rd of July. Much of my time there was spent in the lab building a synchronously-pumped external-resonator Raman system for biophotonics applications while Helen was busy promoting some of our research projects to several institutions around Scotland. The Institute of Biophotonics at Strathclyde has a strong emphasis on developing laser sources which can enable new biophotonic processes, and/or make such processes work more effectively, and this visit, partly funded by FABLS, enabled us to build a system that has the wavelength versatility needed in biophotonic processes such as 2-photon microscopy. Strathclyde's researchers Gail McConnell and Elric Esposito visited us a few months ago for initial experiments on a similar laser here at Macquarie, and it worked very well. So the purpose of this visit was to implement the same setup in their labs so they could evaluate it for different biophotonics applications.



Macquarie University OSA Student Chapter

As we wade into this semester, the OSA Student Chapter is formalising its calendar of events. With our undergraduate lab scheme getting underway, we have a couple of slightly more social events organised for later this month and early October.

Hot Pizza, Hot Photonics

Date: Wednesday 16th September
Time: 1pm
Venue: TBC
An informal pizza-accompanied presentation, showing some of the recently popularised advances in optics and photonics. Primarily for OSA SC members, postgraduates and undergraduates, but open to staff members if interested. Staff must notify OSA SC if attending.

Macquarie University OSA Student Chapter Soccer Tournament
Date: expect a Wednesday or Friday afternoon in early-mid October
Time and location: TBC
Since the weather seems to be holding fair, we will be hosting a soccer tournament for all comers from the Faculty of Science. We're hoping to see some inter-year undergraduate competition as well as the resolution of any inter-department grudges.

Alex Butler

aip AUSTRALIAN INSTITUTE OF PHYSICS

CSIRO

Australian Government
National Measurement Institute

NSW Medical Physics Showcase

STUDENT POSTER COMPETITION

2009 PHYSICS IN INDUSTRY DAY

Thursday 19th November 2009
Hosted by CSIRO at their Lindfield facility in Sydney

SHOWCASE YOUR WORK plus YOUR CHANCE TO WIN

$1000 ($500 & $250 runners up)

- ⇒ Posters with a strong medical physics theme and/or industry application will be judged favourably
- ⇒ One minute "speed sell" to promote your work (optional)
- ⇒ FREE event registration for the primary author of each poster includes lunch - how good is that?!
- ⇒ PRE-REGISTRATION absolutely essential - spaces are limited [display space at the venue permits no more than 30 entries]

physics-industry.com

phillips ormonde fitzpatrick
intellectual property

THE ROYAL AUSTRALIAN CHEMICAL INSTITUTE INC

ACPSEM NSW • ACT Branch
Australasian College of Physical Scientists & Engineers in Medicine

AusBiotech
AusMedtech
MEDICAL DEVICES & DIAGNOSTICS