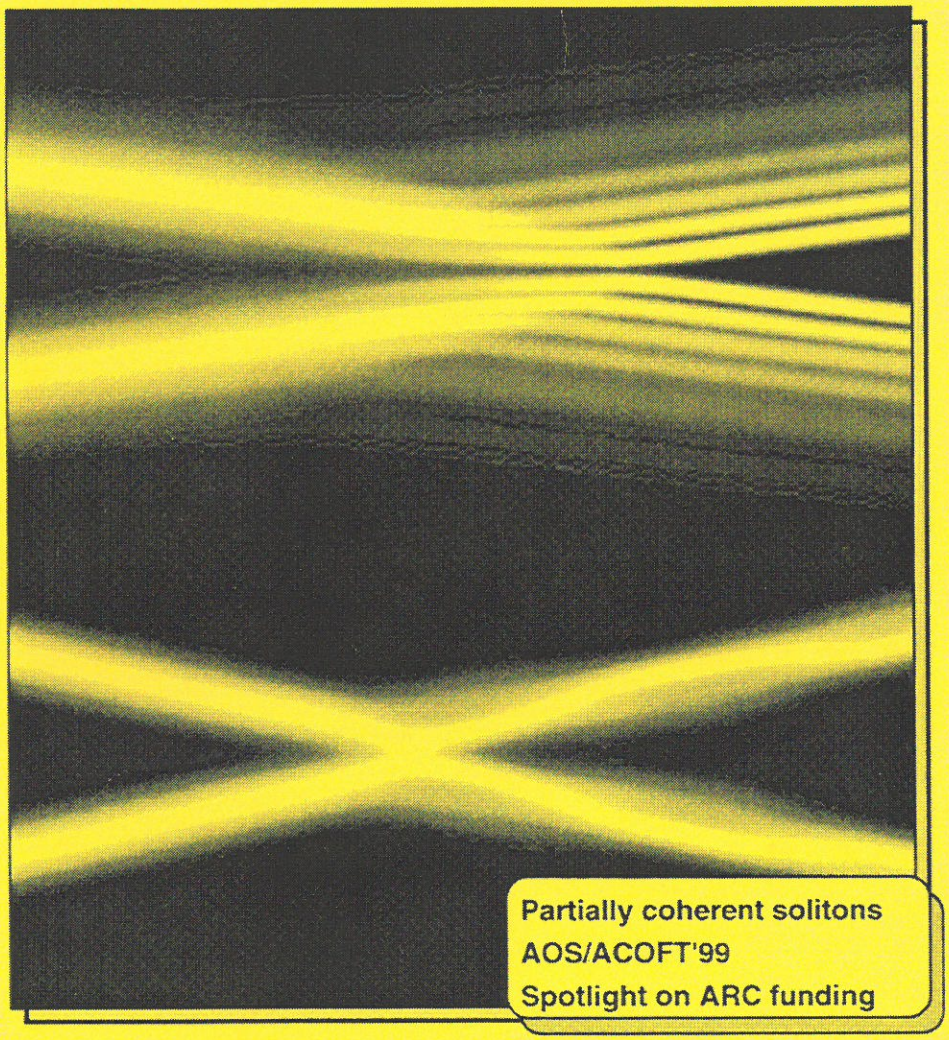
Australian Optical Society

NEWS



Partially coherent solitons
AOS/ACOFT'99
Spotlight on ARC funding

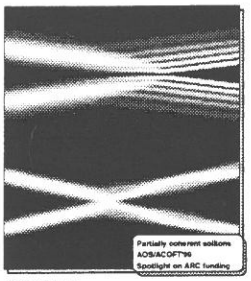
Volume 13 Issue 1

March 1999

Registered by Australia Post
Publication No: 233066 / 00021

MARCH 1999 VOLUME 13 NUMBER 1

AOS NEWS



COVER :

Collisions between partially coherent solitons. The solitons are incident from the left, collide in the centre, and the scattered beams leave at the right of the image

(Top). Simulation of a collision between two slightly asymmetric, partially coherent solitons, each consisting of six linear modes. The collision dramically changes the beam profile.

(Bottom). Simulation of a collision between two two-component partially coherent solitons in a saturable nonlinear medium, with the non-linearity $\Delta n \propto I/(1+0.05I)$.

See the article by Nail Arkhmediev on p9 of this issue.

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 encouraged, or else submission of hard copy together with an ASCII text file on floppy disk.


Where possible, diagrams should be contained within the document or sent as separate encapsulated postscript files. Figures on A4 paper will also be accepted.

ADVERTISING:
Potential advertisers in *AOS News* are welcomed, and should contact the editor.

EDITOR
Shaun Griffin
Baldwin Shelston Waters
60 Margaret St
Sydney NSW 2000
Tel: (02) 9777 1111
Fax: (02) 9241 4666
ShaunGriffin@bswip.com.au

DEADLINE FOR NEXT ISSUE
15th July, 1999

ARTICLES

DEPARTMENTS

AOS News is the official news magazine of the Australian Optical Society. The views expressed in *AOS News* do not necessarily represent the policies of the Australian Optical Society.

President's Report

I would like to welcome our new AOS News editor, Shaun Griffin. Shaun has recently taken over the *AOS News* reigns from Duncan Butler. Duncan has been doing an excellent job for a long time and at the moment is helping Shaun to settle into his new position. Thanks for that Duncan and many thanks for your excellent editorial work. Shaun graduated with a BSc (Hons) in physics and mathematics from La Trobe University in 1993. He then joined Tony Klein's group at Melbourne University and worked on neutron/X-ray optics obtaining an MSc degree in 1998. At present he is working with Baldwin Shelton Waters, Intellectual Property Attorneys. Shaun will be making sure that our *AOS News* Journal covers new and exciting developments in optics. He is looking forward to close collaboration with other members of the editorial board.

As you are aware of our biennial conference - AOSXII is going to be co-located with the Australian Conference of Optical Fibres and Technology '99. These two conferences which are running back to back start on Sunday July 4 with Wednesday July 7 being a joint ACOFT/AOS day of the event. The list of invited speakers looks very exciting and promises an excellent joint meeting. The collocation of the two conferences provides for widening of fields presented and gives us opportunities to establish dialogues and collaborations in closely related areas of optical science and engineering. Further information on this meeting can be found on the Conference Secretariat web page at

www.ozemail.com.au/~ireesoc/conferences

I am sure that all of us will see great benefits of this joint venture.

By the time this issue of *AOS News* will be published the deadline for submission of papers for this conference will have passed. I hope, of course, that many of our members have submitted abstracts summarising their new and exciting results in a wide variety of research in optics. As is the case for any successful conference the ultimate success of this AOS/ACOFT joined meeting is not only dependant upon the excellent list of invited speakers and careful organization of the meeting but also on your attendance and presentation of your new results in optical science and technology.

As you might know AOS has a Memorandum of Understanding with both OSA and SPIE. Recently the OSA/SPIE Joint Task Force (JTF) has recommended that OSA and SPIE combine to form a new Society that incorporates the current societies - including their assets, liabilities, and current operational structure into a new, unified international society. Both OSA and SPIE would be preserved but the staff and finances of both societies would be combined. Each organization would continue the activities that are core to each organization. The new organization would simultaneously be a financial merger and a cultural federation. It is believed that the proposed organization would provide an effective structure for unification of optical science and engineering and preserve the key values and cultures of each organization. The merger recommendations of the JTF are now under close examination. If the OSA and SPIE Boards should vote to implement the JTF recommendations, the entire matter will go to the vote of the members of both societies in mid 1999. A more complete explanation to the JTF recommendations is available on the JTF web site at

www.spie.org/info/jtf/execsummary.html

I believe that the unified structure of the two organizations could provide a much stronger optics forum. We will be awaiting the results of the recommendations and those of us who are members of either OSA or SPIE or both will have an opportunity to actively participate in this discussion and cast a vote.

President Elect of OSA and Vice-President of SPIE will be participating in the AOS/ACOFT '99 conference in Sydney. We hope to organize an AOS member's meeting during the conference and we hope that both Professor Erich Ippen and Donald C O'Shea (SPIE) will join us at this meeting.

I look forward to seeing you at the AOS/ACOFT '99 in Sydney in July.

Halina Rubinsztein-Dunlop
President
Australian Optical Society

Editorial

As with the December 1998 edition of the *AOS News*, the March 1999 issue is approximately three months overdue. The lateness was caused primarily by my learning many new tricks associated with the production a scientific periodical and to the ever relentless needs of my day job.

Firstly, I would like to thank Duncan Butler for his assistance and support in the publication of this issue. Although he has freely transferred the reigns of the *AOS News* editorship, he will, no doubt, play a role in its publication at least until the June 1999 issue and perhaps beyond.

Secondly, I wish to thank Halina Rubinsztein-Dunlop and Chris Chantler for their encouragement and support in the pursuit of both the editorship in general and the publication of this issue in particular.

If any readers have any comments or suggestions relating to the format of the *AOS News*, please feel free to contact me.

Shaun Griffin

Of note:

A **Theoretical Physics Summer School** is planned for Heron Island, Queensland, in early 2000 (see overleaf) .

The AOS web pages have been updated: **http://www.physics.mq.edu.au/~aos/**

The **FASTS** response to the 1999 science and technology budget is reprinted on p 18.

The **AOS conference**, combined this year with ACOFT, starts in the first week of July. See p22 for the provisional timetable.

A **mailing list** (listserver) has been set up to enable AOS members to send an email to the entire AOS membership. See the AOS web page for more information.

IS THERE AN ACCENT ON THE NAME "PEROT"?

W H Steel
Macquarie University

Everyone concerned with interferometers must have noticed the random use of an accent on the *e* in *Fabry-Perot. As* an undergraduate, I probably learnt *é*, with accent, because of the tendency to toss accents around as a sign of learning. I was even taught that there was an *é* in *Abbe* yet he was a German scientist, not a French monk. But I soon saw that the usage was not consistent and that there was some controversy on who got the major credit for the instrument, for many French papers referred to *l'interféromètre Perot-Fabry.*

So, when I spent a month at the University of Marseille in 1965, I decided to investigate, since much of the early work had been done there. The head of Physics and later the Rector of the University, Professor Rouard, was the most reliable source. He told me that *Perot* was a local and was definite that there was no accent "it had been added by Parisian editors who could not spell southern names". I then looked at the original papers in *Comptes Rendus and Journal de Physique et le Radium* in the 1890s. Both *e* and *é* appeared, with a slight preponderance for no accent. There were several cases of no accent in the paper, but an accent in the Table of Contents supports Rouard's claim that Paris editors were to blame.

So I decided on no accent and have used this spelling since, unless "corrected" by an editor. But the story is more complicated because, soon after I was in Marseille, a paper by P M Duffieux appeared in *Applied Optics,* **8**, 329-332 (1969). He claimed that neither Fabry nor Perot was an inventor of the instrument, but R Boulouch at the *Lycee de Bordeaux.* Fabry visited Bordeaux soon after, realized the importance of this interferometer, and developed it further with Boulouch. So, claimed Duffieux, it should be called the *Boulouch-Fabry* interferometer, without mention of *Pérot* (as he spelt it). But I shall stick to *Fabry-Perot* (with no accent).

Theoretical Physics Summer School

Heron Island, Queensland

The University of Queensland has planned to bring together postgraduate students and postdoctoral fellows for a Theoretical Physics Summer School to be held at Heron Island in either of November 1999 or February 2000. Participation in the school will be open to any postgraduate student or post-doctoral fellow from an Australian university.

Heron Island is located approximately 530 km north of Brisbane near the southern end of theGreat Barrier Reef. The island is a true coral cay 1 km in width and provides an ideal site for a theoretical physics summer school.

A selection of the foremost theoretical physicists will be invited to give lectures on fields of research including Quantum Optics, Mesoscopic Systems, Quantum Chaos and Bose-Einstein condensation. The lectures will be of approximately 2 hours duration and designed to stimulate informal discussions.

Postgraduate students will deliver poster presentations and talk sessions of their own work providing valuable peer interaction and experience in the art of presenting scientific research as well as sharpening their own research skills.

The summer school will be to provide an interactive forum where postgraduate students and post-doctoral fellows can learn of each others work and promote their particular fields of research. The invited lectures will serve to elucidate the fundamentals of a range of theoretical topics to aid post graduate students and post-doctoral fellows in gaining a basic understanding of the general methods and techniques used in the particular discipline presented.

This is an excellent opportunity for all theoretical physics post-graduate students and post-doctoral fellows to expand their knowledge and techniques in contempory physics in a unique environment. This occassion is also well suited for providing the participants with a chance to meet colleagues from other Australian universities.

For more information, please contact Sara Schneider at schneider@physics.uq.edu.au or Paul Cochrane at cochrane@physics.uq.edu.au respectively.

AOS News Submission Guidelines

The *AOS News* is always looking for contributions from its members. Here's a short summary of the 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. Authors of scientific or review articles will receive proofs by fax.

**** Conference Report***
If you have been to conference recently, writing a short report would be greatly appreciated.

**** News Item***
Any newsworthy stories in optics from Australia or abroad.

**** Book Review***
If you have read an interesting (and relatively new) book in some field of optics please consider a review for the *AOS News*.

**** Cartoon or drawing***
If you have some artistic bent why not consider submitting a cartoon!

How can you submit?

The easiest way is by email. Either send the document text in your mail, or attach a word processor file using Eudora or your favorite mail program. We accept many file formats.

Incoherent Solitons: New Objects in Optics

[1]Nail Akhmediev, [2]Wieslaw Królikowski and [1]A. W. Snyder

[1]Australian Photonics CRC, Optical Science Centre, Research School of Physical Sciences and Engineering, Australian National University, Canberra ACT 0200, Australia

[2]Australian Photonics CRC, Laser Physics Centre, Research School of Physical Sciences and Engineering, The Australian National University, Canberra ACT 0200, Australia

We discuss novel objects in nonlinear optics: incoherent solitons. These solitons can have an intensity profile which is governed by several parameters and, in particular, can be asymmetric in shape. Collisions of these solitons cause them to change their shape, although each beam behaves as a soliton after the collision.

1. Incoherent Solitons

In physics, a soliton is a solitary wave that does not readily change its profile while it is propagating. A delicate balance between two physical effects — dispersion that spreads the wave and nonlinearity that builds up the beam — causes a soliton to maintain its energy and shape for a much longer distance than does an ordinary wave packet.

Solitons initially were studied by the mathematical theory of inverse scattering and have been observed in many physical systems. They have been observed on the surface of water as well as in the depths of the ocean. In theory, two colliding solitons should pass through each other with no net effects. Theorists also predict that a soliton may exist on the quantum level as a discrete particle with distinct properties, such as single magnetic charge. Recently, laser light has been produced in soliton form.

Spatial solitons represent an optical beam propagating in a nonlinear medium without changing its shape [1]. The process of diffraction is exactly counter-balanced by nonlinear refractive index change so the beam is self-trapped and propagates effectively as a mode (or modes) of the self-induced waveguide [2]. Until recently the term spatial soliton has been associated with *coherent* optical beams [3]. These can be used as interconnections in, for example, an optical 'chip' [2].

An interesting situation arises if the light beam is derived from an incoherent light source. The light emitted from different points of such a source is completely uncorrelated. In effect, the phase across the beam exhibits some randomness. This partially coherent beam is fully described by the mutual coherence function which is a measure of correlation between amplitudes of the beam in two different points. Partially coherent beams diverge more rapidly than corresponding coherent beams of the same transverse extent. The poorer the coherence the stronger the divergence. In addition, the nonuniformity of the beam's phase causes the intensity of the beam to exhibit speckle structure.

One might ask what happens to the partially coherent beam if it is launched into a self-focusing nonlinear medium. Can it form a spatial soliton? Until recently the majority of specialists would answer no to this question. However, it now appears that even with such chaotic input, and with such 'bad' light, solitons can be excited. In this case, they are called 'incoherent solitons' or 'partially coherent solitons' (PCS). (Here we will use both terms on equal footing). In fact, recent work of a group at Princeton [4] has shown experimentally that a partially coherent beam can propagate as a spatial soliton.

In order to create a partially coherent solitons the nonlinearity has to be *nonistantenous*. More precisely, the medium has to respond on a time scale which is slower than that of the fast variation of the beam's phase. Under such circumstances the medium will "see" a time averaged light intensity which is a smooth function of spatial coordinates. Then, the beam will be trapped and propagate in a form of a superposition of many spatial modes. Interestingly, instead of using an incoherent light source, one can generate partially coherent solitons by superimposing mutually incoherent cw wave packets in such a way that they represent different modes of the self-induced waveguide.

2. Theoretical grounds

As far as the theoretical description of spatial partially coherent solitons is concerned, there are several approaches. The most natural one involves the use of the mutual coherence function [5]. This, however, leads to an analytically intractable problem which can only be solved numerically. A theoretical description of spatial incoherent solitons based on the so-called 'coherent density approach', where the partially coherent beam is

represented as a superposition of mutually incoherent components, has been developed in [6,7].

The description of a partially coherent soliton as a multimode self-induced waveguide [8-10] has been especially fruitful. The idea comes from the concept of a vector soliton as a multimode waveguide self-induced by its linear modes. This idea has been put forward by Snyder *et al.* in the study of spatial soliton structures [11,12]. It is apparent that the incoherent soliton is a similar object to a vector soliton. It is a multimode self-induced waveguide in a slowly-responding medium, so that its linear modes are mutually incoherent. Using this approach, stationary soliton propagation is obtained by proper population of various mutually incoherent linear modes of the self-induced waveguide. Due to mutual incoherence, the total light intensity is a direct sum of the intensities of all excited modes. Thus mode beating, which is a signature of coherent excitation, is eliminated.

Incoherent solitons can also be treated in the diffractionless ray optics limit [13]. This approach is accurate when the size of the incoherent soliton is much larger than the optical wavelength. It gives a valuable intuitive view of the problem in terms of geometric optics. In terms of a multimode waveguide, this limit is valid when the number of modes goes to infinity, so that the soliton becomes completely incoherent.

When the number of modes is finite, accurate analysis can be done based on N coupled nonlinear Schrödinger equations [14]. The analysis gives us N propagation constants λ_j as eigenvalues of the problem. These are parameters which nontrivially contribute to the shape of the partially coherent soliton. Moreover, the solution is actually a $(2N-1)$-parameter family. It contains N soliton parameters, λ_i, as well as N relative shifts, Δ_{ij}. Admitting translational symmetry of the solution as a whole, we can define all shifts relative to one of them, so that the total solution then contains $2N-1$ free parameters.

This analysis leads us to another interesting conclusion. Fundamental solitons are known to behave as single particles. The difference, then, between a single fundamental soliton and an incoherent soliton could be compared to that between an elementary particle and a complicated structure, such as an atom. Indeed, detailed analysis has shown that partially coherent solitons are multiparameter families of solutions [15], as distinct from single-parameter families of fundamental solitons [3]. Moreover, partially coherent solitons behave like multi-particle objects in collisions [15].

3. Dualism: self-induced waveguide or multi-soliton complex?

The constants λ_j have a dual physical meaning. First, the incoherent soliton can be considered as a nonlinear superposition of N fundamental solitons. Then λ_j are the amplitudes of partial fundamental solitons in the multisoliton complex. Second, if we consider the sum of the mode intensities as a given self-induced refractive index change, then each λ_j is an eigenvalue (propagation constant) related to a certain mode of this waveguide. This dual understanding is essential when interpreting various properties of incoherent solitons.

The above mentioned $2N-1$ parameters give a huge diversity of PCS shapes which are in general asymmetric and can have either single or multi-peak structure. In Fig.1 we give an example of a partially coherent soliton comprising three incoherent components (N=3). The intensity profile of these solitons is in general asymmetric. It is also clear that particular components u, v, w, ... correspond to fundamental, first, second and subsequent modes of the waveguide self-induced by the soliton. The larger the number of constituent components the more diverse the profile of the partially coherent soliton can be. In the limit of infinite number of components the profile of the soliton is arbitrary.

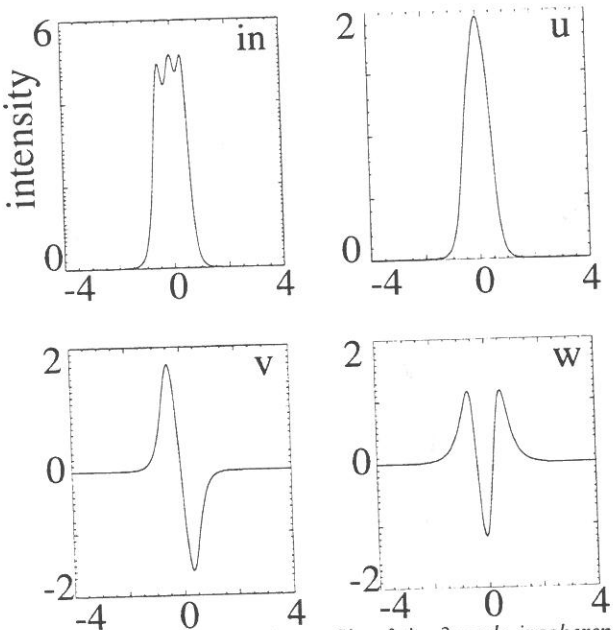


Figure 1: (in) The intensity profile of the 3-mode incoherent soliton and the amplitude profiles of its three linear modes: (u) zero-th, (v) first, and (w) second.

If the ability of partially coherent solitons to assume a variety of profiles is an unusual feature, then the collision properties of these solitons are even more unique. In Fig. 2 we show the collision of two partially coherent solitons consisting of six mutually incoherent modes of the self-induced waveguide. It is clear that collision induces a dramatic change of shape in the solitons. After the collision each beam remains a soliton but has an intensity profile different from the initial one. In the example in Fig.2 collision leads to formation of six-peak structure of the soliton.

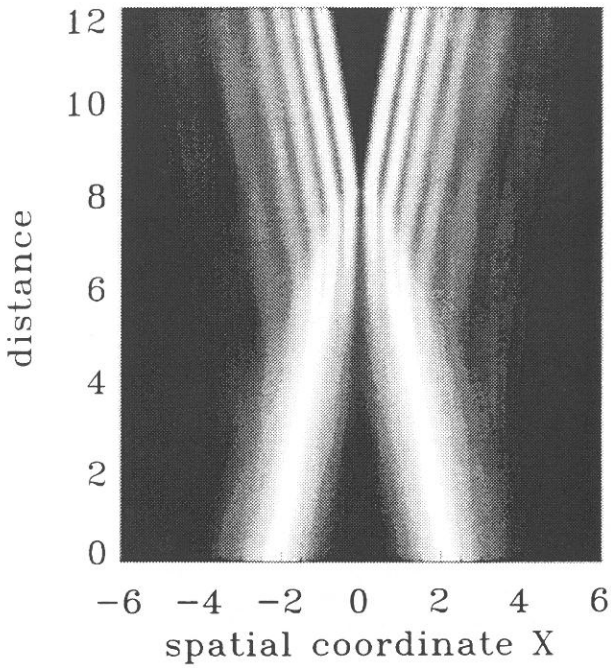


Figure 2: *Collision of two slightly asymmetric partially coherent solitons, each consisting of six linear modes. The solitons are incident from the bottom, collide in the centre, and the scattered beams leave at the top of the image. Parameters chosen in this simulation are* $\lambda_1 = 6.0$, $\lambda_2 = 5.0$, $\lambda_3 = 4.0$, $\lambda_4 = 3.0$, $\lambda_5 = 2.0$, $\lambda_6 = 1.0$, $\Delta x_{12} = 0$, $\Delta x_{13} = -0.2$, $\Delta x_{14} = -0.1$, $\Delta x_{15} = -0.3$, $\Delta x_{16} = -0.1$ *and the angle of collision is chosen such that* $\tan\theta = 0.3$.

This reshaping can be explained using each of the suggested approaches. Suppose that we take the view of the incoherent soliton as a multisoliton complex. It is an established fact that collisions between fundamental solitons lead to a lateral shift of the beam. During the collision each soliton component experiences a lateral shift which depends on the amplitude of the component (λ_j) and on the relative angle of the collision. In the case of an incoherent soliton each component experiences multiple pair-wise collisions. This leads to different lateral shifts and consequently to a change of the soliton profile.

On the other hand, if we take the view of incoherent solitons as a multi-mode waveguides, then the reshaping phenomenon can be understood as mutual refraction of partially coherent solitons on the self-induced waveguides. Since all the constituent modes of partially coherent solitons have different phase velocities, they experience different rates of refraction in the impact area of collision. Self-consistent reassembling of modes after the collision results in a stationary output beam with modified shape.

Multiple collisions of partially coherent solitons lead to complete separation of their components. We can think of this process as transformation and separation of a partially coherent beam into its coherent components. This idea could be used in some applications where an initially incoherent wave packet can be transformed into a number of coherent beams. Interestingly enough, the larger the number of components, the larger their separation after the collision.

4. Recent work

The possibility of incoherent solitons existing on a plane wave background [16], in the same way that a single fundamental soliton may exist on such a background [3], has been confirmed.

Incoherent solitons have been found experimentally in photorefractive crystals where the nonlinearity is not strictly speaking a Kerr-nonlinearity [17]. In this case, collisions also change the soliton shape as shown in Fig.3. Because of non-integrability, collisions transform the incident solitons into solutions which are not stationary. As a result, the solitons have oscillatory dynamics after the collision (see Fig. 3). These properties of incoherent solitons have been confirmed in recent experiments [18].

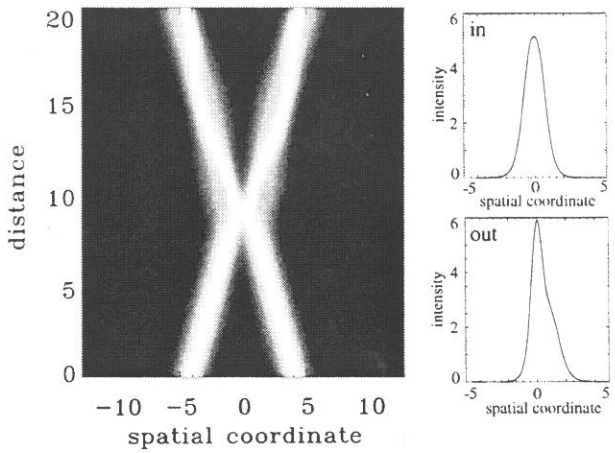


Figure 3: *Numerical simulation of collision of two-component PCS solitons in a saturable nonlinear medium with the nonlinearity* $\Delta n \propto I/(1+0.05I)$. *The input and output profiles are shown on the right hand side.*

5. Conclusion

In conclusion, the common features and differences between the fundamental and incoherent solitons are summarised in Table 1. As we can see, incoherent solitons are more complicated and more interesting objects in nonlinear optics than fundamental solitons. The main features of fundamental solitons are still there but more possibilities can be realised. This may open new ways of information processing using optical solitons. We would like to stress that the study of incoherent solitons is a new field in nonlinear optics, and many properties of these solitons have yet to be studied.

Table 1 : Comparison of basic properties of fundamental and incoherent solitons

	Fundamental soliton	Incoherent soliton
phase across the soliton	is constant	is random
coherence function	fixed across the soliton	decreases with separation
particle analogy	behaves like a single particle	behaves like *N* particles
waveguide analogy	single mode waveguide	*N*-mode waveguide
shape	sech-profile	variable
the shape is controlled by	one parameter	2*N*-1 parameters
shape symmetry	symmetric	arbitrary
collisions in Kerr-like media	are elastic	are elastic
during propagation	shape is unchanged	shape is unchanged
after collision	shape is unchanged	shape changes

References

[1]. M. Segev and G. Stegeman, "Self-trapping of optical beams: Spatial solitons", *Physics Today*, No **8**, 42-48 (1998).

[2]. A. W. Snyder and F. Ladouceur, "Light guiding light: Letting light be the master of its own destiny", *Optics and Photonics News*, 35 - 39, February 1999.

[3]. N. Akhmediev and A. Ankiewicz, *Solitons, nonlinear pulses and beams*, Chapman & Hall, 1997.

[4]. M. Mitchell, Z. Chen, M. Shih and M. Segev, "Self-Trapping of Partially Spatially Incoherent Light", *Phys. Rev. Lett.*, **77**, 490 (1996); M.Mitchell, and M.Segev, "Self-trapping of incoherent white light", *Nature* (London), **387**, 880 (1997).

[5]. G. A. Pasmanik, "Self-interaction of incoherent light beams", *Sov. Phys. JETP*, **39**, 234 (1974) [Zh. Eksp. Teor. Fiz. **66**, 490 (1974)].

[6]. D. N. Christodoulides, T. H. Coskun, R. I. Joseph, "Incoherent spatial soliton in saturable nonlinear media", *Opt. Lett.*, 22, 1080 (1997).

[7]. D. N. Christodoulides, T. H. Coskun, M. Mitchell and M. Segev, "Theory of incoherent self-focusing in biased photorefractive media", *Phys. Rev. Lett.*, **78**, 646 (1997).

[8]. M. Mitchell, M. Segev, T. Coskun, and D. N. Christodoulides, "Theory of self-trapped spatially incoherent light beams", *Phys. Rev. Lett.*, **79**, 4990 (1997).

[9]. V. V. Shuvalov and V. A. Vysloukh, "Cross-modulation coupling of incoherent soliton modes in photorefractive crystals", *Phys. Rev. E* **57**, 6056 (1998).

[10]. D. N. Christodoulides, T. H. Coskun, M. Mitchell and M. Segev, "Multimode incoherent spatial solitons in logarithmically saturable nonlinear media", *Phys. Rev. Lett.*, **80**, 2310 (1998).

[11]. A. Snyder, S. J. Hewlett, and D. J. Mitchell, "Dynamic spatial solitons", *Phys. Rev. Lett.*, **72**, 1012-1015 (1994).

[12]. A. W. Snyder, D. J. Mitchell and Yu. Kivshar, "Unification of linear and nonlinear optics", *Mod. Phys. Lett., B* **9**, 1479 (1995).

[13]. A. W. Snyder, D. J. Mitchell, "Big incoherent solitons", *Phys. Rev. Lett.*, **80**, 1422 (1998).

[14]. A. Ankiewicz, W. Królikowski, N. N. Akhmediev "Partially coherent solitons of variable shape in a slow Kerr-like medium: Exact solutions", *Phys. Rev. E*, April **59**, (1999) - in press.

[15]. N. Akhmediev, W. Królikowski and A. W. Snyder, "Partially coherent solitons of variable shape", *Phys. Rev. Lett.*, **81**, 4632-4635 (1998).

[16]. N. Akhmediev and A. Ankiewicz, "Partially coherent solitons on a finite background", *Phys. Rev. Lett.*, Vol. **82**, 2661 (1999).

[17]. N. M. Litchinitser, W. Krolikowski, N. N. Akhmediev and G. P. Agrawal, "Asymmetric partially coherent solitons in saturable nonlinear media", submitted to *Phys. Rev. E.*

[18]. W. Krolikowski, N. Akhmediev and B. Luther-Davies, "Collision-induced shape transformations of partially coherent solitons", *Phys. Rev. E*, **59**, April (1999) - in press.

WS RELEASE NEWS RELEASE NEWS RELEASE NE

Major change in diode pump technology

In the last 12 months diode pump solid-state laser systems have started replacing lamp-pumped and gas-discharge lasers as the laser of choice.

DIODE PUMPED Nd:YAG LASERS

- Compact
- Efficient
- Extremely reliable
- Fast turn on
- Single-phase
- Air cooled

For enquiries about world leading BMI and Lightwave diode-pumped solid state laser systems contact Raymax Applications Pty Ltd.

BMI

Packages to :
100mJ @ 20Hz low cost
300mJ @ 30Hz - 10ns
100mJ @ 300Hz - 20ns
100W CW

LIGHTWAVE®
ELECTRONICS

200 series - low cost
7W CW - M^2<1.2
2W CW @ 532nm
6W multi-kHz - 20ns
2.5W multi-kHz @ 532nm

APPLICATIONS

RAYMAX

16 Ross Street
Newport Beach NSW 2106
Tel (02) 9979 7646 Fax (02) 9979 8207

Coherent Scientific - Product Listing

Educational Kits
- Erbium doped fibre amplifier
- Fibre optics
- Holographic optical elements
- Holography
- Integrated optics
- Interferometry
- Optics
- OTDR
- Single-mode fibre optics

Electronic Instruments
- Boxcar integrators
- Dynamic signal analysers
- FFT spectrum analysers
- LCR meters
- Lock-in amplifiers
- Low noise preamplifiers
- Multichannel averagers
- Photon counters
- Programmable filters
- Pulse / delay generators
- Thermocouple monitors
- Time interval counters

Fibre Optic Communications
- Tunable laser diode sources
- Erbium-doped fibre amplifiers
- Spectrum/WDM analysers
- PMD analysers
- Millimeter resolution OTDR
- Optical power meters
- Wavelength standards & measurement
- Optical add/drop multiplexers
- Fibre Couplers
- Wavelength division multiplexers
- Optical switches
- Isolators
- In-fibre Bragg gratings
- SM & MM Patch cords
- Holders, mounts & positioners
- Fibre cleavers
- Fusion splicers
- Splices & termination equipment
- Polishing machines

High Voltage Electronics
- Capacitors
- HV power supplies
- Spark gap switches

Imaging Systems
- Cooled CCD cameras
- High speed imaging systems
- Intensified CCD cameras
- Streak cameras

Laboratory Cryogenics & Magnetics
- Cryogenic accessories
- Detector cooling dewars
- Gaussmeters
- Magnet power supplies
- Temperature controllers
- Temperature monitors
- Temperature sensors

Laser Accessories & Components
- Beam homogenisers
- Cavity optics
- Chillers
- Diode laser pump sources
- Electro-optic crystals
- Flash and arc lamps
- Heat exchangers
- Laser dye
- Laser gas
- Laser safety eyewear
- Non linear crystals

Laser Diagnostics
- Fabry-Perot etalons
- Laser beam analysers
- Laser mode analysers
- Laser wavelength meters
- Optical power and energy meters
- Spectrum analysers

Lasers – CW
- Argon / Krypton / Mixed gas ion lasers
- CO_2 lasers
- DBR Laser diodes
- Diode pumped Nd:YAG & Nd:YLF & Nd:YVO_4 lasers
- HeNe lasers
- Laser diodes
- Ring Ti:S & dye lasers
- Standing wave Ti:S & dye lasers
- Tunable diode lasers

Lasers – Industrial
- CO_2, YAG & Excimer Lasers
- Excimer workstations
- FBG workstations
- High power optics
- Laser based cleaning systems
- Laser marking systems
- Laser welding systems
- Micromachining systems

Lasers – Medical
- Diode Lasers
- Erbium Lasers
- Ultrapulse CO_2 lasers
- Versapulse holmium laser
- Versapulse multi-wavelength laser (Nd, Alexandrite)

Lasers / OPO's – Pulsed
- CO_2 lasers
- Diode pumped Nd:YAG & Nd:YLF lasers
- Dye lasers
- Excimer lasers
- Nd:YAG lasers
- Nd:YAG pumped OPO's
- Nitrogen lasers

Lasers / OPA's – Ultrafast
- Mode-locked Nd^{3+} systems
- Mode-locked Ti:S lasers
- Pico / Femtosecond OPA's
- Ti:S regenerative amplifiers

Life Science
- Cell handling products
- Cooled CCD cameras
- Electrochemistry products
- Electrophysiology products
- Freezer / mills
- Image acquisition & analysis software
- Intensified CCD cameras
- Microinjection systems
- Micromanipulation systems
- Oxygen analysis products
- Vibration isolation workstations

Mechanical Components
- Breadboards
- Carriers and rails
- Goniometer and tilt stages
- Mounts and positioners
- Optical table tops
- Posts, rods and bases
- Translation and rotation stages

Microscopy
- Cooled CCD cameras
- Micro-injection systems
- Patch clamp micromanipulators
- Scanning probe microscopes
- Vibration isolation platforms

Optics
- Cavity optics
- Custom made optical filters
- EUV / Soft X-ray Filters
- Fibre optics
- High power laser optics
- Industrial laser optics
- Lenses, mirrors, beamsplitters & filters
- Prisms
- Polarisers
- UV, VIS, IR optics
- Ultrafast optics

Spectroscopy
- CCD and diode array detectors
- Channel Electron Multipliers
- Grating spectrometers
- Interferometers
- Light sources
- Micro-Channel plates
- Radiometers and photometers
- Radiometric and photometric calibration standards
- Spectrum analysers
- Time-of-flight detectors
- UV, VIS and IR spectroradiometers
- Wavelength meters

Vibration Isolation Systems
- Benchtop platforms
- Breadboards
- Optical table tops
- Pneumatic vibration isolators
- Workstations

For more information on any of the above products please contact:
Coherent Scientific Pty Ltd
Tel: (08) 8352 1111 Fax: (08) 8352 2020 E-mail: sales@cohsci.com.au
Web Address: www.cohsci.com.au

Revised: April 1999

IS THE ARC JUST A LOTTERY?

by Hans-A.Bachor

A member of the ARC physics panel, Hans-A.Bachor, looks at the pros and cons of the current system of research grant funding.

ARC research funding moves through an annual ritual, January and February is the time to write the applications for Australian Research Council (ARC) funding, and now the long wait begins. Will it be December again before we know if we have funds for next year? The length of the present process can really not be justified, ten months is far too long and the delays in 1998 were aggravating everybody involved, in particular the research fellows who live of these grants. In addition, the outcome of the funding process appears to many to be random. It seems to be a lottery .

However, one part of the process is essential for fair and essential research funding: this is the international peer review, moderated by a group of experts in the field. Presently the ARC uses peer assessors in all its funding schemes, for the large grants the assessors are typically half from overseas, in some disciplines up to two thirds. This scheme puts the Australian proposals in a global perspective, it uses a judgment of the work of an individual Australian researcher by people who see it as part of the total research field, people who know the science but don't compete for the same funds. Peer review has obvious dangers; to get dumped by an assessor who is actually a competitor, to have an old boys network lifting the value of mediocre work, to have people from other countries using incomparable value scales. To avoid these pitfalls the expert panels have to do a careful job when selecting the assessors and later when evaluating the reports that come back.

How much work is done can be judged from figure 2. This represents the outcome of the 1999 round for large ARC grants for one subdiscipline, physics. The individual projects are ranked by their final score. The continuous line shows the final score for the applications.

There was money for only 34 new projects out of 108 projects that remained after the first cull. This means that the total money available determined the cutoff and the success rate (21%). For each project the height of the bar indicates the average mark of all initial assessments. In many cases the final score is different from the initial score. There are some cases where the initial mark is low, and was adjusted upwards. Here the panel was convinced by arguments given in the rejoinder and found some assessments to be unfair, too negative or based on misunderstandings. In other cases the mark was adjusted down. This could be based on overly generous assessments with little detailed justification. For example, just saying a project is worth 98% without giving detailed reasons is not a useful assessment. In addition, the relative performances of different sub fields of physics were considered. In contrast, factors such as the distribution amongst universities were not considered. In the end, this particular panel found a need to change most of the marks up or down.

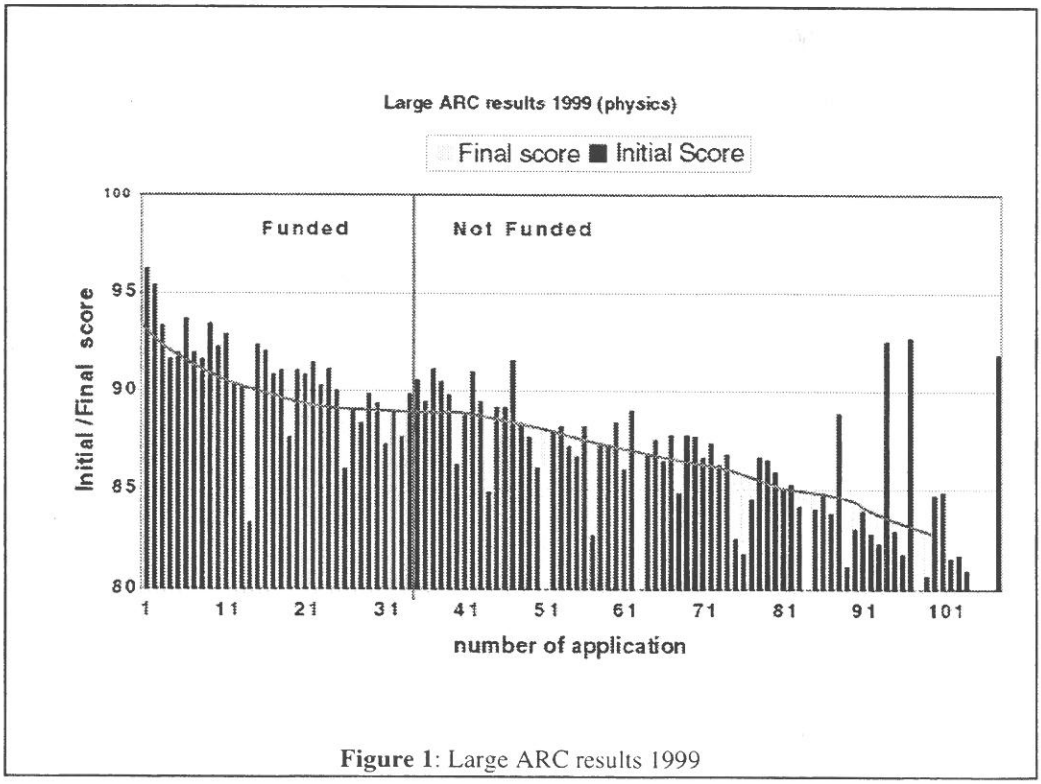


Figure 1: Large ARC results 1999

This process is not a lottery, a lot of detailed work goes into finding this relative ranking of all proposals. However, the uncertainty is still large and the cutoff point, which is defined purely by the funding, is in a very unfortunate position. Projects close to cutoff have the same merit. The decision who exactly is above the line contains some element of luck. Also the return rate of assessments is somewhat random. We have to be grateful for the work our overseas colleagues are putting into the Australian process. We can hardly reciprocate. When was the last time you assessed a proposal from France, the US or Germany? Still, this combination of peer assessment and expert moderation goes a long way to avoid the worst problems that would come with funding directed without the input from scientists and purely based an perceived needs of the nation, or worse, an individual university.

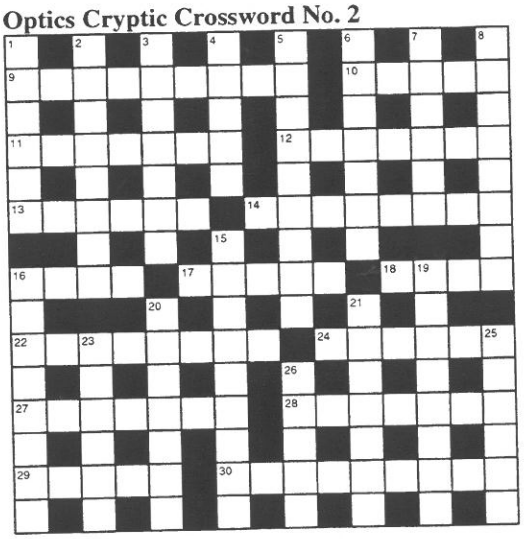
Apart from the obvious shortcoming, the insufficient funds, the present ARC system is not perfect and needs major improvements. The two main areas of complaint are: the lack of feedback to the researchers and the bureaucratic delays in the decision. Both seem to be intrinsic to the current system of essential academic research funding being carried out within a government framework. The expert panels are prevented from giving meaningful feedback by rules that are designed to minimise the number of appeals and to protect the members of the committees from litigation. This is an unfortunate situation where legal thinking overrules the need to explain why and how decisions are made. All one gets back is the frustrating line "not competitive" rather than meaningful words that would allows us to understand why projects are funded or rejected. Similarly, the delays are largely due to a convoluted path whereby the decision by the ARC are really recommendations to the minister and the final approval by the minister and his staff takes actually longer than all meetings of the ARC together. We need improvements on both points. We need a more independent ARC with control over its own decisions.

Soon we will hear about proposals for the future of the ARC. I personally hope they retain the essential features of international peer review, retain a national competition open to all research groups, introduce more feedback and result in decisions within six months of the application deadline. This is is a realistic option we can demand. Simultaneously we need to argue for more funding for the valuable, future-oriented research we could produce.

(The author is simultaneously applicant to ARC, recipient of grants and a member of the ARC physics panel).

25/3/99. This article can be found at:
http://www.anu.edu.au/physics/qoptics/news.html

Optics Cryptic Crossword No. 2



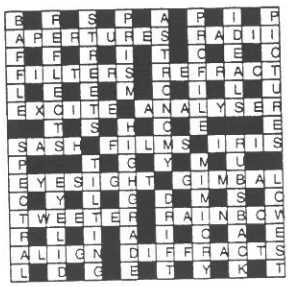
Across

9. Coherent light which could alarm bees (5,4)
10. Become game holding the very last one (5)
11. Type of diode coils in disarray (7)
12. Setup the optics again from real ignorance (7)
13. Stellar performance in fast rally (6)
14. When glowing, a black body? Not! (8)
16. Never cooked but possibly close to extinction (4)
17. Blurry when out of region of interest (5)
18. Reduced especially for a gamble (4)
22. Awful loud 'bing' in nonlinear process (8)
24. Comet Riccardi's unitary system (6)
27. Navigational angle taking negative answer out of Nazi mouth (7)
28. Greek character piles on the runs (7)
29. Cured unprocessed stuff (5)
30. Half glint shimmering after the sun goes down (9)

Down

1. Initiates purple light and sound (made audible in a gaseous state) (6)
2. Tailer so that back-reflections are stopped by this (8)
3. Produce a chaotic picture: internally diffract, almost.(7)
4. Intends rude names (5)
5. Shapeless porous ham (9)
6. Stop and arrange semiconductor impurities (7)
7. Reship broken die (6)
8. Attractive like iron to me, acting unusually (8)
15. The sort of substandard whisky which spoils the view for astronomers at night (9)
16. Brilliance in arcade game (8)
19. Position error caused by moving observer: beyond sounding slack (8)
20. Went milky white when sunlight was blocked.(7)
21. The strange destiny of mass over volume (7)
23. A one-off United Nations one that French ended (6)
25. Tin number the French burn for light (6)
26. Golf club for getting over the western rim? (5)

Solution to Optics Crossword No. 1



Meetings Calendar at a Glance

Date	Meeting	1999	Contact	Location
Jul 4-7	ACOFT99 - Australian conference on Optical Fibre Technology		AOS	Sydney, Australia
Jul 7-9	AOS XII - 12th Conference of the Australian Optical Society		AOS	Sydney, Australia
Jul 12-16	Workshop on Adaptive Optics for Industry and Medicine		OSA	Durham, England
Jul 14-16	7th Microoptics Conference		OSA	Chiba, Japan
Jun 16-18	Optical Engineering for Sensing and Nanotechnology		SPIE	Yokohama, Japan
Jul 18-23	SPIE Annual Meeting		SPIE	Denver, Colorado
Jul 19-21	Integrated Photonics Research		OSA	Santa Barbara, CA
Jul 21-23	Photonics and Switching		OSA	Santa Barbara, CA
Aug 29-3	Conference on Ferroelectric Liquid Crystals		OSA	Darmstadt, Germany
Sep 1-3	Nonlinear Guided Waves and Their Applications		OSA	Dijon, France
Sep 17-22	Photonics East		SPIE	Boston, MA
Sep 24-26	Bragg Gratings, Photosensitivity and Poling in Glass Waveguides		OSA	Santa Clara, CA
Sep 24-26	Organic Thin Films for Photonics Applications		OSA	Santa Clara, CA
Sep 25-1	Interdisciplinary Laser Science Conference		OSA	Santa Clara, CA
Sep 26-1	OSA'99 Annual Meeting		OSA	Santa Clara, CA
Oct 25-27	New Developments and Applications in Optical Radiometry		-	Madrid, Spain
Date	**Meeting**	**2000**	**Contact**	**Location**
Jan 21-27	Photonics West		SPIE	San Jose, CA
Mar 5-10	Optical Fiber Communication Conference		OSA	Baltimore, Maryland
Mar 7-12	CLEO Conference on Lasers and Electro-Optics		OSA	San Francisco, CA
Mar 7-12	QELS - Quantum Electronics and Laser Science		OSA	San Francisco, CA
Jul 30-4	SPIE Annual Meeting		SPIE	San Diego, CA
Sep 10-15	CLEO/Europe2000 - Conference on Lasers and Electro-Optics		OSA	Nice, France
Sep 10-15	IQEC - International Quantum Electronics Conference		OSA	Nice, France
Nov 3-8	Photonics East		SPIE	Boston, MA
Date	**Meeting**	**2001**	**Contact**	**Location**
Feb 12-14	Photonics West		SPIE	San Jose, CA
Feb 18-23	Optical Fiber Communication Conference		OSA	San Francisco, CA
May 6-11	CLEO - Conference on Lasers and Electro-Optics		OSA	Baltimore, Maryland
May 6-11	QELS - Quantum Electronics and Laser Science Conference		OSA	Baltimore, Maryland

This list of optics related conferences is compiled from several sources and should be used as a guide only. Further information can be obtained from :

OSA
2010 Massachusetts Ave
NW Washington DC 20036
USA
Tel: +1 202 223 0920
Fax: +1 202 416 6100
Email: confserv@osa.org
http://www.osa.org/

SPIE
PO Box 10, Bellingham
WA 98227-0010
USA
Tel: +1 360 676 3290
Fax: +1 360 647 1445
Email : spie@mom.spie.org
http://www.spie.org/

EOS (attn. F. Chavel)
Centre Universitaire - B t. 503
B.P. 147 - 91403 ORSAY cedex -
France
Tel: +33 1 69 35 87 20
Fax: +33 1 69 85 35 65
Email : francoise.chavel@iota.u-psud.fr

....AOS Web Address....
http://www.physics.mq.edu.au/~aos/

Photon Engineering Pty. Ltd.

Specialists in Solid-State Laser Technology

Laser Diodes:-

- High Power Diode Lasers (Red / IR)
- Diode Laser Bars and Stacked Arrays (CW / Pulsed)
- Fibre-Coupled Diode Lasers
- Tunable Diode Laser Systems
- Custom Designed Diode Laser Packages
- Diode Drivers and Temperature Controllers

Diagnostics & Measurement :-

- Laser Beam Profilers
- Laser Diode Diagnostic Systems
- Laser Power Meters
- Joulemeters and Ratiometers
- Pyroelectric Detectors
- Tunable Imaging Filters / ND Filters

Scientific Laser Systems:-

- Spectroscopic Laser Systems (UV / Visible / IR)
- Diode-Pumped Laser Systems (all types / powers)
- Nanosecond and Picosecond Pulsed Lasers
- High Power Lasers from 193nm to 5μm
- Ultra-stable CW lasers
- Tunable OPO / OPA systems and Alexandrite lasers
- PIV laser systems

Accessories / Components :-

- Q-switches, Mode-lockers, Modulators
- Non-Linear Optics and Laser Crystals
- Mechanical Mounts / Components
- Laser Power Controllers / Stabilizers
- Spatial Light Modulators

Industrial / Medical Laser Systems:-

- Diode-Pumped IR Lasers for Cutting / Marking (up to 300W)
- Diode-Pumped UV and Visible Laser Systems
- Diode-Pumped Eye-safe Lasers (and 3-5μm Mid-IR)
- Tattoo and Hair Removal Systems
- Diode Laser Systems for Thermal Applications
- New 630-670nm Diode-Pumped Lasers producing up to 8W

Contact us for our new 1999 Catalogue

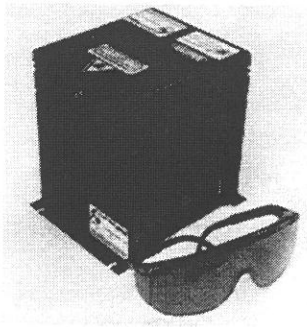
Tel: (08) 8410 4599
Fax: (08) 8410 4544
Email: sales@photon.on.net
Internet: www.photon.on.net

Photon Engineering Pty. Ltd.

Tel: (08) 8410 4599
Fax: (08) 8410 4544
Email: sales@photon.on.net
Internet: www.photon.on.net

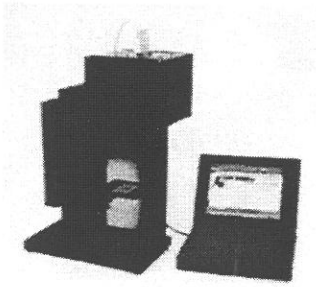
High Power Diode-Pumped Lasers from Light Solutions Corporation

The Orion



5W TEMoo Orion

The miniature air-cooled Orion is compact enough to "fit in the palm of your hand" and can produce in excess of 5 Watts at 1064nm in either CW or Q-switched format. This powerful little laser has a wide range of industrial marking, military and medical applications. The rugged, reliable portability of this system has meant that it has already been used on airplanes and helicopters, robotic arms and all terrain vehicles - anywhere where size and portability is critical.

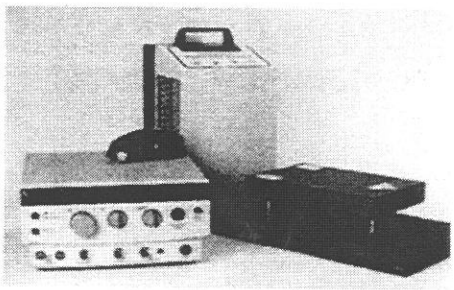


An air-cooled OEM Orion laser as part of a laser marking system

The Lightbook System

The basic 10W *Lightbook* System produces > 10W of TEMoo output ($M^2 = 1.1$) at 1064nm in either CW or Q-switched format. Pulse energies up to 1.5mJ and repetition rates from 1kHz to 100kHz enable many applications requiring high power and excellent beam quality.

The new *Spectrum* add-on allows the user to switch between 10W @ 1064nm, to 5W @ 532nm to 1W @ 355nm. Other add-ons available include monolithic OPO's for multiwatt output at 1.57, 2.1 or 3.4μm, and the upcoming PPLN OPO for output anywhere in the 1.5-5μm range. Amplifier Systems up to 20W and 30W are also available.

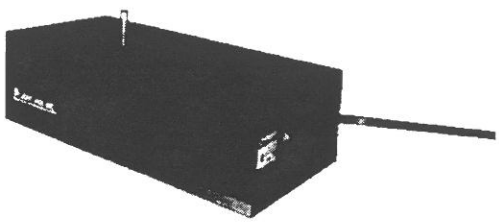


Complete Lightbook System with Laser Head, Driver and new all-solid-state chiller

Tunable Deep UV from Light Age Inc.

The PAL/PRO - UV Laser System

The PAL/PRO - UV laser system from Light Age Inc. is a tunable narrowband Alexandrite laser producing high energy pulsed output at 193nm, 248nm and many other UV wavelengths. The oscillator output is converted to deep UV using frequency conversion options to produce output at 190-200nm / 240-270nm (via 4HG / 3HG) and almost all wavelengths from 190nm to 400nm (via Raman shifting). The system can scan the SLM output over 10's of GHz with spectral linewidths <30MHz in the fundamental and < 25 fm at 193nm. The PAL-PRO - UV is ideal for applications like Deep UV Interferometry, Writing Fiber Gratings, seeding Excimer lasers, Photolithography and testing UV optics to name a few.



PAL/PRO-UV
Solid-State Deep UV Source for 193nm, 248nm + more

FASTS on the Science & Technology Budget '99

Mr Toss Gascoigne

Australia's peak council for scientists and technologists today welcomed increased expenditure in the 1999 Budget for research in health and medicine, and biotechnology.

Professor Peter Cullen, President of the Federation of Australian Scientific and Technological Societies (FASTS), said this investment will help Australia become a serious international player, and generate high-quality jobs in these areas.

"The Government and the community are recognising that new industries and new jobs in Australia are all technology-driven," he said. "It was good to hear the Treasurer last night announce the Government's intention 'to build the nation's education and research capacity.'

"Investment in S&T should be at the top of every Government's shopping list when it comes to budget time. It should be a fundamental part of economic planning, rather than a top-up measure when everything else is in place and the economic signs are good."

But he expressed disappointment that the Government continues to starve the university system of funds.

"This neglect comes with a price-tag," he said. "Our libraries, our laboratories, our staff are feeling the effects of a terrible burden. The $90 million allocated to infrastructure represents a drop in real terms over previous funding measures. How can this be 'an education budget' (as the Government calls it), when it leaves one entire sector out in the cold?"

Professor Cullen said the increases in medical and biotechnology research needed to be echoed in other areas, such as Information Technology and the Australian Research Council.

"Australia needs a massive boost in research if we are to capitalise on our top-quality research and stay in touch with the nations that lead the world," he said. "We need to buy our way into the top league."

"The US, the UK, Germany and Japan are putting huge amount of new resources into science and technology because they know the long-term benefits are there. They will reap the rewards of new high-quality jobs, better standards of living, cleaner environments."

Professor Cullen said the Government had begun to move in the right direction, but there is still unfinished business that needs to be dealt with in future budgets.

"The Innovation Summit (due in February 2000) and the Green Paper on research will afford the Government further insights on what it needs to do
to move towards a knowledge-driven economy," he said.

"We need to enter the new millennium with a plan to revitalise research, recharge the university system and generate new industries."

FASTS CIRCULAR- March 1999

1. SCIENCE AND PARLIAMENT

The policy debate rages in Canberra, and there is a whole raft of issues where impending announcements will have major implications for the way science and technology conducts its business in Australia.

The opinion of FASTS is increasingly sought. Part of this stems from our membership of the Prime Minister's Science Council (PMSEIC), which brings me into regular contact with Ministers covering portfolios ranging from Health to Education and the Environment.

As well as formal contact with PMSEIC and groups like the Government Committee on Science and Industry chaired by Senator Grant Chapman, I am sounded out and asked informally to suggest names for key appointments.

Minister Minchin recently invited a small group to dinner at Parliament House to discuss science issues and priorities, and it is useful on these occasions to inject information from the grass-roots science and technology community.

The matters on which we are asked to comment are becoming increasingly technical, with capital gains tax and the future of the tax concession to industry for R&D two examples of issues with a maze of unintended consequences and side effects.

Both are two key issues for the science and technology community, and both should be seen in the context of clear political signals that neither major party is convinced that money going to R&D is an investment in Australia's future rather than a drain on the public purse.

Both parties are waiting for industry to make up the shortfall by increasing its investment in research.

This is despite examples from the US, the UK and Japan. These countries have seen where the future lies and massively increased their public investment in research. The Wills Review on medical research has endorsed these views and I hope the Government adopts the major recommendations of the Report.

The temptation for Parliamentarians faced with making decisions in these areas against a backdrop clamour of competing causes is to look for the short-term solutions. But anyone involved in research knows it can take 15 years from clever idea to marketable product.

Science is not well served in Australia by the fact that only 11 of the 224 MHRs and Senators have formal qualifications in science. Another 5 have engineeering degrees, and 13 have qualifications in health care. (Source: Australian Parliamentary Library)

Parliamentarians are not unsympathetic to S&T, but the imperatives of a 3 year Parliamentary term and dealing with a bewildering array of issues are powerful incentives to seek quick and simple answers. What Australia really needs is a considered blueprint for the future.

2. GREEN PAPER ON RESEARCH AND RESEARCH TRAINING

The release of this paper by Minister Kemp is imminent. He is expected to allow three months for comment and response, in order to get comprehensive feedback, and in contrast to the botched and secretive release of earlier plans to change the system.

FASTS is planning a symposium to discuss the Paper, and allow people from industry and research to exchange views and hear different perspectives before the time for formal responses has closed.

3. NEW CHIEF SCIENTIST EXPECTED SOON

The announcement of a new Chief Scientist is imminent. The scientific and technological community is watching with interest to see who will pick up the baton from John Stocker.

Stocker is a hard act to follow. One of the bright spots on the science horizon has been the significant rise in prestige and performance of the Prime Minister's Science Council, and I hope the new appointee will be able to match Stocker's astute management of the Council.

4. THE BIOTECHNOLOGY PAPER

The FASTS' Occasional Paper on Biotechnology by Board Member Peter French has sparked interest in business and political circles. It outlines the possibilities open to Australia if industry, government and researchers act together; and gives a realistic assessment of where our international competition lies.

The paper has been widely circulated, and demand from Parliamentary Committees and industry groups has forced a third printing.

5. REVISIONS IN THE WINGS

FASTS will release a revised version of its policy document in November this year. All Member Societies have been invited to nominate changes and additions to the document.

One new issue is the increasing difficulty of arranging scientific exchanges, particularly at the postdoctoral level because of immigration policies in Australia and overseas. Until recently, postdoctoral study overseas was the norm for Australian Ph.D. graduates. Australian laboratories derived substantial benefit from foreign researchers at this level. But many opportunities to fund international exchange visits by scientists are being lost as government policies increasingly favour the appointment of locally qualified people.

Postdoctoral training in Europe is almost prohibited except where individuals have European passports or work permits. Should we be arguing for open borders, or is overseas training and experience no longer important for the next generation of Australian scientists?

6. NEW FASTS' BROCHURE

FASTS wants more members! Fifty thousand scientists and technologists belong to the Learned Societies that make up the membership of FASTS, but many other Societies could join. A brochure explaining the benefits of membership is available from the FASTS' office.

7. RESPONSE TO WILLS REVIEW

FASTS' response to Wills Review on medical research generally applauded its recommendations, but urged a strengthening and increased funding for the NH&MRC; and also improved infrastructure in universities through full implementation of the Boston Review.

Thanks to Board Member David Tracey for drafting and ushering through the process of consultation.

8. NEW OCEANS POLICY

Minister Hill announcement of new funding for Australia's Ocean Territory is welcome, although $50 million of research over three years is not going to discover very much about an ocean area larger than the

land mass of Australia.

The first meeting of the National Oceans Ministerial Board is expected before the end of April and will select a National Oceans Advisory Group. NOAG will provide technical advice, and marine and geological interests with close links to FASTS should be represented on NOAG.

9. COMMERCIALISING SCIENCE

The FASTS' report on the barriers scientists and technologists face in commercialising their science has turned up a whole series of recommendations on how things could be improved.

Information was gathered through focus groups involving 120 scientists across Australia. It was carried out with the assistance of a grant from the Department of Industry, Science and Resources, and the report is scheduled to be finished in the next few weeks.

10. NATIONAL PRIDE IN SCIENCE

Some may have missed reports earlier this year of an international survey to find what it was that made people proud of their country. The Melbourne Institute of Applied Economic and Social Research study showed Australians ranked science and technology second highest on their list, behind only sport.

This was the second highest ranking for science and technology in the 24 countries, and adds weight to FASTS suggestion to the Government to capture the imagination of all Australians with landmark S&T-based projects to mark the Year 2001.

Chair of Policy Committee Ken Baldwin has convened a Committee meeting for April 30, and is interested in hearing ideas and comments.

AUSTRALIAN OPTICAL SOCIETY

12TH CONFERENCE OF THE AUSTRALIAN OPTICAL SOCIETY

and

AUSTRALIAN CONFERENCE ON OPTICAL FIBRES AND TECHNOLOGY '99

The University of Sydney, Sunday July 4 to Friday July 9

AOS'99 Provisional Conference Timetable

Wednesday July 7th

Time	Session	
9:00	Welcome from AOS President (Chair: Prof. Halina Rubinsztein-Dunlop, UQ)	
9:10	***Plenary Lecture*** Professor Erich Ippen, President OSA & MIT Femtosecond Optics: Recent Advances and Applications **P1**	
10:00	***Plenary Lecture*** Professor David Payne, University of Southampton **P2**	
10:50	Morning Tea	
11:15	***Plenary Lecture*** Professor David Williams, University of Rochester Adaptive Optics for the Human Eye **P3**	
12:05	***Plenary Lecture*** Telstra Representative **P4**	
12:55	Lunch	
	Microscopy	**ACOFT post-dead-line session**
2:00	*Image reconstruction through a tissue-like medium under single-photon and two-photon excitation* X. Gan, N. Dragomir & M. Gu Victoria University **MI20**	
2:15	*Progress in Higher Order Adaptive Optics on a Confocal Microscope* P.W.Fekete, M.R.Arnison, W.Sudiarta, M.Serrano, D.Philp, H.Zhao, C.J.Cogswell and J.W. O'Byrne University of Sydney **MI55**	
2:30	*Three-Dimensional Erasable/Rewritable Bit Optical Data Storage in a Photorefractive Polymer Using Two-Photon Excitation* D.Day, M.Gu & A.Smallridge Victoria University **MI74**	

2:45	*Closed Loop Optical Coherence Tomography for high speed profiling of Macroscopic Biological Surfaces* D. Silva, A. V. Zvyagin & D. D. Sampson University of Western Australia **MI86**	
3:00	*Separation of Phase and Intensity Information in Quantitative Optical Phase-Amplitude Microscopy* A.Barty, E.Barone-Nugent, K.A.Nugent, D.Paganin and A.Roberts University of Melbourne **MI97**	
3:15	*A Geometric Phase White-Light Interference Microscopy for Surface Profiling* M.Roy, C.J.R.Sheppard and L.Cherel University of Sydney **MI112**	
3:30	Afternoon Tea	
	Non-Linear Optics	**Spectroscopy**
4:00	*Electromagnetic Momentum in NonLinear Optics* C.Pask, N.Ansari and D.Rowland Australian Defence Force Academy **NL23**	*Determination of the Concentration Profile of Rare Earth-Doped Optical Fibres* T.B.Nguyen, G.Koltovski, G.W.Baxter, P.M.Farrell and A.Roberts Victoria University/ University of Melbourne **SP35**
4:15	*High Power lasers with good beam quality via phase conjugating mirrors* M. Ostermeyer, V. Raab & R. Menzel University of Adelaide **NL44**	*Spectroscopy of Na+ Noble Gas Mixtures: Precise Calculations and Measurements* M.Shurgalin, J.Babb and H-K Chung Harvard-Smithsonian Center for Astrophysics **SP40**
4:30	*Transient Phase Conjugation Using Stimulated Brillouin Scattering (SBS)* S.Afsharvahid and J.Munch University of Adelaide **NL53**	*The First High Accuracy Absolute Test of Quantum Electrodynamics for Helium-Like Vanadium, Z=23, and the Current Assessment of Systematics* D.Paterson, C.T.Chantler, L.T.Hudson, F.G.Serpa, J.D.Gillaspy and E.Takacs University of Melbourne; NIST, USA and Kossuth University, Hungary **SP16**
4:45	*Incoherent Solitons: New Objects in Optics* N.Akhmediev, A.Snyder, W.Krolikowski, G.McCarthy and B.Luther-Davies Australian National University **NL72**	*VUV Laser Spectroscopy of the O2 Schumann-Runge System Near the Dissociation Limit* K.Waring, B.R.Lewis and K.G.H.Baldwin Australian National University **SP61**
5:00	*Soliton Dynamics of a Passively Mode-Locked Fibre Laser: Experimental Investigations* D.Y.Tang and P.D.Drummond, W.S. Man & H.Y. Tam University of Queensland & Hong Kong Polytechnic University, Hong Kong **NL94**	*Laser Cooling of Ytterbium-Doped Optical Fibres* A.Rayner, M.Friese, A.Truscott, N.Heckenberg and H.Rubinsztein-Dunlop University of Queensland **SP114**
5:15	*Bright Solitons in $\chi^{(2)}$ Deep Gratings* A.Arraf, C.M.de Sterke and H.He University of Sydney and Australian Photonics CRC **NL116**	*CW-CRDS: Cavity Ringdown Spectroscopy Using a Continuos-Wave Laser and A Rapidly Swept Cavity* Y.He and B.J.Orr Macquarie University **SP104**
5:30		*Do the Constants of Nature Vary?* J. K. Webb, M. T. Murphy, V. V. Flambaum, V. Dzuba, C. W. Churchill, J. D. Barrow, M. J. Drinkwater University of New South Wales **SP145**

8:00 Council Meeting of the Australian Optical Society.

Thursday July 8th

	Thin Films	Quantum Optics
9:00	***Keynote Address*** *Fixed Line Filters for EO Sensor Protection* T.McKay DSTO **TF137**	***Keynote Address*** *Quantum Optics* P. J. Drummond University of Queensland **QO143**
9:30	*Design and development of Special Coatings For Satellite Laser Ranging (SLR)* A.Boiko, Y.Wang and T.Gao Electro-Optics Systems P/L **TF5**	*Quantum Electrodynamics and New Physics: A survey of some recent developments, and the approach to absolute measurement on the NIST Electron-Beam ion Trap* C.T. Chantler, D. Paterson University of Melbourne **QO13**
9:45	*Improved Techniques in Multilayer Optical Thin Film Deposition* D.J.Drage, R.P.Netterfield and S.Dligatch CSIRO Technological and Industrial Physics **TF8**	*Topological Phase in a three-level atom* B. C. Sanders & W. Zhang Macquarie University, Sydney **QO121**
10:00	*New Coatings for Solar Control Glazing* G.B.Smith, M.Hossain, A.Bendavid and P.Swift University of Technology, Sydney and CSIRO Telecommunications and Industrial Physics **TF103**	*Continuous Variable Quantum Cryptography* T.C.Ralph Australian National University **QO58**
10:15	*Ultrafast Laser Ablation and Deposition of Thin Films with High-Pulse Rate Picosecond Lasers* A.V.Rode, E.G.Gamaly and B.Luther-Davies Australian National University **TF134**	*The University of Canberra Quantum Key Distribution Testbed* G.Ganeshkumar, P.J.Edwards, W.N.Cheung, L.O.Barbopoulos, H.Pham and J.C.Hazel University of Canberra **QO59**
10:30	Morning Tea	
	Optical Fabrication	**Optical Manipulation of Matter**
11.00	***Keynote Address*** *Optics Fabrication in Australia* C. J. Walsh CSIRO Telecommunications and Industrial Physics **OF139**	***Keynote Address*** *Laser Trapping for Optical Microscopy* Min Gu Victoria University **OM138**
11:30	*Optical fibre temperature sensing of the breakage of window glass during fires* M. Cristina Vergara, Scott A. Wade, Yaping He, G.W. Baxter & S. F. Collins *Victoria University* ***OF36***	*Characterisation of scattered evanescent waves for particle-trapped near-field scanning optical microscopy* P.C. Ke & M. Gu Victoria University **OM1**
11:45	*Direct micro-drilling and trepanning in polymers by high-pulse-rate UV laser* E. K. Illy, D.J.W. Brown, M.J.Withford & J.A. Piper Macquarie University **OF67**	*Non-interferometric phase imaging of atoms* M.R. Walkiewicz, C.J. Vale, D.M. Paganin, L.D. Turner, K.A. Nugent & R.E. Scholten University of Melbourne **OM29**
12:00	*Reflection Null Corrector for Holographic telescopes* K. V. Avudainayagam, G. K. Rurimo, P. Veitch & J. Munch University of Adelaide **OF47**	*An experimental and theoretical study of atomic beam techniques in a Vapour Cell* C.J. Vale, E. Mese, M.R. Walkiewicz, P. M. Farrell & R.E. Scholten Victoria University & University of Melbourne **OM32**
12:15	*Large telescopes for lidar receivers* J. Munch, K. V. Avudainayagam, P. Veitch & R. Wueker University of Adelaide **OF50**	*Hollow Optical fibres as wave guides for atoms* R.G. Dall, M.D. Hoogerland, K.G.H. Baldwin & S.J. Buckman Australian National University **OM62**

12:30	Lunch	
	Klein /Opat Plenary	
2:00	**Prof. Anton Zeilinger** *Experiment and the Foundations of Quantum Mechanics* University of Vienna **P5**	
2:50	**Prof. Sam Werner** *Neutron Interferometry and the Australians* University of Missouri-Columbia **P6**	
3:40	Afternoon Tea	
	Klein/Opat Symposium	**Interferometry**
4.00	*Berry phase via quantum Zeno effect* S. Pascazio Universita di Bari and Istituto Nazionale di Fisica Nucleare **KO141** (30 min.)	*Distortion and phase effects of coating on precision Optical Surfaces* B. F. Oreb, R.P. Netterfield, C. J. Walsh, C. H. Freund, A. J. Leistner & J. A. Seckold CSIRO Telecommunications and Industrial Physics, NSW **IN22**
4.15		*Flexible and stable interferometer designs for fabricating in-fibre Bragg reflection gratings* J. Arkwright, G. Yoffe & B. Smith Photonic Technologies Optical Fibre Technology Centre & Australian Photonics CRC **IN41**
4.30	*Matter-Wave Optics in Melbourne* P. Hannaford CSIRO Manufacturing Science and Technology **KO142**	*Aberration Correction Using a Prototype Bimorph Mirror* H.Zhao, P. W. Fekete and J.W. O'Byrne University of Sydney **IN56**
4.45	(30 min.)	*Ultra High Resolution Imaging of Phase Singularities* J.N. Walford, K.A. Nugent, A. Roberts & R.E. Scholten University of Melbourne **IN63**
5.00	*Neutron Interferometric Measurement of the Neutron-Electron Scattering Length* M. Arif National Institute of Standards and Technology (NIST) **KO 144**	*Modulation-free locking of laser to a high finesse Fabry-Perot Interferometer* M.B. Gray, D.A. Shaddock & D.E. McClelland Australian National University **IN100**
5.15	(30 min.)	*Focal Length Measurements Using Multiple Beam Shearing Interferometry* K. Matsuda, T.H. Barnes, B. F. Oreb & C.J. R. Sheppard University of Sydney, University of Auckland, CSIRO Telecommunication & Industrial Physics, NSW **IN111**

8:00 Evening poster with drink and pizza

Physical Optics

Extremely asymmetrical scattering and the frustrated total internal reflection: physical analogies
D.K. Gramotnev & D.F.P. Pile
Queensland University of Technology **PH88**

Steady-State double-resonant extremely asymmetrical scattering of optical waves in periodic arrays
D.K. Gramotnev & D.F.P. Pile
Queensland University of Technology **PH89**

A Relationship between the extremely asymmetrical and conventional Bragg scattering of optical waves
D.K. Gramotnev
Queensland University of Technology **PH90**

Steady-state and non-steady-state double-resonant extremely asymmetrical scattering of optical waves in periodic arrays separated by a gap
T.A. Nieminen & D.K. Gramotnev
Queensland University of Technology **PH91**

Gaussian and Kaiser windows as optical amplitude masks
M.D. Sharma & C.J.R. Sheppard
University of Sydney **PH125**

Effects of disorder on optical transmittance of grating stacks
A.A.A. Asatryan, P.A. Robinson, L.C. Botten, R.C. McPhedran, N.A. Nicorovici & C.M. de Sterke
University of Sydney and University of Technology, Sydney **PH126**

Invariant large scale structure of axial diffraction patterns
K.G. Larkin & C.J.R. Sheppard
University of Sydney **PH136**

Lasers

Using the cross spectrum to study antiphase dynamics in a nonlinear oscillator array
T. Hill, L. Stamatescu & M.W. Hamilton
University of Adelaide **LA004**

Spatial Profiles of the Output from Semiconductor Lasers and their Dependence on the Optical Feedback
V.G. Ta'eed & D.M. Kane
Macquarie University **LA026**

Coherence collapse in short external cavity semiconductor diode lasers
J.S. Lawrence, D.M. Kane and P.S. Spencer
Macquarie University & University of Wales **LA028**

External cavity laser diodes at 767nm, 1323 nm and 1529 nm
C.M. Sullivan, C.J. Vale, S. Trpkovski, P.M. Farrell and R.E. Scholten
Victoria University & University of Melbourne **LA038**

Dynamics of the Q-Switch pulse development in a phase-conjugate oscillator with an intracavity SBS cell
I.Yu. Anikeev & J. Munch
University of Adelaide **LA046**

Nd: YAG Lasers for the Advanced Research Interferometer
D. Ottaway, P. Veitch, C. Hollitt, D. Mudge, M. Hamilton and J. Munch
University of Adelaide **LA052**

Mode-locked solid-state intracavity Raman laser
H.M. Pask, B. Luther-Davies, N. Rimac
Macquarie University, Australian National University & Victoria University **LA64**

High Power UV Second Harmonic Generation from Copper Lasers
D.J.W. Brown, R.I. Trickett, R.P. Midren, M.J. Withford, D.R. Jones & J.A. Piper
Macquarie University & Heriot-Watt University **LA070**

Ytterbium-doped nonlinear-optical laser crystals
P.Wang, P. Dekker, J. Dawes, J. Piper, H. Zhang & X. Meng
Macquarie University & ShangDong University **LA084**

A pulsed, injection-seeded PPLN optical parametric oscillator system: performance and method of cavity-length control
Y. He, G.W. Baxter & B.J. Orr
Macquarie University & ShangDong University **LA107**

The buildup of the upper state population in a laser rod pumped by a high repetition rate, pulsed pump source
S.E. French, M.J. Withford & D.J.E. Brown
Macquarie University **LA118**

X-Rays

Direct observation of scattering contribution in attenuation measurement in the X-Ray regime, and verification of dominance of Rayleigh scattering versus thermal-diffuse or Bragg-Laue scattering
C.T. Chantler, C.Q. Tran, D. Paterson, Z. Barnea, D.J. Cookson and D.X. Balaic
University of Melbourne **XR014**

Square channel x-ray optic analysis
T.H.K. Irving, K.A. Nugent & R.L. Webster
University of Melbourne **XR095**

X-Ray holographic reconstruction without the twin-image problem
D. Paganin, K.A. Nugent, J.B. Tiller, B.E. Allman, A. Barty and P.J. McMahon
University of Melbourne **XR132**

Thin Films

Design and production of thin film notch filters
R. Netterfield, D. Drage, S. Dligatch & J. Cronin
CSIRO Telecommunications and Industrial Physics **TF009**

In-situ ellipsometric monitoring of multi-layer optical coatings
S. Dligatch, R.P. Netterfield & D.D. Drage
CSIRO Telecommunications and Industrial Physics **TF010**

Spectral resonances in sub-wavelength gratings
Z. Hegedus
CSIRO Telecommunications and Industrial Physics **TF011**

The properties of titanium dioxide thin films deposited by filtered ARC deposition
A. Bendavid & P.J. Martin
CSIRO Telecommunications and Industrial Physics **TF085**

Aspects of monitoring thin film growth
W.G. Sainty, F.L. Optics, I. Qin, W.D. McFall
University of Sydney **TF119**

(continued)

Friday July 9th

	Diffractive Optics Plenary	
8.30	Professor Donald O'Shea, President SPIE *Beyond the Grating Equation: Light Patterns in the Era of Diffractive Optics* Georgia Institute of Technology	
	X-Rays	**Lasers**
9:30	**Keynote Address** *X-ray Optics for Synchrotron Radiation* R. F. Garrett ASRP, ANSTO **XR140**	**Keynote Address** *Recent Advances in Copper Vapour Laser Technology and Applications* D. J. W. Brown, M.J. Withford, R. P. Mildren, E.K. Illy, J.M. Fishburn, J.A. Piper Macquarie University **LA68**
10.00	*Precision measurement of the imaginary component of atomic form factors using synchrotron radiation: new results for silicon copper, silver and gold.* C.Q. Tran, C.T. Chantler, D. Paterson, Z. Barnea, D.J. Cookson & D.X. Balaic University of Melbourne **XR17**	*Spectral Technique for Measuring the Pulse Width Jitter of a Gain-switched Laser* K.J. Grant, H-F Liu & R. Jan DSTO & University of Melbourne **LA21**
10.15	*Non-Interferometric quantitative phase imaging with soft x-rays* J.B. Tiller, B.E. Allman, P.J. McMahon, K.A. Nugent, D.Paganin, A. Barty, I. McNulty, S. Frigo, S. Wang & C.C. Retsch University of Melbourne & Argonne National Laboratory,USA **XR133**	*Stability of semiconductor diode lasers with phase conjugate feedback* J.S. Lawrence & D.M. Kane Macquarie University **LA27**
10:30	Morning tea	

11:00-12:30 Second Poster Session

Spectroscopy

Time Resolved photoluminescence spectroscopy of semiconductor quantum-wells
L.V. Dao, M.W. Chipman & M. Gal
Australian National University **SP099**

Cavity ringdown spectroscopy: Experimental strategies and applications to molecular spectroscopy
A.P. Milce, Y. He, G.W. Baxter, J.W. Nibler and B.J. Orr
Macquarie University **SP106**

An atomic optical filter with 100 MHz bandwidth
L.D. Turner, V. Karaganov & P.J.O. Teubner
University of South Australia **SP124**

Microscopy

Optical Gating in Fluorescence imaging Through a Tissue-Like Medium
X.Gan & M.Gu
Victoria University **MI 19**

Phase-Retrieval Aberration-Detection Techniques for adaptive optics on a confocal Microscope
M. R. Arnison, P. W. Fekete & C. J. Cogswell
University of Sydney **MI76**

High-density optical data storage based on grey level recording in photobleaching polymers using two-photon excitation under ultrashort pulse and continuous wave illumination
D. Ganic, D. Day & M. Gu
Victoria University **MI77**

Non-linear

Soliton dynamics of a passively mode-locked fibre laser: Numerical simulations
D.Y. Tang & P.D. Drummond
University of Queensland **NL93**

Incoherent solitons on a finite background
A. Ankiewicz & N. Akhmediev
ANU **NL71**

Solitons due to two resonance wave mixing
I. Towers, A.V. Buryak, R.A. Sammut & B.A. Malomed
Australian Defence Force Academy & Tel Aviv University **NL115**

The evolution of two optical beams in self-focusing media
F.Kh. Abdullaev & E.N. Tsoy
Physical-Technical Institute of the Uzbek Academy of Sciences **NL129**

Optical Manipulation

Three-dimensional laser trapping of metallic Mie particles
D. Morrish, P.C. Ke & M. Gu
Victoria University **OM03**

Novel light fields for atomic manipulation
T.R. Mackin, E. Harvey & R.E. Scholten
University of Melbourne **OM30**

Atom optics with frequency chirped beams
P.J. Fox, T.R. Mackin, M.R. Walkiewicz & R.E. Scholten
University of Melbourne **OM31**

A metastable helium trap for atomic collision physics
M. Colla, R. Gulley, L. Uhlman, M.D. Hoogerland, K.G.H. Baldwin & s.J. Buckman
Australian National University **OM60**

Spontaneous emission of polaritons from a Bose condensate
K.-P. Marzlin & W. Zhang
Macquarie University **OM117**

Interference between colliding Bose condensates in two dimensions
L. Tribe, W. Zhang & B.C. Sanders
Macquarie University **OM120**

Quantum Optics

The first absolute test of Quantum electrodynamics for hydrogenic vanadium, Z=23, and the first absolute QED measurement using the NIST electron-beam ion trap
C.T. Chantler, D. Paterson, L.T. Hudson, F.G. Serpa, J.D. Gillaspy & E. Takacs
University of Melbourne **QO15**

Spontaneous emission in photonic crystals
B.C. Sanders, K. Busch, N. Vats & S. John
Macquarie University **QO33**

Perturbative effects in photon coincidence spectroscopy
L. Horvath & B.C. Sanders
Macquarie University **QO65**

Cavity modes of a planar microcavity
J.-j. Shi & B.C. Sanders
Macquarie University **QO122**

Analysis of phase space resonances for the Quantum Driven Pendulum (QDP)
W.K. Hensinger, A.G. Truscott, M. Hug, N.R. Heckenberg, G.J. Milburn & H. Rubinsztein-Dunlop
University of Queensland **QO80**

Disagreement between semiclassical and quantum mechanical correlations in the damped nondegenerate Parametric oscillator
D. Pope, P.D. Drummond & W.J. Munro
University of Queensland **QO135**

Optical Fabrication & Interferometry

Non-contact monitoring of the curing of composite materials using laser-induced ultrasonics and an optical fibre interferometer
S. Sathiyakumar & S. Collins
Victoria University **OF37**

Studies in phase retrieval using the transport of intensity equation and its application to the investigation of artworks
M.L. Michna, A. Roberts, K.A. Nugent & R. Sloggett
University of Melbourne **OF96**

Experimental Study of Straightness Measurement Using a Reflection Confocal Optical System
K. Matsuda, M. Roy, J.W. O'Byrne, P.W. Fekete, T. Eiju & C.J.R. Sheppard
University of Sydney **OF109**

Position Magnifying Sensor Using Multiple Beam Shearing Interferometry
K. Matsuda, T.H. Barnes, B.F. Oreb & C.J.R. Sheppard
University of Sydney, University of Auckland, Japan Science and Technology Corporation &
CSIRO Telecommunications and Industrial Physics **OF110**

Low coherence interferometry in real time by spectral modulation and analogue feedback
A.J. Stevenson & D.J. Booth
Victoria University & Swinburne University of Technology **IN34**

High resolution laser speckle correlation for displacement and strain measurement
P. Wilksch & R. Feiel
RMIT & Technical University Graz **IN81**

Shape measurement with speckle interferometry
D.I. Farrant & B.F. Oreb
CSIRO Telecommunications and Industrial Physics **IN82**

(continued)

12:30	Lunch	
	Physical Optics	**Lasers**
2:00	*Beam propagation factor and kurtosis parameter of different types of flattened gaussian beams* S. Saghafi, C.J.R. Sheppard & G.W. Forbes University of Sydney, Macquarie University **PH66**	*Effect of Hydrogen on Beam Divergence in Copper Bromide Lasers* P.G. Foster & D. McCoy University of Adelaide **LA045**
2:15	*Bright vortices in parametric system* H. He, P.D. Drummond & C.M. de Sterke University of Sydney University of Queensland **PH128**	*Optical Investigations of semiconductor quantum dots and quantum wires* L.V. Dao & M. Gal University of NSW **LA98**
2:30	*Guided-wave Holographic filter* Z. Hegedus, M. Scott & S. Cunningham CSIRO Telecommunications and Industrial Physics, NSW **PH83**	*Spectroscopic tailoring of multiwave length pulsed optical parametric oscillators: Photonics technology to the rescue?* B.J. Orr, Y. He, G.W. Baxter, M.J. Johnson & J.G. Haub Macquarie University **LA105**
2:45	*Extremely Asymmetrical scattering of bulk optical waves in arrays with varying mean permittivity* D.K. Gramotnev & J.V. Trapp Queensland University of Technology **PH87**	*High Power lasers and optics for gravitational wave interferometry* J Munch, D. Mudge, M. Hamilton, P. Veitch, R. Byer, E. Gustafson & S. Whitcomb University of Adelaide **LA49**
3:00	*Beams with phase singularities* G.F. Brand University of Sydney **PH113**	*Tomographic measurement of the phase noise of diode pumped Nd:YAG laser by high finesse cavity* J.W. Wu, M.B. Gray, P.K. Lam & H.A. Bachor Australian National University **LA57**
3:15	*Anomalous Absorption of light in stacked wire gratings* R.C. McPhedran, N.A. Nicorovici, A.A. Asatryan, P.A. Robinson & C.M. de Sterke University of Sydney **PH127**	*Control of a chaotic system by feedback* G. Kociuba, D.Y. Tang & N.R. Heckenberg University of Queensland **LA92**
3:30	Afternoon tea	
4:00	**AOS medal award** P.J. Drummond on D. Walls	
4:30	**Annual General Meeting of the Australian Optical Society**	
5:00	**Closing**	

5:15 End of Conference

For further details regarding the conference timetable, poster sessions and a raft of other information, please refer to the AOS web site at:

http://www.physics.mq.edu.au/~aos/

AUSTRALIAN OPTICAL SOCIETY

AUSTRALIAN OPTICAL SOCIETY

Notice of Annual General Meeting

The 1999 Annual General Meeting of the Australian Optical Society will be held at 4.30 pm on Friday July 9 in The Webster Theatre, School of Veterinary Science, University of Sydney.

AGENDA
1. Apologies
2. Agenda
3. Minutes of previous meeting
4. Business arising
5. President's report
6. Treasurer's report
7. Election of councillors and office bearers
8. Any other business

Members unable to attend this meeting are strongly urged to complete the proxy nomination form below and submit it to the President or Secretary well before the meeting. This will ensure that your vote on important matters is counted.

==========

Proxy Nomination Form

I, _____ [print name], as a member of the Australian Optical Society entitled under the Constitution of the Association to vote at the Annual General Meeting on 9 July 1999, hereby appoint _____ [print name], to act as my proxy at the abovementioned meeting. He/she has my authority to vote on my behalf in the election of councillors and office bearers, and in any other matters arising at the meeting upon which a vote is called for.

Signed _____

Date _____

==========

KOREA: Subsidy Helps New Grads Find First Science Jobs.

Abridged article by Michael Baker, SCIENCE **283**, No. 5408 Issue of 12 Mar 1999, p 1629

New government program gives thousands of students with advanced degrees a temporary spot in an economy trying to rebound.

Kang Hae Won, with a freshly minted Ph.D. in nutrition from New York University, confronted a bleak job market when she rejoined her husband in Korea in early 1998. Along with some 2500 Korean students who received advanced degrees last year in science and engineering, she was seeking her first research job just as the country's economy took a nose dive and thousands of workers were being laid off. Unable to find a paid position, she signed on as an assistant to biochemist Park Tae Sun of Yonsei University in Seoul for a project that had not yet been funded. In spite of her tenuous status, Kang considered herself fortunate to be working in her field on a project that offered a chance for publication.

Several months later, her financial situation also improved. In September, she was accepted into the first wave of the government's new Research Intern Program, which places new graduates in scientific positions and subsidizes their pay for up to 1 year. The program is intended to carry them through tough times, keep their skills sharp, and stock universities and institutes with young talent.

The intern program, which pays $870 a month to Ph.D.s and $700 to those with master's degrees, is the largest of three recent initiatives for scientists and engineers. Unemployed but experienced scientists are being dispatched to small and medium-sized companies as part of a "Science and Technology Corps" that keeps them active, as well as tapping into their expertise. Other jobless scientists work for similar pay on displays for the National Science Museum.

The government hopes to enroll 5000 scientists and engineers over 2 years in these programs. But the demand is even greater. Last year, the number of positions for scientists at public laboratories in Korea dropped by 8.7%, and private companies trimmed their R&D payrolls by 6%. With another 2500 graduating with advanced degrees this year, the employment picture remains grim. "The programs are too small for all those people," says Chung Sung Chul at the Science and Technology Policy Institute in Seoul. "There is enormous pressure for jobs."

The intern program is run by the Korea Science and Engineering Foundation (KOSEF), which matches job seekers to vacancies. Kang and Park asked to be paired, but graduates without any institutional links can apply individually to KOSEF and wait for a match. From a pool of 1800 applicants, all with degrees received in the last 2 years, the Research Intern Program so far has placed 1300, about half of them at universities. About 40% are engineers, in line with the discipline's overall share of a typical graduating class, followed in descending order by agriculture and fisheries science, biology, chemistry, physics, geoscience, and mathematics.

Although the program is not a perfect solution - the fit isn't always right, interns must keep one eye out for their next job, and their short tenure limits the type of work that can be done — it offers a life preserver to recent graduates floundering in a suddenly troubled job market

Interns who have promised to work in Korea in exchange for government funding of their graduate education face a particularly tough future in an economy where domestic jobs are scarce. Geoscientist Lee Yong Joon, a recent graduate of Texas A&M University, has the scientific and language skills to compete for a job overseas, but he owes the government 3 years in Korea in return for his training. "Yong Joon is a good scholar and researcher," says Lee Jin Han, his project supervisor at Korea University. Unfortunately, the school's budget may be too tight to hire him after the intern subsidy is up. In the meantime, Lee Yong Joon is making a contribution by peering at hyper-thin slices of rock, searching for signs of a new fault in central Korea.

Some of the biggest beneficiaries of the new programs are companies needing help with shop-floor issues or in the lab. The Science and Technology Corps dispatches experienced teams or individuals to provide technical assistance. At Kumho Life and Environmental Science Lab in Kwangju, for example, 10 of its 55 workers are paid by the program and work alongside full-time employees to crystallize proteins, breed transgenic plants, and conduct studies on environmental stress signals.
The Corps employees have appropriate backgrounds and learn quickly, says Song Pil Soon [ED. Professor Pil-Soon Song of University of Nebraska is one of the founding editors of KASTN], one of Kumho's principal investigators. Song would like to keep them on when the government funding expires, but Kumho, like many companies in Korea these days, is under a hiring freeze.

Despite these obstacles, a KOSEF survey found that 90% of institutions and interns are satisfied with the program, and that 75% believe the interns stand a good chance of finding a permanent job after the government subsidy ends. "I'm very happy and grateful to the government," says Kang, whose 1-year appointment runs through August. "And I'm sure that I will find a [permanent] position when the economy improves."

FRANCIS LORD OPTICS
Sydney Australia

Established 1946

For the last 50 years Francis Lord Optics have provided Australia with a unique optical fabrication service. We now have pleasure in announcing an important extension to our product line to include an extensive range of thin film coatings in our

MultiCoat Service

We Produce:-

- Optical Windows and Flats
- Lenses
- Prisms
- Output Couplers & Retardation Plates for Submillimetre Lasers
- Mirrors

All of these components can be produced from a wide range of materials and in quantities suitable for prototyping through to production.

To these components we can apply:-

- Broadband and Monochromatic Antireflection Coatings
- High and Partial Reflection Coatings for both Wideband and Laser Applications
- Dichroic Colour Separation Filters for Illumination and Lighting Systems
- Hot and Cold Mirrors
- Colour and Temperature Balance Filters
- Astronomical and Front Surface Mirrors Protected with our Special Quartz Coating

All work carried out using state-of-the-art

- Ion-based deposition procedures using our specially developed Hi-Flux Ion Sources*
- Optical Control Monitoring from the ultraviolet to infrared
- Optical thin film design programs

Glass Thermal Toughening

In combination with the above services or separately, we can thermally toughen standard glasses with our Flat Bed Process. Please inquire for details.

For all inquiries contact
Dr Wayne Sainty
Tel (02) 9807 1444
Fax (02) 9809 7136
Email wayne@flo.com.au

Call and see us at
33 Higginbotham Road
Gladesville 2111

* patent applied for

Newport

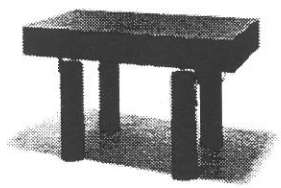
Coherent SCIENTIFIC

AOS/ACOFT Table Sale !

Vibration isolation systems available at heavily discounted prices !

This year ACOFT and AOS will co-locate at the University of Sydney from Sunday July 4th to Friday July 9th. The exhibition will be held from July 6th to 8th. Coherent Scientific, as a major sponsor of both conferences, would like to extend an offer to all customers through our annual table sale. ALL vibration isolation systems from Newport will be heavily discounted effective immediately. The offer will end, however, at the close of the conferences. Shipment of all table will then be consolidated.

Newport optical table tops feature;



- ⇒ Sealed, threaded (M6 or1/4-20) mounting holes
- ⇒ Unsurpassed end-to-end flatness
- ⇒ Superior tuned vibration damping
- ⇒ Rigid, steel honeycomb core material
- ⇒ Performance specifications guaranteed for life

For more details please send your request to sales@cohsci.com.au

Coherent Scientific Pty. Ltd. - 116 Burbridge Road - Hilton - SA - 5033
Phone: (08) 8352 1111 E-mail: sales@cohsci.com.au
Fax: (08) 8352 2020 Web: www.cohsci.com.au

Why Newport Tables Outperform All Others

1. Proprietary Tuned Damping

Superior compliance is achieved by the use of hydraulic dampers, each individually tuned to minimise table motion at specific resonance modes.

2. Self-damping Side Panels

Newport side panels dampen vibration much like loudspeaker enclosures which are constructed of the same vibration attenuating material.

3. Lighter Tables for Superior Rigidity

Newport tables weigh approximately 35% less than ordinary tables, yet provide more than twice the torsional rigidity.

4. Precision Platens for Superior Flatness

These platens are the biggest and flattest in the industry, giving Newport tables a guaranteed end-to-end flatness of +/-0.005 inches (0.127mm).

5. Proprietary Bonding Technology

Newport uses a rigid epoxy and a time-proven bonding process to guarantee bond strength and stiffness. Newport guarantee against table skin delamination - for life.

6. Patented, Corrosion Proof Sealed Mounting Holes

Newports tough, fibre-glass reinforced, polyester resin sealing layer, is completely and permanently impervious to all acids, bases, and common laboratory solvents.

7. Non-resonant, Free Standing Legs

Newport's large-footprint, free standing isolators avoid problems associated with tie-bar vibration amplification.

8. Exclusive Hybrid Chamber Isolator Design and Performance

Newport isolators provide faster table settling time, in addition to much improved damping efficiency over a wide range of operating conditions.

9. Unrivalled Technology Leader

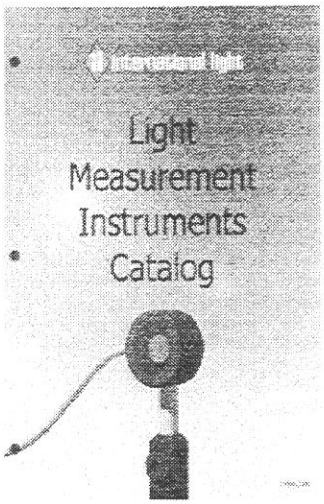
Responsible for inventing steel-core honeycomb table tops in the 1970's, Newport is still leading the way with new high performance systems like the **Electro-Damp** Active Vibration Control System, **Formel** Granite-Honeycomb tables and **Stacis 2000** Stable Active Control Isolation systems.

10. Proven Performance that has Passed the Test of Time

Over 25,000 vibration isolation systems installed during more than 25 years of service. Newport tables not only work better, they also last longer. We have over 25 years of history to prove it !

Coherent Scientific Pty. Ltd. - 116 Burbridge Road - Hilton - SA - 5033
Phone: (08) 8352 1111 E-mail: sales@cohsci.com.au
Fax: (08) 8352 2020 Web: www.cohsci.com.au

New from **WARSASH Scientific**

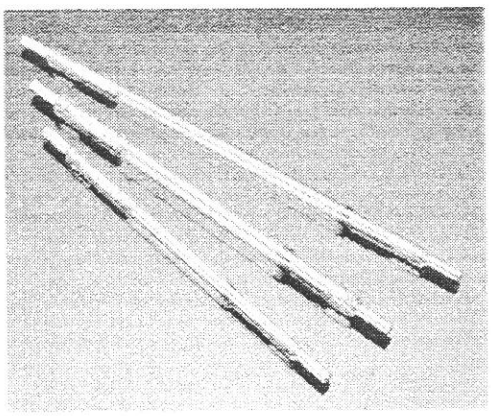


International Light's new 1999-2000 catalogue now available

International Light's new 36-page catalogue is a comprehensive source of light measurement instruments, detectors, and accessories for experienced electro-optical and photonics engineers and newcomers. Featuring an expanded application section, it describes a variety of manufacturing and quality control uses for light measurement including photostability testing, UV-curing, LED and flash measurement, photodynamic therapy and UV-health hazard testing.

Flashlamps for all requirements

We can provide a complete range of flashlamps both standard and custom designed and built or a wide range of applications.
These include solid state laser lamp replacement machine vision systems and UV curing, replacing the majority of commercially available laser systems. We also provide a complete range of trigger transformers.



WARSASH Scientific is pleased to once again support the Australian Optical Society and will be exhibiting at ACOFT/AOS'99 from Tuesday 6 July to Thursday 8 July at the University of Sydney.
Come see us on stands 5 and 6 in the Refectory. We shall be showing the latest from our wide range of fibre optic and optoelectronic equipment and systems, including fibre optic receiver modules, laser diodes, piezoelectric nanopositioning and many more.

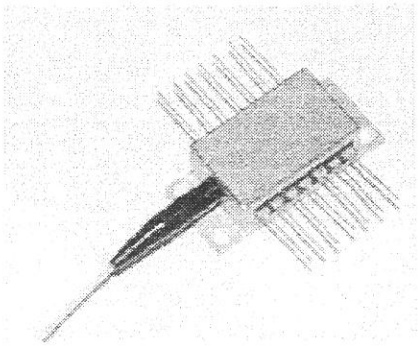
WARSASH Scientific at tel: (02) 9319 0122 – fax: (02) 9318 2192
email: sales@warsash.com.au – website: http://www.warsash.com.au

WARSASH

New from **WARSASH Scientific**

S-330 $\theta_X\theta_Y$ Ultra-Fast Piezo Tip/Tilt Platforms

S-330 Piezo Tip/Tilt Platforms are fast and compact tilt units, providing precise angular movements of the top platform in two orthogonal axes. The tilt range is ±1 mrad (each axes) with sub-µrad resolution. Closed loop versions are available for highest accuracy and repeatability. S-330 systems are designed for mirrors up to 50 mm diameter and have outstanding angular stability over a wide temperature range

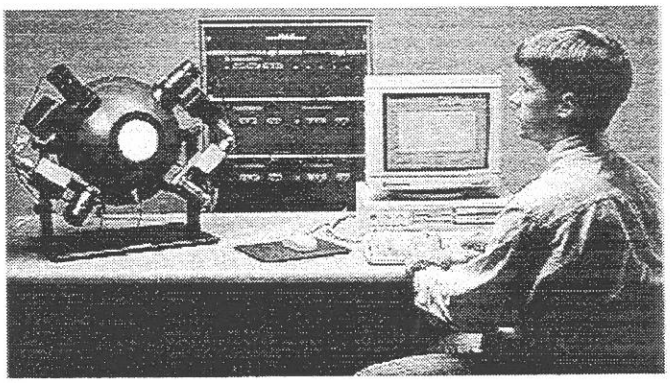


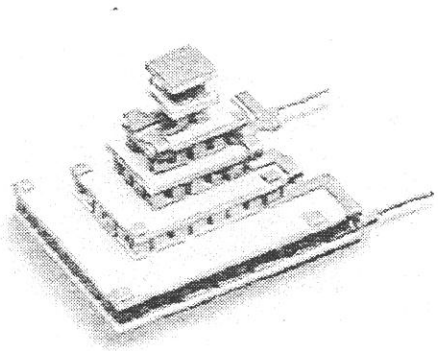
EG&G Telecommunication Receiver modules

EG&G offers a broad range of Silicon and InGaAs photodiode devices and hybrid photodiode-preamplifier modules for the 400nm to 1700 nm wavelength range. Frequency response of 3.5 GHz is achieved with InGaAs photodetectors and 1 GHz is achieved with Si detectors.

Labsphere Uniform Light Source Systems

Labsphere's integrating sphere UNIFORM LIGHT SOURCES are the worldwide industry choice for calibration and test of remote sensing and surveillance instrumentation, electronic or photographic imaging devices, as well as spacebourne multispectral imagers. Labsphere's luminance / radiance standards are used to calibrate and test cameras, telescopes, photometers, radiometers, optical detectors and CCD arrays.





New High Performance Thermoelectric Coolers

Marlow Industries, Inc. is the world leader in quality thermoelectric cooling technology. For over 25 years, Marlow has developed and manufactured thermoelectric coolers (TECs) and subsystems for the military, aerospace, medical, high speed integrated circuits and telecommunications markets. New from Marlow are their AT series High heat pumping capacity modules. Identical to the DT series in Electrical characteristics but due to a novel manufacturing technique offer a 5% to 10% better performance.

WARSASH Scientific at tel: (02) 9319 0122 – fax: (02) 9318 2192

email: sales@warsash.com.au – website: http://www.warsash.com.au

Serving Australian & New Zealand Scientific Research & Industry

INDEX TO ADVERTISERS

CORPORATE MEMBER ADDRESS LIST

A.G. Thomson & Co. (S.A.) Pty Ltd
17 Synagogue Place
Adelaide SA 5000
Tel: (08) 8223 2466
Fax: (08) 8232 2594

Australian Holographics Studios Pty Ltd
PO Box 160
Kangarilla
SA 5157
Tel: (08) 383 7255
Fax: (08) 383 7244
austholo@camtech.net.au

AVIMO Electro-Optics Pty Ltd
14 Fifth Lok Yang Road
Singapore, 2262
Tel: +65 265 5122
Fax: +65 265 1479

British Aerospace Australia
PO Box 180
Salisbury SA 5108
Head Office:
14 Park Way
Technology Park
The Levels, SA 5095

Coherent Scientific Pty Ltd
116 Burbridge Road
HILTON, SA, 5033
Tel: (08) 8352 1111
Fax: (08) 8352 2020
cohsci@cohsci.com.au

Electro Optic Systems
55A Monaro St
Queenbeyan, NSW, 2620
Tel: (06) 299 2470
Fax: (06) 299 2477

Electro Optics Pty Ltd
PO Box 67
Kenthurst, NSW, 2156
Tel: (02) 9654 1873
Fax: (02) 9654 1539

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

Hadland Photonics Pty Ltd
19A Hampsbire Road
Glen Waverley, VIC, 3150
Tel: (03) 9560 2366
Fax: (03) 9560 8402

Jung Precision Optics
Bld 186
Contractors Area
Salisbury, SA, 5108
Tel: (08) 8287 2422
Fax: (08) 8287 2706

Kidger Optics Limited
9a High Street
Crowborougb, East Sussex
TN6 2QA
UK
Tel: +44 1892 663555
Fax: +44 1892 664483
sales@kidger.demon.co.uk

Laser Electronics (operations) Pty Ltd
PO Box 359
Southport
QLD, 4215
Tel: (075) 96 0177
Fax: (075) 96 3530

Lastek Pty Ltd
GPO Box 2212
Adelaide, SA, 5001
Tel: (08) 8443 8668
Fax: (08) 8443 8427
sales@lastek.com

OptiScan Pty Ltd
PO Box 1066
Mt. Waverley MDC
VIC 3149
Tel: (613) 9562 7741
Fax: (613) 9562 7742

Photon Engineering
PO Box 10269, Gouger St
Adelaide SA 5000
Tel: (08) 8410 4599
Fax: (08) 8410 4544
photeng@ozemail.com.au

Raymax Applications Pty Ltd
16 Ross Street
Newport Beach, NSW, 2106
Tel: (02) 9979 7646
Fax: (02) 9979 8207

Spectra-Physics Pty Ltd
25 Research Drive
Croyden, VIC, 3136
Tel: (03) 9761 5200
Fax: (03) 9761 5600

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