MACQUARIE UNIVERSITY | MQ PHOTONICS RESEARCH CENTRE

NEWSLETTER

Issue 30 – 10 March 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. on the due date. **Next due date: Tue 20 April 2010.**

Focal Points

Taking a look at ourselves – *MQ Photonics* General Meeting

The recent *MQ Photonics* General Meeting (at midday on Wednesday 24 March) enabled us take a critical, pro-active look at ourselves. Our most recent previous General Meetings had been on 12 June 2008 (for staff only) and 1 April 2009. At the former, we resolved to introduce the *MQ Photonics* Newsletter (with all that this has brought us) and at the latter we addressed some of the same issues that we discussed last week. The French have a well-known saying that begins: "Plus ça change ..."!

A detailed "summary of outcomes" from our General Meeting has been circulated by e-mail, but it is probably useful to précis that information in terms of the following Talking Point headings – many of which deserve a lot more time and contemplation than we had to devote to them in a single hour:

1. **Where has *MQ Photonics* come from?** – see our June '07 MQRC application and November '09 report
2. **Where is *MQ Photonics* heading? What value do we add to MQ's profile?** – see our 2-page prospectus
3. **How can *MQ Photonics* enhance its "visibility"?** – various suggestions were considered, including:
   - We need to produce a glossy brochure – more professional than our 2-page prospectus
   - The *MQ Photonics* Newsletter (unsuitable for wider circulation) could assist ~6-monthly update inserts
   - We should make a "bigger splash" – e.g., topical workshops; summer schools; invited seminars
4. **What "big research problems" should *MQ Photonics* focus on strategically?** – we need to aim high
5. **How can we improve participation in, and governance of, *MQ Photonics*?**
   - Most people seem to "belong" *via* interest groups, social events, Newsletter and outreach beyond Physics
   - Our new Advisory Board seems to be on the right track, with adjustment of its membership under review
   - Various models for a Management Committee and its representation were discussed at length (see below)
6. **Other matters of general interest to *MQ Photonics*** – Brief topical reports from members, including:
   - Special interest groups, such as CUDOS, NCRIS, BioFocus, coherent sources, astro- & nano- photonics
   - LaserFest and related outreach activities.
   - OSA Student Chapter
   - AOS and other professional bodies
   - Website and other publicity?
   - CoE and FttP CRC proposals
   - HDR and general research student interests
   - Succession planning (Director, etc.)
   - Any other business?

The General Meeting was followed by a convivial lunch (pizza, sushi, fruit, ...), thanks to Liz ...

Next General Meeting: Monday 7 June (*MQ Photonics* Showcase Day & Advisory Board Meeting)

Over the last two years or so, we have been operating *MQ Photonics* on an *ad hoc* basis, with much decision-making made by means of direct discussions between the Director and key colleagues on a day-by-day basis, occasional *MQ Photonics* group discussions, sub-committees to develop/coordinate specific initiatives (*e.g.*, research grant application consortia, specialised research groups, planning of outreach activities such as Laser Fest, OSA Student Chapter, etc.). This *ad hoc* approach to management and strategic planning for *MQ Photonics* has proved to be relatively effective and efficient and has encouraged natural, regular engagement with our members, to encourage them to identify with the Centre's objectives. Such communications have been facilitated by occasional General Meetings for scientific, strategic and social purposes – in addition to regular *MQ Photonics* seminars and smaller research group meetings.

However, we recognise that, with our new Advisory Board established, the time has come to establish a *MQ Photonics* Management Committee to guide the Director *via* regular monthly meetings. This is an important intended part of the governance process for *MQ Photonics*, but it had not previously been established owing to the pressure of higher priorities. It has proved difficult so far to establish such a Management Committee in view of the pre-existing heavy time commitments and duties of its likely members.

At our General Meeting last week, we threw around ideas (not for the first time!) about the best way(s) to organise a *MQ Photonics* Management Committee. Possible models that we considered included a hierarchical model based on representation from various levels of appointment and a portfolio model structured according

to various areas of Centre organisation. However, we agreed in the end to proceed with a model based on representation from various areas of *MQ Photonics* Centre research, with membership as follows:

1. **Director** (*ex officio*, convenor)
2. **Centre Administrator** (*ex officio*, non-voting)
3. **A representative of "CUDOS" interests** – including parts of the following focus areas: Microphotonic optical systems, Nano-optics & nanophotonics; Ultrafast laser applications
4. **A representative of "BioFocus" interests** – including non-CUDOS parts of the following focus areas: Biophotonics, Nano-optics and nanophotonics, Optical sensing and imaging
5. **A representative of "photonic sources" interests** – including non-CUDOS and non-BioFocus parts of the following focus areas: Photonic sources, Ultrafast laser applications
6. **A representative of general interests** – including parts of the following focus areas not otherwise represented: Astrophotonics, Nano-optics and nanophotonics, Optical sensing and imaging
7. **A representative of "contract researcher" interests** – Research Associate and Research Fellow researchers in non-continuing appointments
8. **A representative of HDR student interests** – PhD, MPhil, MSc and Honours research students
9. **Any other *MQ Photonics* member(s) by invitation on an *ad hoc* basis** – for specific topics such as AOS, LaserFest, HDR, outreach, topical workshops, etc.)

I am grateful that **Judith Dawes** has kindly offered to help out with this issue of the *MQ Photonics* Newsletter and that **Mick Withford** will take responsibility for the next issue, while I am away in China.

Brian Orr

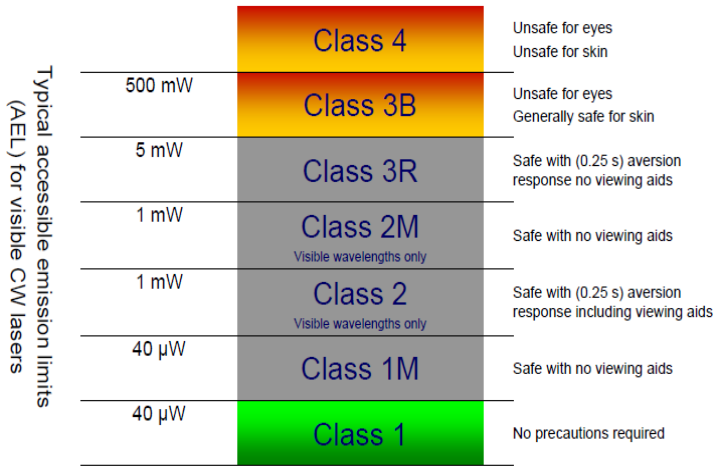
Laser Safety matters ...

We are busy obtaining registrations for all the lasers in the Department of Physics and Engineering, particularly those acquired since November 2006 (when the last audit was done). Information on laser safety (including all forms) is on the Faculty OH&S website:

http://web.science.mq.edu.au/intranet/ohs/lasers/index.htm

For a list of laboratories and known lasers, follow the link to 'Registered Lasers' under the heading 'Faculty of Science Registered Lasers' (Faculty of Science login required). There are links to registration forms where these have been submitted, so lab supervisors can check the status of their registrations and get in touch with me if they want to update things. It is not necessary to fill out a new form if a laser is moved, just let me know. The system is now set up so we can track their location. I am now chasing the new E7B Level 1 labs but will move onto Level 2 soon.

(Dr) Susan Law
Technical Manager, Dept of Physics & Engineering

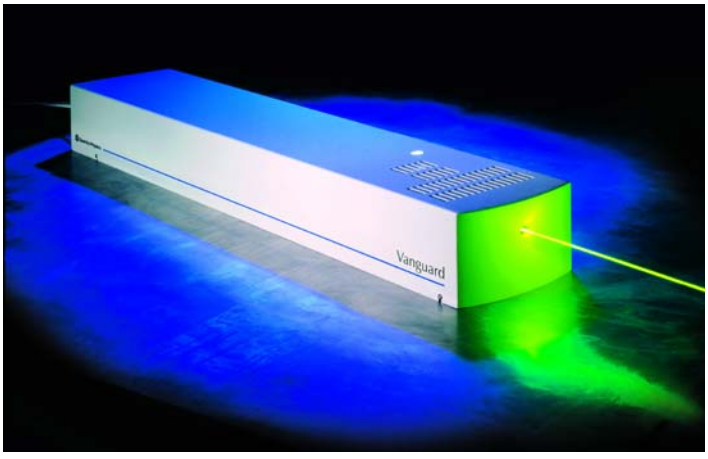


Laser sources focus group – *NEW!*

We have just initiated a new special interest group, aimed at drawing together the laser expertise within *MQ Photonics*. These 'laser sources' meetings are aimed at complementing *MQ Photonics* seminars, providing a more specialised and technical forum for informal exchange of ideas, sharing of experience, and providing an opportunity for students to discuss their work more widely with their peers.

We will meet fortnightly on Mondays at 11am, E7B161, starting 29 March. All welcome. Please let me know if you wish to be on our mailing list.

David Spence



Vanguard laser (from the Spectra-Physics literature)

Australian National Fabrication Facility Ltd
http://www.anff.org.au/

www.osmr.nsw.gov.au/science_and_innovation/science_leveraging_fund

Funding announcement ...

On 26 February, at the launch of the UNSW Node of Australian National Fabrication Facilities Limited (ANFFL), the NSW Chief Scientist and Engineer Professor Mary O'Kane announced that the NSW Consortium Nodes of ANFFL (including UNSW, Macquarie U and the Universities of Wollongong and Newcastle) had been awarded $1.5 million from the NSW Science Leverage Fund. In her statement, the Minister for Science and Medicine, the Hon. Jody McKay, noted the NSW Consortium Nodes will "continue to enhance NSW leadership in advanced micro- and nano-technology, and drive job creation in the State."

Funding that will ultimately flow to Macquarie U will support salaries of key personnel needed to commission and operate new equipment which will be funded under the Australian Government's *Super Science Initiatives* (see **http://minister.innovation.gov.au/Carr/Pages/SUPERSCIENCEFUTUREINDUSTRIES.aspx**).

Michael Withford

Fresh vistas

Research funding opportunities – external schemes

Australian Government
Australian Research Council

ARC LIEF (Linkage Equipment & Facilities) Grants (LE11) – for funding commencing in 2011

Expressions of interest to Research Office: 5 pm, Wed 14 April
Final ARC LE11 closing date: Wed 26 May

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

Review & feedback due – 21 April; Submit to Research Office – 5 May; Submit to ARC – 12 May

ARC Centres of Excellence (Full Invited Proposals, for funding commencing in 2011)

... Applications close finally on Mon 19 April

– Congratulations to the MQ Photonics and Physics staff who are on short-listed CoE bids!

Research funding opportunities – internal schemes

Macquarie University Research Development Grant Scheme (MQRDG)

Open 10 Mar 2010 Closed 21 Apr 2010 Outcome 19 May 2010

Macquarie University Linkage Projects Seeding Grants (MQLSG) – Stage 1

Open 15 Mar 2010 Closed 7 Apr 2010 Outcome 21 Apr 2010

MQ New Staff and Staff Returning from Parental Leave Research Grants Scheme (MQNS) – Round 1:

Open 17 Mar 2010 Closed 28 Apr 2010 Outcome 26 May 2010

Last chance to consider if YOU are 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

LaserFest 2010 @ *MQ Photonics* ...

LaserFest 2010 is a year-long celebration of the 50th anniversary of the laser, which was first demonstrated on 16 May, 1960. It is a collaboration between the American Physical Society, the Optical Society (OSA), SPIE and IEEE (see **www.laserfest.org/**). In 2009, around a dozen of us from *MQ Photonics*/Physics applied for a LaserFest grant to run **LaserFest Sydney**. We were successful, and the grant of US$10k has been supplemented by $10k from DVC(Research) and additional funds from *MQ Photonics* and the Faculty of Science. So we have an opportunity to prepare some interesting, fun and "different" activities.

The number 1 mission of LaserFest Sydney is to showcase the prominence of the laser in today's world as far as the community is affected. So LaserFest Sydney is primarily an "outreach activity" – to school students, university students, industry and the community at large. But in doing this, we also promote awareness of *MQ Photonics*, and the Physics Department more generally.

There are lots of activities planned, and the LaserFest Sydney team welcome all who would like to be involved. Some of the activities planned include Lecture Series, School workshops on De-mystifying lasers, a competition for school students, and several events events in partnership with a major holography exhibition by the Art Gallery, the second Astronomy night in October this year and Movies at Macquarie. I'm keen for LaserFest Sydney to involve all our ranks, whether students or staff. The more people we have to offer ideas and put our plans into action, the better the outcomes will be. So please come and see me, or email, if you want to find out more or be put on the LaserFest Sydney email list. It's an opportunity to get involved in organising some fun and worthwhile activities, and also to work more closely with people that perhaps we wouldn't otherwise .

The OSA Student Chapter is independently pursuing its Laser Graffiti and Laser Maze activities, separately funded by LaserFest. Thanks to Alex Butler, who has been part of our LaserFest Sydney planning team, and we're expecting that these Student Chapter activities will feature several times at the LaserFest Sydney events.

Helen Pask

Publications

Recently accepted / in press articles

R J Williams, N Jovanovic, G D Marshall, M J Withford, "All-optical, actively Q-switched fiber laser", *Optics Express*, (in press, accepted 23rd March 2010)

Abstract: All-fiber lasers offer increased robustness and simplicity over other fiber laser systems. Current active Q-switching techniques for all-fiber lasers rely on electro-mechanical transducers to strain-tune an intra-cavity fiber-Bragg grating, which adds complexity and can lead to vibrational sensitivity. An all-optical technique for achieving active Q-switched operation is a more elegant approach and would maintain the inherent robustness and simplicity of an all-fiber laser system. In this work, we studied the optical tuning of a fiber-Bragg grating by resonant optical pumping and optimized it for application to active systems. We incorporated an optically-tunable fiber-Bragg grating into a fiber laser and demonstrated active Q-switching at 35 kHz with this all-optical, all-fiber laser system. We highlight the potential to operate at >300 kHz with the current embodiment. To our knowledge, this is the first demonstration of an optically-driven active Q-switch in a fiber laser. Further potential to operate at MHz frequencies is discussed.

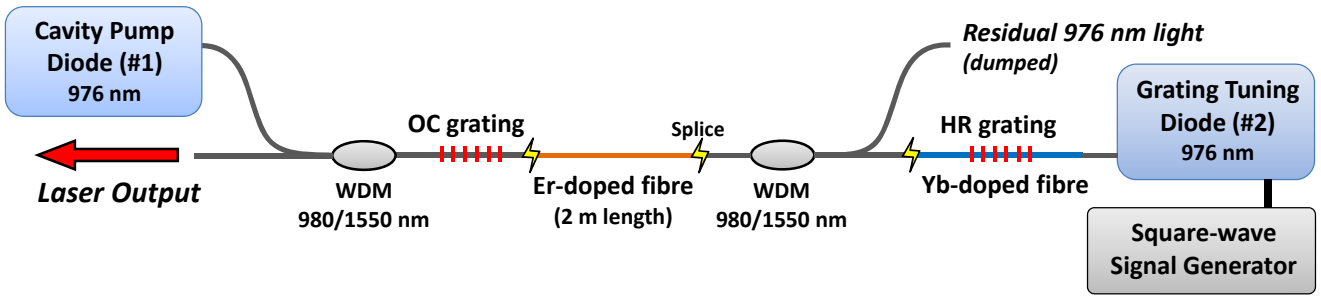


Fig. 1 Schematic diagram of the Q-switched erbium fiber laser cavity.

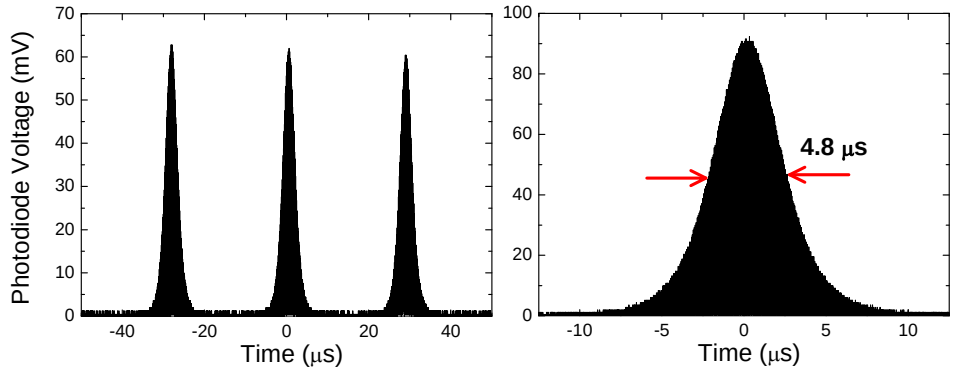


Fig. 2 Output of the Q-switched fiber laser at 35 kHz, shown on two different time-scales.

MQ Photonics seminars

Time: 12 Noon, Wed 31st March Place: E7B T3 Presented by: **Judith Dawes & Edward Cheng**

TOPIC: **LaserFest computer game**

ABSTRACT: Judith Dawes is supervising two computing students doing a project to develop a LaserFest computer game, and one of them, Edward Cheng, will come to the seminar and present some ideas for the computer game. We propose a discussion and invite constructive feedback from *MQPhotonics* for Edward. There are two possible scenarios at present being considered: a derivative of Laser chess, or a role playing game to discover the "secret of light" by unlocking laser locks with various laser beam patterns or power levels or focusing geometries or interference fringes or colours – each of which can be created using laser light and key components that need to be earned playing the game.

Time: 12.30 -1.30 pm, Wed 21st April Place: C5C498 Presented by: **Chris Miese**

TOPIC: **Direct writing of photonic devices in the cumulative heating regime**

ABSTRACT: The direct write technique enabled the fabrication of three dimensional optical components in various dielectric media. The high integration, stability and compatibility to standard fiber components facilitated complex photonic circuits, integrated waveguide amplifiers and monolithic waveguide lasers. While the majority of experiments have been carried out utilizing ultrafast amplifiers at kHz repetition rates it became apparent that the low writing speeds represent a major disadvantage, especially with regard to industrial mass fabrication. In order to increase the fabrication speeds high repetition lasers have to be used. Studies indicate that this combination, namely a higher repetition rate coupled with higher pulse energies hold promise because the benefits of heat accumulation effects and heat diffusion can then be exploited in an optimal way. These processes lead to entirely new writing dynamics that are in strong contrast to the kHz writing regime. In our approach we study ultrafast direct device writing in the cumulative heating regime using chirped-pulse femtosecond oscillator (CPO) as the laser source. Furthermore we investigate the inscription of micro-structures by utilizing a Pockels cell to precisely modulate the writing energy for the fabrication of waveguide Bragg gratings.

Time: 12.30 – 1.30 pm, Wed 5th May Place: C5C 498 Presented by: **Josh Toomey**

TOPIC: **Chaotic Lasers – Nonlinear Dynamics and Applications**

ABSTRACT: I will present a summary of my PhD project, including discussion on how to identify and characterise chaos, how to generate chaotic signals from laser systems and the applications these signals have in secure communication systems.

People and Progress

Brian Orr to be a Deputy Editor of *Optics Express* ...

OSA's electronic journal, *Optics Express*, has become the world's highest-impact general optics journal (recently taking the lead from OSA's *Optics Letters*). For the last four years, I have been an Associate Editor of *Optics Express* (and, for six years before that, a Topical Editor of *Journal of the Optical Society of America B*) and have now accepted an invitation to be one of six new Deputy Editors that are being introduced to streamline the operations of *Optics Express*.

Brian Orr

Optics Express

THE INTERNATIONAL ELECTRONIC JOURNAL OF OPTICS

Editor-in-Chief: C. Martijn de Sterke

http://www.opticsinfobase.org/oe/Issue.cfm

Macquarie OSA Student Chapter

Nothing to report this issue

JOB OPPORTUNITY: Research assistant or associate required to work approx 3months full-time, or part-time equivalent on the following project.

Remote sensing of water temperature and salinity profiles

A new, optical approach to measuring water temperature and salinity depth profiles in waterways and catchments is proposed. Based on the well-known technique of Raman spectroscopy, the approach offers potential for land, boat or aircraft-based measurements. This seeding project will be laboratory-based, and will provide a proof of principle evaluation of the approach in terms of accuracy and depth resolution in a range of water samples. The ultimate outcome from the project will be the specification of a practical system for collection of temperature and salinity depth profiles which could form the basis of much larger projects.

Please contact Helen Pask if you are interested in this position, or pass on to any colleagues who may be interested. Contact details: *hpask@ics.mq.edu.au* or tel(02)98508932.