MACQUARIE UNIVERSITY | MQ PHOTONICS RESEARCH CENTRE

NEWSLETTER

Issue 28 – 17 February 2010

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 9 March '10.**

Focal Points

We hear on the ARC grapevine ...

The ARC has selectively released information about the short-listed proposals for its 2011 Centres of Excellence round. Those in which we have more than a passing interest include: CUDOS III, two on quantum computing/ information, and one on quantum & atom optics. Well done to all our colleagues involved in these bids – and now the serious work of preparing full-scale applications is on!

It is also reported by a "vinicultural" route that the ARC is likely not to re-organise the timetable for its Linkage grants, where it was earlier suggested that Linkage Project proposals would be invited only in Round 2 each year and APAI applications only in Round 1. It seems that protests about this notion were overwhelming!

Brian Orr

Fresh vistas

Research funding opportunities – external schemes

Australian Government
Australian Research Council

ARC DP11 closing date: Wed 3 March

ARC Discovery Projects (DP11)
– for funding commencing in 2011

Feedback on draft by Faculty Office:	9am 25th Jan to 5pm 5th Feb
Compliance check by Research Office:	5pm 10th Feb
Completed applications to Research Office:	5pm 24th Feb

ARC Linkage Projects (Round 1, for funding commencing in 2011)

– applications most likely due in May 2010 (still tentative)

Are YOU eligible for one of the following AOS Prizes or Awards?

The Australian Optical Society (AOS) offers several prizes in recognition of members' achievements.

The closing date for all Prize applications or nominations is March 31 each year.

See previous Newsletter (issue 27, 20 January) for details.

All applications and nominations are to be forwarded to the AOS Secretary (Dr John Holdsworth, School of Mathematical & Physical Sciences, University of Newcastle, Callaghan NSW 2308; e-mail: John.Holdsworth@newcastle.edu.au). You must be a member of the AOS to apply.

- **AOS Geoff Opat Early Career Researcher Prize**
- **AOS Postgraduate Student Prize**
- **AOS Technical Optics Award**
- **AOS/Warsash Science Communication Prize in Optics**

AUSTRALIAN OPTICAL SOCIETY

Conference Reports

SPIE Photonics West 2010

23–28 January 2010, The Moscone Center, San Francisco, CA; http://spie.org/x7777.xml

A newcomer's view of Photonics West ...

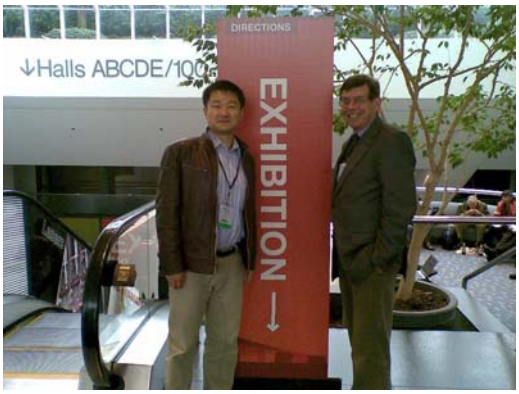
I had never attended Photonics West before – it always clashes with Australia Day festivities, etc. But this year, I forsook the beach and headed off to San Francisco, which proved to be cool and drizzly.

MQ Photonics was well represented at Photonics West, with six contributed papers and invited talks by Jin Dayong and myself. ► See previous Newsletter (issue 27, 20 January) for details.

For me, the highlights of the conference were:

- On Sunday, a full-day meeting within BiOS on Raman/CARS Microscopy – an area that I have been watching closely. Keynote or invited talks were given by some the big names in this field: Sunney Xie (Harvard U), Ji-Xin Cheng (Purdue U), Warren Warren (Duke U), Frank Wise (Cornell), Eric Potma (UC Irvine), Vladimir Yakovlev (U Wisconsin – Milwaukee). I met many people with whom I had previously only corresponded. Moreover, I learned that the ideas and ambitions that **Dave Coutts**, **Yabai He** and I had been developing in this area were right on the mark (an opinion not shared by the ARC, alas!). I enjoyed attending the /CARS Microscopy Speakers' Dinner in a Chinatown restaurant – until a serious bout of food poisoning hit in the early hours of the following morning.
- Europeans swept the pool in the Photonics West student prizes: 1st & 2nd to Germany and 3rd to Austria. **Jens Thomas** (Jena) ► (plus his *MQ Photonics* connections – **Nem Jovanovic** *et al.*!) received his second prize and a few words of wisdom from Nobel Laureate Charles Townes. By the way, head perched on Jens's left shoulder is our Canadian colleague Peter Herman (one of the co-chairs). I attended some excellent presentations by *MQ Photonics* student– notably those of **Simon Gross** and **Robert Williams**.
- The part of the LASE conference in which my talk was scheduled was entitled "Nonlinear Frequency Generation and Conversion: Materials, Devices, and Applications IX". It lived up to its name, providing some neat ideas about newish NLO OPO materials such as $LiInSe_2$, $CdSiP_2$ and OP-GaAs, OPO/OPG-based sensing, and THz generation (including the first cw THz OPO using PPMgLN and cascaded, backward-propagating DFG-type process). I heard about periodically poled silicon (PePSi) but am not holding my breath waiting for it to materialise! My own invited talk went very well (without being interrupted by a fire alarm, as had happened at the MQ rehearsal!) and attracted a lot of post-talk networking and offers of some nice NLO materials for future mid-infrared OPOs.
- Conference receptions rarely rate a mention, but this one was out of the box, based on the "Cirque du Lasaire" light-show concept. ►
- The Photonics West exhibitions were big and impressive – larger scale than CLEO these days but not as grand as Lasers Munich, I think. I browsed around and picked up quite few leads (not to mention the new ThorLabs T-shirts that Yabai and I now have!).

Brian Orr



Jin Dayong and **Brian Orr** making an exhibition of themselves at Photonics West.

Photonics West student prize-winners, after receiving awards from Charles Townes.

The "Cirque du Lasaire" extravaganza!

There was no shortage of food, drink, clowns (some of them in costume) and laser beams at the Photonics West reception.

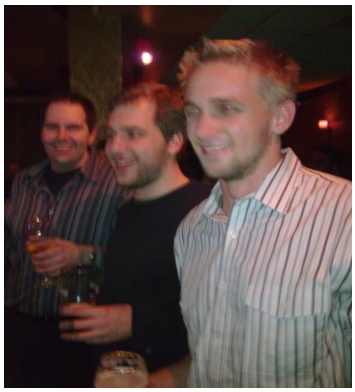
... and a PhD student's view of Photonics West

Jin Dayong, **Simon Gross**, **Ravi McCosker**, **Brian Orr** and **Robert Williams** attended the SPIE Photonics West conference in the last week of January to present invited talks (Jin and Brian) and contributed papers (Simon, Ravi and Robert). This year the conference was held at the Moscone Center in San Francisco – a big improvement on the previous locale, San Jose. All the talks were very well presented and well attended, with plenty of interest from the audiences. Despite some of the sessions being filled with some industry-style talks, there was plenty of excellent science on display. Notably, our friends from Friedrich Schiller University of Jena gave some very impressive presentations in the field of ultrafast-inscribed waveguides and Bragg gratings. In fact, Jens Thomas's cladding-mode paper (in collaboration with *MQ Photonics* co-authors **Nem Jovanovic**, **Graham Marshall**, **Mike Steel** and **Mick Withford**) won second prize in the LASE Best Student Paper competition, granting him a lunch with Charles Townes (and a cash prize). I remember him grinning afterwards and holding out his hand, saying: "I shook hands with Charles Townes!".

There was also plenty of fine dining and good beer (and cheer) to be had in the free time – excellent seafood in "Little Italy" and great entertainment (such as duelling pianos at a basement Irish pub). Simon and I also enjoyed the student social event – free beer, pool and laser pointers with the Jena guys and the students from Peter Herman's group at University of Toronto. All in all, a good conference, a big trade fair and a great time!

Robert Williams

◄ Just a bit of the impressive Photonics West trade fair.



International collaborations: Jason Grenier (U of Toronto), Jens Thomas (Jena) and Simon Gross (MQ). ►

OSA Topical Meetings

Advanced Solid-State Photonics (ASSP)

San Diego, California, USA; 31 Jan – 3 Feb, 2010

Collocated with:

Applications of Lasers for Sensing and Free Space Communications (LS&C)
Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)

http://www.osa.org/meetings/topicalmeetings/ASSP/program/default.aspx#ConferenceProgram

A first-hand account of ASSP ...

ASSP was in San Diego this year from 31 January to 3 February, and was attended by **David Coutts** and myself. We both gave talks which went down pretty well, plus there were a couple of posters with co-workers **Andrew Lee**, **Eduardo Granados**, **David Spence** and **Richard Mildren** which were received particularly well. The conference is only three days long, but they are long days and a lot into is certainly packed into them.

There seemed to be an emphasis on fibre and ultrafast lasers this year, and chirped pulse amplification featured strongly. The conference dinner speaker was Orazio Svelto who, in the spirit of Laser Fest, took us through the excitement of some early laser achievements. For me, a highlight of the conference was a short course on Terahertz Technology by Rene Beigang of the Fraunhofer Institute, Kaiserslautern, as well as catching up with collaborators from Strathclyde University, Scotland and University of Sao Paolo, Brazil. Takashige Omatsu (Chiba U, Japan) was there also and is planning to visit us again later this year. Also good to catch up with Iain McKinnie who many of us know; he is now CEO of Kapteyn-Murnane Labs in Colorado after many years at CTI (Coherent Technologies Inc). He said being CEO is a bit like doing an MBA but the case studies are for real!

Next year's ASSP conference will be held in Istanbul. Helen Pask

MQ Photonics presentations at ASSP

ASSP Nonlinear Optics Oral Paper AWD1:
Helen M. Pask, **Andrew J. Lee**, **David J. Spence**, **James A. Piper**
"CW Crystalline Raman Lasers: Multi-Watt and Multi-Wavelength Operation in the Visible"
Abstract: We report the generation of high power, continuous-wave yellow emission from a frequency-doubled, self-Raman laser. Output power of 2.25 W at 586.5 nm is achieved with a diode to yellow conversion efficiency of 13.2%.

ASSP New Laser Materials Oral Paper ATuB5:
Eduardo Granados, **David W. Coutts**, **David J. Spenc**e
"Cerium Lasers Generate Ultrafast Deep Ultraviolet Pulses"
Abstract: We demonstrate for the first time that the DUV laser material cerium LiCAF can be mode-locked to produce picosecond pulses in this hard-to-access spectral range, and we discuss the potential to directly generate sub-femtosecond pulses.

ASSP Poster Paper ATuA20:
David J. Spence, **Eduardo Granados**, **Helen M. Pask**, **Richard P. Mildren**
"KGW and Diamond Picosecond Visible Raman Lasers"
Abstract: We present three synchronously pumped Raman lasers generating picosecond visible laser pulses. Using KGW and diamond, we efficiently convert the wavelength of standard neodymium picosecond laser sources, as well as substantially compressing the pulse duration.

ASSP Poster Paper ATuA22:
Andrew J. Lee, **Helen M. Pask**, **David J. Spence**, **James A. Piper**
"Generation of Yellow, Continuous-Wave Emission from an Intracavity, Frequency-Doubled Nd:KGW Self-Raman Laser"
Abstract: We report generation of 450 mW continuous-wave emission at 590 nm from an intra-cavity, frequency-doubled, self-Raman laser utilising Nd:KGW. Power scaling is limited by secondary emission lines, astigmatic thermal lensing and thermally-induced fracture.

Ninth National Laser Symposium, Mumbai, India, 13 – 16 January

I was recently one of just nine international invited speakers, at the Indian Ninth National Laser Symposium, in the closed city of Trombay in greater Mumbai, Jan 13-16. I was invited by Dr Sunita Sing of the Bhaba Atomic Research Centre (where the conference was held). Despite the strong local interest in copper vapour and dye lasers, I presented our recent work on cerium ("Cerium Lasers - The Ti:Sapphire of the Ultraviolet" D. W. Coutts, E. Granados, D. J. Spence) as per request. It was very interesting to be in one of the last places where there is still a substantial research activity in copper vapour lasers (CVLs) and dye lasers. This is mostly for Atomic Vapour Laser Isotope Separation (AVLIS) – mainly for uranium enrichment. It was surprising how many people announced that they had read my copper vapour and dye laser papers, despite the fact that I have not published in that field for some years (I wonder if there is any isotope with the equivalent half-life to my CVL papers!).

It was very intriguing to visit Sunita's AVLIS dye laser development laboratories and see almost exact clones of the Oxford Lasers CU40 copper vapour lasers (CU40's are 1980's technology, giving just 40 W which is the highest power CVL that could be sold to India). Elsewhere in India more advanced CVLs are being developed including using IGBT solid state switches combined with magnetic pulse compression to replace thyratrons which cannot be sold to India because of international non-proliferation regulations. Still, to produce average powers of order 150 W requires 5 or more amplifiers in a chain (not that I was allowed to see their pilot AVLIS facility).

The conference included two firsts for me: my first visit to India, and the first time I have delivered a conference presentation during a solar eclipse (always an auspicious occasion in India). While at the southern tip of India this was a fully annular solar eclipse (predicted to be the longest of the millennium), for Mumbai the moon obscured at most just over half the sun. I was fortunate that by noon the conference was running over an hour late (as usual) so that I could see the eclipse near maximum using a pinhole and screen I had hastily prepared before dashing inside to give my scheduled talk. David Coutts

9th Annual CUDOS Workshop, Lake Crackenback Resort, 9–12 February

The CUDOS@Macquarie group recently attended the Ninth Annual CUDOS Workshop which was once again held at the Lake Crackenback Resort in the Snowy Mountains. The meeting was well attended by international visitors, including the Chair of the *MQ Photonics* Advisory Committee – Prof John Harvey. John gave a fascinating talk on his studies of similariton modelling and generation in active fibre systems. There was also a notable talk by Prof John E. Sipe from the University of Toronto on biphoton wave functions, an area that overlaps with the current quantum photonics research activities of the Macquarie group. *MQ Photonics* research also featured strongly at the meeting. Project Leader Dr **Martin Ams** led a series of talks highlighting recent development in the Flagship Project *Integrated Waveguide Oscillator*. A/Prof **Judith Dawes** also highlighted *MQ Photonics* research contribution to the Flagship Project *3D Bandgap Confinement*, presenting new results regarding radiation dynamics of diamond nanoparticles (a collaboraton with A/Prof **Jim Rabeau**'s group). The poster sessions were also lively with strong representation from Dr Jon Lawrence's astrophotonics team, new results presented by Dr **Graham Marshall** capturing ongoing work in quantum photonics and new collaborations with Prof Tony Wilson's

group at the University of Oxford, and **Nem Jovanovic** presenting our collaborative studies with Professors Nolte and Tünnermann at the Friedrich Schiller University in Jena.

The meeting also included many opportunities for social interaction. A highlight was the SkiTube ride up to Blue Cow, followed by a dinner, lively discussions and a raucous trip back down the hill. True to form the Outreach Prize once again attracted significant interest. The Macquarie entry "So You Think You Can Refract" illustrated light refraction through the unique medium of dance. This entry was awarded second place, narrowly missing out to the University of Sydney entry which beautifully captured CUDOS research using rap! Thanks to **Josh Toomey** for his hard work editing the Macquarie entry. Mick Withford

The CUDOS@MQ gang looking relaxed at Crackenback.

Yo, bro! Some *MQ Photonics* members grooving.
Photo by Josh Toomey

Upcoming conferences

2010 International Conference on Nanoscience and Nanotechnology

22–26 February 2010 ▪ Sydney Convention and Exhibition Centre, Darling Harbour

More information: **http://www.ausnano.net/iconn2010/**

MQ Photonics (& MQ Physics) presentations at ICONN 2010 ...

Carlo Bradac
"Prediction and Measurement of the Size Dependent Stability of Fluorescence in Nano- Scale Diamonds"

Robert Carman
"Development of incoherent EUV/VUV light sources: tailoring the output pulse characteristics for materials processing applications"

Gregory Staib
"Optical Surface Profilometry and AFM of Spider Web Silks"

Krystyna Drozdowicz-Tomsia
"Plasmons in Dense Two- Dimensional Silver Nanoparticle Arrays"

Jason Twamley
"Scalable quantum register based on coupled electron spins in a room temperature solid"

I understand that we shall also be represented in a number of poster presentations, not listed on the internet.

In addition, **Deb Kane** is a member of the ICONN 2009 Organising Committee and will chair Symposium 5: Nanophotonics. We all hope that the conference goes well, Deb! Brian Orr

Publications

Recently published articles

A R H Preston, B J Ruck, W R L Lambrecht, L F J Piper, **J E Downes**, K E Smith, H J Trodahl
"Electronic band structure information of GdN extracted from x-ray absorption and emission spectroscopy"
Applied Physics Letters **96**, 032101 (2010)

Abstract: The electronic structure of GdN films grown by pulsed laser deposition has been investigated by soft x-ray absorption (XAS) and x-ray emission spectroscopy (XES) at the N K-edge. Density functional calculations within the local spin density approximation with Hubbard-U corrections of the N p weighted bands and density of states are used to extract band information from the spectra. Gd M4,5 XAS and XES spectra are also presented. The XES-XAS separation is shown to give information on the f-band spin splitting and the XAS line shapes are shown to reflect atomic multiplet effects.

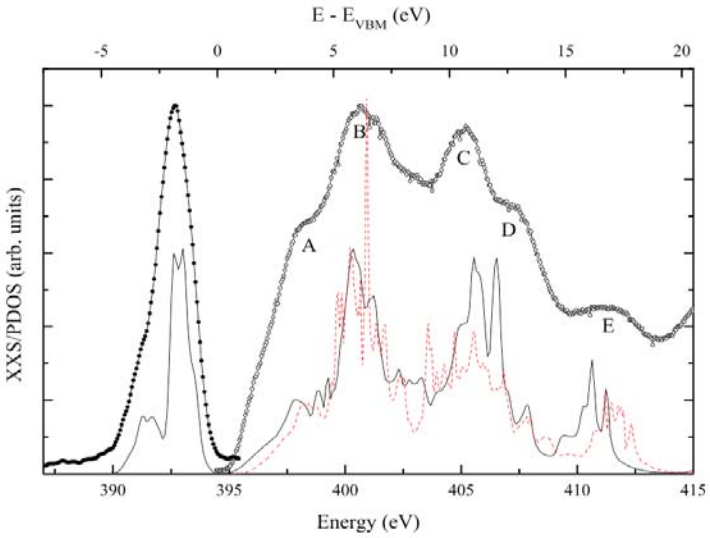


Fig. 1. (Color online) GdN N K-edge XES (solid circles) and XAS (empty circles). Also shown is the calculated PDOS. Both the standard PDOS (black line) and a core-hole calculation (dashed red line) are shown.

Recently accepted / in press articles

E Granados, **H M Pask**, E Esposito, G McConnell, **D J Spence**
"Multi-wavelength, all-solid-state, continuous wave mode locked picosecond Raman laser"
Optics Express (accepted: 6 February 2010; Doc ID: 122341)

Abstract: We demonstrate the operation of a cascaded continuous wave (CW) mode-locked Raman oscillator. The output pulses were compressed from 28 ps at 532 nm down to 6.5 ps at 559 nm (first Stokes) and 5.5 ps at 589 nm (second Stokes). The maximum output was 2.5 W at 559 nm and 1.4 W at 589 nm with slope efficiencies up to 52%. This technique allows simple and efficient generation of short-pulse radiation to the cascaded Stokes wavelengths, extending the mode-locked operation of Raman lasers to a wider range of visible wavelengths between 500 – 650 nm based on standard inexpensive picosecond Nd:YAG oscillators.

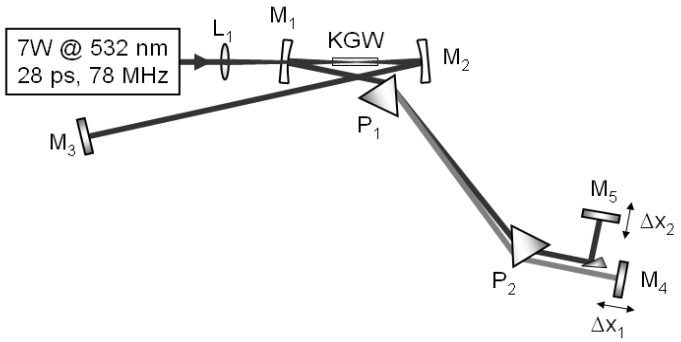
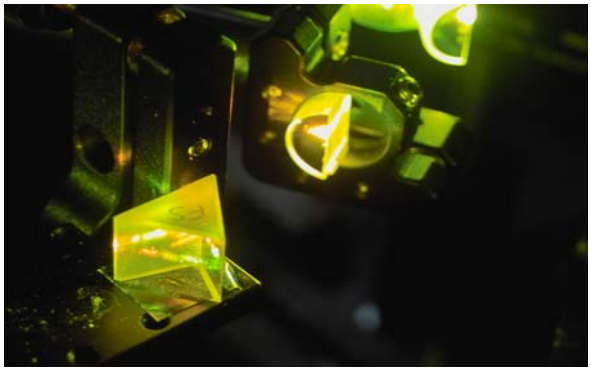


Fig. 1. Setup for the multi-cavity continuous-wave mode-locked Raman oscillator.



1st, 2nd and 3rd Stokes modes through prism P_2

L Jiang, J Wu, G Wang, Z Ye, W Zhang, **D Jin**, J Yuan, **J Piper**
"Development of a Visible-Light-Sensitized Europium Complex for Time-Resolved Fluorometric Application"
Analytical Chemistry, in press (2010); published online: 12 February 12, 2010; DOI: 10.1021/ac100021m

Abstract: Time-resolved luminescence bioassay technique using luminescent lanthanide complexes as the labels is a highly sensitive and widely used bioassay method for clinical diagnostics and biotechnology. A major drawback of the current technique is that the luminescent lanthanide labels require for UV excitation (typically less than 360 nm), which can damage many biological systems and is holding back further development for f time-resolved luminescence instruments. Herein we describe two novel visible-light-sensitized Eu^{3+} complex systems in aqueous media for time-resolved fluorometric applications: a dissociation enhancement aqueous solution that can be excited by visible light for EDTA-Eu^{3+} detection and a visible-light-sensitized water-soluble Eu^{3+} complex conjugated bovine

serum albumin (BSA) for biolabeling and time-resolved luminescence bioimaging. In the first system, a weakly acidic aqueous solution consisting of 4,4'-bis(1",1",1",2",2",3",3"-heptafluoro-4",6"-hexanedion-6"-yl)-o-terphenyl (BHHT), 2-(N,N-diethylanilin-4-yl)-4,6-bis(3,5-dimethylpyrazol-1-yl)-1,3,5-triazine (DPBT) and Triton X-100 was prepared. This solution shows strong luminescence enhancement effect in the presence of EDTA-Eu^{3+} with a wide excitation range from UV to visible light (a maximum at 387 nm) and a long luminescence lifetime (520 ms), to provide a novel dissociation enhancement solution for time-resolved luminescence detection of EDTA-Eu^{3+}. In the second system, a ternary Eu^{3+} complex, 4,4'-bis(1",1",1",2",2",3",3"-heptafluoro-4",6"-hexanedion-6"-yl)-chlorosulfo-o-terphenyl (BHHCT)-Eu^{3+}-DPBT, was covalently bound to BSA to form a water-soluble BSA-BHHCT-Eu^{3+}-DPBT conjugate. This new biocompatible label maintains the feature of being visible-light excitable with a wide range from UV to visible light (a maximum at 387 nm), a long luminescence lifetime (460 ms) and a higher quantum yield (27%). The conjugate was successfully used for streptavidin (SA) labeling and time-gated luminescence imaging detections of three environmental pathogens, *Giardia lamblia*, *Cryptosporidium muris* and *Cryptosporidium parvium*, in water samples. Our strategy radically extended the excitation wavelength from UV to blue for the europium based bioassays, the absorbance co-efficient at 405 nm was XXX (~75% of maximum at 387nm), opening up an opportunity of being excited by the 405 nm semiconductor diode lasers through plastic optics, ideal for disposable point-of-care applications.

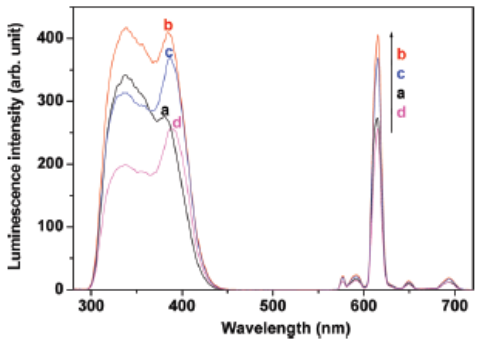
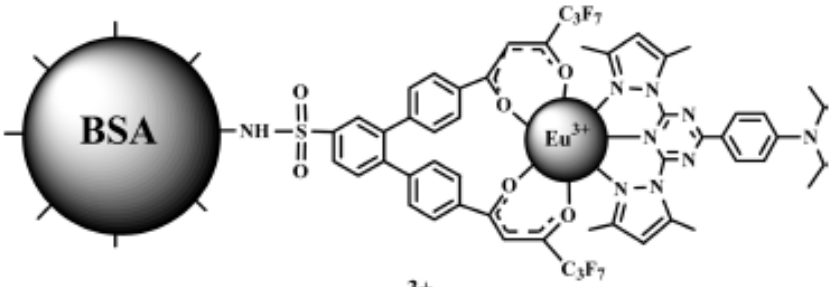


Figure 2. Time-resolved excitation (300−500 nm) and emission (500−710 nm) spectra of EDTA−Eu^{3+} complex (1.0 μM) in four dissociation enhancement solutions containing 60 μM DPBT and BHHT and different concentrations of Triton X-100 (a, 0.025%; b, 0.05%; c, 0.1%; d, 0.2%). The spectra were measured with the following conditions: excitation wavelength, 387 nm; emission wavelength, 615 nm; delay time, 0.2 ms; gate time, 0.4 ms; cycle time, 20 ms; excitation slit, 10 nm; emission slit, 5 nm.

Scheme 1. Preparation Principle of the BSA−BHHCT−Eu^{3+}−DPBT Conjugate

BSA + BHHCT ⟶ BSA-NH-SO_2-diketone

BSA-NH-SO_2-diketone $\xrightarrow[EuCl_3]{DPBT}$ BSA-BHHCT-Eu^{3+}-DPBT



(BSA-BHHCT-Eu^{3+}-DPBT)

I L Farrell, R J Reeves, A R H Preston, B M Ludbrook, **J E Downes**, B J Ruck, S M Durbin
"Tunable Electrical and Optical Properties of Hafnium Nitride Thin Films"
Applied Physics Letters (accepted 29 Jan 2010; ref. L09-10704R)

Abstract: We report structural and electronic properties of epitaxial hafnium nitride films grown on MgO by plasma-assisted pulsed laser deposition. The electronic structure measured using soft x-ray absorption and emission spectroscopy is in excellent agreement with the results of a band structure calculation. We show that by varying the growth conditions we can extend the films' reflectance further towards the UV, and we relate this observation to the electronic structure.

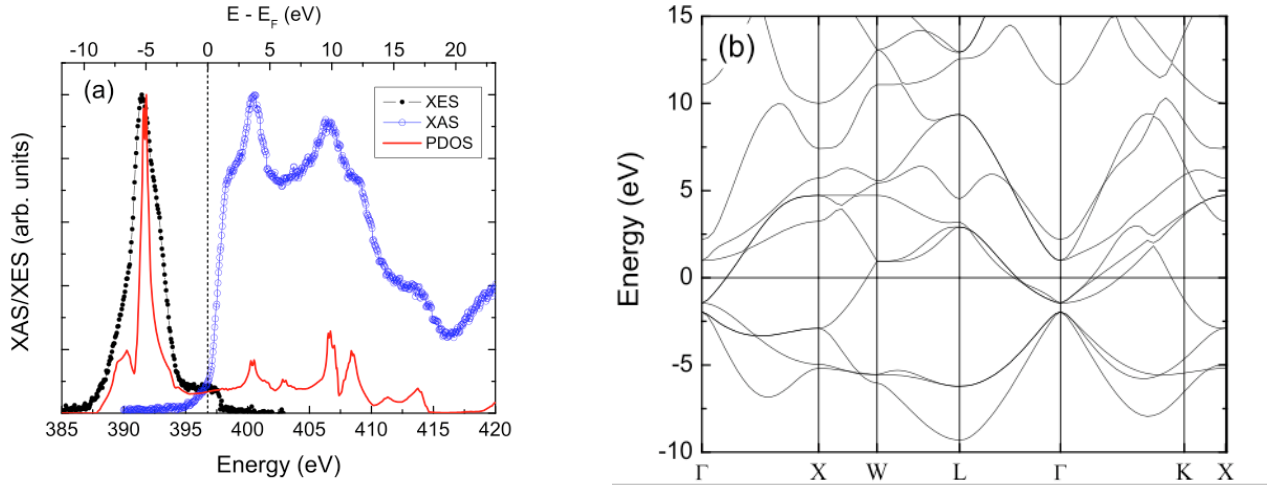
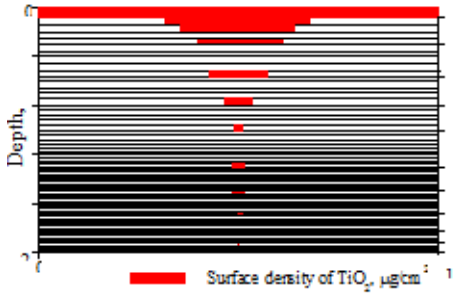


FIG. 2: (colour online) (a) X-ray emission (filled black circles) and absorption (open blue circles) which measure, respectively, the filled and empty nitrogen *p*=projected density of states, compared to the calculated PFOS (red). The dashed line marks the calculated Fermi level. (b) Calculated band structure of HfN. The bands crossing the Fermi level (0 eV) originated from Hf *d*-orbitals.

A P Popov, **A V Zvyagin**, J Lademann, M S Roberts, W Sanchez, A V Priezzhev, R Myllylä, "Designing Light-Protective Skin Nanotechnology Products"
J. Biomed. Nanotechnol (accepted 6 Feb 2010; manuscript # JBN-09-SN-OP-005)

Abstract: In this review, we discuss the use of nano-particles, mainly zinc oxide (ZnO) and titanium dioxide (TiO_2), for sunscreen applications considering their intrinsic physical properties and the Mie theory. These properties cause, from one side, attenuation of the ultraviolet light by absorption and scattering (dependent on a particle size), which is the purpose sunscreens are designed for, and formation of free radicals (i.e. photo-toxicity) during this process - from the other. Particle penetration into skin is also an important issue addressed in this review due to possible adverse effects associated with interaction between nanoparticles and living cells.



Experimental in-depth profile of TiO_2 particles localized within the stratum corneum, obtained by the tape-stripping technique.

L Fisher, **A V Zvyagin**, T Plakhotnik, M Vorobyev, "Numerical modeling of light propagation in the array of dielectric cylinders"
J. Optical Society of America A (accepted 3 Feb 2010; manuscript # 116812)

Abstract: To model the light-guiding properties of an array of dielectric cylinders, we have numerically solved Maxwell's equations. Size and refractive indices of the cylinders reproduced those of the outer segments of the cone photoreceptors in the human central retina. In the array, light propagates predominantly as a 'slow' mode, with a noticeable contribution of a 'fast' mode, with the optical field localized in the intra- and inter cylinder space, respectively. Interference between these modes leads to substantial (up to ca. 60%) axial oscillations in optical power within the cylinders. Our numerical model offered approximate functional dependence of the optical intensity distribution within the cylinders versus their radius and separation.

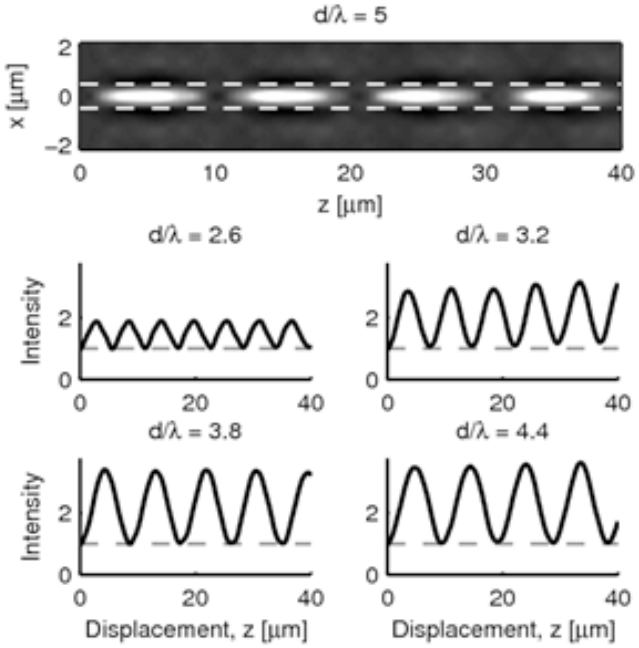


Figure Caption: Time-averaged electric field intensity obtained from the hexagonal array for an unitary amplitude excitation source . A longitudinal cross-section through the cylinder center in the array is shown in the top panel. The average intensities over the cylinder cross-section are shown in the four bottom panels for various spacing designated with d/lambda, a/lambda =1.

MQ Photonics seminars and Physics Colloquia: *Nothing to report – watch this space!*

People and Progress

Welcome to Jiangbo Zhao (Tim)

Jiangbo Zhao was awarded his B.Sc. degree in Applied Physics from Inner Mongolia University in 2006 and M. Sc. degree in Nanomaterial Physics at University of Science and Technology of China (USTC) under the supervision of Prof. Weiping Zhang and Prof. Min Yin (2006 to 2009). As results of his Master degree research, he discovered a number of fundamental interesting properties of luminescence lanthanide nanoparticles and established several effective methods to produce highly luminescent diverse lanthanide nanoparticles, such as upconversion luminescence nanoparticles (UCNPs). Tim's academic enthusiasm in using lanthanide nanomaterials for advanced biosensing applications won himself a prestigious international Macquarie University Research Excellence Scholarship (iMQRES) in 2009. Mr. Zhao officially joined *MQ Photonics* Research Centre in 2010 under the joint supervision of Prof. **Jim Piper**, Prof. **Ewa Goldys**, A/Prof. **Judith Dawes** and Dr. **Dayong Jin**. He is currently investigating new strategies using lanthanide nanoparticles as bioprobes for ultra-sensitive multiplexing cell sensing and immuno-fluorescence bioassays. Dayong Jin

Welcome to A/Prof. Dae Suk Kim (visiting us from 2 Feb to 26 Feb)

Dae Suk received his PhD in Mechanical Engineering from Korea Advanced Institute of Science & Technology in 2002. He was a postdoctoral associate at Department of Electrical & Computer Engineering, University of Connecticut in USA till 2004. Also, he worked for Samsung Electronics by 2007. From May 2007, he is working as an assistant professor at Division of Mechanical System Engineering in Chonbuk National University in Korea. For the last 15 years, his major interests have been in opto-mechatronics for micro nano regimes which included real time phase sensitive optical metrology, 3D imaging and display, opto-electronic devices such as high brightness LED and ultra-precision actuation systems. Recently, he is focusing on single shot based phase measurement fields containing new concepts on digital holography and spectroscopic ellipsometry. He has not only various academic backgrounds but also strong industrial experiences associated with IT and BT industry. His favorite sport is basketball. And also, he likes jogging and reading books. Andrei Zvyagin

Where is Yabai?

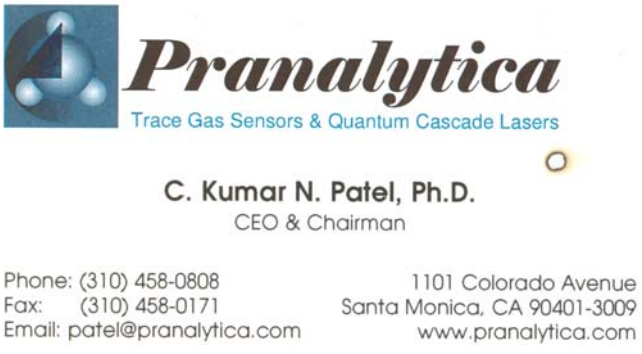
Since last week, Research Fellow **Dr Yabai He** has taken up a 0.6-FTE part-year appointment at the National Measurement Institute (NMI) in West Lindfield, working on a collaborative project that involves us at *MQ Photonics*, ANU, U of Western Australia and a number of other bodies such as AARNET and CSIRO Radiophysics. A 10-km "dark-fibre" telecom link between NMI and *MQ Photonics* labs will be used to explore effective ways to distribute NMI's time and frequency standards *via* optical fibre to more remote universities and other institutions (and ultimately to the site of the proposed Square Kilometre Array in outback WA. This project will provide the focus for a forthcoming ARC Linkage Project application. So, for the time being, you might not find Yabai in his usual F7B lab when you expect to – but on the other hand he may be there at times that you don't expect, because much of the NMI work will based within *MQ Photonics* and the remainder of his work will continue at Macquarie U on a 0.4-FTE basis. Brian Orr

Macquarie OSA Student Chapter

The Chapter has had a relatively quiet month, the calm before the semester, with our only activity of note being the well received Media Communications Workshop last week. Conducted by Greg Welsh, Media Manager in Macquarie's PR and Marketing Department, the informal workshop was just under two hours in length and was highly informative on how best to communicate with various media outlets. After first drawing attention to the fact that there was a dedicated Macquarie department for this sort of thing, Greg led us through the various methods of relaying our scientific breakthroughs to the outside world. With focus on television, radio and print media, we identified which approaches could be used to produce high-impact press releases. The session culminated in our writing our own press releases, based on our research and using the pointers given us by Greg and after some light and minor criticism, all efforts were given high praise. This workshop proved a big success and will hopefully form part of the Chapter's future programme. Alex Butler

From a pioneer of lasers and spectroscopy ...

As a postscript to our Photonics West reports, here is one for the old-timers among us! They will recall the name Kumar Patel – one of the pioneers of our field. Working at Bell Labs in 1963, he co-discovered the rovibrational spectrum of the CO_2 laser, and later developed spin-flip Raman lasers and their application to photoacoustic laser spectroscopy. He is still going strong as CEO of Pranalytica (which markets laser-spectroscopic sensing instruments) and a UCLA Professor. His business card ► shows a burn hole (just below the "s" in "Lasers") inflicted by a high-power mid-IR quantum cascade laser that he eagerly showed me. Brian Orr



Kumar Patel's demonstration that mid-infrared quantum cascade lasers can be seriously powerful!