



March 2000 Newsletter

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Chair's Message **March, 2000**

These are exciting times in laser science. Laser science continues to hold great excitement both for fundamental studies of light-matter interactions and for varied applications. Laser science is

truly interdisciplinary: its members and activities span several subfields of physics as well as a variety of disciplines within chemistry, biology, medicine, and engineering. The past year has been marked by triumphs for our community, such as the awarding of the Nobel Prize in Chemistry to DLS member Ahmed Zewail, and by sorrows, such as the loss of our esteemed colleague Arthur Schawlow, one of the pioneers of laser science.

I had the honor of becoming the Chair of the Division of Laser Science (DLS) following the 1999 Interdisciplinary Laser Science Conference (ILS), which is the annual meeting of our division. I succeeded Bill Phillips in this position, and will be succeeded in one year by Marsha Lester who in turn will be followed by Tony Heinz. Let me take this opportunity to welcome Rick Freeman as our new Secretary/Treasurer, and to thank Win Smith who has just stepped down from this position after providing three years of exemplary service to DLS. Let me also welcome Tom Gallagher and Mark Raizen who join our Executive Committee as Councillors at Large and Carl Lineberger who is our new APS Divisional Councillor.

The Division of Laser Science is the youngest division of the American Physical Society, having achieved Division status in 1996. There is still work to be done associated with our transition from a topical group to a full division. At a formal level, we are still operating under the Bylaws of the Laser Science Topical Group. A committee consisting of Win Smith, Rick Freeman, Bill Stwalley and myself is presently drafting proposed bylaws for DLS. These bylaws will be subject to approval by vote of the DLS membership before being adopted. Comments and suggestions for the structure of the DLS bylaws from the DLS membership would be highly welcomed. Please send your comments to any of the individuals mentioned above.

Over the coming year our executive committee will also be concerned with the governance of the many activities sponsored by DLS, such as the structure of the ILS (our annual meeting), QELS (a meeting which we cosponsor with OSA and IEEE/LEOS), and a variety of programs such as our Distinguished Travelling Lecturer program and Summer Research for Undergraduates. We welcome suggestions and comments from the community on possible improvements of these programs. Please feel free to contact any of us with your comments.

I will look forward to seeing you at QELS.

Robert W. Boyd

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DEADLINES

March 31, 2000* Fall 2000 DTL Host School Applications
April 1, 2000 2000 APS Fellow Nominations
April 3, 2000* Summer Undergraduate Research Grants
April 3, 2000* Student Travel Grants for 2000 QELS/CLEO
May 16, 2000 ILS Conference Abstracts
July 3, 2000 Schawlow Prize Nominations
August 10, 2000 Student Travel Grants for 2000 ILS

*Note extension in deadlines from those reported in August 1999 newsletter."

New Officers of the DLS Executive Committee

We would like to congratulate the winners of this fall's election. Tony Heinz was elected as the Vice-Chair, Rick Freeman as Secretary-Treasurer, Tom Gallagher and Mark Raizen as Executive Committee Members-at-Large and Carl Lineberger was elected as APS Divisional Councilor. Their term of office began at the conclusion of the ILS-XV Conference. We thank the out-going members of the Executive Committee, Paul Houston, Winthrop Smith, Thomas Mossberg, Doreen Weinberger, and Daniel Grischkowsky, for all of their service to the DLS.

2000 APS AWARD WINNERS

Congratulations to our DLS colleagues who were the recipients of 2000 APS awards or prizes for their research in laser science. See <http://www.aps.org/praw/praw95.html> for more information on these honors.



The Davisson-Germer Prize
In Atomic or Surface Physics
William Happer, Princeton University

Citation: *For his research leading to fundamental understanding and applications of atomic processes on spin or excitation transfer through atomic collisions.*

Background:

Dr. William Happer, a Professor in the Department of Physics at Princeton University, is a specialist in modern optics, optical and radiofrequency spectroscopy of atoms and molecules, and spin-polarized atoms and nuclei. He received a B.S. degree in Physics from the University of North Carolina in 1960 and the Ph.D. degree in Physics from Princeton University in 1964. He was a member of the Physics Department of Columbia University from 1964 until 1980, when he joined the faculty at Princeton University. From 1991 until 1993 he served as Director of Energy Research in the Department of Energy, where he oversaw a basic research budget of some \$3 billion, which included much of the federal funding for high energy and nuclear physics, materials science, magnetic confinement fusion, environmental science, the human genome project. He was reappointed Professor of Physics at Princeton University in 1993, and Chair of the Princeton University Research Board in 1995. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and is a member of the American Academy of Arts and Sciences, the National Academy of Sciences and the American Philosophical Society. He was awarded an Alfred P. Sloan Fellowship in 1966, an Alexander von Humbolt Award in 1976 and the Broida Prize of the American Physical Society in 1997.

His current research interests are focused on how on various gas-phase collisional interactions and wall interactions limit the large spin polarization produced by optical pumping of the magnetic resonance imaging isotopes, ^3He and ^{129}Xe . Dr. Happer's group at Princeton has designed and built MRI equipment using hyperpolarized gases which provide enhanced photos and images without the risks of radiation exposure associated with other imaging techniques.



Earl K. Plyler Prize for
Molecular Spectroscopy
Michael D. Fayer, Stanford University

Citation: *For the development of optical and infrared ultrafast spectroscopic methods, and especially for experiments using these methods to measure dynamical processes in condensed phase systems.*

Background:

Dr. Michael D. Fayer received his BS in chemistry from the University of California at Berkeley in 1969 and received his Ph.D. in chemistry from the same institution in 1974. He then went directly from Berkeley to join the faculty of the Department of Chemistry at Stanford University in the field of physical chemistry and chemical physics. He became Professor of Chemistry in 1984. He is a fellow of the American Academy of Arts and Sciences as well as the American Physical Society. He has received fellowships from the Guggenheim Foundation, the Camille and Henry Dreyfus Foundation, and the Alfred P. Sloan Foundation.

Professor Fayer's areas of research involve the development and application of ultrafast non-linear optical and infrared methods for the study of complex molecular condensed matter systems. He developed transient grating methods to study acoustic wave dynamics in crystals, liquids, and thin films; transport processes involving excitons, thermal diffusion in solids and films, and chemical species in gasses and flames; and electronic excited state dynamics in solids, liquids and gases. He developed ultrafast photon echo methods and related pulse sequences and applied them to the study of dynamics in crystals and glasses. He pioneered the application of ultrafast non-linear optical Kerr effect techniques for the study of dynamics in complex liquids. Most recently, he has used ultrafast infrared pulses from a free electron laser and from optical parametric amplifier systems to perform vibrational echo studies of dynamics in liquids, glasses and proteins.



Arthur L. Schawlow Prize in
Laser Science
Richard N. Zare, Stanford University

Citation: For a broad range of laser experiments in molecular physics, chemistry, and biophysics including molecular photofragmentation anisotropies, 'laser fluorescence' which led to chemical reaction dynamics at the limit of complete quantum state specificity, laser directed bond-selective chemistry, ultrasensitive detection techniques, and selective manipulation of single bio-molecules.

Background:

Prof. Richard N. Zare is the Marguerite Blake Wilbur Professor in Natural Science at Stanford University with an appointment in the Department of Chemistry and a courtesy appointment in the Department of Physics. He is a graduate of Harvard University, where he received his BA degree in chemistry and physics in 1961 and his Ph.D. in chemical physics in 1964. In 1965 he became an assistant professor at the Massachusetts Institute of Technology, but moved to JILA, University of Colorado at Boulder in 1966. He remained there until 1969, holding joint appointments in the departments of chemistry, physics and astrophysics. In 1969 he was appointed to a full professorship in the Department of Chemistry at Columbia University, becoming the Higgins Professor of Natural Science in 1975. In 1977 he moved to Stanford University.

Professor Zare is renowned for his research in the area of lasers applied to chemical reactions and to chemical analysis. He is the recipient of many awards, including the National Medal of Science in 1983, the APS Earl K. Plyler Prize in 1983, the APS Irving Langmuir Prize in 1985 and the Welch Award in Chemistry in 1999. He has authored and co-authored over 600 publications.

INTERDISCIPLINARY LASER SCIENCE CONFERENCE

ILS-XVI

The 16th Annual Interdisciplinary Laser Science Meeting (ILS-XVI) will be held in Providence, RI on October 22 - 26, 2000. The 2000 Meeting, which is colocated with the OSA Annual Meeting, will bring together a scientists across a broad range of disciplines to discuss new work in the rapidly moving field of laser science and applications to chemistry, biology and physics.

The focus of the ILS meeting is on emerging areas of chemical, biological, physical and optical science that use laser technology to push the boundaries of the fields, and to create new fields. The Plenary talk, Critical Review Tutorials, and Symposia will highlight some of the most exciting and important advances in our understanding of lasers and laser-matter interactions in these fields. Professor **Charles V. Shank**, the Director of the Lawrence Berkeley Laboratory and a faculty member at the University of California at Berkeley is the Plenary Speaker. His pioneering work in ultrafast laser science and his multidisciplinary approach to the study of ultrafast phenomena provide him a uniquely broad perspective.

Critical Review talks will continue the cross-disciplinary theme, and will feature experts on quantum-enhanced precision measurements, nonlinear matter waves, the generation of attosecond light pulses and nano-optics. These topics will also be highlighted in the symposia.

DLS has agreed to cover the registration fees for student members who attend the conference. The deadline for paper submission is May 16, with submission by electronic means only. Further information about ILS-XVI can be obtained at http://www.osa.org/mtg_conf/. We look forward to seeing you in Providence.

Lewis Rothberg, University of Rochester, Conference Chair

Ian Walmsley, University of Rochester, Program Co-Chair

Louis DiMauro, Brookhaven National Laboratory, Program Co-Chair

1999 APS FELLOWS

Congratulations to the DLS members who were named as APS Fellows in 1999! In this edition of the newsletter we honor the new Fellows who were nominated by the DLS. A listing of all DLS members who were named as Fellows in 1999 will be published in the next edition of the newsletter.

William H. Breckenridge, University of Utah

For his pioneering contributions to state-to-state dynamics using laser pump-probe "bulb" methods, to half collision van der Waals methods in dynamics, and to laser spectroscopic characterization of bonding in metal/rare-gas diatomic molecules.

Michael C. Downer, University of Texas

For fundamental contributions to nonlinear and ultrafast laser spectroscopy of solids and surfaces near the melting threshold and of gases and underdense plasmas near the thresholds of ionization and wakefield generation.

John William Hepburn, University of Waterloo

For important contributions to laser chemistry and laser spectroscopy, particularly in the area of applications of coherent vacuum ultraviolet radiation to threshold photoionization spectroscopy.

Mark Albert Johnson, Yale University

For developing controlled sources of cold cluster anions and using infrared dissociation to elucidate the structure of water networks around anions.

Wolfgang Peter Schleich, Universitdt Ulm

For outstanding work on the correlated emission laser, interference in phase space, and quantum state holography.

George I. Stegeman, University of Central Florida

For pioneering contributions to nonlinear optics and optoelectronics, especially the study of nonlinear guided wave optics.

Kent R. Wilson, University of California-Davis

For his development of photofragment spectroscopy, his pioneering work on the dynamics of chemical reactions in solution, and his recent innovations in ultrafast x-ray diffraction and absorption and quantum control.

NOMINATIONS SOUGHT FOR 2000 APS FELLOWS

The DLS has made many distinguished contributions to the list of APS Fellows, including the seven elected this year. Nominations for next year's fellowships are now being solicited.

The number of DLS nominations chosen to be forwarded to the APS for confirmation as Fellow in a given year is typically in the range 5-10. This depends on the good judgement of the nominators and the Divisional Committee on Fellows headed by the DLS Vice-Chair, Tony Heinz, but the Committee can do nothing without nominations. This is where DLS members must come into the picture. The Executive Committee is urging all DLS members to consider whether they know of a colleague who is deserving of the prized honor of APS Fellowship. If you are uncertain about a colleague's status, consult the APS Membership Directory, where an asterisk identifies Fellows. Nominations for deserving women, minority, and foreign DLS members are especially sought.

Any member can nominate any other member, and the supporting documentation is not difficult to assemble. The deadline for a nomination and supporting letters to reach the APS, in time for DLS consideration, is April 1, 2000. All of the required information is available on the WWW at <http://www.aps.org/fellowship/fellinfo.html>. Further information can be obtained from the APS at (301) 209-3268 (phone), (301) 209-0865 (fax), or email at fellowship@aps.org.

DISTINGUISHED TRAVELING LECTURER PROGRAM IN LASER SCIENCE

The Distinguished Traveling Lecturer (DTL) program provides funds to send outstanding scientists and communicators in the areas covered by DLS to visit predominantly undergraduate colleges and universities. Visits are for two days and generally include lectures and informal meetings with students and faculty. Details about the program and the application procedure can be found at the DLS web site at http://www.physics.wm.edu/~cooke/dls/p_dtl.cfm. **Applications for Fall 2000 are due March 31, 2000.**

The DTLs for the 2000-2001 Academic Year are:

- Lee W. Casperson, Portland State University, *Lasers and Optical Systems*
- Jim Kafka, Spectra Physics, *Laser Development*
- Mara Prentiss, Harvard University, *Atom Optics*
- Carlos Stroud, University of Rochester, *Wavepackets*
- Wolfgang Ketterle, Dept. of Physics, MIT, *Atom cooling and trapping*

Zewail Awarded 1999 Nobel Prize in Chemistry



The 1999 Nobel Prize in Chemistry was awarded to DLS member Ahmed H. Zewail, Linus Pauling Chair of Chemical Physics at California Institute of Technology, *for his studies of transition states of chemical reactions.*

Zewail was awarded the 1999 Nobel Prize in Chemistry by the Royal Swedish Academy of Sciences for his work pioneering the new research field of femtochemistry. Using ultrafast pump-probe laser techniques, Zewail and his coworkers have been able to explore reaction dynamics on the timescale of chemical changes. Examples of chemical processes explored by Zewail include unimolecular dissociation, bimolecular reactions, and photoisomerization.

Professor Bengt Nordin in the Press Release of the Swedish Academy, noted the significance of this work:*

Femtochemistry has enabled us to understand the underlying mechanisms why some chemical reactions occur but not others, and why reaction rates and yields are dependent on temperature. Inspired by Zewail's pioneering experiments some 10 years ago, scientists the world over are

studying processes with femtosecond spectroscopy in gases, fluids and solids, on surfaces, in polymers and in biological systems. Applications range from how catalysts function and how molecular devices should be designed, to the most delicate mechanisms of life processes and how the medicines of the future should be designed and produced.

*Further information on the 1999 Nobel Prize in Chemistry can be found at:

<http://www.nobel.se/announcement-99/chemistry99.html>

Zewail has been honored for his accomplishments by numerous international and national awards. He is a Fellow of the APS and was awarded the APS Earle Plyler Prize for Molecular Spectroscopy in 1993 and the Herbert P. Broida Prize in 1995.

STUDENT TRAVEL GRANTS

The Division of Laser Science (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 co-author either an oral or poster paper at the ILS-XVI meeting, or at the QELS conference. 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.

Complete details concerning the application process can be found at:

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

Applications must be received by April 3, 2000 for 2000 QELS meeting and by August 10, 2000 for the ILS-XVI/OSA meeting. Applications should be submitted to the current Secretary/Treasurer of the DLS, Prof. Richard R. Freeman (see address listed below).

UNDERGRADUATE RESEARCH IN LASER SCIENCE

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.

Proposals should be submitted in writing by **April 3, 2000** to the current Secretary/Treasurer of the DLS, Professor Richard R. Freeman.

Prof. Richard R. Freeman

Dept. of Applied Science

University of California, Davis

Davis, CA 95616

Tel: 510-422-3653

Fax: 510-422-5811

Email: rrfree@ucdavis.edu

Nominations Sought for the

ARTHUR L. SCHAWLOW PRIZE IN LASER SCIENCE

The Arthur L. Schawlow Prize was endowed by the NEC Corporation in 1991 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.

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. Nominations are open to candidates who have made outstanding contributions to basic research using lasers. Nominations are active for three years.

The deadline for submission of nominations for the 2001 Prize is: **JULY 3, 2000**. Five (5) copies of nominations and all supporting documentation should be sent to the Chair of the 2001 Prize Selection Committee:

William C Stwalley
Dept of Phys U46
Univ of Connecticut
2152 Hillside Rd
Storrs CT 06269-3046
Phone (860) 486-4924
Fax (860) 486-3346
Email stwalley@uconnvm.uconn.edu

Complete guidelines for nominations can be found at <http://www.aps.org/praw/nomguide.html>.

CALENDAR

CLEO/QELS 2000, May 7-12, 2000, San Francisco, CA. http://www.osa.org/mtg_conf/

DAMOP 2000, 31st meeting of the Division of Atomic, Molecular and Optical Physics, June 14-17, 2000, University of Connecticut, Storrs, CT. <http://www.aps.org>

ILS-XVI, Annual Meeting of the DLS (collocated with **OSA 2000**), October 22-26, 2000, Providence, RI. http://www.osa.org/mtg_conf/

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