Australian Optical Society

NEWS

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

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AOS NEWS

AUSTRALIAN OPTICAL SOCIETY

12TH CONFERENCE OF THE AUSTRALIAN OPTICAL SOCIETY *and* **AUSTRALIAN CONFERENCE ON OPTICAL FIBRES AND TECHNOLOGY '99**

COVER :

The Australian Optical Society held its 12th biennial conference at the University of Sydney from the 4th July to 9th July, 1999.

See the article by Christopher Chantler on p7 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.

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DEADLINE FOR NEXT ISSUE
5th October, 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 wish to record, with great regret, the passing of one of our local community's most prominent and original physicists of recent decades. Sadly, Professor Daniel F Walls died in May from cancer after a long illness. For a long time Dan had coped bravely with a kidney failure and cancer but this did not slow down his pace of work, nor did it prevent him from keeping in touch with many of his colleagues.

Professor Wall's contribution to the field of theoretical quantum optics and atom optics is enormous, with over 300 papers published in major physics journals and a number of books. It is therefore fitting that Professor Walls was recently chosen to be the recipient of the 1999 Australian Optical Society Medal. He was a holder of a number of other prestigious awards and scholarships, including the recently awarded Paul Dirac Prize and Medal.

Dan Walls was a pioneer of the study of non-classical light. He has made a famous prediction of photon untibunching in atomic resonance fluorescence. This prediction led to major experimental efforts in many laboratories around the world and was subsequently verified. Professor Walls has helped to establish both quantum optics and, more recently, atom optics as mature theoretical disciplines.

Dan Walls has made a major contribution to optics in Australasia. He has been very successful in raising the international profile of optics in this part of the world and has put optics in Australia and New Zealand on the world map. He interacted with many other physicists and educated a large number of students who today occupy senior academic positions in Australia, New Zealand and the USA.

The AOS is proud to have chosen Dan Walls as the winner of our 1999 Medal. Our deepest sympathies go to his family for their loss.

During our recently held AOS'99 conference in Sydney Professor Peter Drummond gave a tribute to Dan Walls on Friday 9 July in the afternoon session where the presentation of this years winner of the AOS Medal was made.

AOS'99 conference was co-located with the Australian Conference on Optical Fibre Technology (ACOFT'99). It was in many ways a very special conference. It was for the first time that we co-located AOS Conference with the Australian Conference on Optical Fibre Technology (ACOFT'99). There are strong synergies between the two conferences. Many of us find usually both of these meetings of considerable interest and therefore in the past we made an effort to attend both of them. To make the relationship even closer we made a first attempt and co-located the two meeting. Out of almost 200 participants of AOS Conference over a third attended the ACOFT meeting. We witnessed a week long, very exciting scientific program of the two conferences with plenary sessions, keynote addresses, contributed papers and posters. The Wednesday of the conference was a shared day and we listened to three plenary speakers covering subjects ranging from femtosecond optics, through optical communication to adaptive optics for the human eye.

Last cognate conference that was held in the region was the Australian Conference on Optics, Lasers and Spectrosocpy held in Christchurch, New Zealand in December 1998. This was an excellent meeting with strong emphases on quantum optics, atom optics and the Bose-Einstein Condensate. As the AOS'99 was following rather short time after the above mentioned meeting the Techincal Program Committee chaired by Keith Nugent elected to make a program with more emphases on local themes and concerns. All of the keynote speakers presented in fact an overview of their area and

discussed their view on the future developments of these particular areas of optics in Australia.

Another highlight of the program was Klein/Opat Symposium in honour of the contributions that Tony Klein and Geoff Opat have made to Australian optics. That was an afternoon filled with a lot of memories of how Tony and Geoff started their famous experiments on neutron interferometry, and the description of the current status of the field. We also heard very exciting talks on their most recent contributions to optics such as matter-wave optics and studies of Berry phase via quantum Zeno effect. It was a magnificent afternoon with very lively discussions following each invited talk.

We had two very successful poster sessions which culminated with the award for the best poster presentation going to Jennifer Fishburn from Macquarie University for the poster entitled "Micromachining of metals with copper laser". Congratulations Jennifer! Two other poster presenters received an honourable mention: Tracie Mackin from Melbourne University for the poster presentation entitled " Atom optics with frequency chirped beams" and Winfried Hensinger from the University of Queensland for his work on "Analysis of phase space resonances for the quantum driven pendulum". My congratulations go to both of you!

I am sure that all who attended the AOS'99 Conference would like to join in with me in thanking again the organizers for the most successful conference. My warmest thanks go to Keith Nugent who was chairing the Technical Program Committee and the other members of this committee. I would also like to express my very warm thanks to Ian Bassett who was the chair of the Local Organizing Committee and the other members of his committee as well as to Barry Sanders for the excellent job as a treasurer of the conference. It was a very well staged conference. Somewhere else in this issue of AOS News you will be able to read about the feedback that we got from the participants on the conference. Chris Chantler has summarised the results.

I would like to draw the members attention to the changes in the rules for the AOS Postgraduate Student Prize, which now can be applied for by any postgraduate student who is a member of the Society and is enrolled at an Australian University as a PhD student in a research field related to optics. An applicant must demonstrate potential to make a significant contribution to optics or a related area. The prize is being advertised in this issue of the AOS News. We do have many very capable optics postgraduate students in Australia who should strong candidates for this prize.

AOS, ACOFT, ACOLS, the Photonics CRC, the IREE and the IEEE/LEOS within Australia are collaboratively putting forward a submission to CLEO/Pacific Rim Steering Committee to host the 2003 CLEO/Pacific Rim Conference in Sydney. This bid is going to be presented at the next CLEO/PAC Rim Steering Committee Meeting in Korea in the beginning of September 1999. We will keep you informed on the outcomes of that meeting.

Halina Rubinsztein-Dunlop
President
Australian Optical Society

Editorial

This issue reports on the annual general meeting of the Australian Optical Society, as well as its Twelfth Conference, held at the University of Sydney from the 4^{th} to 9^{th} July, 1999.

I managed to visit the conference on the 8^{th}, and attended some very interesting sessions. A highlight was the lecture delivered by Anton Zeilinger in the Klein/Opat plenary session. The lecture presented the results of recent experiments by his team at the University of Vienna on the diffraction of C_{60} buckyballs, as well as providing Professors Klein and Opat with their very own life size 'buckyballs'.

During my brief visit to the conference, I was again surprised by both the variety and quality of optics related research in Australia. Moreover, much of the work presented by postgraduate students was of a particularly high calibre, and is hopefully reflective of the state of Australian optics research.

Accordingly, I would encourage all optics researchers to submit either new results or synopses of recent work for publication in the AOS News.

Shaun Griffin

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.

AOS'99: A Great Success

I have been asked to give a report on AOS'99. This is a rather personal and biased report, but I will share with you what encouraged and surprised me about our Society and the meeting.

The colocation of AOS'99 with the Australian Conference on Optical Fibre Technology (ACOFT'99) was a major experiment for our Society (although we arguably do something similar with ACOLS). This was based on the common interests of both communities, and the fact that significant numbers of people attend both. In terms of timing, this was a very logical response.

If we add ACOFT-only numbers to our own, and note that some failed to attend because of the recent ACOLS meeting, we may note that the major jump in numbers we experienced at AOS'11 in Adelaide was more-or-less maintained. This is a measure of success.

A specific purpose was to encourage joint participation by each side into both of the colocated conferences. The resulting numbers show this clearly – the organisers had anticipated that 10% of the attendees would be joint, but more like 40% were. This shows a remarkable encouragement and success in this sense.

The ACOFT meeting was reported to be very good by some joint attendees. Several of the talks appeared of quite high relevance and interest.

As an experiment in colocation, I think there were some things we can learn from in the future. We learnt about difficulties relating to the University of Sydney facilities management, and about the complexity of multiple local organisations for colocated conferences. I think the exhibitors stalls and job-search forum were well done, although it is unfortunate that these were largely given in the first three days of colocation, and completed before our first poster session. The lack of pizza for the first poster session was a fairly minor glitch, made up for with lunch the following day, and apparently also due in part to the U. Sydney facilities management. Hopefully we will make use of some of this learning experience for the colocation with the AIP in December of next year, but I don't think the negative impact was that severe.

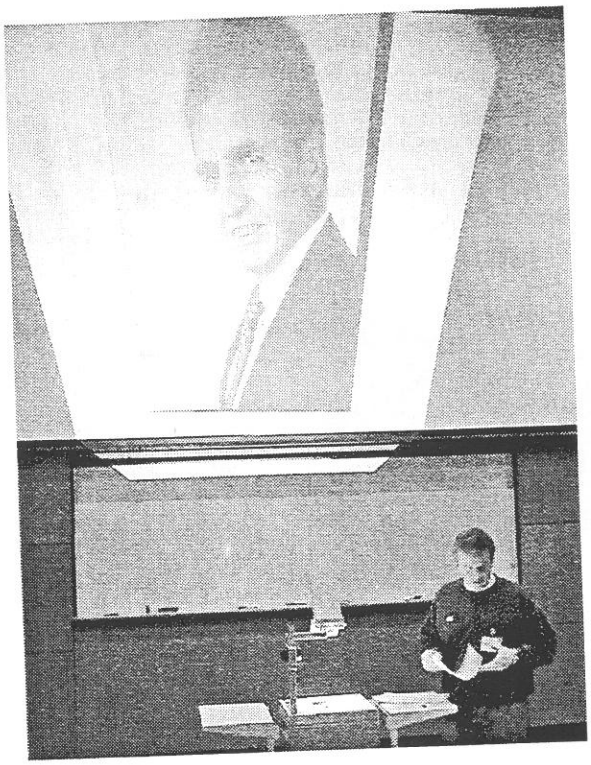
The main criteria for the success of a conference are the numbers, the excellence of presentations, the interactions and the ideas presented. In all these areas I was encouraged and impressed.

The AOS President, Halina Rubinsztein-Dunlop, presents the prize for best student poster at AOS '99 to Jennifer M. Fishburn of Macquarie University for a poster entitled "Phase explosion during micromachining of metals with copper lasers", by Fishburn, Kapitan, Brown, Withford and Piper. Honourable mentions went to Tracie Mackin from Melbourne University and to Winni Hensinger of the University of Queensland.

Our plenaries were excellent. I might highlight the plenary by David Williams on adaptive optics for the human eye – the first ophthalmic lecture where I have walked away *wanting* to get tested! As for all the colour-blind Professors in Australia – perhaps some of the

news will help! I would also highlight our first plenary by Erich Ippen, which linked up an amazing array of common sub-themes flowing through different sessions.

I personally was greatly entertained by the Klein-Opat plenaries and session. Given the circumstances of impending retirements and contributions Professors Klein and Opat have made to the Society and to Australian science, I felt that this emphasis was completely appropriate, and served as a great education for those of us not active in matter-optics.



At AOS '99, Professor Peter Drummond, of the University of Queensland, describes the scientific career of Professor Dan Walls, whose death from cancer in May of this year occasioned great sadness in the optics community. Dan Walls was selected as the winner of the Australian Optical Society medal for 1999. The medal will be taken to the University of Auckland later this year and presented to Dan's family at a special ceremony.

One of my highlights of the conference was the quality of the student oral talks. We had very few talks which were not presented extremely well, and very few which did not convey something new to the audience. Even coming from the same university and research group, I was impressed (for a random example) by the new aspects of doughnut-mode propagation presented by Julian Walford, arising from the clarity of his presentation.

I found several sessions to be remarkably cohesive given the range of topics covered. The Quantum Optics session and the Spectroscopy session covered a wide range of problems and new Australian solutions, across ranges in energy varying by several orders of magnitude. However, each session formed a good cohesive whole, and I was happy to learn something from each speaker.

The X-ray optics session was a short session, and it is the first time such a session has been in the AOS conference. I would strongly encourage its continuance in view of the comments made by the keynote of that session, that Australian involvement in X-ray optics and physics is likely to increase dramatically over the next few years.

One consequence of the strength in numbers and presentations was the need for parallel sessions, and this is my only concern. We were forced to choose between sessions which occasionally had some overlap, and most sessions were in parallel, so we all missed out on some excellent presentations.

However, this is really a positive statement about the strength of our Society, its members and the attendees.

This report is relatively brief, since there will be a follow-up based on comments of all other attendees (and the surveys handed in). Anyone who has lost their survey sheet but would like to make any comments may feel free to email me at chantler@ph.unimelb.edu.au.

Chris. Chantler

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Revised: April 1999

Meetings Calendar at a Glance

Date	*Meeting*	*1999*	*Contact*	*Location*
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 ni 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. Furter information can be obtained from:

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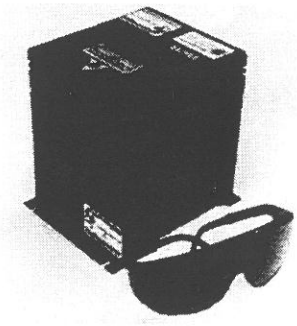

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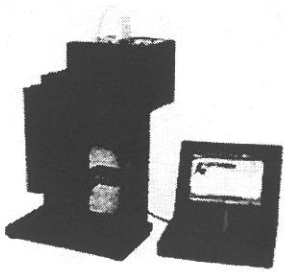

An air-cooled OEM Orion laser as part of a laser marking system

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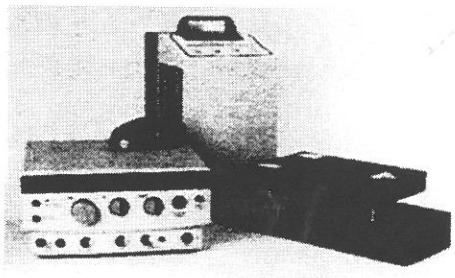

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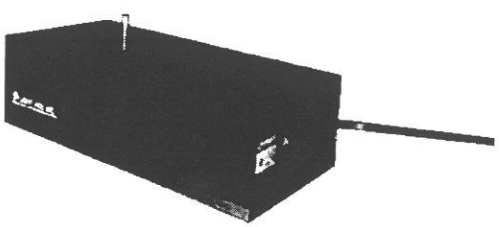

PAL/PRO-UV
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DANIEL F. WALLS

1942-1999

Introduction

Daniel F. Walls, one of the most well-known physicists in Australasia, died recently in Auckland. His death was not unexpected. Dan had suffered through one serious illness after another in recent years, and his cancer was diagnosed as terminal nearly a year ago. Despite the illness, Dan worked at his physics, which he loved, to the end.

To understand Dan, it may help to give the significant dates and events that led to his international reputation. In this article, I will try to describe some of the memorable passages in his life, and to explain just why he was so important to the New Zealand physics community especially, and also to the wider physics world.

New Zealand has had other famous physicists - starting with Lord Rutherford, who grew up in Nelson, and took his M. Sc. degree at Canterbury. But traditionally, eminent New Zealand physicists did their research in Europe (like Rutherford), or America. Dan set the example of a home-based `Kiwi' researcher, who made major discoveries in quantum optics from a strong base in New Zealand.

First, here are some dates in Dan's life.

Born: Napier, New Zealand, 13th September, 1942

M. Sc. (First Class Hons), University of Auckland, New Zealand,1966

Ph. D., Harvard University, USA 1969

Einstein Medal and Prize for Laser Science 1990

Paul Dirac Medal and Prize (The Institute of Physics, U.K.) 1995

Died: Auckland New Zealand, 12th May, 1999

Auckland 1955-1966

Dan attended Auckland Grammar School, famous in Auckland for its rugby players, lawyers, and as the academic `sweat-shop' that usually produced the most scholarship winners in the New Zealand University system. As a rugby playing mecca, the school was largely responsible for instilling the devotion to sports that Dan was later well-known for.

While Auckland Grammar has many famous graduates in New Zealand, physicists are likely to be most familiar with two other graduates in particular:

Quantum optics and statistical physicist Professor Crispin Gardiner

Knot theorist and Field medalist Vaughan Jones

Next came Auckland University, which Dan attended together with his Auckland Grammar classmate Crispin Gardiner - as did mathematician Vaughan Jones some years later. He studied both for a B.Sc. degree and later for a masters degree, as was the custom at Auckland. At this time, Auckland theoretical physics mostly centered around nuclear theory. Dan won the Auckland University Physics Prize in 1966, for his M. Sc. Research in theoretical nuclear physics, which was supervised by Professor David Hooton, a nuclear physicist who was himself an ex-student of Max Born.

Dan's thesis topic and first publication was:

- *A Diffraction Model Treatment of Polarization in Direct Nuclear Reactions,* Nuclear Physics **A90**, 353 (1967).

Harvard University 1966-1969

Next came the decision to study in the USA. Dan followed Rutherford's example of choosing the Northern hemisphere for his doctoral studies. It was usually recommended to good students of this era, that they try and travel at the doctoral stage. While this was good advice, it carried with it the undercurrent that the quality of supervision might be better elsewhere. Dan was to change this perception!

He was a keen rugby player, and carried this devotion to sport - not to mention the social life after the game - with him. In between games, he was very successful in the Harvard environment. Rather astutely, he chose the pioneer quantum optics theorist Roy Glauber as his supervisor, and finished his Ph.D. quickly. By deciding to switch from nuclear physics to the emerging field of quantum optics, Dan ensured that he would be at the fore-front of a new field of physics.

At Harvard, his distinctions were:

Fulbright fellow

Frank Knox Memorial fellow

His thesis topic was one of the first Ph. D. theses studying the quantum properties of light, motivated by the rapid growth of laser techniques. The title was:

Topics in Nonlinear Quantum Optics

Post doctoral studies 1969-1972

Dan decided to take up a postdoctoral position with Professor Hermann Haken, at the University of Stuttgart, who was a pioneer in laser theory, and later introduced the idea of Synergetics, as a development of non-equilibrium thermodynamics. Dan worked on laser theory and the quantum statistical properties of radiation.

His publications included one of the first studies of quantum statistics in Raman scattering. This topic is still very relevant to propagation of radiation in fiber-optical communications systems. A seminal paper from this period was:

- *Quantum Theory of the Raman Effect*, Z. Phys. **237**, 224 (1970).

The next postdoctoral position was back at Auckland University. His research centered on one of the first serious uses of numerical techniques to study time evolution in a nonlinear problem in quantum optics. This work was carried out with Chris Tindle, another young researcher at Auckland University.

This simple technique, of expansion in a number state basis followed by numerical solution of an ordinary differential equation, has since been copied by almost every quantum optician! A well-known, and widely cited paper from this era was:

- *Non-linear Quantum Effects in Second Harmonic Generation*, Nuovo. Cim. Letters **2**, 915 (1971).

Waikato University 1972-1987

As a new faculty member at the recently founded University of Waikato, Dan started to lay the

foundations of his ongoing research into the field of quantum optics.

At the same time, Dan and his old class-mate Crispin Gardiner built an impressive reputation for the `Waikato School' of theoretical physics. This emphasized quantum optics and non-equilibrium physics, as opposed to the more traditional fields of solid-state and nuclear physics pursued elsewhere in New Zealand.

Dan and Crispin together made a strong impact on the New Zealand physics community, driving and influencing research throughout the country towards new directions of research, and away from the traditional bastions like nuclear physics. Dan had superb physical intuition, and Crispin a fine mathematical insight.

Most importantly of all was the attitude that emerged at Waikato, of a research group that felt it could tackle any problem, and solve it without the need for external help. While Dan travelled widely and visited numerous research centres to keep up with the latest developments, the group focussed its efforts firmly around the Waikato base.

Waikato University became a magnet for a succession of graduate students - some local, and others attracted from elsewhere in New Zealand, or from overseas. Dan popularized the master equation, and developed novel techniques for strongly coupled systems, in which methods now used in cavity QED were first thought of.

Dan's graduate students were strongly encouraged to play in the soccer team Dan had organized at Waikato. The local competition, though not always very skillful, could be lethal at times. After moving sheep off the field, came the encounters with tough opponents from the local meat-works, or the forestry workers of the region.

The first student in the Waikato School was Ken McNeil, now a Japanese lecturer (having learned Japanese on a Physics post-doc in Japan). Howard Carmichael or `Hoagie', now a Professor at University of Oregon, was attracted to study in the group, and has developed into a thoughtful and highly influential physicist.

An important paper with Howard Carmichael from this time was:

- *Master Equation for Strongly Interacting Systems*, Journal of Physics **6A**, 1552 (1973).

Numerous applications of master equations and their related Fokker-Planck and stochastic equations to quantum optical processes were undertaken at this time, establishing a variety of methods for handling these problems in a non-perturbative way. A typical example was:

- *Quantum theory of optical bistability*, Phys Rev A **23**, 2563 (1981).

With Professor John Harvey of Auckland University, Dan co-directed the New Zealand Symposia in Laser Physics and Quantum Optics held in 1977, 1980, 1983, 1986, 1989 and 1994. These attracted an increasingly large group of attendees and internationally prominent scientists to New Zealand.

An important function of these meetings was to communicate the excitement of this rapidly growing field to the many graduate students from New Zealand and Australia, who attended the meetings.

Photon Anti-bunching and Squeezing

Another highly regarded paper with Carmichael, was Dan's 1976 master equation treatment of the dynamic Stark effect, which led to an important prediction:

Photons produced from the resonance fluorescence of an atom were predicted to be emitted one by one, with an anti-correlation or anti-bunching between successive emissions.

This work was the first published account of non-classical photon statistics in resonance fluorescence, i.e. light with statistical properties that could not be obtained with any classical theory. It was published in 1976:

- *A Quantum Mechanical Master Equation Treatment of the Dynamic Stark Effect*, Journal of Physics **B9**, 1199 (1976).

This effect gave reduced or non-classical noise, as compared with a laser in which photons were un-correlated, or a thermal source in which photons were correlated. The novel prediction was soon verified experimentally, by Len Mandel, Jeff Kimble and Mario Dagenais of Rochester University. The field of non-classical photon statistics blossomed in the ensuing years, developing into numerous related areas.

Indeed, there are direct relationships between this early, pioneering work, and current studies in areas like quantum cryptography and quantum `teleportation'. Dan's contribution, as always, was to find and solve the model that had the key properties

of being both experimentally accessible, and theoretically soluble.

An important development around this time was the realization that nonlinear materials in an interferometer could also produce reduced fluctuations, but with much larger directionality and intensity. Dan published the first treatment of this type of system in the case of two-photon absorption. He then gave an influential treatment of intra-cavity down-conversion, which later proved to be the most successful device in experiments in the growing area of `squeezing' of light:

- *Non-equilibrium transitions in sub/second harmonic generation,* Optica Acta **28**, 211 (1981).

Work on squeezed light was one of Dan's major research activities during the 1980's. So many co-authors were involved from all over the world, that it is not practical to list them all. It is a tribute to Dan's ability to inspire others, that he never lacked for expert scientists to work with.

Numerous papers appeared, including the original theoretical treatment of Dick Slusher's first squeezing experiment, and a widely cited review paper:

- *Squeezed States of Light*, Nature **306**, 141 (1983).

Dan also realized that parametric oscillators might be able to violate a Bell inequality, giving a new test of quantum mechanics in nonlinear optics, that has since been experimentally developed by many groups. The pairing of emitted down-converted photons is one of the simplest yet fundamental tests of quantum mechanics:

- *Violation of Bell's Inequalities in Quantum Optics*, Phys. Rev. Lett. **53**, 955 (1984).

Auckland University 1988-1999

Dan decided to move to Auckland University, to take up a chair in theoretical physics. He started a large group in quantum and atom optics, and published an influential text-book with an ex-student, Gerard Milburn - that in part arose from a series of graduate lectures Dan had given at Waikato:

- *Quantum Optics*, Springer (1994).

By this time, an ongoing and incurable kidney infection, was proving very serious. Dan nevertheless moved vigorously into the new field of atom optics and atom cooling, which was later to result in a Nobel prize award for his American and European colleagues - demonstrating his insight into the most exciting new fields.

An important paper from this period was an investigation into double BEC condensates exhibiting coherent tunneling. This was later demonstrated at the NIST laboratories in Boulder:

- *Coherent quantum tunneling between two Bose-condensates*, Phys. Rev. A **54**, 4625 (1996).

Dan now experienced severe kidney failure. After a long struggle with dialysis, he had to have a kidney transplant. He was treated with an array of anti-rejection drugs, which suppress the natural immune system. Probably as a side-effect of the drugs, he developed skin cancer, which spread to his ear and throat. He decided to keep working, and was at Auckland University with his research group almost every day.

Despite his illness, Dan was still extraordinarily productive, with a large and supportive research group at Auckland University. The work was characterized by a great deal of cooperation with others, both inside and outside the group. To indicate in some measure his productivity, the following papers were published in 1998 alone:

- *Transfer of photon statistics in a Raman laser,* Opt. Commun. **156,** 426 (1998).
- *Dynamical quantum noise in trapped Bose-Einstein condensates,* Phys. Rev. A **58,** 4824 (1998).
- *Generic model of an atom laser,* Phys. Rev. A **58**, 4841 (1998).
- *Gravitational and collective effects in an output coupler for a Bose-Einstein condensate in an atomic trap,* Phys. Rev. A **58**, 4248 (1998).
- *Thermal properties of interacting Bose fields and imaginary-time stochastic differential equations,* Europhys. Lett. **43**, 641 (1998).
- *Comment on `strongly interacting photons in a nonlinear cavity`,* Phys. Rev. Lett. **81**, 2833 (1998).
- *Quantum correspondence for linear canonical transformations on general Hamiltonian systems,* Phys. Rev. A **58**, 1765 (1998).

- *Quantum state of a trapped Bose-Einstein condensate,* Phys. Lett. A **245**, 49 (1998).
- *Creation of vortices in a Bose-Einstein condensate by a Raman technique,* Phys. Lett. A **246**, 32 (1998).
- *The physics of trapped dilute-gas Bose-Einstein condensates,* Phys. Rep. **303** , 2 (1998).
- *Bose-Einstein condensate in a double-well potential as an open quantum system,* Phys. Rev. A **58**, R50 (1998).
- *Measuring the quantum state of a Bose-Einstein condensate,* Phys. Rev. A **57**, 4686 (1998).
- *Motional states of atoms in cavity QED,* Phys. Rev. A **57**, 4804 (1998).
- *A comparison of bichromatic beam splitters for atoms,* Opt. Commun. **147**, 382 (1998).
- *Pumping two dilute-gas Bose-Einstein condensates with Raman light scattering,* Phys. Rev. A **57**, 3805 (1998).
- *Gravitational and collective effects in an output coupler for a Bose-Einstein condensate in an atomic trap,* Phys. Rev. A **57**, 1248 (1998).

Memories

Dan was the most distinguished Australasian physicist of his generation. He published over 300 research papers in a prominent career. Just one of his papers, the 1983 Nature review paper on squeezing, has been cited over 800 times to date. He was awarded numerous prizes and medals, including the Australian Optical Society medal, just before his death. A partial list is as follows:

1995 Paul Dirac Medal and Prize (The Institute of Physics, U.K.)

1990 Einstein Medal and Prize for Laser Science of the Society of Optical and Quantum Electronics (U.S.A.)

1988 Hector Medal of the Royal Society of New Zealand

1986 Mechaelis Award, University of Otago

1981 Medal of the University of Helsinki

1978 Medal of the College de France

Dan also was a keen member of international physics and science bodies, and was well-recognized, in turn, for his contributions to science. He was appointed a fellow of many distinguished bodies:

Fellow of the Royal Society of London

Fellow of the Royal Society of New Zealand

Fellow of the New Zealand Institute of Physics

Fellow of the American Physical Society

Fellow of the Optical Society of America

Those with the good fortune to have worked with Dan, will never forget his good humor, his enthusiasm for new ideas, and his great insight into his chosen field. He retained these characteristics to the end, despite the severe ongoing medical problems he suffered in later life.

To quote his colleague, Lev Plimak (now at the Weizmann Institute):

> **Two or three weeks before his death, I** *asked Dan if he could do any work. He told me that he needed to put the dose and schedule of painkillers right, and then he was quite positive he would be able to work a few hours a day. He just never surrendered.*

Dan is survived by his son Mark, and wife Beverly.

P. D. Drummond, 1999.

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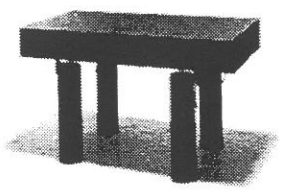

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AUSTRALIAN OPTICAL SOCIETY
NEWS FROM COUNCIL

Council Meeting

Council held a meeting on the evening of Wednesday 7 July 1999, the joint day of the ACOFT '99/AOS '99 back-to-back conferences. (Actually, the conferences were back-to-front, but somehow that doesn't sound quite right). We had, as guests for the first part of our meeting, the distinguished visitors Professor Erich Ippen of MIT, who is also President-elect of the Optical Society of America, and Professor Donald O'Shea of the Georgia Institute of Technology, who is Vice-President of the International Society for Optical Engineering (SPIE).

With the presence, in addition, of Ken Baldwin (AOS's International Liaison Officer), Shaun Griffin (Editor of *AOS News)* and Levante Horvath (assistant to the Treasurer), and the absence of only one councillor (Gerard Milburn, who was overseas), it was an unusually well-attended council meeting.

To facilitate matters for our American guests, we dealt with international business first. Much of the discussion centred around the proposed partial merger of OSA and SPIE. Both societies' boards have approved the plan, which still has to be voted on by the general membership. If the merger proceeds, our future memoranda of understanding regarding reciprocal membership rights and other matters would be with the merged body. Both Erich Ippen and Donald O'Shea stressed the importance to their respective societies of international membership. While Ippen had some reservations about the merger agreement in its present form, he said that he hoped that whatever happened, closer collaboration between OSA and SPIE will result. He would like Australia to participate in OSA's International Council (although this remains unresolved). Council expressed appreciation for the valuable contacts provided by both societies.

We then moved on to discuss other business. We decided to award a prize of $50 (or a donated book) for the best poster presented at the conference by a student. [This prize was later awarded to Jennifer M. Fishburn — see elsewhere in this issue]. Council also unanimously approved the executive's decision to award the AOS Medal to Dan Walls (he was notified of the award shortly before his death).

The was a great deal of discussion on matters raised in the Treasurer's Report. The very serious decline in numbers of corporate members needs urgent attention, and the general decline in membership numbers is also cause for concern. For AOS '99 we did not enforce our "in principle" decision that all conference registrants must be AOS members, but those who were not would be approached and encouraged to join. We need to look for other ways of fund-raising, such as running short courses, and a budget strategy meeting is planned for later this year. Membership fees in all categories would also have to be increased, and a motion to this effect tabled at the AGM.

It was proposed that AOS, in collaboration with ACOFT, ACOLS, the Photonics CRC, IREE, and IEEE/LEOS make a submission to host the CLEO Pacific Rim Conference in Sydney in 2003. While approving of this in principle, Council deferred a final decision due to concern about the level of liability we

might have to bear. Clarification on this is being sought.

Ian Bassett, Keith Nugent and Barry Sanders reported on AOS '99. There had been rather limited success in obtaining sponsors for the conference, and the scattered nature of the organisation also led to logistic difficulties. The short course, attended by 15 people, was a success, and the technical program came together very well. However, there were a number of organisational problems arising from the geographical split between conference committees. IREE was often slow, for example in updating web page information. Financial interaction with IREE, however, had been very satisfactory, with David Charrett's efforts often going above and beyond the call of duty. The final conference deficit is not yet known, but the Treasurer recommended that AOS actually sponsor conferences, rather than running a deficit budget for them. The large number of registrants choosing to attend both conferences was gratifying, but it presented AOS with a financial shortfall, as we benefited more from people who attended AOS '99 only. (Of 119 people attending AOS '99, 71 also attended ACOFT '99). The University of Sydney also turned out not to be a completely satisfactory venue. The President expressed thanks to everyone involved, with particular mention of Ian Bassett, Barry Sanders, John Love, Chris Walsh, Chris Chantler, and to David Charrett and staff at IREE.

Planning is under way for AOS '00, which will be held as part of the AIP Congress in Adelaide in December next year. Finding a suitable venue has been a problem, although one has now been selected. Details of the liaison between AIP and AOS need to be clarified, and a technical committee set up.

AOS '01 is likely to be part of ACOLS, in Brisbane. Another collaboration with ACOFT is being considered as a possibility for AOS '02.

Council also discussed the problems associated with the change in editorship of *AOS News*. The December 1998 and March 1999 issues had both experienced significant delays, but these appear to be transitional problems, and we were still hoping to get four issues out in the year. (We are hopeful that the June issue will appear in August, the September issue in October, and the December issue in December).

The delay in publication of *AOS News* meant that $200 had to be spent in sending out mail notices of the AGM. Council approved a motion to be put to the AGM which would permit such notices to be sent by e-mail, although individual members may "opt out" of this arrangement if they choose (by so indicating on their subscription application).

Annual General Meeting

The AGM was held at 4.30 pm on Friday 9 July, following Professor Peter Drummond's talk on the late Dan Walls, the 1999 AOS Medallist.

The President's and Treasurer's reports are provided separately. The meeting voted to increase subscription rates from $30 to $40 for (regular) members, from $10 to $15 for students, from $250 to $300 for corporate members, and from $125 to $150 for associate members. This motion was carried with one dissenting vote.

The office-bearers and council membership remain unchanged, following the re-election of Barry Sanders as Treasurer, and of Peter Farrell and Lew Whitbourn as councillors. (All other office-bearers and councillors are currently mid-term).

The motion to allow notices to be sent to members by e-mail (where members have not opted out of the arrangement) was passed *nem con.*

On behalf of the members, Brian Orr thanked the President, Treasurer and Secretary for their work for the society in the course of the year. There was no other business.

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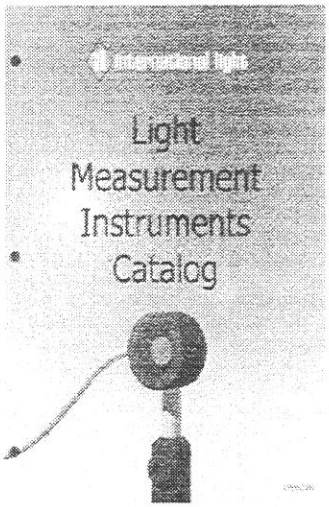

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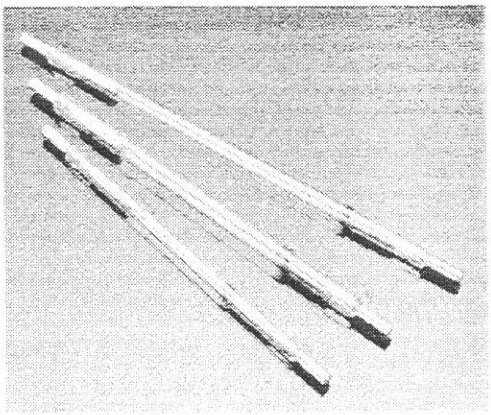

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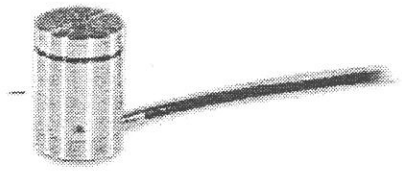

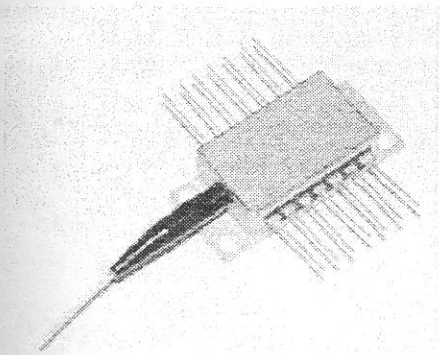

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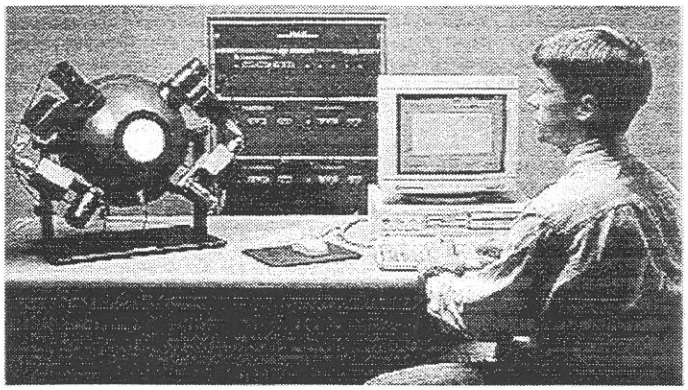

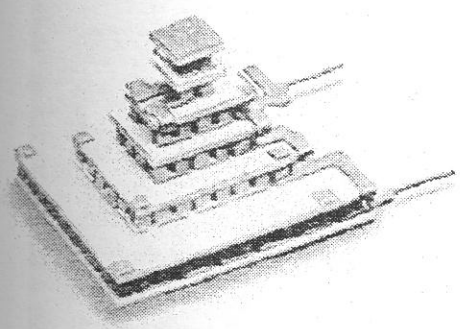

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1999 MID-YEAR AOS MEMBERSHIP REPORT

Submitted by: Barry Sanders (Honorary Treasurer) and Levente Horvath

As of 23 July 1999, the AOS membership consisted of 5 life members, 16 Honorary members and 271 financial members. Of these financial members, 7 are corporate members, 234 are ordinary members and 30 are student members. For comparison, on 30 June 1998 there were 5 life members, 14 honorary members and 278 financial members. Of these financial members in 1998, there were 6 corporate, 254 ordinary and 18 student members.

Many of these 271 financial members are also members of affiliated organisations. There are 105 members in the Australian Institute of Physics, 41 in the International Society for Optical Engineering (SPIE) and 117 in the Optical Society of America, with 7 of these members of all three of these organisations! New South Wales represents 35% of the financial membership and Victoria the second largest number at 21% (an increase from 16% last year in June). The membership in Queensland has risen from 8% to 11% since June 1998. South Australia membership has declined from 14% last year in June to 9% this year. Membership has remained fairly steady in ACT, QLD, Tasmania, NZ, Europe and the USA at 12%, 11%, 1%, 3%, 1% and 2%, respectively. Membership has declined as a percentage of the total in Asia (now 1%), NT (now 0%), and WA (now 2%).

The profile of interests is shown in the table below. These preferences are presented effective Oct 1996, June 1998 and July 1999. The diverse range of interests continues and is indicative of the growth and excitement of optical science and technology.

	Category	1st Preference			2nd Preference			3rd Preference		
		10/96	6/98	7/99	10/96	6/98	7/99	10/96	6/98	7/99
1	Astronomical Optics	21	13	17	11	4	7	7	5	4
2	Atmospheric Optics	13	6	8	4	3	3	4	1	5
3	Communications and Fibres	39	31	36	21	8	17	14	14	10
4	Electro-optics	20	10	15	27	17	20	18	9	14
5	Fabrication and Testing	11	7	8	9	4	6	11	9	8
6	Information Processing	7	4	4	7	6	6	9	5	7
7	Lasers	53	35	31	48	19	31	36	22	32
8	Optical Design	16	8	13	28	23	17	22	14	12
9	Optical Physics	18	13	14	36	26	27	30	23	30
10	Radiometry, Photometry & Colour	8	9	10	17	8	12	6	4	6
11	Spectroscopy	16	9	15	23	18	22	27	17	20
12	Thin Films	9	5	4	8	7	5	11	7	9
13	Vision	8	7	5	5	4	4	7	5	3
14	Quantum Optics	20	12	20	8	7	-	13	5	0
15	Nonlinear Optics	19	12	15	29	23	23	24	20	22
16	Teaching	5	6	6	9	8	9	24	18	20
17	Holography	9	6	5	4	4	7	9	5	5
18	-	33	25	34	12	10	15	10	7	10
19	-	-	-	-	7	6	8	1	1	2
20	-	-	-	-	-	-	-	1	-	-

Table: Interests of AOS Members

Australian Optical Society

(A.C.N 009 548 387)

Accounts – 30th June, 1999

Summary of Significant Accounting Policies

The accounts have been prepared in accordance with the requirements of the Accounting Standards and other mandatory professional reporting requirements. The Accounts have been prepared on the basis of historical costs and do not take into account changing money values or, except where stated current valuations on non-current assets. The accounting policies have been consistently applied, unless otherwise stated.

The Income Expenditure Statement has been prepared on a cash basis.

Incorporation

The Society was formed on the 17th September, 1984.

Membership Subscriptions

As at 30th June, 1999, the Society has members whose subscription status was as follows:

	30/6/99		30/6/98
Current	267*		291
Non-Paying-Life or Honorary	21		19
Non-Current	97		56
Total Membership	385		366

* Includes one paid 2000 subscription

Funds Held In Trust

In addition to cash in the bank of $41914 (1998: $43116), the Australian Optical Society held in trust $24729 (1998: $38852) for the Australian Conference on Optics Lasers and Spectroscopy. Interest earned by these trust funds, upto $1000, will be income of the Australian Optical Society. Interest income earned on these funds for the year ended 30th June, 1999, amounted to $878 (1998: $2185). None of the inteest was transferred to the Australian Optical Society during the year or has been taken up in the 1999 Accounts. The balance amounts to interest amounts of interest income earned on this deposit of $2675 (1998: $1579) will also be transferred in the subsequent periods.

On the 21st August, 1995, $15000 of the Australian Optical Society trust funds was loaned to the organising committee for the 20th International Quantum electronics Conference. The loan was repaid on the 28th November, 1996. However, the interest on $15000 is still to be received.

Comparative Figures

The 1998 comparative figures represent the period from 1/4/97 to 30/6/98.

Income Tax

The Society is limited by guarantee and has obtained exemption from income taxation.

Liabilities Of Members

In the event of the Society being wound up and being able to pay its debts in full, every member will become liable to contribute an amount not exceeding $100.

Balance Sheet			
As at 30 June, 1999			
1998			1999
Current Assets			
14952	Cash at Bank	24160	
14952			24160
	Represented by:-		
	ACCUMULATED FUNDS		
14952	Balance at 1 July, 1998		9472
(12382)	Surplus/(Deficit) Income over Expenditure for period ended 30 June, 1998	(20140)	
(6000)	Transfer to AOS News Acc	(6000)	(26140)
12902	Income		40828
9472	BALANCE AT 30 JUNE 1999		24160

Audit Conducted by E. P. Groombridge & Co., dated 9th July, 1999.

OFFER TO MEMBERS

Madison's Central Hotel in Sydney is offering AOS members a special accomodation rate until 30th November, 1999. The discounted rate is $85 per room per night, plus 10% state tax, and is available to members and anyone travelling with them. The Hotel is located at 6 Ward Avenue, Elizabeth Bay, and is accessable from the Airport Exress bus route.
To book, phone toll-free 1-800-060-118, and ask for the "Association Special Rate".

AOS POSTGRADUATE STUDENT PRIZE

The Australian Optical Society wishes to encourage participation in national and international conferences by high-quality postgraduate students. To this end, the Society has instituted an award, the Australian Optical Society Postgraduate Student Prize. This will take the form of a grant to assist the grantee to attend a conference in optics or a related field. For 2000, the award will be valued at up to $1500. The Society now invites applications from suitably qualified people for this prize for 2000.

Prerequisites

An applicants must be enrolled in a postgraduate research degree in Australia as at 31 October 1999, with a project in an optically related area, and be a member of the Australian Optical Society. Non-members of the AOS may join the Society concurrently with their application for the prize. (Application forms are available in AOS News, or may be obtained from the Treasurer or Secretary). The prize cannot be awarded more than once to any individual.

Selection Criteria

An applicant must be sufficiently advanced in the research project to have obtained significant results in optics or a related area, such that those results are suitable for presentation at a proposed conference that falls in the twelve month period commencing 1 December 1999. It is expected that the presentation at the proposed conference would take the form of a research paper, invited or contributed, oral or poster. The successful applicant will be expected to write a summary of the conference for AOS News.

Preference will be given in the selection procedures to applicants who intend to use the prize to attend and present their research results at a major conference outside Australia or New Zealand.

It is not essential that the results to be presented should already have been accepted for presentation at the proposed conference at the time of application, but no payment of the prize will be made until evidence of such acceptance is provided to the Society. Applicants are encouraged to provide tangible evidence of the results likely to be presented at the proposed conference (for example, in the form of an outline of a paper that has been accepted or submitted or is being prepared for that conference) and to make clear the benefits that would arise from their attendance at that conference.

The AOS award is not intended to cover the full cost of the applicant's attendance at the proposed conference. Wherever possible, applicants should identify means by which their research group and/or institution is likely to make a substantial contribution to their travel costs. Evidence of any such supplementary support should be provided (for example, by an undertaking in the supervisor's letter of recommendation). However, students with no identifiable supplementary travel support will not be disadvantaged in the selection process.

Since the research supervisor's report is a major factor in the assessment process, supervisors should be prepared to rank their students against the selection criteria if contacted by the selection committee.

Application Details

1. Curriculum vitae

2. List of publications, conference papers, theses, reports, etc.

3. Details of postgraduate research project

4. Details of proposed conference (including its status and relevance to optics)

5. Details of participation in the conference (nature of contribution as specified above)

6. Details of predicted expenses, as well as other (probable or confirmed) sources of funding for attendance at the conference

7. Reports from the candidate's research supervisor and one other referee

8. Statement of agreement to write a summary of the conference for AOS News.

Applications should be sent to the Secretary by **31 October, 1999**:

Dr Clyde Mitchell
CSIRO MST
Private Bag 33
Clayton South
Victoria 3169
Fax: (03) 9544 1128

The winner will be announced early in 2000.

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4 electro-optics
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