Precision Measurement and Fundamental Constants

NEWSLETTER

A Topical Group of The American Physical Society *No. 19 February 1998*

Pipkin Award Becomes a Reality

At its November, 1997 meeting, the APS Council gave final approval to the Francis M. Pipkin Award, the first award or prize to be sponsored by our topical group. The award was established in memory of Frank Pipkin, of Harvard University, who had been an enthusiastic member of our topical group from its establishment in 1987, and who was about to become chair of the group at the time of his untimely death in 1992. During his exceptionally productive scientific career, Frank carried out many beautiful experiments in atomic, solid state, nuclear, and particle physics, always with a special interest in precise measurements and their interdisciplinary implications. In many ways, his career personified the defining interests of our topical group, and it therefore seems quite appropriate to memorialize him with this award, which will honor outstanding work in the area of precision measurement and fundamental constants by a young scientist. The award, which will be given in odd-numbered years beginning in 1999, will consist of a $2000 stipend and support of travel to the meeting at which the award is presented. Eligibility is limited to scientists who have held the Ph.D. (or equivalent) degree for no more than fifteen years, as of the nomination deadline. It is anticipated that the nomination deadline for the 1999 Pipkin Award will be July 1, 1998. The call for nominations will be issued later this spring. Special thanks are due to the many members of the topical group who contributed towards the establishment of this award. The award is presently endowed at the level of about $31,000, which is sufficient to establish it in perpetuity, and fund awards in alternate years. Additional donations, which would further strengthen the award fund, can still be made. Donation checks should be made out to: "Francis M. Pipkin Award, American Physical Society", and should be sent to Michael Stephens, APS Treasurer's Office, One Physics Ellipse, College Park, Md 20740-3844.

Annual Business Meeting

Our annual business meeting, held in conjunction with the joint APS/AAPT Spring Meeting, has been scheduled for 4:30 PM, Saturday April 18, 1998 in the Pickaway Room of the Hyatt Hotel in Columbus OH. The Hyatt is adjacent to the Convention Center. Information on registration, hotel, travel and an up-to-date program of invited and contributed talks can be found at http://www.aps.org/meet/APR98/index.html

Annual Business Meeting Agenda

1. Opening of the Meeting
2. Results of the Election of Officers
3. Membership & Finances
4. Pipkin Award
5. Planning for the 1999 APS Centennial Meeting
6. Presentation of APS Fellowship Certificates
7. Suggestions from the Membership for Additional TG Activities
8. Other Business
9. Adjourn

INSIDE

Election of Officers and Executive Committee Members

This year a new Vice Chair, a new Secretary Treasurer and two of the six Executive Committee Members-at-Large will be elected to replace those whose terms expire at the end of the APS Spring Meeting. Chair is a one year term, at the end of which, Chair Elect moves up to Chair and Vice Chair moves up to Chair Elect. At the close of the APS meeting, Daniel Heinzen will become Past Chair, replacing Geoffrey Greene, Stephen Lundeen will become Chair, and Peter Bender will move up to Chair Elect. A new Secretary-Treasurer, whose duties includes editing the Newsletter will be elected to replace Harvey Gould who is rotating off after a three year term. Two New Executive Committee Members will replace John Bollinger, and Priscilla Cushman, who are rotating off after 3 year terms.

The candidates listed below were nominated by the Nominating Committee, consisting of Harold Metcalf (Chair), Stuart Freedman, Leo Holberg, and Ronald Walsworth. The biographical information was supplied by the candidates and is reproduced below. A ballot is enclosed. Next year we will be electing a Vice Chair and two Executive Committee Members at Large. Suggestions for nominees (including yourself) for these positions would be most welcome. The qualifications are membership in the Topical Group, and a willingness to do some work, and attend the TG Executive Committee and Business Meetings, held in conjunction with the APS Spring Meeting.

Candidate Biographies

FOR VICE CHAIR

RONALD DREVER

Positions:
1979-present: Professor of Physics, California Institute of Technology; formerly Titular Professor of Natural Philosophy, Glasgow University; Research Fellow, Morris Loeb Lecturer, Harvard University.

Main Research Interests:
Since 1972 gravitational radiation detection and measurement. Developed and used wideband bar gravity-wave detectors. Originated sensitive laser interferometers with long Fabry-Perot cavities between test masses, initiating widely-used technique for precision laser frequency stabilization. At Caltech formed group which developed 40 m interferometer gravity-wave detector. This, with other ideas and contributions, formed initial prototype for the LIGO Project for a 2-site gravity-wave observatory with 4-km interferometers, currently under construction. Now developing further gravity-wave and other sensitive measurement techniques.

Earlier research included a fundamental nuclear precession experiment which set limit to anisotropy of inertial mass of 5×10^{-23}, work in nuclear physics, atmospheric Cerenkov cosmic-ray observations, Mossbauer red-shift measurement, radio astronomy.

Other Activities and Awards:
Public service has included work for funding agencies (NSF, SRC) formerly a Vice-President of the Royal Astronomical Society (UK).

PETER MOHR

Positions:
Physicist, National Institute of Standards and Technology (NIST),1987-. Ph.D., University of California, Berkeley, 1973. Physicist, Lawrence Berkeley Laboratory, 1973-8. Gibbs Instructor, Assistant, and Associate Professor, Yale University, 1978-85. Program Director in Atomic Physics and Theoretical Physics, National Science Foundation, 1985-7.

Main Research Interests:
1. 1998 CODATA Least Squares Adjustment of the Fundamental Physical Constants (with Barry Taylor).
2. Precise calculation of QED effects in bound systems.
3. Basic theory of structure and transitions of highly-ionized few- electron atoms.
4. Development of interactive WWW physics databases.

Other Activities and Awards:
Coordinator, "Relativistic, Quantum Electrodynamic, and Weak Interaction Effects in Atoms" workshop, Institute for Theoretical Physics (University of California, Santa Barbara), Jan-June 1988. Member and chairman, Advisory Committee of the Institute for Theoretical Atomic and Molecular Physics (Harvard University) 1991-4. Alexander von Humboldt Senior U.S. Scientist Award, 1995. Member, CODATA Task Group on Fundamental Constants. Member Executive Committee, Few-Body Systems and Multiparticle Dynamics Topical Group. APS fellow, AAAS member.

FOR SECRETARY-TREASURER

WAYNE M. ITANO

Positions:

Physicist, Time and Frequency Division, NIST (1979-present), Ph.D., Harvard University (1979).

Main Research Interests:

Trapped ion optical cooling and spectroscopy with applications to frequency standards, quantum logic, strongly-coupled plasmas, and demonstrations of basic quantum mechanics.

Other Activities and Awards:

APS Fellow; Member, APS DAMOP, DLS, TG/PMFC; Secretary-Treasurer, APS Laser Science Topical Group (TG/LS) (1990-93); Member, Fellowship Committee, TG/LS (1995-96); Member, Publications Committee, DAMOP (1984-85); Member, Optical Society of America (OSA); Member, OSA Publishing Technology Committee (1994- 96); Member, OSA Optics Express Development Consortium (1997); NIST Stratton Award; Department of Commerce Gold Medal; Science and Technology Agency Fellow, Communications Research Laboratory, Tokyo (1990); Lecturer, Winter College on High Resolution Spectroscopy, ICTP, Trieste (1990); Member, Program Committee, 1994 OSA Annual Meeting and 10th Interdisciplinary Laser Science Conference; Member, Program Committee, 1991 Conference on Quantum Electronics and Laser Science.

JONATHAN R. SAPIRSTEIN

Positions:

Professor of Physics, University of Notre Dame (1991-present); Assoc. Prof. (1988 1991) and Asst. Prof. (1984-1988), University of Notre Dame; Research Associate, (1982-84), Cornell University; Research Associate, (1979-1982), U.C.L.A.; Ph.D., Stanford University (1979), thesis topic, Infrared Behavior of Gauge Theories, advisor Stanley Brodsky.

Main Research Interests:

a) Calculation of Weak interaction Effects in Heavy Atoms,
b) QED Effects in Highly Charged Ions,
c) Precision Tests of QED in One and Two Electron Atoms

Other Activities and Awards:

Fellow, APS

FOR EXECUTIVE COMMITTEE MEMBER-AT-LARGE

RALPH S. CONTI

Positions:

Associate Research Scientist (Research Faculty), University of Michigan, 1995 - present; Assistant Research Scientist, U of M, 1989 - 1995; Research Investigator, U of M, 1983 - 1989; Postdoctoral Scholar, U of M, 1978 - 1983; Ph.D., University of California Berkeley, 1979 (A Search for Parity Violation in Atomic Thallium).

Main Research Interests:

(1) Tests of QED in positronium, including measurements of the fine structure intervals in the n=2,3 levels and the decay rate of orthopositronium.
(2) Tests of the discrete symmetries C, P, and T in positronium (has eigenstates of C) and in other atoms, in particular, the search for C-odd, P-even interactions in positronium and for P-even, T-odd interactions in rubidium. The latter is a test purely of time-reversal invariance in a three-state, triply-driven system.
(3) Spin-off theory/experiment involving (a) Chaotic transport in a positron Penning trap PRL **75**, 3118 (1995), and (b) Simultaneously forbidden resonances in the Autler Townes effect with a modulated pump PRA **55**, 2186 (1997).
(4) Other topics including possible exotic decay modes of positronium, biomedical imaging, and anti-hydro gen formation and measurements of its fundamental properties.

STEVE K. LAMOREAUX

Positions:

Technical Staff Member, Physicist, Los Alamos National Laboratory, Physics Division P-23 Activities and Awards: Henderson Prize (1986), Fellow, APS (Nov. 1997)

Main Research Interests:

Currently, I am a collaborator with the Los Alamos quantum computation project, both in regard to theory and experimental techniques, and with the quantum cryptography project. In addition, we are developing a new experimental technique for measuring the neutron electric dipole moment with up to a 1000 fold increase in sensitivity. Recently, I produced the first conclusive direct measurement of the Casimir force. My previous activities include tests of fundamental symmetries using atomic systems and neutrons, and tests of quantum mechanics. This work employed precision laser spectroscopy (parity violation in atomic Pb and Tl), optical pumping of 199Hg (applied to tests of spatial isotropy, time reversal symmetry, and quantum mechanics), and general development of new precision experimental and theoretical techniques, particularly in regard to neutron physics.

FRED RAAB

Fred Raab earned his Ph.D. in Physics from the State University of New York at Stony Brook in 1980, working in the area of precision molecular spectroscopy. As a research scientist at the University of Washington from 1980 to 1988, he worked on atomic physics tests of time-reversal non-invariance and tests of local Lorentz invariance. He also worked on torsion balance experiments, designed to search for anomalous forces or violations of the equivalence principle. In 1988, he became Assistant Professor of Physics at the California Institute of Technology and he was a co-author of the construction proposal for the Laser Interferometer Gravitational-Wave Observatory (LIGO).

His research interests in LIGO have covered interferometer configurations, thermal noise and seismic isolation development. He is currently Head of the LIGO Hanford Observatory.

He also serves on the Executive Committee of the APS Topical Group on Gravitation and the Gravitational Wave International Committee.

DAVID SHINER

Positions:
Assistant Professor of Physics, Physics Department, University of North Texas (1994-present); Associate Research Physicist and Lecturer, Yale University (1989-94).

Main Research Interests:
To develop and apply precision experimental techniques to the study of simple atoms and their nuclei and to understand the implications of such measurements to the physical theories of these systems. In particular, I have focussed on precision laser and electro-optic techniques applied to the helium atom. The work has bearing on approximation methods in quantum mechanics, the electron-electron interaction and quantum electrodynamics, fundamental constants, and few-body nuclear physics.

Other Activities:
Member APS-TGPMFC, APS-DAMOP, APS-DNP, OSA.

APS Fellows Elected

Two new Fellows of the American Physical Society were elected through our unit in 1997.

Edward E. Eyler, University of Connecticut
"For precision spectroscopic measurements of simple atomic and molecula systems, especially molecular hydrogen." Ed is a previous member of the Executive Committee of the Topical Group and a member of the Pipkin Award Committee.

Larry R. Hunter, Amherst College
"For his contributions to precise tests of fundamental physical laws and symmetries, and in particular for substantially improving the bound on the electric dipole moment of the electron." Larry is a previous Chair, and a founding member of the Topical Group.

Certificates will be presented at the Annual Business Meeting. If there is a member of the Topical Group you would like to recommend for nomination as a fellow of the American Physical Society, please submit their name to the American Physical Society by April 1 (for consideration for fellowship in 1999). Complete details about the fellowship program, and a fellowship nomination form can be obtained from the APS web page at http://www.aps.org. As described by the APS; "the APS Fellowship Program was created to recognize members who may have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the teaching of physics or service and participation in the activities of the Society."