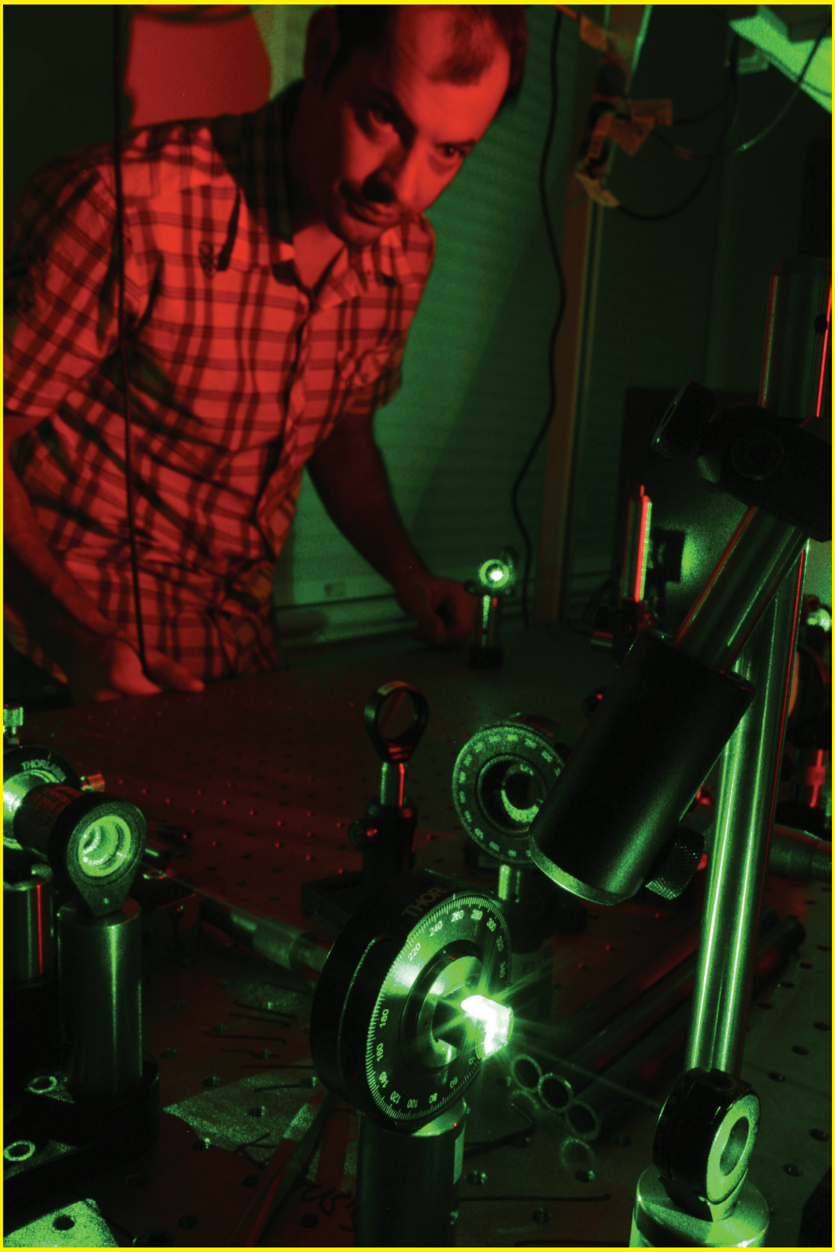
Australian Optical Society

NEWS



Volume 21 Issue 3
September 2007

ISSN 1832-4436

Registered by Australia Post
Publication No: 233066 / 00021

lyncée tec DHM

At Lyncée Tec, we make the invisible visible

with our:

DIGITAL HOLOGRAPHIC MICROSCOPES "DHM"

DHM T1000 Transmission mode

you benefit from:

- Real-time 3D topography with nanometer resolution
- Non-contact and non-invasive dynamical measurements
- Insensitive to environmental conditions

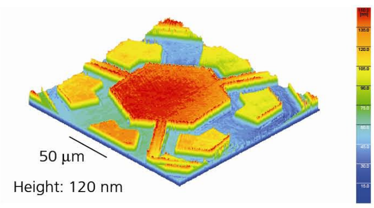
you master the whole cycle of your product from:

- Research & Development to
- New Product design and manufacturing to
- Quality control in production to
- Product development

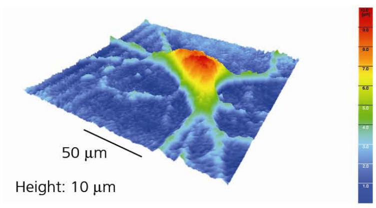
DHM R1000 Reflection mode

for your application in :

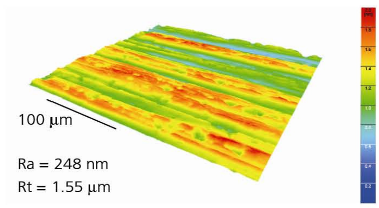
- Micro and Nanotechnology and Material Science
- Life Science



MEMS/MOEMS



Neuron cell



Surface analysis

Please visit our web site: www.lynceetec.com info@lynceetec.com

For more information:
sales@oftc.usyd.edu.au
Tel: 02 9351 1926
Fax: 02 9351 1911
OFTC, Bldg C80
University of Sydney
NSW 2006,
Australia

AUSTRALIAN OPTICAL SOCIETY

ABN 63 009 548 387

AOS News is the official news magazine of the Australian Optical Society. Formed in 1983, the Society is a non-profit organisation for the advancement of optics in Australia. Membership is open to all persons contributing to, or interested in, optics in the widest sense. See the back page (or the AOS website) for details on joining the Society.

AOS News - Editorial Board

Submission guidelines

The *AOS News* is always looking for contributions, especially from AOS members. Here is a short summary of how to make a submission.

What can you submit?

* ***Scientific Article***

A scientific paper in any area of optics.

* ***Review Article***

Simply give a run down of the work conducted at your laboratory, or some aspect of this work.

* ***Conference Report***
* ***News Item***
* ***Book Review***
* ***Cartoon or drawing***

Reviewing of papers

On submission of a scientific or review article you may request that the paper be refereed, and if subsequently accepted it will be identified as a refereed paper in the contents page. The refereeing process will be the same as for any of the regular peer reviewed scientific journals. Please bear in mind that refereeing takes time and the article should therefore be submitted well in advance of the publication date.

How can you submit?

The easiest way is by email. We accept nearly all file formats. (Famous last words!).

Submitted articles will be imported into an Adobe InDesign file. It is best if the diagrams and other graphics are submitted as separate files. All common graphics formats are acceptable, but the resolution must be in excess of 300d.p.i.. Be aware that all colour diagrams will be rendered in grayscale, so if you do use colours, choose colours that show up well in grayscale.

When using Greek letters and mathematical symbols, use font sets such as Symbol or MT Extra. Please avoid using symbols that are in Roman fonts, where the Option or Alt key is used; e.g. Opt-m in Times font on the Mac for the Greek letter mu.

If using TeX, use a style file similar to that for Phys Rev. Letters (one column for the title, author and by-line, and two for the main body). The top and bottom margins must be at least 20mm and the side margins 25mm. Submit a pdf file with the diagrams included (no page numbers), as well as copies of the diagrams in their original format in separate files.

If using a word processor, use a single column. If you do include the graphics in the main document, they should be placed in-line rather than with anchors, but must be submitted separately as well.

SUBMISSION OF COPY:
Contributions on any topic of interest to the Australian optics community are solicited, and should be sent to the editor, or a member of the editorial board. Use of electronic mail is strongly encouraged, although submission of hard copy together with a text file on CD will be considered.

ADVERTISING:
Potential advertisers in *AOS News* are welcomed, and should contact the editor.
Rates:
Colour A4 adverts, $250 +GST per issue,

Page 1 Black and White $100 + GST,

Places may be booked for placing ads - this attracts a 10% surcharge.

Black and White in main body of newsletter - free to corporate members.

Conference announcements are free.

COPY DEADLINE
Copy for the next issue (Dec 07) should be with the editor no later than 21 November 2007.

EDITOR
Murray Hamilton
The University of Adelaide
Physics Department
Adelaide SA. 5005
Tel: (08) 8303 3994
Fax: (08) 8303 4380
murray.hamilton@adelaide.edu.au

Australian Optical Society website
http://aos.physics.mq.edu.au

- News
- Membership
- Optics links
- Prizes/awards
- Conferences
- Jobs/Scholarships
- Affiliated societies
- ...and more

September 2007 **Volume 21 Number 3**

AOS NEWS

ARTICLES

9 **Surface Plasma Photonics; Conference Report**, K. Vernon

10 **Light Engineering in Medicine and Biology**, D. Sampson

12 **CUDOS News**

13 **ACQAO News**

DEPARTMENTS

5 **President's Report –** Hans Bachor

5 **Conference Watch**

26 **Product News**

32 **ICO Newsletter**

38 **Index of Advertisers & Corporate Members Information**

39 **AOS Subscription Form**

Cover Picture: Neil Baker a PhD student at the CUDOS group at Sydney University in the lab.

AUSTRALIAN OPTICAL SOCIETY

ABN 63 009 548 387

AOS EXECUTIVE

PRESIDENT
Hans-A Bachor
ARC Centre of Excellence for Quantum-Atom Optics, Building 38
The Australian National University,
Canberra ACT 0200
Tel: 02 6125 2811
Fax: 02 6125 0741
hans.bachor@anu.edu.au

VICE-PRESIDENT
Ben Eggleton
CUDOS
School of Physics,
University of Sydney
Sydney NSW 2006
Tel: 0401 055 494
Fax: (02) 9351-7726
egg@physics.usyd.edu.au

SECRETARY
John Holdsworth,
School of Mathematical and Physical Sciences, University of Newcastle,
Callaghan 2308 NSW
Australia
Tel: (02) 4921 5436
Fax: (02) 4921 6907
John.Holdsworth@newcastle.edu.au

HONORARY TREASURER
Stephen Collins
Optical Technology Research Lab
Victoria University
PO Box 14428, Melbourne, VIC 8001
Tel: (03) 9919 4283
Fax: (03) 9919 4698
stephen.collins@vu.edu.au

PAST PRESIDENT
Murray Hamilton
Department of Physics, University of Adelaide, Adelaide, SA 5005
Tel: (08) 8303 3994
Fax: (08) 8303 4380
murray.hamilton@adelaide.edu.au

AOS COUNCILLORS

Min Gu
Faculty of Engineering and Industrial Sciences,
Swinburne Univ. of Technology,
PO Box 218
Hawthorne VIC 3122
Tel (03) 9214 8776
Fax: (03) 9214 5435
mgu@swin.edu.au

John Love
Optical Sciences Centre,
Research School of Physical Sciences and Engineering
The Australian National University
Canberra ACT 0200
Tel: (02) 6249 4691
Fax: (02) 6279 8588
jd1124@rsphysse.anu.edu.au

Halina Rubinsztein-Dunlop
Department of Physics,
University of Queensland,
St Lucia, QLD 4072
Tel: (07) 3365 3139
Fax: (07) 3365 1242
halina@kelvin.physics.uq.oz.au

Judith Dawes
Division of ICS
Macquarie University,
Sydney NSW 2109
Tel: (02) 9850 8903
Fax: (02) 9850 8983
judith@ics.mq.edu.au

Ann Roberts
School of Physics,
University of Melbourne
VIC 3010
Tel: (03) 8344 5038
Fax: (03) 9439 4912
a.roberts @physics.unimelb.edu.au

Ken Baldwin
Laser Physics Centre
ANU, RSPSE
Canberra ACT 0200
Tel. (02) 6125 4702
Fax. (02) 6125 2452
kenneth.baldwin@anu.edu.au

John Harvey
Department of Physics,
University of Auckland,
Private Bag 92019,
Auckland, New Zealand
Tel: (+64 9) 373 7599 X88831
Fax: (+64 9) 373 7445
j.harvey@auckland.ac.nz

AFFILIATES
OSA
(Optical Society of America)
SPIE
(International Society for Optical Engineering)

CORPORATE MEMBERS

ARC COE for Quantum-Atom Optics
Australian Fibre Works
Bandwidth Foundry
Bitline System
Coherent Scientific
CUDOS
Francis Lord Optics (Avtronics)
Lambda Scientific
Laserex
Lastek
NewSpec
Optiscan
Photon Engineering
Raymax Applications
Warsash Scientific
Wavelab Scientific

President's Report

From the president,

last month we held our AGM and it was good to see the keen interest in our activities. Without a conference it is difficult to get people sparing a bit of their precious. But the lively discussions showed that we have a healthy and interested membership, which now stands at about 200 people across Australia and New Zealand, that sees good value in our association.

The AOS is evolving. We thank Chris Chantler and Martijn de Sterke for their contributions as AOS councillors and we are welcoming Judith Dawes from Macquarie University and Min Gu from Swinburne University of Technology as new councillors.

A good debate was held about the future of our AOS newsletter and webpage. It is heartening to see that many read it and want to see it continue as an independent source of information. It is used by many to learn about the activities of our colleagues in other locations. We looked at merging it with other publications , such as the AIP journal, but there seems to be strong feeling that we should maintain our own printed newsletter and find ways to strengthen our webpage.

The AOS webpage could be our most visible identity and could carry the latest news. One example is information about job offers in the optics and photonics industry. We are fortunate that the job market is active again, that our skills are in demand. We can help, through offering free job adds on our webpage, to spread the details quickly to our members.

Based on this discussion, we will be moving forward to develop a new type of webpage that is directly linked to the newsletter, that provides more links and is up dated more frequently. Here is an opportunity for you to bring in new ideas and suggestions. What would you like to see ? Can you contribute news items, opinions or useful links ? Please send your ideas to me or Ben Eggleton.

I would like to thank Murray Hamilton for his great effort in maintaining or newsletter single handedly for such a long time. He wants a rest from chasing us, including me, for material and contributions. Thanks Murray for producing the impressive publication that you see here. He will soon hand over the editorial tasks to a new team, and the next issue might get to you from Sydney.

with best regards
Hans Bachor
(*Yep! it's true, I'm off the hook! However I'm still accepting copy for the next issue. Ed.*)

Conference Watch

APOC—Asia-Pacific Optical Communications (www.spie.org)	**Wuhan**	**1–5 November 2007**
12th ILOPE (China International Lasers, Optoelectronics, Photonics and Display Exhibition) (www.ilope-expo.com)	**Beijing**	**20 - 22 November 2007**
Quantum Atom Optics Down-Under (www.acqao.org)	**Wollongong**	**3 - 6 December 2007**
International Conference on Optical Fibre Sensors OFS-19 (obel.ee.uwa.edu.au/OFS-19/)	**Perth**	**April 14-18, 2008**
CLEO/QELS 2008 (paper submission deadline 3 Dec 2007) (www.osa.org)		**May 2008**
SPIE Astronomical Telescopes and Instrumentation 2008 (www.spie.org)	**Marseille**	**23 - 28 June 2008**
21st ICO Congress (incorporating AOS conference) (www.iceaustralia.com/ICO2008)	**Sydney**	**7 - 10 July 2008**
OECC/ACOFT 2008 (www.iceaustralia.com/OECC_ACOFT2008)	**Sydney**	**8 - 10 July 2008**

Australian Academy of Science News: congratulations to the AOS members who have been recognised by the AAS this year; *Ben Eggleton*, Pawsey Medal; *Yuri Kivshar*, Lyle Medal, *Min Gu*, elected as fellow

SPIE The International Society for Optical Engineering

SPIE was formed in 1955 as the Society for Photo-optical Instrumentation Engineers, and has been dedicated to providing the best possible service to the optical engineering community. SPIE is an international technical society dedicated to promoting the engineering and scientific applications of optical, photonic, imaging and optoelectronic technologies through its education and communications programs, meetings and publications.

SPIE offers

International Networking

Today SPIE is the largest international professional engineering society serving the practicing engineer and scientist in the field of optics and photonics. The Society serves the global technical and business communities, with over 14,000 individual, 320 corporate, and 3,000 technical group members in more than 75 countries worldwide. Advance professionally through networking and visibility among your peers. Learn from others and gain access to the voices, ideas, and the energy of a global community.

Meetings

Among the many services the Society offers are the sponsorship, planning, and execution of technical conferences, product exhibitions, and symposia. SPIE's technical meetings and symposia are internationally-acclaimed gatherings of engineers and scientists working in optics, optoelectronics, and many related fields. They take place in large and small venues, from specialised topics to cross-disciplinary information exchanges, complete with extensive programs including short courses, workshops, and other special activities.

Publications

A major activity of SPIE is the publication and distribution of archival professional journals, full-manuscript conference proceedings, newsletters, and optics-related texts and monographs. SPIE publications deliver timely, high-quality technical information to the optics, imaging, and photonics communities worldwide. Membership includes a subscription to
OE Reports, a monthly newspaper that provides news and commentary on cutting-edge technology.

and More

In addition, SPIE provides numerous services to its members, including on-line electronic databases, electronic bulletin board and networking services, and employment assistance. To further serve the public good, the Society sponsors a number of awards, scholarships, and educational grants every year, and publishes a comprehensive catalogue of educational resources in the optics field,
Optics Education.

To join SPIE: Complete the online membership form at *www.spie.org/membership_form.html*, print and fax it to SPIE along with a copy of your AOS dues receipt. (Be sure to indicate that you are eligible for the US$20 discount as an AOS member). Any queries can be directed to Mr Paul Giusts at *membership@spie.org*

SPIE International Headquarters
Tel: +1 360 676 3290 *Fax*: +1 360 647 1445 *email:* spie@spie.org
web: http://spie.org
PO Box 10, Bellingham WA 98227-0010 USA

AOS Postgraduate Prize – Conference Report

Kristy Vernon, Queensland Univ. of Technology

Surface Plasmon Photonics 3 (SPP3) was a groundbreaking conference with invited speakers from all over the world, and I imagine every plasmon research group was represented in some way at this conference. The conference was held from Sunday the 17th of June until Friday the 22nd of June in Dijon, France.

There were some fantastic talks given at conference. In particular, there were many presentations on improving the resolution of near-field microscopy. One of the prominent leaders in the field, Lukas Novotny, suggested using conventional near-field scanning optical microscope (NSOM) tips coupled or attached to nano-particles, which will improve the local field enhancement and thus the resolution of the NSOM down to 80nm.

There was also a fantastic review by Prof. Zhang, the leader of the UC Berkeley group. He provided an in depth overview of the nano-optical lenses produced in their group. Their plasmon superlens can provide a resolution of about 90nm. Their group has also been working on far-field and hyper lenses. The far-field lens, using plasmons to obtain high resolution, then couples the plasmons back to the far-field using a special grating. The hyper lens otherwise known as the optical turbine, consists of alternating circular arcs of metal-dielectric layers and provides hyperbolic dispersion of the wave so that as the wave travels away from the center (and thus the arc radii increase) the wave number of the wave will decrease so that eventually the plasmons are coupled out into the far-field or bulk radiation.

The Van Dorpe group gave a very interesting presentation on the generation of plasmons using electrical excitation. The efficient generation of plasmons can prove quite troublesome in some structures, so this novel idea of directly applying electrical fields to a structure may be quite useful in nano-scale plasmonic circuitry.

I presented my research on Tuesday night – I had two presentations, one on the channel plasmon-polarition waveguide, which is a way of guiding plasmons on the nano-scale and has received much interest of late and there are now quite a few groups working on this waveguide. My other presentation was on a direct plasmon coupler device using nano-scale rectangular slots in a thin layer of metal film. I had quite a few interesting conversations with people about my research. In particular a couple of groups are attempting to fabricate some similar devices so we talked about correct existence angles etc. I believe SPP3 was probably the most relevant and useful conference I have ever attended. The discussions I have had with other researchers about my work has been very inspirational and I have many new ideas about directions for my work and there are even talks of possible collaborations.

The conference was set at the University of Bourgogne in the heart of the French countryside. On Wednesday we had the opportunity to explore the nearby city of Beaune and attend a banquet dinner, wine tasting and tour an olden day hospital which was a fabulous experience, not just for the sights but also for the great opportunity to mingle with other researchers on a casual level.

On Thursday there were some very interesting presentations on channel plasmon-polariton waveguides and wedge plasmon waveguides which were directly applicable to my research. There was a very important presentation by V.S. Volkov about including a grating inside the channel plasmon-polariton waveguide to filter out certain wavelengths. Garcia Videl also gave a very interesting presentation comparing the channel plasmon-polariton and wedge waveguide, showing that both provide a similar propagation length; but the wedge provides a much stronger localisation for the same structural parameters as the groove for the telecom wavelengths.

After the conference, my colleague and I had the privilege to speak at the Max-Planck Polymer Institute in Mainz, Germany. They have a large plasmon group and after the talks we had the opportunity to tour the facilities and also see some poster presentations of their research. Our work was well received and stimulated a lot of interesting discussions and ideas.

The next day we visited the Fachhochschule Wiesbaden (University of Applied Science) where we met several students interested in an exchange program between QUT and their university. We also had the fantastic opportunity of visiting the laboratories and discussing our current research and theirs and possible projects we can collaborate on.

All in all, the trip was a fantastic experience and introduced me to many novel ideas and directions for plasmonics. I'd especially like to thank Professor Langbein of Russelsheim branch of the Wiesbaden University of Applied Science for his interest and great hospitality, the members of the Max-Planck Institute for having us and the privilege of being accepted to present at SPP3. I would also like to thank QUT for its support, my supervisors (Dr. Dmitri Gramotnev and Dr. David Pile) for their contributions and support, and of course the Australian Optical Society. This experience has not only expanded my horizons in terms of my research, but I've made many valuable friendships and look forward to meeting everyone again in the future.

The town centre in Dijon.

Light Engineering in Medicine and Biology

David D. Sampson

Optical+Biomedical Engineering Laboratory, School of Electrical, Electronic & Computer Engineering, The University of Western Australia, Crawley, WA, 6160, Australia

Abstract — **There is a major gap in function and resolution between laboratory optical microscopy and medical imaging. Bridging this gap requires photonics science and technology. This paper reviews diagnostic optical imaging and highlights opportunities for photonics.**

I. Introduction

Photonics, a synonym of 'light engineering', underpinned the communications revolution of the 1990s, its development tracking the frenetic growth of the Internet until the dot.com bubble burst in 2001. With the calamitous years following 2001 behind us, the signs are that health is returning to the sector. This recovery has been accompanied by a noticeable diversification in photonics, in both the academic and corporate sectors, towards sensors and towards medicine and biology, so-called biophotonics. This article provides a selective overview of the diagnostic and imaging applications of light in medicine and biology, in so doing highlighting opportunities for photonics, and illustrates these opportunities with examples from our laboratory.

II. The Optical Microscopy-Medical Imaging Gap

Optical microscopy [1], one of the most used tools in biology, is found in laboratories from universities to hospital pathology services to biotechnology companies. Commonly, samples are thin slices of tissue (typically 5 μm or so) or cells that have been stained with dye to make them visible – usually pink and purple. Of course, there is a plethora of microscopy methods, many of which make use of fluorescence as the basis for visualising the sample. Microscope companies are busy importing and developing photonics technologies such as single-mode fibre beam transport, acousto-optic tunable filters, and thin-film filters, and there have been commercial spin offs in Australia, such as Iatia from Keith Nugent's group at the University of Melbourne. Microscopy's key tasks are to resolve sub-cellular microstructure, typically at resolutions of a few hundred nanometers or less, and to add optical contrast to functional units, *e.g.*, green fluorescent protein [2], so that their function and distribution can be studied. Optical microscopy underpins much of the revolution in the life and medical sciences and remains a very active research area.[3]

At the other end of the imaging spectrum, medical imaging methods, such as ultrasound, magnetic resonance imaging, and X-ray computed tomography, provide gross structural images deep inside the human body. While medical imaging is an enormously successful area, it is obvious that there remains a vast gulf between the microscopic imaging methods, which provide their highest resolution on preserved tissue specimens, and medical imaging methods, which provide images of living tissues deep within the body, but at much lower resolution and specificity.[4] A good example is the 85% of cancers originating in the epithelial tissues [5] that form the external and internal surface structures of the body. Established imaging modalities tend to pick up relatively advanced and large invasive tumours, but it is widely accepted that in most cancers early detection is essential for long-term survival. The high-resolution images in living, subsurface tissue that would provide the best information for the early detection of such pathologies are not available. Many new optical technologies have the potential to bridge this resolution/function gap, but as yet very few are in routine clinical use.

III. Options For Probing Thick Tissue

To obtain the required microscopic information from biological tissue, we can simply try to translate to deep in the human body the techniques available on the microscope slide in the laboratory. To do this we need a deep understanding of how the image formation process is modified by the intervening tissue, and we also need to understand how to introduce into the tissue any probe being used. The accompanying issues of biocompatibility and toxicity are, of course, paramount. The mitigation of the distorting effects of the tissue medium has led to a range of optical sectioning techniques that seek to isolate a slice of the medium under investigation, to be discussed shortly, but there are other options. One is to try to tease out the information through measurement of the modification of the properties of light itself, without forming microscopic images, for example, through spectroscopy; another is optical computed tomography (CT).

IV. Image Formation Techniques In Thick Tissue

One of the most successful and widespread image formation techniques is optical coherence tomography (OCT).[6][7] OCT combines low-coherence interferometry with lateral point beam scanning to produce two- or three-dimensional images. The low (temporal) coherence is provided by broadband light and endows the technique with an optical depth sectioning capability - a 'coherence gate'. OCT's penetration of highly scattering tissues is currently limited to a few millimetres at most. Its potential resolution for *in vivo* imaging is typically ~10 μm, and can be as high as

~1 μm, although it is known to strongly degrade with depth, which has not been well characterised. It is an established medical imaging modality in ophthalmology, and in the early clinical phases for the gastro-intestinal and cardiovascular systems, but many other applications are still emerging.[7]

One of the convenient features of OCT is its ready fibre-optic implementation, making it ideally suited for endoscopic applications. It shares this feature with confocal microscopy; Australian company Optiscan and French company Mauna Kea Technologies are both well advanced in commercialising endoscopic versions. The confocal microscope produces optical depth sectioning by using a confocal aperture to pass only those rays emanating from the focal plane of an objective lens. High resolution requires a high-numerical aperture lens, a big challenge in an endoscopic geometry, and high light-rejection levels, generally requiring photon-counting detectors and fluorescence to generate sufficient signal. Point-beam lateral scanning approaches are based on a fibre tuning fork or a fibre bundle.

It is interesting to briefly contrast these two leading techniques. OCT is not generally capable of resolving cells in tissues, but is restricted to revealing gross tissue organization such as layers and their disruption, but such features can be observed at depths in excess of 2 mm. OCT's source of signal is just the native tissue (back) scattering; contrast agents do not yet exist. The current 'killer application' for OCT is deducing layer architecture in the human retina, which is now very widely available clinically through Zeiss. By contrast, confocal endoscopy can see exquisite detail within cells and reveal groups of cells, but only for fairly shallow depths, perhaps 50-100 μm at best, and only after administration, intravenously or topically, of fluorescent agents such as fluorescein and acriflavine. Thus, the two techniques appear at this point in time to be largely complementary, with OCT resembling ultrasound in its image quality and utility, whereas confocal endoscopy is a genuine microscopic technique.

There are many emerging imaging techniques that show promise for deep tissue imaging, nearly all based on nonlinear effects. These include fluorescence from two-photon excitation [8], second and third harmonic generation [9], and coherent anti-Stokes Raman spectroscopy (CARS).[10] The challenge with most of these techniques is to successfully perform them in an endoscope and this aspect is very much in its infancy. Much of the research challenge is to deliver an unbroadened femtosecond pulse to the sample, which is necessary to attain sufficient optical intensity to excite the nonlinear effect. In Australia, Min Gu's group at Swinburne University is engaged in nonlinear endoscopy [11] and Schnitzer has provided an excellent overview of the approaches.[12]

Most nonlinear techniques have been limited in penetration depth to the few-hundred microns range, with some success in sub-cellular resolution. Although some work has been done in this area, there is yet to emerge a complete understanding of what limits performance. An obvious difference between coherent techniques, such as OCT, harmonic generation, and CARS, and incoherent techniques involving fluorescence is the difference in the effects of propagation. In the coherent techniques, scattering or wavefront distortion during propagation in either direction affect the image quality and signal collection, but in fluorescent techniques, only the incident beam effects degrade resolution, with the return process being one of merely collecting the photons. Thus, double-clad photonic-crystal fibres that can deliver femtosecond pulses unbroadened and collect fluorescence efficiently in high-numerical aperture cladding are very attractive.[11]

There have been notable attempts to improve the *in vivo* penetration depth of imaging techniques. Adaptive optics is being pursued mostly in relation to improving transverse resolution in retinal imaging, but there is some activity in more turbid media. There is also an emerging body of work in using biocompatible optical clearing agents in tissue [13][14], which has shown some success, although it remains a largely empirical technology.

One limitation common to all image formation techniques is the poor theoretical understanding of the image degradation process in scattering and absorbing tissues and there is a notable absence of a strong research effort in this area.

V. Tomography And Spectroscopy In Thick Tissue

Thick tissue imaging has also been advanced based on optical CT. Although such techniques have not been demonstrated in an endoscopic format, they still enjoy the benefits of using non-ionising radiation. The most advanced CT techniques have exploited the transit time and optical spectroscopic variations of diffuse photon propagation through centimetre tissue path lengths (measured in either the time or RF frequency domain) achieving typically millimetre resolution, and focussed on functional and diagnostic imaging of the breast and brain.[15] A related area in which there is a lot of scientific [16] and commercial activity (*e.g.*, Xenogen) is in the enhancement of three-dimensional localisation of fluorescence in small animal models. An intriguing related new photoacoustic technique, based on tomographic detection of sound waves created by the absorption of pulsed laser light, has demonstrated spectacular subsurface *in vivo* images of animals and humans.[17] CT techniques relying on relatively strong transmission through largely transparent samples have been applied to mainly transparent embryos, *e.g.*, optical projection tomography [18] or selective plane illumination microscopy.[19]

Optical non-imaging spectroscopic techniques are much better suited to endoscopic implementations and can benefit from the lower technical challenges presented by using large multimode fibres. Both the native (endogenous) auto-fluorescence and fluorescence from external (exogenous) agents have been examined, and shown promise in areas as diverse as detecting abnormal lesions in the colon to diagnosing cervical cancer (see, *e.g.*, Canadian company Xilix). Raman spectroscopy provides a tantalisingly rich source of spectral information, but to date the challenges of performing the measurement *in vivo* and unambiguously interpreting the resulting spectra appear to have held it back.

VI. EXAMPLES

I will briefly highlight two areas of our research that contribute to diagnostic and medical imaging. The first relates to wide-field, high-resolution imaging of microstructure, which is a broadly desirable goal in much histological analysis, but which is not readily achievable without the recording and laborious processing of multiple images. We have been investigating the use of digital Fourier holography to capture, over a wide field in a single hologram, the microstructural information based on the angular elastic scattering from the sample.[20][21] At the same time, we have extended this work to a form of aperture synthesis enabling very wide-field high-resolution images to be synthesized from low-resolution ones, with a number of compelling advantages.[22] The second area relates to a variant of OCT, anatomical OCT [23][24], which we have been using to quantitatively monitor the upper airway of sleeping patients with obstructive sleep apnoea, a task which cannot be done in any other way. These examples serve to highlight the breadth of activities and areas of photonics science and technologies in medical diagnosis and biological imaging.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the following colleagues and students at OBEL: Steven Adie, Sergey Alexandrov, Julian Armstrong, Timothy Hillman, Blake Klyen, Matthew Leigh, Bruce Murphy.

REFERENCES

[1] Microscopy Resource Center http://www.olympusmicro.com/, Accessed: 4 April, 2007.

[2] R. Y. Tsien, "The green fluorescent protein," *Annual Review of Biochemistry*, vol. 67, pp. 509-544, 1998.

[3] R. Y. Tsien, "Imagining imaging's future," *Nature Cell Biology*, pp. Ss16-Ss21, 2003.

[4] D. M. McDonald and P. L. Choyke, "Imaging of angiogenesis: from microscope to clinic," *Nature Medicine*, vol. 9, pp. 713-725, 2003.

[5] V. Backman, M. B. Wallace, L. T. Perelman, J. T. Arendt, R. Gurjar, M. G. Muller, et al., "Detection of preinvasive cancer cells," *Nature*, vol. 406, pp. 35-36, 2000.

[6] D. Huang, E. A. Swanson, C. P. Lin, J. S. Schuman, W. G. Stinson, W. Chang, M. R. Hee, T. Flotte, K. Gregory, C. A. Puliafito, and J. G. Fujimoto, "Optical Coherence Tomography," *Science*, vol. 254, pp. 1178-1181, 1991.

[7] D. D. Sampson and T. R. Hillman, "Optical coherence tomography," in *Lasers and Current Optical Techniques in Biology*, vol. 4, *Comprehensive Series in Photochemistry and Photobiology*, G. Palumbo and R. Pratesi, Eds., Royal Society of Chemistry, 2004, pp. 481-571.

[8] W. R. Zipfel, R. M. Williams, and W. W. Webb, "Nonlinear magic: multiphoton microscopy in the biosciences," *Nature Biotechnology*, vol. 21, pp. 1368-1376, 2003.

[9] C. K. Sun, "Higher harmonic generation microscopy," *Microscopy Techniques*, vol. 95, pp. 17-56, 2005.

[10] C. L. Evans, E. O. Potma, M. Puoris'haag, D. Cote, C. P. Lin, et al., "Chemical imaging of tissue in vivo with video-rate coherent anti-Stokes Raman scattering microscopy," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 102, pp. 16807-16812, 2005.

[11] L. Fu, A. Jain, H. K. Xie, C. Cranfield, and M. Gu, "Nonlinear optical endoscopy based on a double-clad photonic crystal fiber and a MEMS mirror," *Optics Express*, vol. 14, pp. 1027-1032, 2006.

[12] B. A. Flusberg, E. D. Cocker, W. Piyawattanametha, J. C. Jung, E. L. M. Cheung, and M. J. Schnitzer, "Fiber-optic fluorescence imaging," *Nature Methods*, vol. 2, pp. 941-950, 2005.

[13] V. V. Tuchin, *Optical Clearing of Tissues and Blood*: SPIE Press, 2006.

[14] R. Cicchi, F. S. Pavone, D. Massi, and D. D. Sampson, "Contrast and depth enhancement in two-photon microscopy of human skin ex vivo by use of optical clearing agents," *Optics Express*, vol. 13, pp. 2337-2344, 2005.

[15] N. Shah, A. Cerussi, C. Eker, J. Espinoza, J. Butler, J. Fishkin, R. Hornung, and B. Tromberg, "Noninvasive functional optical spectroscopy of human breast tissue," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 98, pp. 4420-4425, 2001.

[16] V. Ntziachristos, "Fluorescence molecular imaging," *Annual Review of Biomedical Engineering*, vol. 8, pp. 1-33, 2006.

[17] H. F. Zhang, K. Maslov, G. Stoica, and L. H. V. Wang, "Functional photoacoustic microscopy for high-resolution and noninvasive in vivo imaging," *Nature Biotechnology*, vol. 24, pp. 848-851, 2006.

[18] J. Sharpe, U. Ahlgren, P. Perry, B. Hill, A. Ross, J. Hecksher-Sorensen, R. Baldock, and D. Davidson, "Optical projection tomography as a tool for 3D microscopy and gene expression studies," *Science*, vol. 296, pp. 541-545, 2002.

[19] J. Huisken, J. Swoger, F. Del Bene, J. Wittbrodt, and E. H. K. Stelzer, "Optical sectioning deep inside live embryos by selective plane illumination microscopy," *Science*, vol. 305, pp. 1007-1009, 2004.

[20] S. A. Alexandrov, T. R. Hillman, and D. D. Sampson, "Spatially resolved Fourier holographic light scattering angular spectroscopy," *Optics Letters*, vol. 30, pp. 3305-3307, 2005.

[21] T. R. Hillman, S. A. Alexandrov, T. Gutzler, and D. D. Sampson, "Microscopic particle discrimination using spatially-resolved Fourier-holographic light scattering angular spectroscopy," *Optics Express*, vol. 14, pp. 11088-11102, 2006.

[22] S. A. Alexandrov, T. R. Hillman, T. Gutzler, and D. D. Sampson, "Synthetic aperture fourier holographic optical microscopy," *Physical Review Letters*, vol. 97, art.no. 168102, 2006.

[23] J. J. Armstrong, M. S. Leigh, I. D. Walton, A. V. Zvyagin, S. A. Alexandrov, S. Schwer, D. D. Sampson, D. R. Hillman, and P. R. Eastwood, "In vivo size and shape measurement of the human upper airway using endoscopic long-range optical coherence tomography," *Optics Express*, vol. 11, pp. 1817-1826, 2003.

[24] J. J. Armstrong, M. S. Leigh, D. D. Sampson, J. H. Walsh, D. R. Hillman, and P. R. Eastwood, "Quantitative upper airway imaging with anatomic optical coherence tomography," *American Journal of Respiratory and Critical Care Medicine*, vol. 173, pp. 226-233, 2006.

Contactless

PRECITEC

Measuring Technology

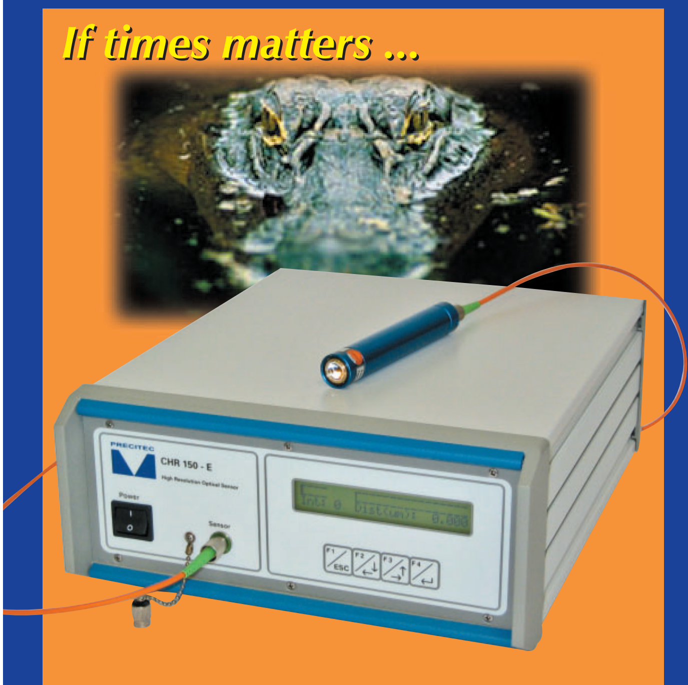
Measure distance and thickness – Scan all surfaces

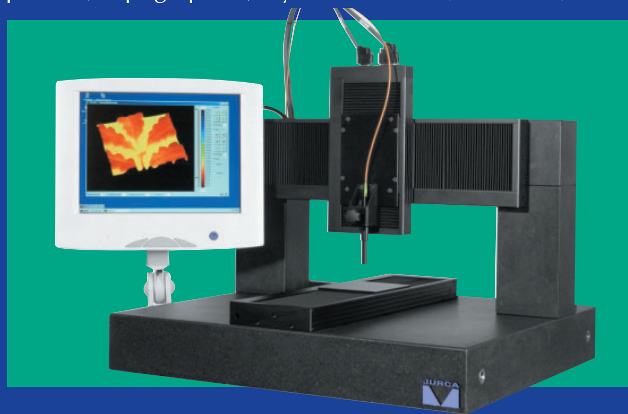
CHROCODILE:

Delivers contactless measurement of distances and layer thicknesses with up to 10nm resolution.

NEMESIS:

High resolution 3D contactless measurement of profiles, topographies, layer thicknesses, contours, etc.



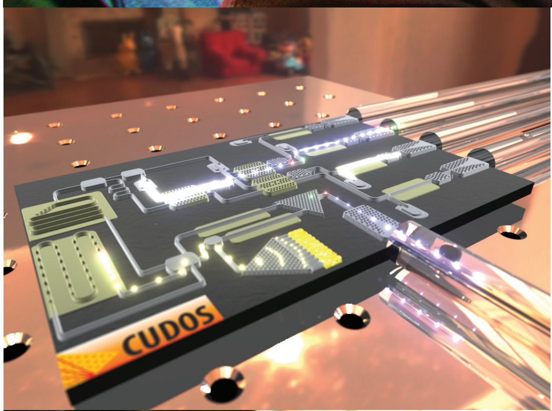


LASTEK

Lastek Pty Ltd
Thebarton Campus, University of Adelaide,
10 Reid Street, Thebarton SA 5031 Australia
Ph (08) 8443 8668 Fax (08) 8443 8427
Email: sales@lastek.com.au Lastek website: www.lastek.com.au

www.precitec-optronik.de

LTWAM4529/R



News from CUDOS

Neil Baker, Snjezana Tomljenovic-Hanic, Ben Eggleton and Jamie Vahn in the lab at Sydney University. Neil Baker a PhD student at the CUDOS group holds a CUDOS photonic chip (detail at left) fabricated at the ANU CUDOS group.

Sydney University celebrated the new CUDOS labs in an opening on Thursday 24th May. Photo shows Professor Harry Messel, Ben and others in the new lab located in the basement of the School of Physics.

NEWS from ACQAO

Teleportation of Massive Particles Without Shared Entanglement

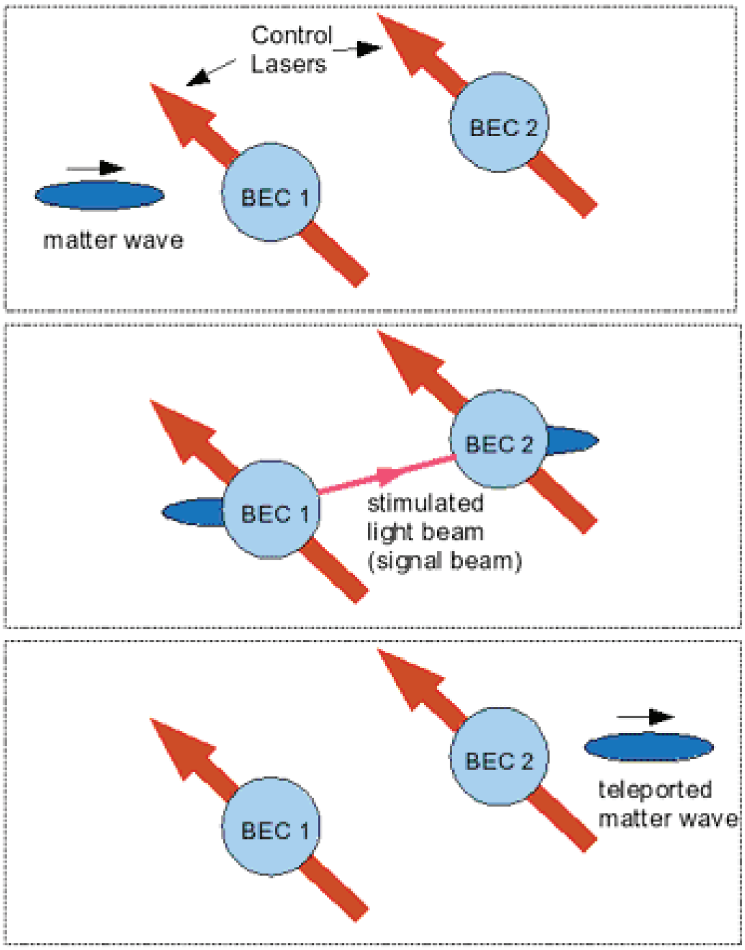
A team of researchers (Murray Olsen and Ashton Bradley, born in New Zealand and based at the University of Queensland) and two Australians (Simon Haine, University of Queensland, Joe Hope, Australian National University) all working in the Australian Research Council Centre of Excellence for Quantum-Atom Optics (ACQAO) have proposed a scheme to transfer the quantum state of an atom laser beam from one position to another by transferring quantum information to light and back again. This proposal, technically known as a quantum channel, is close in spirit to the science fiction teleportation as it does not rely on entangled states being shared between a sender and receiver. They have shown that it may be possible to teleport an atom laser pulse by transferring its quantum state to a laser beam, which then travels to a new location where the receiver can recreate the original group of atoms almost exactly. The scheme relies on the sender and receiver each having a Bose-Einstein condensate, the first of which acts as the sender and the second as the receiver.

The atoms have three internal electronic levels which are used for Raman incoupling and outcoupling, the second of which is commonly used in atom lasers.

As shown above, a pulse of atoms travels towards a trapped condensate, which is illuminated with a laser beam (the control beam), slightly detuned from an excited state. The atoms are stimulated to join the trapped BEC via a Raman process, and emit photons which have a very well defined momentum, forming the signal beam. By careful adjustment of the intensity and wavelength of the control beam, the quantum state of the atomic pulse (i.e., the position and momentum of each atom, or, equivalently, the amplitude and phase of the atomic matterwave) are encoded onto the signal beam. Ideally, the number of photons in the signal beam is exactly equal to the number of atoms in our original atomic pulse.

This information then travels to a second BEC, which is also illuminated with a control laser. The atoms in the BEC absorb a photon from the signal beam, and are forced to emit into the control beam due to stimulated emission, transferring the some of the BEC atoms into an output atomic beam. As the information of the original atomic pulse is transferred to the new pulse, the original group of atoms has effectively been teleported, without any sharing of an entangled state.

The original paper can be found at http://arxiv.org/abs/0706.0062



OSA | **Topical Meeting:**

QUANTUM-ATOM OPTICS *DOWNUNDER*

ARC COE FOR QUANTUM-ATOM OPTICS

Wollongong, Australia
December 3 – 6, 2007

In conjunction with the

International Student Summer School on Quantum-Atom Optics, Kioloa 28/11-1/12/2007

CO-CHAIRS: Hans Bachor, Ken Baldwin
ORGANISING C'TEE: P. Drummond, W. Ertmer, P. Hannaford, M. Leduc, R. Wilson
PROGRAMME C'TEE: H. Bachor, K. Baldwin, R. Blatt, C. Gardiner, P. Hannaford, Y. Kivshar, P. Knight, A. White

This will be the first conference devoted to the overlap of Quantum and Atom Optics - providing new fundamental insights and experimental realizations of concepts common to both fields. This conference will bring together key researchers from across the world to discuss the latest results in areas such as:

- statistical effects and correlations in ultracold quantum gases - including BEC's, atom lasers and degenerate Fermi gases;
- the generation and measurement of macroscopic quantum states;
- optical entanglement and quantum imaging;
- applications of atom-light entanglement including quantum communication;
- quantum properties of lattices and periodic systems.

Currently accepted Invited Speakers: A. Aspect, K. Burnett, P. Drummond, W. Ertmer, M. Leduc, W. Phillips, E. Polzik, J. Eberly

www.acqao.org www.osa.org www.novotelnorthbeach.com.au

oeMarket.com **www.oemarket.com**

Opto-Electronics	Fiber Optics	Fiber Connection	Test Equipment

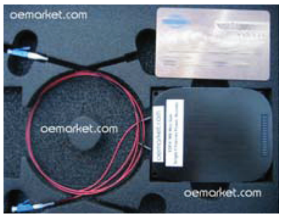
WDM modules – DWDM Mux/Demux modules, 100GHz, 200GHz channel spacing, 4 to 32 channels, user-defined channel arrangement; CWDM Mux/Demux modules, 4 or 8 channels; one channel add/drop filters; 1270~1620nm full range CWDM filters

Wide band optical isolators – cover S, C and L bands (1460nm ~ 1620nm)
Multimode isolators – 1310 or 1550nm, MM fiber networks
Special wavelength isolators – 1480nm or 1064nm
Polarization Maintaining isolators

Optical circulators – 3 ports or 4 ports, polarization maintaining, wide band (C+L bands)

Patch cords – various connector types, including LC, MT-RJ, MU, ST, E2000; multimode, customized patch cords
PM Patchcords
Optical adapters – FC, SC, ST, LC, MU, MTRJ, hybrid adapters
Female – Male hybrid adapters

Broadband light source – ASE, LED, SLED sources, mini size, various output power levels, gain flattening filter option
Optical amplifiers – Mini size EDFA, single or multi-channel applications, pre-amp, power booster or inline amp; DWDM EDFA, inline, two-stage or booster amplifiers



Laser sources – DFB or FP laser sources, CWDM, DWDM ITU grid wavelengths, automatic power and temperature control, internal and external modulation options.
Handheld laser sources – single, dual and three wavelength sources, battery driven and rechargeable, ideal for field use, 650, 850, 1310 and 1550nm

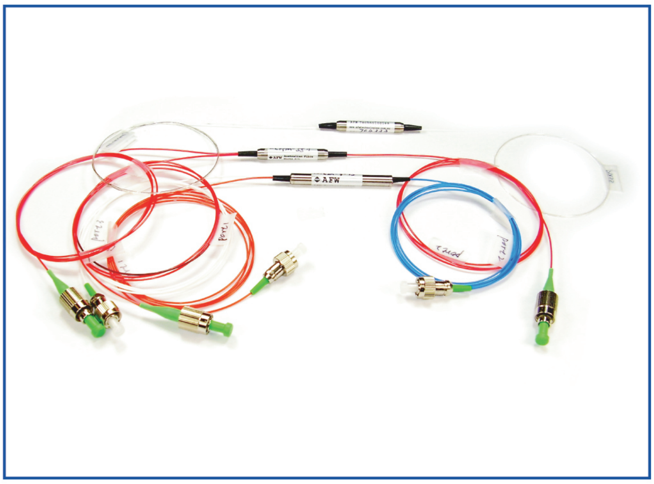
Optical power meters – handheld, pocket-size and desktop power meters, PC interface option, memory for data notes, large dynamic range, low-cost solutions
Handheld optical switches – fast 1x2 switching, very useful in fiber optical testing and measurement.
Fiber identifier and visual fault finder

Fiber Optical Products for the Industry

Bitline System Pty. Ltd.
Tel: 02-9597 2689
Fax: 02-9597 1959
Web: www.oemarket.com
Email: sales@oemarket.com

AFW

AFW Technologies Pty Ltd



Polarization Maintaining WDM/Dense WDM

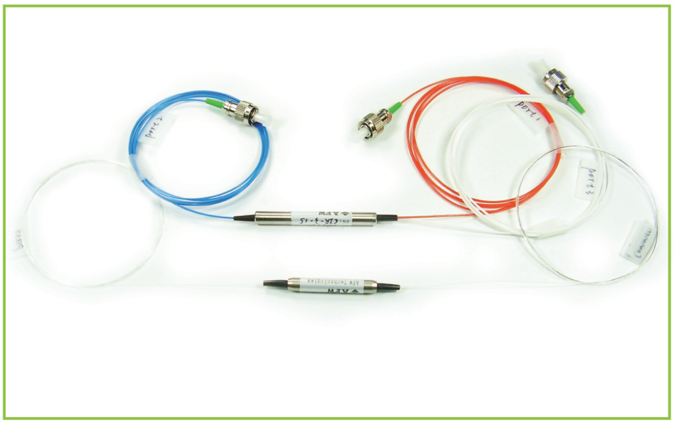
PM WDM provide wavelength division multiplexing while maintaining signal polarization. Micro-optic filter technology used to build devices to achieve wideband, low IL and high extinction ratio.

- Various wavelengths 980/1550, 1310/1550, 980/1064nm
- 4 ,8, 16 channel PM DWDM multiplexer or demultiplexer module
- PM Coarse WDM, 3 port device
- 100GHz or 200GHz channel spacing

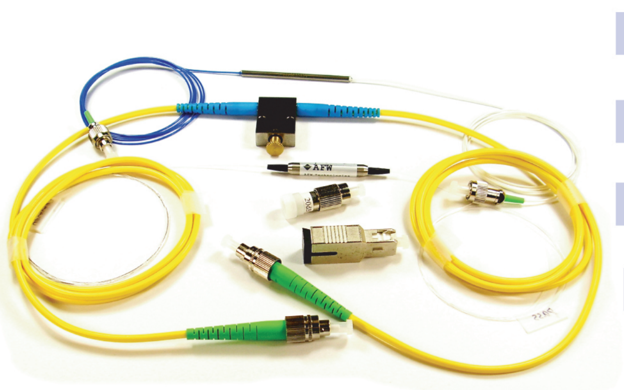
Polarization Beam Combiner/Splitter

High performance light wave device that can combine two orthogonal polarization components to one output fibre or split incoming light into two orthogonal states.

- Singlemode fibre or PM panda fibre
- Available in 250um, 900um or 3mm cable types
- High extinction ratio, high RL, low IL, high power
- 1030nm, 1064nm, 1310nm and 1550nm
- With or without connector, Narrow or wide key



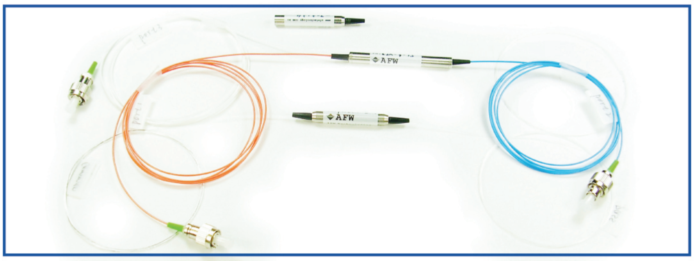
Optical Attenuator- PM and non-PM version



- Variable and fixed type for SM fibre
- Fixed attenuator for PM panda fibre
- High attenuation precision
- 0.8 ~ 60dB attenuation
- Fibre coupled attenuator with or without connector
- 20dB min extinction ratio, high RL on PM fibre attenuators
- For communication systems, sensors and lab research
- Available in customer specified attenuation values

Other Components

- In-line polarizer 1064, 1310 and 1550nm wavelength range, PM-PM fibre or SMF to PM fibre or SM-SM fibre
- Optical faraday mirrors and in-line faraday rotator - Collimator SMF or PMF
- Band pass filters for 1064nm, 1310nm or 1550nm - Polarization beam splitter/combiner
- Fibre optic faraday rotator 1064, 1310, 1480, 150nm



AFW

AFW Technologies Pty Ltd

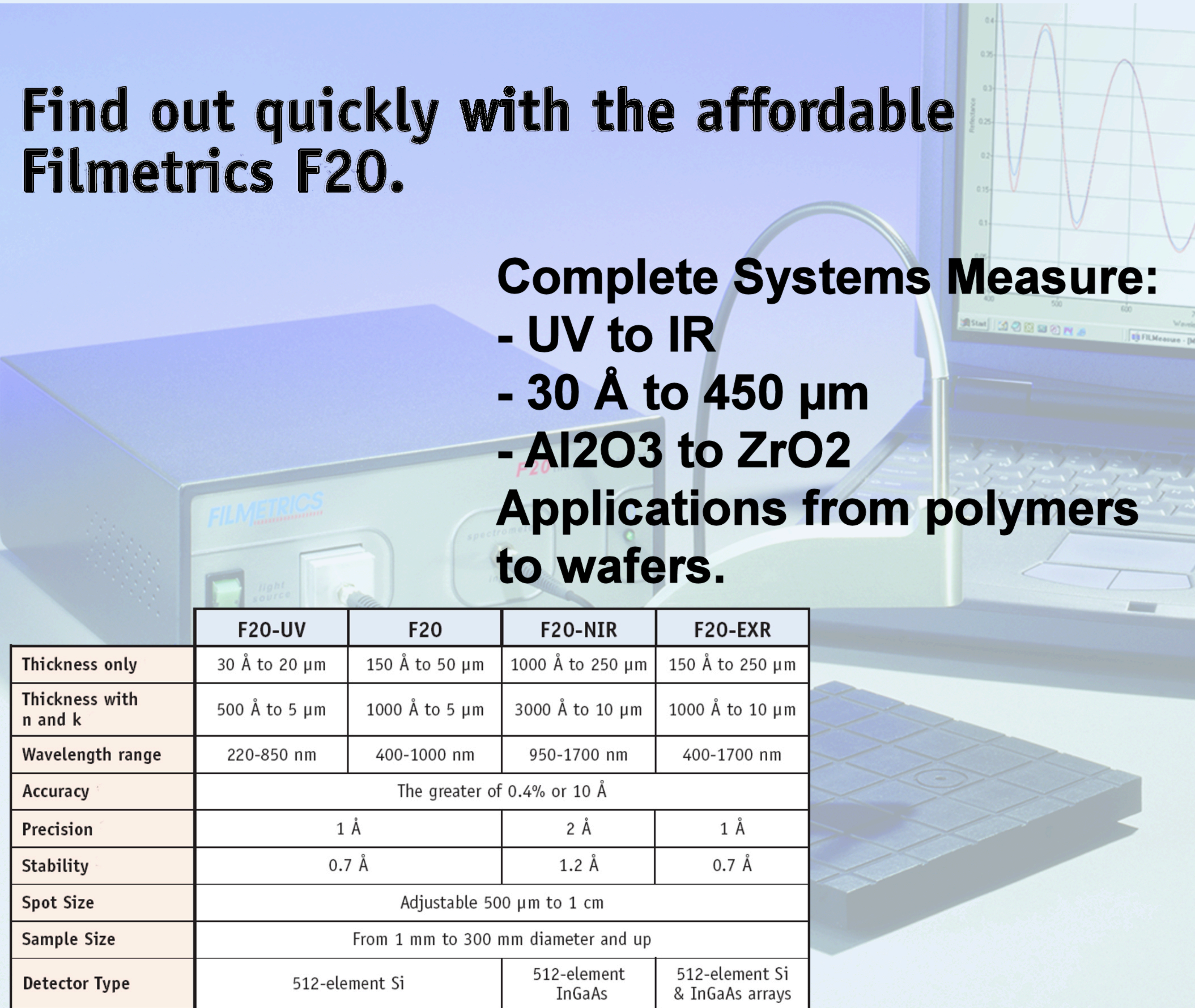
Suite 15, 88-90 Walker Street
Dandenong VIC 3175 Australia

T + 613 9702 4402 F + 613 9708 6883

sales@afwtechnology.com.au
www.afwtechnology.com.au

FILMETRICS

What's Your Film Thickness?



Find out quickly with the affordable Filmetrics F20.

Complete Systems Measure:
- UV to IR
- 30 Å to 450 µm
- Al_2O_3 to ZrO_2

Applications from polymers to wafers.

	F20-UV	F20	F20-NIR	F20-EXR
Thickness only	30 Å to 20 µm	150 Å to 50 µm	1000 Å to 250 µm	150 Å to 250 µm
Thickness with n and k	500 Å to 5 µm	1000 Å to 5 µm	3000 Å to 10 µm	1000 Å to 10 µm
Wavelength range	220-850 nm	400-1000 nm	950-1700 nm	400-1700 nm
Accuracy	The greater of 0.4% or 10 Å			
Precision	1 Å		2 Å	1 Å
Stability	0.7 Å		1.2 Å	0.7 Å
Spot Size	Adjustable 500 µm to 1 cm			
Sample Size	From 1 mm to 300 mm diameter and up			
Detector Type	512-element Si		512-element InGaAs	512-element Si & InGaAs arrays
Light Source	Regulated Tungsten-Halogen			
Computer Requirements	5 MB hard disk space 2 MB free memory Available USB port			
Power Requirements	100-240 VAC, 50-60 Hz, 0.3-0.1 A			

WARSASH Scientific
Advanced Instruments for Research & Industry

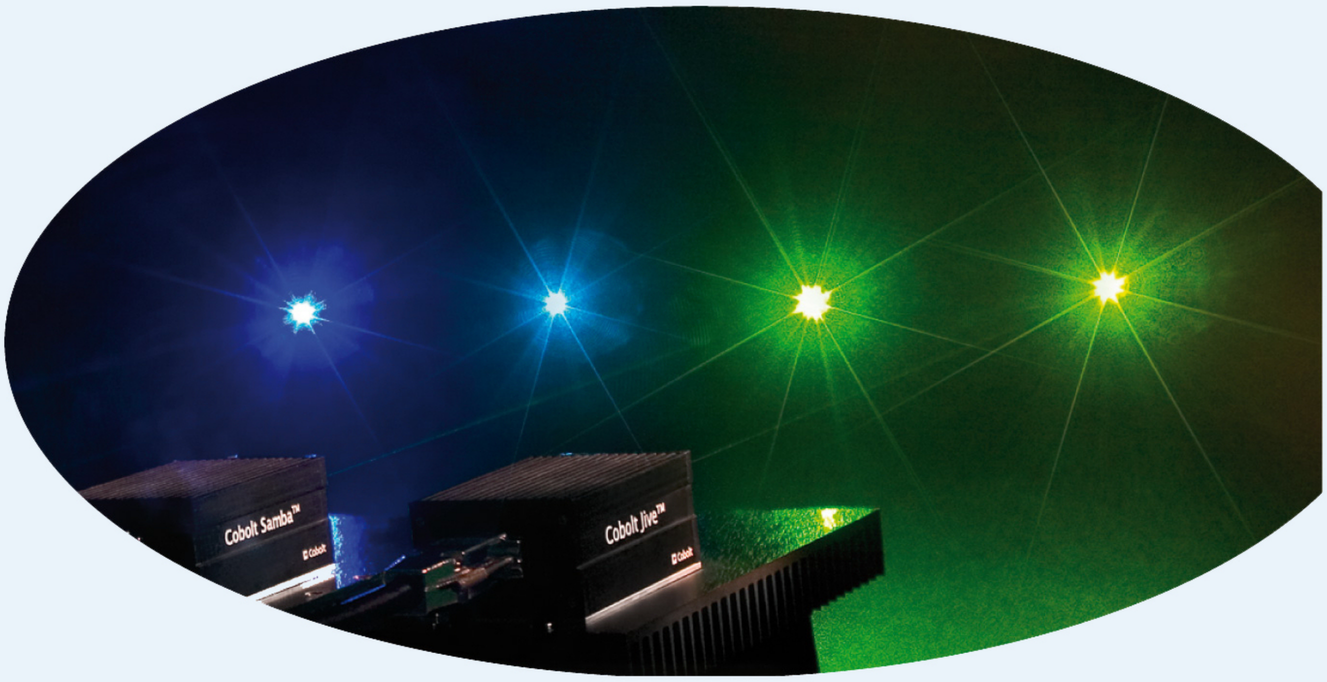
Unit 7, 1 Marian Street, Redfern, NSW, 2016
(adj. to the Australian Technology Park)
Tel: (02) 9319 0122; Fax: (02) 9318 2192
sales@warsash.com.au; www.warsash.com.au

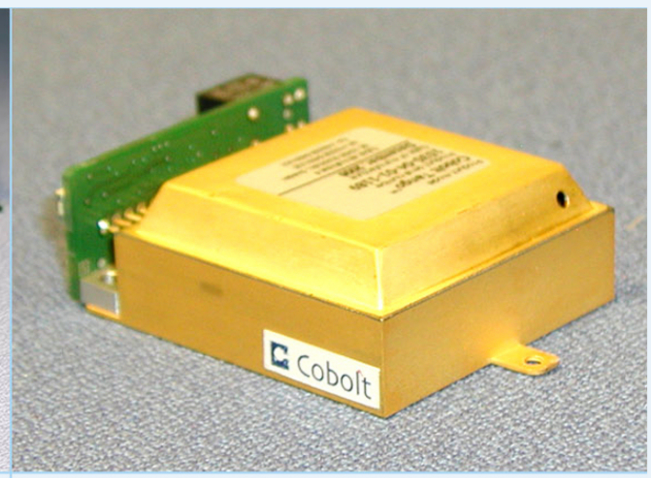
Cobolt

DPSS laser Solutions

Applications:

- Flow Cytometry
- Confocal Mircoscopy
- Spectroscopy
- Holography
- Fluid Dynamics
- Range Finding





Cobolt Dual Calypso™

491 + 532 nm CW DPSSL

20 + 20 mW, 50 + 50 mW

Cobolt Calypso™

491 nm CW DPSSL

25 - 100 mW

Cobolt Jive™

561 nm CW DPSSL

10 - 75 mW

Cobolt Samba™

532 nm CW DPSSL

25 - 150 mW

Cobolt Blues™

473 nm CW DPSSL

25 - 50 mW

Cobolt Tango™

- 1535 nm pulsed microchip laser
- Up to 2 kW peak power in 3 - 5 ns pulses
- Eye-safe wavelength
- Hermetically sealed

WARSASH Scientific

Advanced Instruments for Research & Industry

Unit 7, 1 Marian Street, Redfern, NSW, 2016
(adj. to the Australian Technology Park)
Tel: (02) 9319 0122; Fax: (02) 9318 2192
sales@warsash.com.au; www.warsash.com.au

Fibre Confocal Microscope

New model, compact, robust, easily transportable

The fibered confocal microscope can be adapted to all Raman spectrometers that are equipped with a fibre-optic input, enabling confocal measurements on both a microscopic and a macroscopic scale.

It is the best solution when a completely integrated system, like the LabRAM, is not well suited and where a modular system is needed. Examples are those applications where the analytical part (the spectrograph) and the signal collection part (microscope, probe) must be separated. This fiber-optic configuration turns out to be flexible and easily transportable and is therefore perfectly adapted for measurements in for instance fumecupboards or clean room but also on archaeological sites or on crime sites.

Technical Description:

High stability confocal microscope (OlympusBX41) with a direct laser entry or coupled by optical fibre (single mode or multimode). The microscope is equipped with:

- A true variable confocal hole (0 to 1000 µm)
- Notch filters mounted in a (patented) Kinematic assembly, allowing rapid exchange of excitation wavelengths
- A manual micrometric XYZ stage (motorised stage optional)
- A White light illumination in both reflection and transmission modes
- A high definition integrated colour video camera for viewing simultaneously laser spot and sample under white light illumination

and others options are available as polarisation accessories, heating/Freezing stages…

HORIBA JOBIN YVON

(All HORIBA Jobin Yvon companies were formerly known as Jobin Yvon)

France : HORIBA Jobin Yvon S.A.S., 231 rue de Lille, 59650 Villeneuve d'Ascq. Tel : +33 (0)3 20 59 18 00, Fax : +33 (0)3 20 59 18 08. Email : raman@jobinyvon.fr www.jobinyvon.fr
USA : HORIBA Jobin Yvon Inc., 3880 Park Avenue, Edison, NJ 08820-3012. Tel : +1-732-494-8660, Fax : +1-732-549-2571. Email : raman@jobinyvon.com www.jobinyvon.com
Japan : HORIBA Ltd., JY Optical Sales Dept., 1-7-8 Higashi-kanda, Chiyoda-ku, Tokyo 101-0031. Tel: +81 (0)3 3861 8231, Fax: +81 (0)3 3861 8259. Email: raman@horiba.com
Germany: +49 (0) 6251 84 75-0 **Italy:** +39 02 57603050 **UK:** +44 (0)20 8204 8142
China: +86 (0) 10 6849 2216

US BUYING SERVICE

OPTICS SHOP

www.opticsshop.com.au

Duggo Delivers!
Go Duggo!

A DIVISION OF LASTEK

Save and control your freight costs!

- **$50 delivery ex USA** (for parcels up to 1kg by weight or volume)
- **No extra charges if multiple back order deliveries occur**

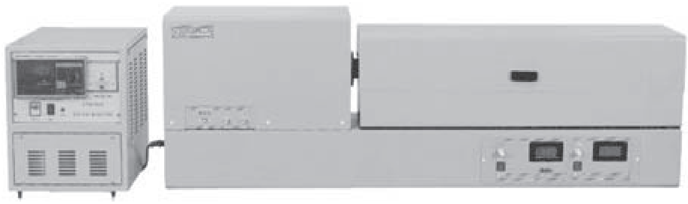
Please contact Caroline at opticsshop@lastek.com.au

Experimental Instruments

LEOI-61 Single-photon Counting Experimental System

Photon counting is a promising detection technique and has been widely applied to the accurate measurement of very weak lights in Raman spectrum, and fluorescence spectrum in substances at 300 to 650nm.

This unit, composed of a single photon counter, external light path and a semiconductor refrigeration system , employs pulse height discrimination technology and has a higher linear dynamic range. It is suitable for educational purposes in universities and colleges.



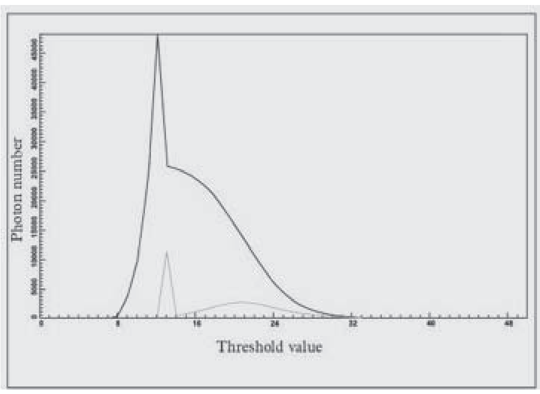
Specifications

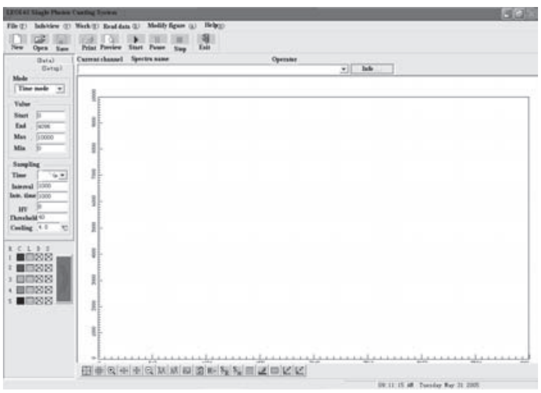
Wavelength Range	360 - 650 nm
Wavelength Repeatability	≤ 0.2nm
Resolution	≤ 0.4nm
Stray Light	$\leq 10^{-3}$
Integration Time	0-30 min (1ms/stop, adjustable)
Threshold Voltage	0-2.56V (10 V/stop, adjustable)
Max Count Reading	more than 10^{7}
Dark Count	less than 30 cps (-20°C)
Relative Aperture	Adjustable from 0 to 2mm

Key Features

- Easy operation
- USB interfaced with Windows application
- High sensitivity and low noise
- Semiconductor refrigeration system

The Windows application software controls the whole system, manages, processes and extracts information from acquired spectra as shown below.





www.lambdasci.com

Lambda Scientific Pty Ltd
2/147, Buxton Street, North Adelaide SA 5006 Australia
Phone: +61 8 8267 2686
Fax: +61 8 8267 2689
E-mail: sales@lambdasci.com

AFW Technologies Pty Ltd

Large diameter core multimode fiber cable assemblies for Broad UV/VIS/NIR spectral range

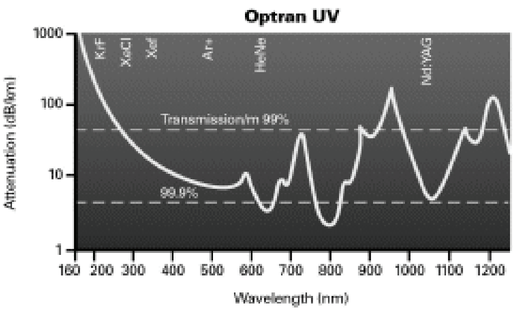
Cable assemblies available with SMA-905 or FC connectors to suit various fiber types and supplied with Low NA – 0.12, standard NA-0.22 or high NA – 0.28.

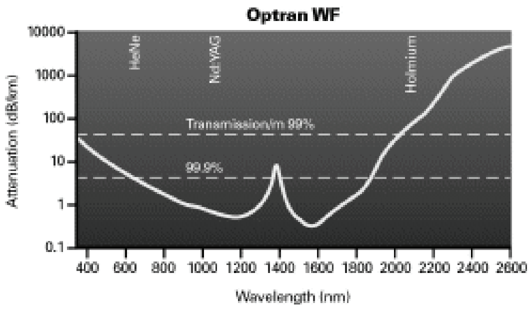
Application

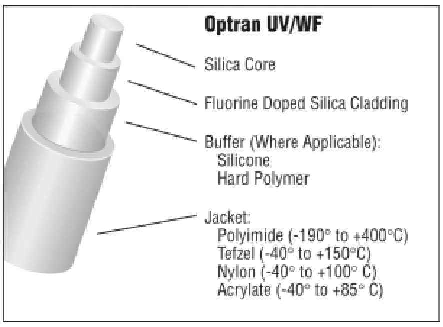
- Spectroscopy
- Sensors
- UV photolithography
- Laser welding / soldering / marking
- Laser delivery
- Nuclear plasma diagnostics
- Analytical instruments
- Laser diode pigtailing
- Pyrometry
- Semiconductor capital equipment

Features

- Broad UV / VIS / NIR spectral range:
  - UV: 160 - 1200 nm
  - WF: 350 - 2500 nm
- Silica core/cladding
- Large core diameters 200/220, 400/440, 600/660, 800/880 µm
- 3mm outer cable diameter with connector boots behind the connector
- Available lengths 1, 2, 3m or custom length
- FC or SMA-905 Alloy connector







Products & technical inquiries please contact:

AFW Technologies Pty Ltd
Tel: +613 9702 4402 Fax: +613 9708 6883
Email:sales@afwtechnology.com.au,
WEB:http://www.afwtechnology.com.au

Product News

Introducing the Brilliant EaZy Q-Switched Nd:YAG laser

Brilliant EaZy is a new compact, lamp pumped Nd:YAG laser combining Quantel's innovative and compact Brio power-supply design with the proven Brilliant laser head and plug-and-play harmonic modules.

The integrated power supply/closed-loop heat exchanger weighs only 14kg and occupies half the space of other power supplies, roughly the size of a PC hard drive tower.
Quick cable disconnects and a convenient carry handle make system transportation easy.

The ability to mount the laser head and / or power and cooling unit either horizontally or vertically allows it to be used in space-limited applications such as LIDAR.

The laser produces > 330mJ @ 1064nm with excellent energy stability (< 2%). The high pulse energy, excellent spatial beam profile, low beam divergence and excellent pointing stability make the laser suitable for spectroscopic applications such as pumping OPOs and dye lasers.

Harmonic modules are easily attached and disconnected from the laser head without the need for alignment, creating a truly plug-and-play laser system. Harmonic modules for 532nm, 355nm and 266nm are available.

Energy specifications (at 10Hz rep. rate) are:

- > 330mJ @ 1064nm
- > 165mJ @ 532nm
- > 90mJ @ 355nm (with high energy UV option)
- > 35mJ @ 266nm

Please contact Gerri Springfield or Paul Wardill for further information;

Coherent Scientific Pty Ltd
sales@coherent.com.au
www.coherent.com.au
(08) 8150 5200

Single Wavelength Diode Lasers

Introducing the New Focus **S**ingle **W**ave**L**ength family of diode lasers - Integral(TM) SWL-7500 - for high performance applications requiring very stable single frequency output.

- Single frequency, mode-hop free operation, keeping in line with New Focus' tuneable laser diode range
- Guaranteed linewidth specification <200kHz
- Coherence length up to 500m
- Three wavelengths ranges - 630-634nm (SWL-7504), 650-660nm (SWL-7505) and 770-785nm (SWL-7513)
- Selected wavelength accuracy +/-50pm
- Output power options up to 70mW
- Good power stability <2%pp guaranteed
- Compact footprint of only 64mm x 61mm including baseplate mount
- Robust construction
- Reliable

Ideal for metrology and test and measurement applications, LIDAR and Raman imaging and spectroscopy.

New Focus. Simply Better™

Please contact Christian Gow for further information on the Integral and other New Focus products.

Coherent Scientific Pty Ltd
sales@coherent.com.au
www.coherent.com.au
(08) 8150 5200

Handheld Variable Optical Attenuator (VOA)

This handheld variable optical attenuator is a very useful instrument in testing, measurement and maintenance of fiber optical systems and networks. It can be used to continuously change the optical power level in the optical fiber.

Specs: 3 to 60dB attenuation range, 1310nm or 1550nm; bi-directional; 1.0dB resolution.

Contact: sales@oemarket.com **or**

Visit www.oemarket.com

New! Thin Film Measurement System from Lambda Scientific

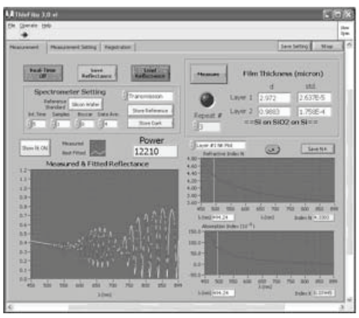
Lambda Scientific is excited to announce the creation of a cost effective way to now measure the thickness of your thin films! The Thin Film Thickness Measurement System is a wonderful addition to the many quality products Lambda Scientific manufactures, based on interference spectral analysis of multi-reflection beams, this instrument functions non-contact optical measurement of thickness, refractive index and absorption index of various optical thin films and coatings.

Example Layers: SiO_2, CaF_2,MgF_2, Photoresist, Polysilicon, Amorphous Silicon, SiNx, TiO_2, Sol-Gel, Polyimide, Polymer Film.
Example Substrates: Silicon, Germanium, GaAs, ZnS, ZnSe, Acrylic, Sapphire, Glasses, Polycarbonate, Polymer, Quartz.

Measurement Features

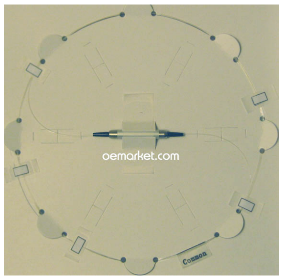
- Substrate refractive index and absorption index evaluation
- Film thickness measurement, mean and standard deviation
- Saving of measured spectral dependent reflectance data
- Statistics of measurement results
- User friendly cursor controlled display of measured results
- Flexible choice of computation wavelength range
- Flexible choice of guess thickness range to minimize computation time
- Convenient selection of film and substrate materials from included database
- User defined materials selection and import.

Thin Film Panel



Lambda Scientific Pty Ltd
Phone: +61 8 8267 2686 Fax: +61 8 8267 2689
E-mail: sales@lambdasci.com
Web: www.lambdasci.com

PM WDM Couplers



We provide various types of polarization maintaining couplers and WDM couplers. These PM couplers are useful in polarization sensitive systems, including sensors, coherent systems, Raman amplifiers, etc. These components feature high power (2W CW), high extinction ratio (>20dB), low insertion loss (0.7dB typical), customized bandwidth. Operating wavelengths include 1550nm, 1310nm, 980nm, 1060nm, etc.

Contact: sales@oemarket.com or

Visit www.oemarket.com

ZEMAX DEVELOPMENT CORPORATION

Lastek is proud to offer ZEMAX Optical Sytem Design Software again!

Lastek is now an authorised agent for Zemax Optical Sytem Design Software for Australia and New Zealand. Please contact Lastek for any questions or inquiries on the Zemax software packages and licenses.

ZEMAX Advanced + Illumination training in Singapore 29th October - 2nd November:

Instructor Profile: Andrew Locke:
Andrew is an Optical Engineer at ZEMAX Development Corporation with a BS in Optical Engineering from the University of Arizona. Andrew has more than 10 years' experience in the optics industry. Prior to working for ZEMAX Development Corporation, Andrew worked in the data storage metrology industry. He has been teaching both private and public classes on ZEMAX for more than 2 years.

Course Content: Advanced Optical Design Using Zemax:

Solves & Optimization
Simple Designs (Doublets & Newtonian Telescope)
Coordinate Breaks
Afocal Analysis
Multi-Configuration Systems (Zoom Lens, Scanning System, Thermal Analysis)
Programming ZEMAX (ZEMAX Programming Language, ZEMAX Extensions)

Image Analysis
Diffractive Optics
Polarization Analysis & Coatings
Gaussian Beam Analysis
Fiber Coupling
Physical Optics Propagation
Tolerancing
Illumination & Stray Light Analysis:

Overview of Non-Sequential Components (NSC)
Polarization & Coatings
Scattering
Ray Splitting, Filters and Ray Database
Stray Light Analysis
Diffractive Optics
Coherence & Interferometers
ZEMAX Programming Language (ZPL)
Light Pipes
CAD Export & Import
Free-Form Reflectors
Optimization
Projection Systems
Complex Object Geometries

For more information please contact Lastek at sales@lastek.com.au

Ocean Optics HR4000CG UV-NIR Composite-grating Spectrometer

The HR4000CG Composite-grating (CG) Spectrometer uses our HC-1 Grating -- a revolutionary and proprietary variable-blazed grating specifically designed to provide full spectral output throughout the 200-1100 nm range, with best efficiency at 200-1050 nm. The revolutionary HR4000CG is a preconfigured HR4000 Spectrometer with all of the optical bench options already selected for you, and is now available for immediate delivery from the USA.

The HR4000CG Spectrometer utilizes a 5 μm entrance slit, proprietary HC-1 grating and patented order-sorting filter to provide a 200-1100 nm wavelength range and excellent optical resolution: 0.75 nm (FWHM). The HR4000CG comes with a 3648-element linear-array CCD detector that not only provides better optical resolution throughout the 200-1100 nm range, but also provides improved sensitivity in the 1070-1100 nm region. The HR-series Spectrometers use the "HR" Optical Bench and come with UV Detector Upgrades to enhance the performance of the spectrometers in the UV.

Features:
Wide range (200-1100 nm) broadband spectrometer
High resolution (0.75 nm FWHM)
Installed HC-1 composite grating and order-sorting filter
Works with SpectraSuite Spectrometer Operating Software
For more information please contact Lastek at sales@lastek.com.au

Lastek Pty Ltd
Adelaide University - Thebarton Campus
10 Reid St, Mile End, South Australia 5031
Phone: (08) 8443 8668
Toll Free: 1800 882 215 (NZ: 0800 441 005)
email: sales@lastek.com.au
web: www.lastek.com.au

Kimmon HeCd lasers

Kimmon, the world's oldest and largest manufacturer of Helium Cadmium lasers currently offers 18 models of our IK series 325nm laser, 10 models of our IK Series 442nm laser and 10 models of our IK series dual wavelength 325nm & 442nm laser.

Kimmon's 35 years of He-Cd laser manufacturing experience allows Kimmon to provide He-Cd lasers with the highest polarised output power, average lifetimes and reliability. This superior performance over the past 3 decades along with the best warranty available has resulted in Kimmon having the largest worldwide installed base of HeCd lasers.

Kimmon's He-Cd lasers are used in various applications, including Photoluminescence, Raman Spectroscopy, Biosciences, Flow Cytometry, Lithography, Photopolymer exposure, Printing, Precision measurement and Holography.

Warsash Scientific represent Kimmon Laser Systems in Australia and we are pleased to announce an extension of Kimmon's range of lasers to include Helium Neon 633nm, Nd:YAG 1064nm, Blue Violet 408nm lasers.

For more information please contact Warsash Scientific.

He-Cd Laser: IK Series He-Cd Laser: 325nm (UV), 442nm (Blue) and Dual Wavelength

Renishaw Raman Systems: StreamLineT

Renishaw Raman Systems, leader in high efficiency Raman microspectrometers have released a new chemical imaging technology, StreamLineT , which enables you to produce Raman chemical images far faster than has been possible before. Raman images that used to take hours to produce can now be created in minutes. (approximately 100x faster than point mapping !)

StreamLineT technology is available as an option for Renishaw's inVia Raman microscopes. It comprises proprietary hardware and software that dramatically increase the speed of data acquisition. The resultant image is in fact a hyperspectral data cube, with Raman spectra collected for every single point, without any loss of spectra resolution. Raman Spectroscopy is extremely chemically selective technique and Renishaw's patented high efficiency spectrometers have brought Raman into the mainstream as a standard tool for chemical analysis & identification.

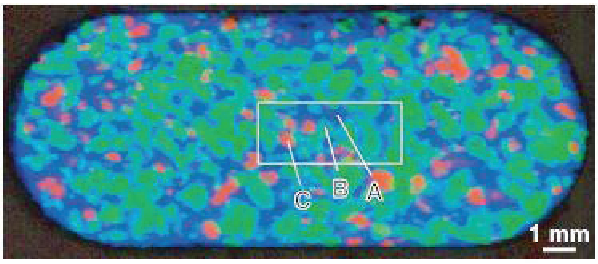
StreamLine's applications include materials science, component distribution determination in pharmaceuticals, imaging of biological samples, forensic analysis, semiconductors, minerals, etc.

Warsash Scientific represent Renishaw Raman Systems in Australia & New Zealand and have over 13 years of experience supplying Raman spectrometers for a variety of chemical identification applications. Please contact Warsash to discuss a Raman spectroscopy solution customised to your research needs.

For more information please contact Warsash Scientific.

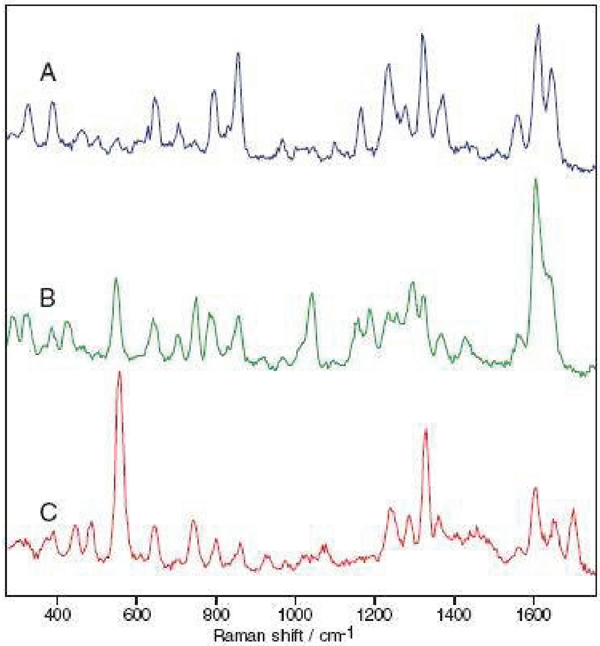
Warsash Scientific Pty Ltd
Unit 7, 1 Marian Street Redfern NSW 2016
(adj to the Australian Technology Park)
PO Box 1685 Strawberry Hills
NSW 2012 AUSTRALIA

Tel: +61 (0)2 9319 0122
Fax: +61 (0)2 9318 2192
Mob: +61 (0)403 180 085



StreamLine™ image of a pharmaceutical tablet (size 18 mm × 7 mm), acquired in 30 minutes (50 ms per spectrum).

Colour coding: caffeine (red); aspirin (green); paracetamol (blue).



StreamLine™ spectra from the three locations indicated in the figure above, showing the very high data quality.

Australian Optical Society Awards

AOS W. H. (Beattie) Steel Medal	Closing date for nominations - 15 February each year.
AOS Postgraduate Student Prize	Applications close on 31 October each year.
AOS Technical Optics Award	No closing date for nominations
Warsash/AOS Student Prize	Applications close on 30 June each year

See the AOS web site for further information http://aos.physics.mq.edu.au

Spectrum Detector Inc: ***Detector Solutions that Cover the Spectrum.***

About our company:

Spectrum Detector, Inc. is a company founded on a passion for creative technical solutions to optical measurements that cover the spectrum ... UV to Extreme IR.

We have assembled a staff with more than 60 years of experience in Pyroelectrics, Detector Instrumentation and Optical Calibration.

We have quickly become the World Leader in Optical TRAP Detectors based on NIST Boulder technology.

Products you can trust:

We pride ourselves on the design of reliable, high performance detector based products that include:

- ✔ $LiTaO_3$ Pyroelectric Detectors
- ✔ Broadband Pyroelectric Radiometers
- ✔ Silicon and Germanium Radiometers
- ✔ Pyroelectric and Silicon Joulemeters
- ✔ Unique Optical and Thermal TRAP Detector
- ✔ THz Detectors and Instruments

Reliable service:

We're totally focused on our customers needs. We strive to be a part of your team, working closely to find the right detector solution for your measurement challenge.

Services we provide:

- ✔ Responsive technical support
- ✔ Custom engineered detectors and instruments
- ✔ Turnkey optical test sets
- ✔ NIST traceable calibration in Watts and Joules

Spectrum Detector Inc.

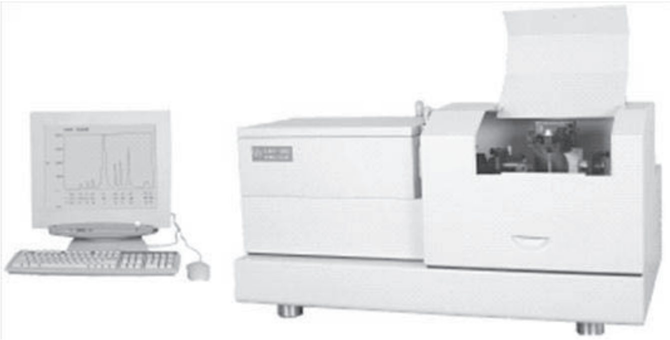
WARSASH Scientific
Advanced Instruments for Research & Industry

Sydney
PO Box 1685
Strawberry Hills
NSW 2012

Tel: (02) 9319 0122
Fax: (02) 9318 2192
sales@warsash.com.au
www.warsash.com.au

LIRA-300 Laser Raman Spectrometer

Laser Raman/Fluorescence Spectrometer is used for Raman spectrum and fluorescence measurements in physics and chemistry labs of research institutes, universities and colleges. Except basic research, it is suitable for educational purposes in universities and colleges due to its cost effectiveness.



Key Features

- USB interfaced with Windows application
- High resolution and low stray light
- Single-photon counter detector with high sensitivity and low noise
- External light path and different lasers allowed
- Solid state laser of more than 40mW at 532nm
- Various accessories for analysis of liquid and solid samples

Specifications

Wavelength Range	200 ~ 800nm (monochromator)
Wavelength Accuracy	≤ 0.4nm
Wavelength Repeatability	≤ 0.2nm
Stray Light	$\leq 10^{-3}$
Reciprocal of Linear Dispersion	2.7nm/mm
Half-width of Spectral Line	≤ 0.2nm at 589nm
Power Supply	AC 220 ~ 240V, 50/60Hz
Overall Dimensions	700(L) × 500(W) × 450(H) mm
Weight	70kg

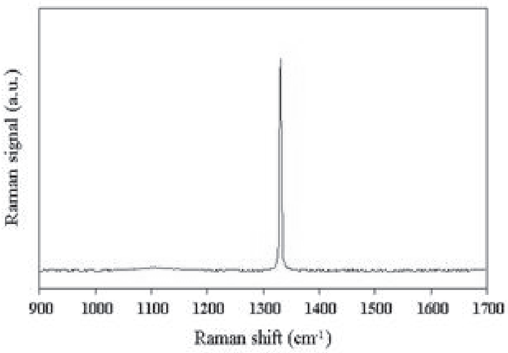


Figure 1 Raman spectrum of CCl_4 with trap filter added

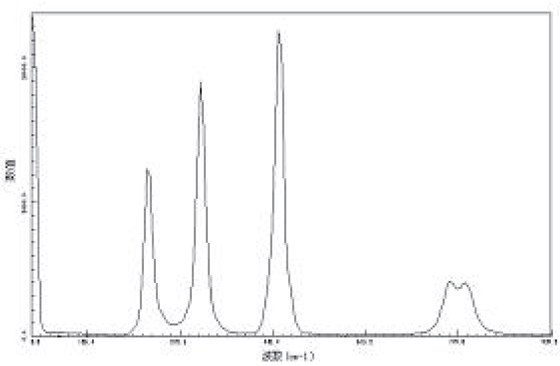


Figure 2 Raman spectrum of natural diamond (type IIa)

Lambda Scientific Pty Ltd
2/147, Buxton Street, North Adelaide SA 5006 Australia
Phone: +61 8 8267 2686
Fax: +61 8 8267 2689
E-mail: sales@lambdasci.com

NEWSLETTER

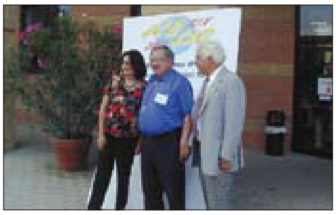
COMMISSION INTERNATIONALE D'OPTIQUE ● INTERNATIONAL COMMISSION FOR OPTICS

Arthur Guenther leaves a brilliant legacy

We remember the unique contribution of a key figure in ICO.

Arthur H Guenther (1931–2007).

Ari T Friberg, ICO president, and Arthur Guenther at the V RIAO/VIII OPTILAS meeting held in Isla Margarita, Venezuela, in October 2004.



María L Calvo, Arthur Guenther and René Dändliker at the ICO-19 General Congress and Assembly, in August 2002,

It is always a sad and difficult task to write an obituary. It is even harder when it refers to a friend and colleague who has been a key individual at ICO during the past decade.

Arthur H Guenther, Art to his friends and colleagues, died on 21 April at his home in Albuquerque, New Mexico.

Art was a research professor at the University of New Mexico (UNM) Centre for High Technology Materials (USA). He arrived at UNM after a career as chief scientist with the US Air Force, chief scientist for advanced defence technology at the Los Alamos National Laboratory, and science adviser for laboratory development and manager of alliances for Sandia National Laboratories. In 1998 he helped found the New Mexico Optics Industry Association. He promoted optics education programmes, constructing a career ladder for optical technicians and theorists at West Mesa High School, Central New Mexico Community College and UNM.

Remembering Art is to recall many aspects of his activities and his multifaceted personality. He was brilliant, very talented and very much involved in the development and expansion of optics and photonics.

A strong focus on optics

Art was constantly developing the kind of initiatives that made sense to the optics community and benefited many of us. His wide spectrum of activities was focused on developing both centres and institutions. Moreover, it represented a very general and generous offer to many colleagues from all over the world.

I had the great fortune to work with Art during his various periods as a member of ICO Bureau. He was elected ICO vice-president for the term 1996–1999 then ICO president during the period 1999–2002, and he later acted as ICO past-president for 2002–2005.

Art was very interested in expanding opportunities for the education and training of young researchers, professionals and photonics technicians and coordinated many training programmes. He was deeply involved in the Education and Training in Optics and Photonics series of meetings, an international forum in collaboration with the Optical Society of America (OSA), the International Society for

PIERRE CHAVEL

The ICO Bureau meeting held in Joensuu, Finland, in July 2003. Arthur Guenther is on the far right.

Optical Engineering (SPIE) and, very recently, the Institute of Electrical and Electronic Engineers/Laser Electro-Optics Society. He was also a strong advocate for the development of African centres and for the involvement of the African Laser, Atomic and Molecular Physics and Optics Network. He was one of the organizers of the first ICO topical meeting held in Dakar, Senegal in 2000.

It is difficult not to be impressed by the consistency of Art's opinions on the development of science as a unique instrument to improve local education programmes and technological projects. He was one of the creators of the book *Harnessing Light*, as well as many other texts, including the fifth volume of *International Trends in Applied Optics*. He also promoted the provision of free educational texts to centres in developing countries.

In June 2006 Art was appointed as a member at large of the US Advisory Committee for the International Commission for Optics (USAC-ICO), which represents the interests of the US optics community internationally.

All of this is a very short review for such an enormous task and dedication. Art was the factor of the lemma "ICO, the place were the World of Optics meets", which now appears as a welcome on the ICO website. This should be assumed by us all to maintain our common co-operation for optics and photonics.

ICO expresses here its condolences to all in the optics community, SPIE, OSA, the USAC-ICO Committee and the colleagues who are mourning this sad loss.

Finally, we would like to express our sympathies to his wife, Joan, his great companion, and all of his family.

María L Calvo, ICO secretary

Arthur Guenther: another tribute to a champion of optics

Pierre Chavel remembers a leading figure in the optics community.

Prof. Arthur H Guenther has left us, shortly after celebrating the 50th anniversary of his graduation with a PhD from Pennsylvania State University. He was not only a friend, but also a respected leader with a sense of vision, devoted to serving the field of optics at the boundary between science, technology and the economy. As the secretary of ICO during Art's presidency, from 1999 to 2002, I wish to offer a testimony of his conviction that the coordination of the optics community worldwide has its role to play in the wellbeing of our societies throughout this century – a teaching that we should not forget.

A volunteer in optics learned societies for many years, Art came to ICO through the US Advisory Committee for ICO, where he served for several years. He was nominated for vice-president in 1996 and, after his election in that capacity, he immediately joined the ICO Long Range Planning Committee – quite an appropriate choice, given his gift and taste for global perspectives – as well as the ICO Standards Committee and the ICO Fellowship Committee. During that period he also played a significant role in the organization of the ICO XVIII Congress held in San Francisco in August 1999. Through his activity in the Bureau it soon became obvious that he had the talent required to lead the Commission and he was elected president at ICO XVIII.

Supporting global exchange

During his term as president, Art stressed the new initiatives that could bring together scientists from all countries where optics activity exists in higher education, research or business. The already strong links between ICO and the Abdus Salam International Centre for Theoretical Physics were instrumental in several of these activities.

Art thus chaired the advisory committee for the first ICO major event in Africa: the Topical Meeting on Optical Sciences and Applications for Sustainable Development held at Université Cheick Anta Diop, Senegal, in April 2000, under the auspices of the African Laser, Atomic and Molecular Physics and Optics Network (LAM). He also contributed to the African Laser Network initiative, which was being discussed at that time, and he took part in the LAM meeting organized by the University of Tunis El Manar in Tunis in December 2002.

He was supportive of optics initiatives worldwide and expended time and energy to help them to grow, striving to unify the efforts of all bodies that in one way or another contribute towards a common goal of the global development of optics. In 2002 he wrote: "The ICO is looking towards Latin America, both Central and South America, as fertile areas for assistance, which can take the form of travelling lecturers and fellowships, or to further participate, for example, in the ICTP optics programmes in Trieste. The Latin American Initiative is being done in collaboration with the US Advisory Committee to the ICO as an initiative in their role as the US voice for ICO."

GLENN SINCERBOX

The Bureau meeting in San Francisco in 1999 as Prof. A H Guenther takes over the presidency from Prof. T Asakura.

He had a global vision for the development of optics and thought of ICO as a useful instrument to carry it further, in the long term, acting as a neutral platform where members of the optics community and learned societies in all countries could meet on an equal basis. He gave ICO its vision statement: "ICO, the place where the World of Optics meets".

His vision of the 21st century as the "age of light" and the role of optics in international co-operation underlie many of his commitments outside ICO. As part of his professional activity as a chief scientist in a laboratory on Kirtland Air Force Base in New Mexico, and as a professor at the University of New Mexico in Albuquerque, he played a prominent role in the Laser-Induced Damage symposium, also known as the Boulder Damage symposium, for more than 35 years. Through this he became acquainted with scientists in that domain from all over the world including, at the time, the USSR where he had close friends.

Between 1996 and 1998, as a member of the Committee on Optical Science and Engineering, he participated in the US National Research Council study *Harnessing Light* and later publicized its findings as a guest speaker at many events, starting in China in 1998. As a follow-up measure to that study, he participated in the Coalition for Optics and Photonics and supported the development of optics clusters in every suitable geographical area worldwide.

Of particular importance to him was the development of an optics workforce consisting of the technicians, engineers and scientists of the future who would carry optics research and the development of products and services into the "age of light". He was concerned that more should be done to provide employment with a sufficient number of professionals at all levels so that the potential of optics for society could be realized. He strove to have optics recognized by accreditation bodies in the US, supported the Education and Training in Optics and Photonics initiative, and participated in local and national measures for developing training programmes and education materials. He was likewise concerned with the issue of bringing optics literacy to the general public and, in particular, to all schools.

These objectives for a lifetime commitment to optics were only possible through hard work and dedication, and through a combination of scientific and technical skills with managerial and leadership qualities, plus the ability to discourse in political circles. He served as chief scientific adviser to two governors of New Mexico.

As was aptly said by Prof. María L Calvo, secretary of ICO, Art always had a positive attitude even when dealing with difficulties or conflicting situations. That, also, is a distinctive quality of a genuine leader. We owe Art more than a few lines can convey. We shall remember him with gratitude and respect, and our attachment to him will remain.

Keeping in mind Art's counsels, let me conclude as he would most often conclude his letters, "for optics".

Pierre Chavel, former ICO Secretary General (1990–2002)

Roger Lessard proved a tireless ambassador for optics

We pay tribute the president of the ICO Canadian Territorial Committee.

Roger A Lessard (1944–2007).

Roger A Lessard died on 26 February, in Quebec City, Canada, after a battle with cancer.

Dr Lessard obtained a bachelor's degree in science from the Université de Moncton, Nouveau-Brunswick (Canada) and in physics from Université Laval. In 1973 he graduated with a DSc in physics and optics from Université Laval where he went on to spend most of his career as a researcher and professor.

He was director of the Department of Physics, Engineering Physics and Optics at Université Laval. A tireless builder, he founded the Centre for Optics, Photonics and Lasers there in 1989. He was also co-founder of Holospectra (which became Lasiris and is now StockerYale) and Laser InSpeck (which is now InSpeck). He sat on the board of directors of Gentec Electro-Optics and the Société du Centre des Congrès de Québec. He was a member of the scientific committee of Molex, a company located in Chicago, and acted as a consultant to numerous start-up and established businesses in the province of Quebec and in the rest of Canada.

Dedicated to science

Dr Lessard was an active member of a number of scientific organizations. He was a fellow of the International Society for Optical Engineering (SPIE), the Optical Society of India, the Optical Society of America and the International Commission for Optics (ICO), of which he was president of the Canadian Territorial Committee for the last five years. He was also a senior member of the Institute of Electrical and Electronic Engineers.

He was involved in many international initiatives and activities aimed at the enhancement of programmes in optics and photonics, in particular in developing countries. In 2000 he was a participating lecturer at the inaugural ICO Topical Meeting on Optical Science and Applications for Sustainable Development, held in Dakar, Senegal.

He was named Ambassador of the Year for Quebec City in 1996 as a result of his organization of several international scientific conferences. In 1998 the Quebec Tourism Board also named him Ambassador of the Year. He received an honorary doctoral degree from the Université Blaise-Pascal in France for his contributions to holography and to the development of optical materials. The Quebec Association for Industrial Research gave him a lifetime achievement award for his contributions to the field of optics in the greater Quebec region and, in May 2002, he was named Knight of the National Order of Quebec for his dedication to the development of optics in Quebec and internationally.

Editorial expertise

Among his many activities, Dr Lessard acted as interim editor of SPIE's *Optical Engineering* journal. He served a one-year term in 2000 while editor Donald C O'Shea took up the SPIE presidency that year. He was also a member of the editorial board of *Optical Engineering* for several years, with his areas of expertise being in photophysics, spectroscopy and optical data storage. He was a member of the SPIE board of directors from 1998 until 2000.

A special session "A Tribute to Roger Lessard and Art Guenther" was organized at the last Education and Training in Optics and Photonics (ETOP) meeting, held in Ottawa, in June 2007. The session addressed the many contributions made by both of these important figures and gave all of the attendees the opportunity to honour them and their work in the optics community. Details will appear in the ETOP 2007 report in the October 2007 issue of the *ICO Newsletter*. A second special session will commemorate Art Guenther and Roger Lessard at the forthcoming ICO topical meeting, to be held in Cape Coast, Ghana, November 2007.

Henri H Arsenault, former ICO vice-president (1999–2002)

G8–UNESCO forum argues for reform across the globe

ICTP forum focuses on education, research and innovation.

The opening session of the G8–UNESCO forum Education, Research and Innovation, held in Trieste on 10–12 May 2007. From left to right: K Matsuura, director of UNESCO, R Prodi, Italian prime minister, U Calzalari, rector of the University of Bologna, P Supachai, secretary general of UNCTAD and KR Sreenivasan, director of ICTP.

The Abdus Salam International Centre for Theoretical Physics (ICTP) hosted the G8–UNESCO forum in Trieste on 10–12 May 2007. The main focus of the event was Education, Research and Innovation: New Partnership for Sustainable Development. It was attended by 600 experts in science, policy and industry scope from 60 countries. Among them were two winners of the Nobel Prize for Physics (M Perl and C Rubbia), three Italian ministers (G Fioroni, minister of education; F Mussi, minister of the university and research; L Nicolais, minister for reform and innovation) and six African ministers of education from the Democratic Republic of Congo, Egypt, Ghana, Rwanda, South Africa and Uganda.

The opening ceremony was chaired by Prof. K R Sreenivasan, ICTP director, and was honoured by the attendance of Romano Prodi, prime minister and president of the Council of Ministers of Italy, and Koïchiro Matsuura, director general of UNESCO.

In his introduction Prodi urged Matsuura to begin a process directly aimed at materializing strategic programmes for education in those parts of the world where huge difficulties are giving rise to a great challenge for development.

Five key topics

The origins of the forum lie in the 2006 G8 summit in St Petersburg, and the event was focused on three aspects: education, scientific research and technological innovation.

During the three-day meeting, 10 sessions took place dedicated to various crucial issues: universities, research, institutions and industry; the development of partnerships in global innovation and society; education in the knowledge-based society; global environmental challenges; and sustainable development and health, energy and knowledge. In particular, in the session dedicated to universities, research institutions and industry, there was general agreement that universities are still applying an old-fashioned model (a rather medieval concept) to their internal organizations. Universities need to overcome obsolete systems and provide updated disciplines for modern training.

Universities now require large budgets for efficient functioning (as expressed by U Calzalari, rector of the University of Bologna). The results obtained from fundamental research have to be freely disseminated for universal knowledge (as proposed by D V Livanov, rector of the State Technological University of Moscow). Also, Z Xinsheng of the UNESCO executive board of directors noted the importance of the impact of China on science and technology in the coming years. As with India, indicators predict a high rate of growth in the young population.

The conference room during the speech of U Cazalari, rector of the University of Bologna.

Regarding the current educational status in Africa, a special session devoted to science, technology and innovation in African regions was organized, with particular emphasis on the sub-Saharan situation. One conclusion was the forthcoming launch of a network of centres of excellence for sustainable development. This was a clear decision reached following the intervention of various African ministers of science and technology, stating that the current conditions for the development of new programmes in science at universities in many African countries are quite unfavourable.

Two ICO representatives attended the forum (M L Calvo, secretary and G von Bally, associate secretary). ICO is ready to enhance its ties with ICTP initiatives supporting activities in optics and photonics, identifying urgent programmes to be developed in pertinent geographical areas and key subjects. These emerging actions should form part of a bridge between the many areas of modern society in which education may lead the progress of humanity.

More information can be found at http://g8forum.ictp.it/

María L Calvo, ICO secretary

To find out about forthcoming events with ICO participation, see the events page of the ICO website at www.ico-optics.org/events.html

Contacts

International Commission for Optics (www.ico-optics.org).

Bureau members (2005–2008)

President A T Friberg
Past-president R Dändliker
Treasurer A Sawchuk
Secretary M L Calvo, Departamento de Óptica, Universidad Complutense, 28040 Madrid, Spain. E-mail mlcalvo@fis.ucm.es.
Associate secretary G von Bally
Vice-presidents, elected
S N Bagayev, A M Guzmán, G F Jin, B Y Kim, M Kujawinska, H Lefèvre, J Love, I Yamaguchi
Vice-presidents, appointed
J Braat, M Gu, I C Khoo, G Sincerbox, P Stahl, A Wagué
Senior adviser (ad personam)
P Chavel
IUPAP Council representative
Y Petroff

IOP

Responsibility for the accuracy of this information rests with ICO. President: Ari T Friberg, Royal Institute of Technology, Optics, Electrum 229, SE-164 40 Kista, Sweden; e-mail ari.friberg@imit.kth.se. Associate secretary: Gert von Bally, Laboratory of Biophysics, Medical Centre, University of Münster, Robert-Koch-Str. 45, D-48129 Münster, Germany; e-mail lbiophys@uni-muenster.de.

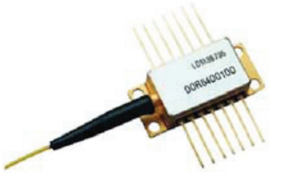
oeMarket.com

www.oemarket.com

Opto-Electronics	Fiber Optics	Fiber Connection	Test Equipment

10Gbps Surface Mount PIN/TIA detector module – InGaAs PIN integrated with low noise TIA, 1280nm to 1580nm, 10.7Gbps, surface mount MSA package
10GHz PIN photodetector – 10GHz 3dB bandwidth, InGaAs/InP planar photodiode, 1100nm to 1650nm operating wavelength
1GHz ~ 2.5GHz photodiode – 1G~2.5GHz PIN, fibre pigtailed, low cost
Optical power monitor – pigtailed photodiode packaged with tap coupler, low cost optical power monitoring, 2GHz 3dB bandwidth

2.5Gbps receiver modules – multi-rate clock and data recovery circuits (four different bit rates), APD or PIN photodetector, high sensitivity, analog optical input level monitor, +5V single power supply, DIP metal package

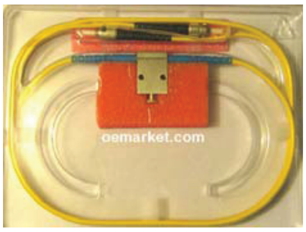


DFB / FP laser diodes – coaxial pigtailed or butterfly package, 1310nm, 1490nm and 1550nm, integrated TEC and PD monitor, high output power, high modulation bandwidth, applications in analog and digital optical links.
Un-cooled SLED diodes – 1310nm or 1550nm**,** >50nm bandwidth
CWDM DFB Laser Diodes – ITU grid CWDM wavelengths

Optical transceivers for passive optical networks – EPON transceivers, 1.25Gbps, burst-mode, single fiber bi-directional, 1310nm/1490nm WDM, +3.3V single power supply, metallic package, 10km and 20km reach.
Multimode transceivers – 1.25Gbps, 62.5/125μm multimode fiber links
155Mbps 1x9 transceivers – 1310nm, 2km, 15km or 40km reach
SFP Transceivers – 1.25Gbps, 1550Mbps, bi-directional

Optical couplers – single mode, multimode, wideband, multi-band, miniature package, polarization maintaining, 1x3, 1x4, star or tree couplers, special wavelengths (from 460nm to 1625nm).
WDM couplers – low cost high quality, 1310, 980, 1480 or 1064nm WDM couplers, multimode WDM couplers
Triplexer WDM Couplers for FTTH – 1310, 1490 and 1550nm mux/demux
Customized WDM devices – red band splitter, 1310nm combiner, etc.
Planar Lightwave Circuits (PLC) Splitters
Polarization Maintaining Couplers - PM WDM couplers

Optical attenuators – fixed attenuators, variable attenuators (all fiber device, collimator type or low cost adapter type), benchtop VOA instrument
Optical switches – opto-mechanical switches, 1x1, 1x2, 2x2,1x4,1x8, 1x16



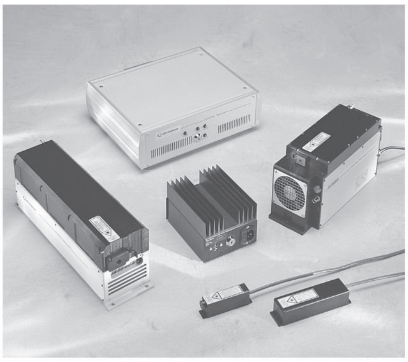
Fiber Optical Products for the Industry

Bitline System Pty. Ltd.
Tel: 02-9597 2689
Fax: 02-9597 1959
Web: www.oemarket.com
Email: sales@oemarket.com

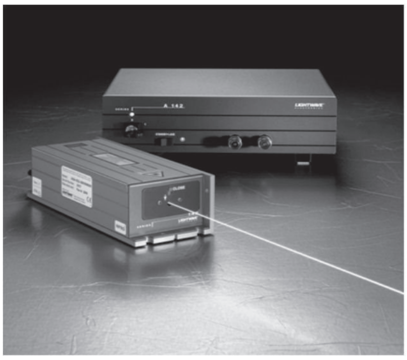
Photon Engineering

Photon Engineering Pty Ltd
PO Box 122 Rundle Mall
Adelaide SA 5000 AUSTRALIA
Tel: +61 - 8 - 8232 3444
Fax: +61 - 8 - 8232 9333
info@photonengineering.com.au
www.photonengineering.com.au

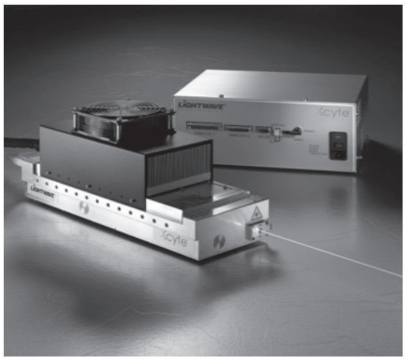
Specialists in Solid-State Laser and Diode Laser Technologies



Compact DPPS Lasers

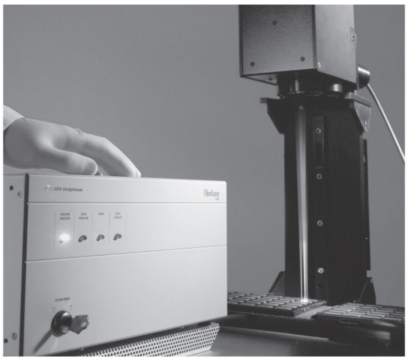


Single Frequency DPPS Lasers



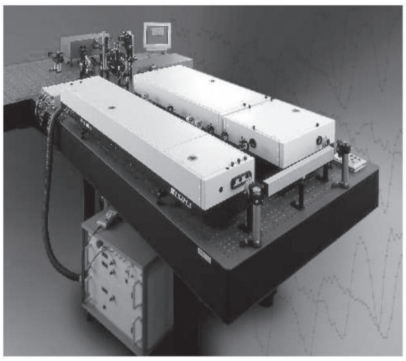
Multi-Watt IR, Green & UV DPSS Lasers

Diode Lasers & Fibre Lasers



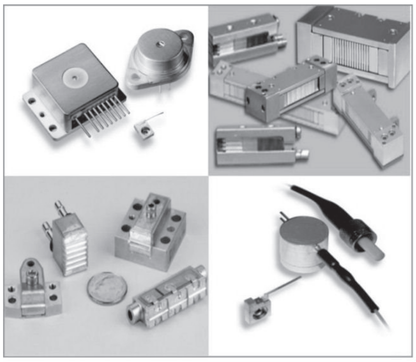
Integrated Industrial Lasers

Tunable Lasers & OPO's

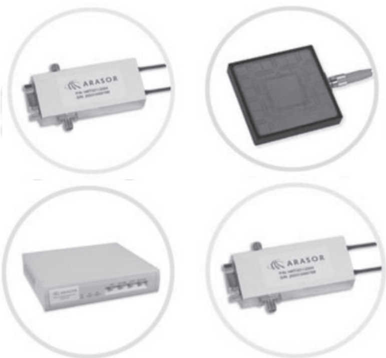


Custom Solid-State Lasers

DPSS Pump Modules

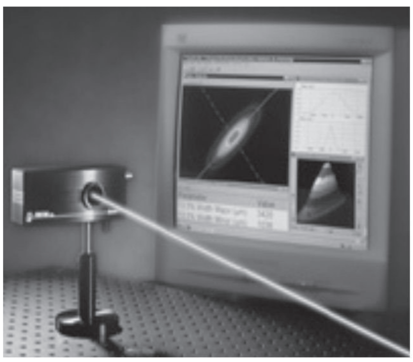


Laser Diodes, Bars & Arrays



Fibre Optic Components & Sub-systems

Optics, Optical Mounts & Micropositioners



Laser Beam Profilers, Power & Energy Meters

Index to Advertisers

Australian Fibreworks 18, 19, 25

Coherent Scientific...................................back cover

Lambda Scientific...24, 31

Lastek...........................13, 22, 23, inside front cover

oeMarket 17,36

OFTC 1

NewSpec...40

Photon Engineering................ 37, inside back cover

Warsash Scientific.....................................20, 21, 30

Corporate Member Address List

ARC COE for Quantum-Atom Optics
Building 38A, Science Road,Australian National University,
Canberra ACT 0200
Tel: (02) 6125 2811
Fax: (02) 6125 0741
Hans.bachor@anu.edu.au, http://www.acqao.org

AFW Technologies Pty. Ltd.
Suite 15, 88-90 Walker Street
Dandenong, Victoria 3175, Australia
Tel: +61 3 9702 4402
Fax: +61 3 9708 6883
Email:sales@afwtechnology.com.au
Web: www.afwtechnology.com.au

Bandwidth Foundry Pty Ltd
Suite 102, National Innovation Centre,
Australian Technology Park, Eveleigh, NSW, 1430
Tel: (02) 8374 5300
Fax: (02) 8374 5301
info@bwfoundry.com
http://www.bwfoundry.com

Coherent Scientific Pty Ltd
116 Sir Donald Bradman Drive
Hilton, SA, 5033
Tel: (08) 8150 5200
Fax: (08) 8352 2020
scientific@coherent.com.au, http://www.coherent.com.au

CUDOS
School of Physics,
University of Sydney, NSW, 2006
Tel: (02) 9351 5897
Fax: (02) 9351 7726
cwalsh@physics.usyd.edu.au

Francis Lord Optics (Avtronics)
33 Higginbotham Rd, Gladesviile, NSW, 2111
Tel: (02) 9807 1444
Fax: (02) 9809 7136

`

Lambda Scientific Pty Ltd
2/147 Buxton St , North Adelaide, SA 5006, Australia
Tel.: +61 8 8267 2686
Fax: +61 8 8267 2689
email michaellee@lambdasci.com
http://www.lambdasci.com

Laserex Technologies Pty Ltd
5A Corbett Court, Export Park SA 5950, Australia
Tel. +61 8 8234 3199
Fax.+61 8 8234 3699

Lastek Pty Ltd
GPO Box 2212, Adelaide, SA, 5001
Tel: (08) 8443 8668
Fax: (08) 8443 8427
alex@lastek.com.au, http://www.lastek.com.au

NewSpec Pty Ltd
83 King William Rd, Unley, SA 5061
Freecall 1800 153 811
Tel: (08) 8273 3040
Fax: (08) 8273 3050
sales@newspec.com.au, http://www.newspec.com.au

oeMarket.com - Bitline System Pty Ltd
8 Princes St
BEXLEY NSW 2207
Tel:02 9597 2689
Fax:02 9597 1959
info@oemarket.com,http://www.oemarket.com/

OptiScan Pty Ltd
PO Box 1066, Mt. Waverley MDC, VIC 3149
Tel: (03) 9538 3333
Fax: (03) 9562 7742
rogerw@optiscan.com.au, http://www.optiscan.com.au

Photon Engineering
PO Box 122, Rundle Mall, Adelaide, SA 5000
Tel: (08) 8232 3444
Fax: (08) 8232 9333
info@photonengineering.com.au
www.photonengineering.com.au

Raymax Applications Pty Ltd
PO Box 958, Unit 1/303 Barrenjoey Road
Newport Beach, NSW, 2106
Tel: (02) 9979 7646
Fax: (02) 9979 8207
sales@raymax.com.au
http://www.raymax.com.au

Warsash Scientific Pty Ltd
PO Box 1685, Strawberry Hills, NSW, 2012
Tel: (02) 9319 0122
Fax: (02) 9318 2192
sales@warsash.com.au

WaveLab Scientific Pte Ltd
Blk 2, Bukit Batok St 24, #06-09 Skytech Building,
Singapore 659480
Tel: 65-65643659
Fax: 65-65649627
bob@wavelab-sci.com, http://www.wavelab-sci.com

AUSTRALIAN OPTICAL SOCIETY

ABN 63 009 548 387

2008

Subscription Renewal Form

Postal Address

Title | Initials

First Name(s)

Surname

Employer/Institute/Company

Telephone Number

Facsimile Number

email

Affiliations (please tick) AIP ☐ OSA ☐ SPIE ☐

Main Activities (number up to three, in order of importance)

First ☐ Second ☐ Third ☐

1 astronomical optics
2 atmospheric optics
3 communications and fibres
4 electro-optics
5 fabrication and testing
6 information processing
7 lasers
8 optical design
9 optical physics
10 radiometry, photometry & colour
11 spectroscopy
12 thin films
13 vision
14 quantum optics
15 nonlinear optics
16 teaching
17 holography
18 (.....................................)
19 (.....................................)
20 (.....................................)

Email Notices: Notices will be sent to the email address provided. Do you wish to receive posted notices as well? *Yes* ☐ *No* ☐

SUBSCRIPTION RATES (inc. GST): Corporate: A$ 290 p.a. Member A$ 43 p.a. Student A$ 16 p.a.

PAYMENT METHOD *(please tick*

*Cheque** ☐ *MasterCard* ☐
Money Order ☐ *Bankcard* ☐
Visa ☐

Send form and payment to:

A/Prof Stephen Collins, Hon Treasurer AOS
OTRL (F119), Victoria University, PO Box 14428
Melbourne, Vic 8001, AUSTRALIA
Tel: (+61) 03 9919 4283; Fax: (+61) 03 9919 4698
email: stephen.collins@vu.edu.au

Cheques payable to "THE AUSTRALIAN OPTICAL SOCIETY" (Please do not staple cheques to this form; use a paperclip)

If paying by credit card please complete ALL boxes in this authorisation. Incomplete forms cannot be processed.

EXPIRY DATE /

CARD NUMBER

CARDHOLDER

AMOUNT A$

SIGNATURE

DATE

Newport Experience | Solutions

Spectra-Physics
A Division of Newport Corporation

Newport's new 1918-C Benchtop Performance in the Palm of Your Hand

Measure a lot, with just a little! Newport's new 1918-C Series handheld Power Meters bring the leading edge performance and advanced features you'd expect to find in a benchtop instrument, right into the palm of your hand.

In designing the 1918-C Optical Power Meter, we combined the feedback received from you the customer, and our own 20+years of experience designing, manufacturing and using laser measurement instruments every day. The result is an instrument that sets a new standard in Optical Power Meters.

Whether you are using the power meter to tweak up your laser, or in an application such as laser spectroscopy, multiphoton microscopy, biophotonics, or nanophotonics, we think you'll be impressed with the 1918-C.
Visit www.newport.com/1918-C

> Compact and ergonomic design ideal for use in the lab and in the field
> Power measurements from 1 nW – 6 kW
> Energy measurements from 250 μJ – 75 J
> Measurement rep rates up to 2 kHz
> Built-in stand for fexible viewing
> Compatible with all Newport "Smart" power and energy detectors

Contact us for a free copy of the Newport Resource catalogue

NewSpec

Freecall 1800 153 811
Phone 08) 8273 3040
Fax 08) 8273 3050
sales@newspec.com.au
www.newspec.com.au
83 King William Road
Unley SA 5061
ABN 82 882 831 899