



January 1998 Newsletter

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1997 was a vintage year for laser physics. On October 13 at the joint meeting of the Optical Society of America and the DLS-sponsored Interdisciplinary Laser Science Conference, the 1997 Schawlow Prize was awarded to Eric Ippen and Charles Shank for their pioneering work in generating short pulses. Less than 24 hours later it was announced that the Nobel Prize in Physics would be awarded to Steven Chu, William Phillips and Claude Cohen-Tannoudji for their work on cooling and trapping of atoms with laser light. All three are Fellows of the APS.

Many of us at the meeting had the pleasure of hearing the news while Bill Phillips, the DLS chair-elect, was in attendance. In fact, at the DLS executive committee meeting that same day, we also learned that Bill had previously been selected by the Schawlow Prize committee for the 1998 award. We extend to all these prize winners our sincere congratulations as well as our thanks for advancing laser science!

We also congratulate our new Vice-Chairman, Robert Boyd, and new executive committee members, Margaret Murnane and John Miller, all of whom began service this past October. Joe Eberly succeeds to Past-Chair, where he will continue to provide the sage advice that marked his previous years of service to the Division. He deserves our sincere thanks for a job well done.

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The 1997 calendar year saw progress in many other areas of laser science interest as well. Our Distinguished Traveling Lecturers gave a number of talks at predominantly undergraduate universities and colleges, several undergraduate summer research project applicants were funded by the Division, seven new Fellows of the APS were elected from the DLS membership, and the Division funded numerous travel grants for students to attend the ILS or CLEO conferences. The Division sponsored three symposia at the March meeting to increase our interaction with those applying laser techniques to condensed matter physics. Of course,

contd. on pg. 4

New Officers of the DLS Executive Committee

We would like to congratulate the winners of this fall's election. **Robert Boyd** was elected as the Vice-Chair, and **John Miller** and **Margaret Murnane** as the Members-at-Large. Their term of office began at the conclusion of the ILS-XIII Conference.

APS FELLOWS

Congratulations to the seven DLS members who were elected Fellows of APS in 1997:

David W. Chandler, Sandia National Laboratories

For important contributions to molecular dynamics, in particular for his invention and applications of

photofragment imaging and for his work using laser-induced gratings

Eric Allin Cornell, NIST

For pioneering research that led to the first observation of Bose-Einstein condensation in an atomic gas,

an observation that has opened a new area of investigation in physics

Phillip L. Gould, University of Connecticut

For his pioneering research in the use of lasers for diffracting and manipulating atoms, cooling trapped

atoms to ultracold temperatures, ultracold atomic collisions and developing techniques for photoassociative molecular spectroscopy

Irving Philip Herman, Columbia University

For distinguished accomplishments in laser physics, notably the development and application of laser techniques to probe and control materials processing

Wolfgang Ketterle, M.I.T.

For pioneering research in achieving Bose-Einstein condensation in an atomic vapor, and for seminal studies on the properties of the condensate

Steven Lloyd Rolston, N.I.S.T.

For pioneering work applying laser cooling and trapping to the study of optical control of collisions, the

quantum motion of atoms in optical lattices, and atomic properties in metastable states

Bernard Yurke, Lucent Technologies

For theoretical and experimental research in quantum states of light, especially the generation of squeezed

light in cavities and Schroedinger cat states

STUDENT TRAVEL GRANTS

Awards of up to \$700

The DLS is pleased to continue its program to support student travel to DLS-sponsored meetings. A limited number of grants for travel and living expenses, up to \$700, are available to graduate students who are DLS members and who are authors or co-authors on an oral or poster paper at the ILS-XIV meeting. To make these funds as widely available as possible, some priority will be given to requests for a lower level of support and to distribution of these grants to students of different institutions.

Applicants should submit a letter stating their estimated need for travel funds, including commitment of institutional support, if any, attached to a copy of the submitted abstract on which they are first author, and a letter of nomination from a member of DLS. Please list daytime phone number, fax number, e-mail address, and social security number. **Applicants are required to fax or e-mail their acceptance letter or attach it to the application upon receiving the official notice from OSA. Only one award will be given to a research group.** If it is likely that the paper cannot be given without financial support, the student should indicate whether the paper would have to be withdrawn if this request for funds cannot be met. Checks will be issued at the meeting. Hotel accommodations will be covered at up to half the conference rate for a double room.

The nominator should certify that the applicant is a full-time graduate student, and, in the case of foreign students, that they have a student visa valid through the meeting dates. The applicants will be evaluated by the selection committee chaired by Dr. Winthrop W. Smith. Applications should be sent to Dr. Smith at the address given on the first page of this Newsletter. **The deadline for submitting applications for the QELS/CLEO Meeting must be received by March 20, 1998. The deadline for the ILS-XIV/OSA Meeting is August 10, 1998.**

Fellow Nominations for 1998 are Solicited!

Many distinguished members of the Division of Laser Science (DLS) have been honored by being named Fellows of the APS. Nominations for next year's fellowships are now being solicited. These nominations will be processed by a Divisional Committee on Fellows headed by the DLS Vice-Chair, Bob Boyd (see the first page of this newsletter for Bob's phone number and email address). A number of these nominations, typically in the range 5 to 10, will be

forwarded to APS for confirmation. The Executive Committee is urging all DLS members to identify colleagues deserving of the rank of Fellow. If you are uncertain about a colleague's status, please consult the APS Membership Directory, where an asterisk identifies Fellows. Any member can nominate any other member, and the supporting documentation is not difficult to assemble. All of the required information is available on the world wide web. The procedure for nomination can be found at

<http://aps.org/fellowships/fellinfo.html>. You will need to submit a nomination form, available at <http://aps.org/fellowship/fellform.html>, along with a CV of the nominee and a set of supporting letters.

The nomination deadline is April 1, 1998.

Chair's Message (*contd. from pg. 1*)

our major activity was the ILS meeting in Long Beach. Attendance was high, and the meeting, held jointly with the OSA Annual meeting, continues to highlight important advances in laser science. More information on these activities and programs appears elsewhere in this newsletter.

The Division made strides in solidifying existing relationships as well as in establishing new ones. We have close ties, of course, with the APS and the OSA. Three representatives from the Division (David Chandler, Charles Bowden, and Hyatt Gibbs) serve on the USAC/ICO steering committee, which is planning a major conference in San Francisco in August, 1999. One member (Duncan Steel) represents the Division to CLEO, and several members (Tony Heinz, Ian Walmsley, and Rick Freeman) represent us to IQEC. Two Divisional Associate Editors (Ken Kulander and John Miller) were appointed by Joe Eberly to cover laser science in Phys. Rev. Lett., and ties to other journals are being pursued. We met at Long Beach with representatives of J. Phys. B., Cambridge University Press, J. Wiley and Sons, as well as with members representing research funding agencies and foreign laser laboratories. These relationships with other organizations help the Division both to extend the reach of its programs and to bring news of other activities to the attention of the membership.

The executive committee joins me in wishing all of our members a productive new year. May it be equally successful and exciting as the last one!

Paul Houston

1997 NOBEL PRIZE IN PHYSICS

The Royal Swedish Academy of Sciences has awarded **the 1997 Nobel Prize in Physics** jointly to

Professor **Steven Chu**, Stanford University, Stanford, California, USA,

Professor **Claude Cohen-Tannoudji**, Collège de France and École Normale Supérieure, Paris, France, and

Dr. **William D. Phillips**, National Institute of Standards and Technology, Gaithersburg, Maryland, USA,

for development of methods to cool and trap atoms with laser light.

Drs. Steven Chu, Claude Cohen-Tannoudji, and William D. Phillips have developed methods of using laser light to cool gases to the micro-Kelvin temperature range and keeping the chilled atoms floating or captured in different kinds of "atom traps". The laser light functions as a thick liquid, dubbed optical molasses, in which the atoms are slowed down. Individual atoms can be studied there with very great accuracy and their inner structure can be determined. As more and more atoms are captured in the same volume a thin gas forms, and its properties can be studied in detail. The new methods of investigation that the Nobel Laureates have developed

have contributed greatly to increasing our knowledge of the interplay between radiation and matter. In particular, they have opened the way to a deeper understanding of the quantum-physical behavior of gases at low temperatures. The methods may lead to the design of more precise atomic clocks for use in, e.g., space navigation and accurate determination of position. A start has also been made on the design of atomic interferometers with which, e.g., very precise measurements of gravitational forces can be made, and atomic lasers, which may be used in the future to manufacture very small electronic components.

Intensive development is in progress concerning laser cooling and the capture of neutral atoms. Among other things, Chu has constructed an atomic fountain, in which laser-cooled atoms are sprayed up from a trap like jets of water. When the atoms turn at the top of their trajectory and start falling again, they are almost stationary. There they are exposed to microwave pulses that sense the atoms' inner structure. With this technique it is believed that it will be possible to build atomic clocks with a hundredfold greater precision than at present. The technique rewarded this year also forms the basis for the discovery of Bose-Einstein condensation in atomic gases, a phenomenon that has attracted great interest over the last several years.

1998 ARTHUR L. SCHAWLOW PRIZE IN LASER SCIENCE

to

WILLIAM D. PHILLIPS

National Institute of Standards & Technology

Citation: *"For pioneering experiments in laser cooling and trapping, including the first demonstrations of Zeeman cooling, the magnetic trapping of neutral atoms and the extension of laser cooling below the Doppler limit."*

Dr. Phillips, a NIST Fellow since 1996, is internationally known for advancing basic knowledge and new techniques to chill atoms to extremely low temperatures. The cooling and trapping of atoms, a discipline that emerged in the mid-1970s with the advent of laboratory lasers, has allowed scientists to observe and measure quantum phenomena in atoms that seem to defy the physical principles governing our tangible room-temperature realm.

After earning his Ph.D. in physics and completing post-doctoral research at the Massachusetts Institute of Technology, Dr. Phillips came to NIST (then the National Bureau of Standards) in 1978 to work in the Electricity Division. His official duties at NBS originally were related to his first thesis experiment, involving precision electrical measurements. However, he explains, he was allowed to use "stolen moments to dabble in laser-cooling" with lab equipment he brought from MIT. With encouragement from NBS management, he continued experiments and demonstrated that a beam of neutral atoms could be slowed and cooled with radiation pressure from a laser.

NIST's accomplished and internationally recognized laser cooling and trapped atom research program grew out of these early experiments. Dr. Phillips and the team he built have made numerous pivotal contributions to the field. For example, in the mid-1980s, Dr. Phillips' team found serious discrepancies between its own measurements and the generally accepted "Doppler cooling limit." They demonstrated that it was actually possible to chill atoms well below the accepted limits down to a few microKelvins. This discovery paved the way for scientists seeking to create Bose-Einstein condensation, an exotic new form of matter in which atoms all fall into their lowest energy levels and merge into a single quantum state. In the summer of 1995, a NIST/University of Colorado group in Boulder, Colorado, announced the creation of the first Bose-Einstein condensate.

Dr. Phillips and his team are continuing to study ultra-cold trapped atoms with spin-off applications for improved accuracy in atomic clocks and in fabrication of nanostructures. For the latter, Dr. Phillips envisions using light to focus an atom laser to create what might be the basis of a next generation of ultra-small structures for electronic circuits.

Dr. Phillips is one of the recipients of the 1997 Nobel Prize in Physics. He is a member of the National Academy of Sciences. He is also a fellow of the American Physical Society, the Optical Society of America, and the American Academy of Arts and Sciences. He has received silver and gold medals of the U.S. Department of Commerce in 1983 and 1993, respectively, and has also been awarded the Michelson Medal of the Franklin Institute in 1996.

IN FOCUS

"A rose by any other name...." William Shakespeare

For thirteen years, the Interdisciplinary Laser Science Conference has earned an outstanding reputation for bringing exciting new research to the attention of laser scientists across the disciplines, from those working in physics, chemistry and biology to those working on laser sources, applications and non-linear phenomena. The ILS conference has always been the flagship forum for our group, first when it was a topical study group, the LSTG, and more

recently now that we have become a division. While the ILS name is well-known, it suffers from the drawback that the conferences are not immediately identified by their name with the APS Division of Laser Science. We write to suggest that the conference name be changed.

The rationales for this change are 1) that most conferences, for example the OSA Annual, the APS March, the SPIE, and the ACS meetings, are clearly named so as to identify the conference with the group that sponsors it while ours is not, and 2) that, particularly in our case where we hold the meeting jointly with the OSA Annual, the ILS/DLS affiliation is either lost or confused.

We suggest that the conference name be changed to: **The APS Division of Laser Science Conference.**

The numbering could continue consecutively from the last ILS-XIII conference; i.e., the next conference would be called the DLS-XIV. Or the conferences could be numbered by year, i.e., DLS'98, etc. This last possibility parallels the name of the meeting of the Division of Atomic, Molecular, and Optical Physics: DAMOP'98, etc.

Opinions on this topic are solicited, will be relayed to the executive committee, and (if requested) possibly published in the newsletter. Please address them to Win Smith at winthrop@uconnvm.uconn.edu

Paul Houston

Michael Raymer

Keep up on the Division of Laser Science on the DLS home page at <http://www.physics.wm.edu/~cooke/dls/dls.cfm> (this is also accessible by going to the APS home page at <http://www.aps.org> and clicking on Divisions)

DISTINGUISHED TRAVELING LECTURER PROGRAM IN LASER SCIENCE

The **Division of Laser Science (DLS)** announces the appointment of three new Distinguished Traveling Lecturers in Laser Science:

- Lee Casperson, Portland State University, Instabilities and chaos in lasers, waterfalls, and other physical systems.
- Wolfgang Ketterle, Massachusetts Institute of Technology, Atom cooling and trapping, Bose-Einstein condensation, and atom lasers.
- Carlos Stroud, University of Rochester, Electronic wave packets in atoms, Schrodinger cat-like states, and fractional dynamical revivals.

They join the continuing DTLs:

- Philip Bucksbaum, Univ. of Michigan, High-Field Laser Physics.
- Geraldine Richmond, Univ. of Oregon, Surface Non-Linear Optics.
- Jagdeep Shah, AT&T Bell Laboratories. Semiconductor Quantum Optics.

The DLS invites applications from host schools for awards for the Distinguished Traveling Lecturer Program. The DTL Awards are intended to bring distinguished laser scientists to predominantly undergraduate colleges and universities for two-day visits, which generally include lectures and informal meetings with faculty and students. Details about the program and the application procedure may be found on the DLS Web Site at

http://www.physics.wm.edu/~cooke/dls/p_dtl.cfm

TARGET DATES FOR APPLICATIONS ARE FEBRUARY 18 AND JUNE 15, 1998.

ARTHUR L. SCHAWLOW PRIZE IN LASER SCIENCE

Purpose: To recognize outstanding contributions to basic research which uses lasers to advance our knowledge of the fundamental physical properties of materials and their interaction with light. Some examples of relevant areas of research are: nonlinear optics, ultrafast phenomena, laser spectroscopy, squeezed states, quantum optics, multiphoton physics, laser cooling and trapping, physics of lasers, particle acceleration by lasers, and short wavelength lasers.

Nature: The prize consists of \$10,000 plus an allowance for travel to the meeting at which the prize is awarded and a certificate citing the contributions made by the recipient. The prize will be awarded annually.

Establishment & Support: The prize was endowed by the NEC Corporation in 1991.

Rules & Eligibility: Nominations of candidates for this prize can be made by any member of the American Physical Society. Nominations are active for three years.

The deadline for submission of nominations for the 1999 Prize is: JULY 1, 1998

Nominations should be sent to the Chair of the 1999 Selection Committee

Mark G Raizen
Dept of Phys
Univ of Texas
Austin TX 78712
Phone (512) 471-4753
Fax 512 471 9637
Email raizen@physics.utexas.edu

Other 1999 Prize Selection Committee Members:

Paul L. Kelley
Erich P. Ippen ('97 Recipient)

Robert W. Field (Vice Chair)
Charles V. Shank ('97 Recipient)

Student Summer Research Grants

The Division of Laser Science will again make funds available to provide stipend for approximately eight undergraduate students to conduct laser-related research in the summer between the student's junior and senior year. Preference will be given to DLS student members. The research may be performed at the student's home institution, or at any other U.S. undergraduate or graduate institution at which the student's faculty sponsor can provide close supervision. The DLS invites proposals from any of its members in good standing as of the date of receipt of the proposal. (Membership in the DLS may be renewed or initiated at any time during the year by APS members upon payment of the \$5 subunit fee to the APS Membership Department, One Physics Ellipse, College Park, MD, 20740-3486 (301) 209-3200.) Proposals should be limited to about a one--page description of the research to be performed, the qualifications of the candidate, and the level of support needed, together with a brief vita of the faculty sponsor and a copy of the student's transcript. These funds may not be used for indirect costs. Selection will be made based upon the appropriateness of the project, its relevance to encouraging the student to consider further involvement in work using or developing lasers, adequacy of the resources available, and the scientific and educational content of the research. The student will be expected to submit a brief summary of accomplishments at the conclusion of the research. The selection committee will be announced.

Proposals should be submitted in writing by **March 20, 1998** to Professor Winthrop Smith, Department of Physics, University of Connecticut, 2152 Hillside Road, Storrs, CT 06269-3046. (A second, backup copy may be submitted by email to winthrop@uconnvm.uconn.edu) First consideration will be given to proposals from sponsors who have not obtained support in the previous year; others will be considered if sufficient funds are available. This year's awards will be announced on or about April 1, 1998.

PHYSICAL REVIEW A EDITORIAL BOARD

Physical Review A announces the appointment or reappointment of the following as members of its Editorial Board:

Keith Burnett (University of Oxford)
Eugen Merzbacher (University of North Carolina)
Robert F. O'Connell (Louisiana State University)
Jean-Michel Raimond (Laboratoire Kastler Brossel, France)

For further information, contact:

Barbara Maddaloni (516) 591-4033
Fax (516) 591-4155
barb@aps.org

CALENDAR

Conference on Lasers and Electro-Optics

(CLEO '98), 3-8 May, 1998, San Francisco, CA. Co-located with the Quantum Electronics and Laser Science Conference (QELS '98). Sponsored by: IEEE-LEOS/OSA in cooperation with EPS-QEO/JQEJG. Technical Meeting, Short Courses, Technical Exhibit.

Quantum Electronics and Laser Science Conference (QELS '98), 3-8 May, 1998, San Francisco, CA. Co-located with the Conference on Lasers and Electro-Optics (CLEO '98). Sponsored by APS-DLS/IEEE-LEOS/OSA. Technical Meeting.

APS Division of Atomic, Molecular and Optical Physics 1998 Annual Meeting (DAMOP'98), 27-30 May, 1998, Santa Fe, New Mexico. For further information contact James S. Cohen, T-4, MS B212, Los Alamos National Lab, Los Alamos, NM 87545. Email: damop@t4.lanl.gov.

Gordon Research Conference on Multiphoton Processes, 14-19 June, 1998, Tilton, New Hampshire. The conference e-mail address is MPGordon@spaniel.llnl.gov. The World Wide Web page is at www-phys.llnl.gov/Multiphoton98.

The 1998 International Conference on Applications of Photonic Technology (ICAPT'98), 27-30 July, 1998, Chateau Laurier Hotel, Ottawa, Ontario, Canada. More information can be obtained by visiting our webpage at: <http://www3.sympatico.ca/icapt/icapt.html>. Co-sponsored by IEEE, and supported by SPIE, CAP, OSA and IEE.

OSA '97 Annual Meeting, 4-9 Oct, 1998, Baltimore, MD. Co-located with the ILS-XIV. Abstract Deadline: April 10, 1998. Technical Meeting, Tutorials, Engineering "How To" Program, Short Courses, Technical Exhibit (Technical Exhibit sponsored by: OSA\Photonics Spectra).

Interdisciplinary Laser Science Conference

(**ILS-XIV**), 4-9 Oct, 1998, Baltimore, MD. Co-located with the OSA Annual Meeting. Abstract Deadline: April 10, 1998. Sponsored by APS-DLS, in cooperation with OSA. Technical Meeting.

DEADLINES

Distinguished Lecturer Applications
(Fall 1998): 18 February 1998
Student Summer Research Grants:
20 March 1998
CLEO/QELS Student Travel Grants:
20 March 1998

ILS-XIV/OSA Student Travel Grants:
10 August 1998
Fellow Nominations: 1 April, 1998
OSA '98 & ILS Abstracts: 10 April, 1998
Distinguished Lecturer Applications
(Spring 1999): 15 June 1998

ASK YOUR COLLEAGUES TO

JOIN THE DIVISION OF LASER SCIENCE

The Division of Laser Science (DLS) is a subunit of the American Physical Society (APS) specifically concerned with the use of lasers in science, the application of lasers in technology, and the interests of the laser community within the APS.

The DLS

- Promotes laser interests within the APS and represents such interests with other societies.
- Sponsors awards and educational program, including a Distinguished Traveling Lecturer Program aimed at four-year institutions.
- Sponsors the Interdisciplinary Laser Science (ILS) Conference and co-sponsors the Quantum Electronics and Laser Science (QELS) Conference.

Benefits of Membership

- Summer research fellowships for undergraduate students sponsored by DLS members.
- Travel grants to the ILS and QELS meetings for graduate students who are sponsored by DLS members.
- The DLS Newsletter, a valuable source of information related to your profession including advanced meeting information.
- A route to APS Fellowship.
- Influence of the Laser Science actions in APS.
- Increased interactions with your colleagues in Laser Science related fields.

How to Join

If you are already an APS member, check the DLS line on your APS renewal form and include the additional \$6 with your dues. If you have **already renewed** your APS membership for the year beginning 1 July 1997, or if you **are not** an APS member, call the APS Membership Department at (301) 209-3280 or look up the membership information on the APS Home Page at <http://aps.org/memb/membapp.cfm> (select **ASCII Text** or **HTML format**).