Precision Measurement and Fundamental Constants

NEWSLETTER

A Topical Group of The American Physical Society *No. 21 January, 1999*
http://www.aps.org/units/pmfc

First Pipkin Award Winner Announced

The Pipkin Award, established by the PMFC Topical Group, is given biennially and consists of $2,000 plus support of travel expenses to the APS Meeting at which it is conferred. The purpose of the award is to honor exceptional research accomplishments by a young scientist in the interdisciplinary area of precision measurement and fundamental constants and to encourage the wide dissemination of the results of that research.

The 1999 Francis M. Pipkin Award is awarded to: **Steven Keith Lamoreaux** , Los Alamos National Laboratory.

Citation: *For extensive contributions to precision measurements science, especially searches for a permanent electric dipole moment of the neutron and atoms, measurements of atomic parity violation, and tests of spatial symmetries and quantum mechanics, including observation of the vacuum Casimir Effect.*

Background: Dr. Lamoreaux received his BS in physics from the University of Washington in 1981 and his Ph.D. in physics from the University of Washington in 1986. He remained at the University of Washington from 1986 through 1996 as a Research Associate Professor. In December of 1996 he moved to Los Alamos National Laboratory where he currently is a staff member.

Dr. Lamoreaux has many areas of interest including precision atomic and neutron experimental techniques; the theory of neutron matter interactions; lasers and optoelectronics, and radiofrequency spectroscopy. His current work includes classical and quantum cryptography, quantum computing, and tests of fundamental interactions using ultracold neutrons. He is the co-author of two books, “Ultracold Neutrons,” and “CP Violations without Strangeness: The Electric Dipole Moments of Particles, Atoms and Molecules.”

contd on pg 6

Renew your Topical Group Membership!

The current PMFC Topical Group membership is 471, almost the same as last year’s 472. A few years ago, there were over 500 members. The slippage in numbers is small, but the trend is still a matter for concern. By continuing your Topical Group membership with your next APS renewal, you will be helping us continue our programs, which include sponsoring symposia at meetings, offering travel support for students, sending out the newsletter. The $6 dues ($5 of which goes to the Topical Group) is our main source of income. Encourage your colleagues to join (or rejoin if they have let their membership lapse). Current APS members who want to join the Topical Group between APS renewals can do so by filling out the form at http://www.aps.org/memb/unitapp.html or by calling the APS Membership department at (301) 209-3280.

INSIDE

1999 APS Centennial Meeting in Atlanta 2
Annual Topical Group Business Meeting 2
New APS Fellows 2
Nominations for Fellowship 3
Current Topical Group Executive Committee 3
Committee Chairs 3
Election of Executive Committee Members 4
Candidate Biographies 4
Maria Goeppert -Mayer Distinguished Scholar 6
Travel Support for Young Scientists 6
Membership Response Form 7
Ballot ..... enclosed

1999 APS Meeting in Atlanta

The Topical Group is participating in four Invited Sessions at the Centennial Meeting of the APS in Atlanta on March 20-26, 1999. The Centennial Symposia we are involved in are the following:

Atomic Clocks in Science and Technology
8:00 - 10:30 Tuesday, March 23

The Natural Standards
10:30 - 13:00 Tuesday, March 23

Precision Measurements in Atomic Physics: A Window into Fundamental Interactions
14:00 - 17:00 Wednesday, March 24

In addition, we have a joint invited session with DAMOP on Thursday. The talks will be by the winners of the Pipkin Award (sponsored by the PMFC Topical Group), the Rabi Prize, and the Broida Prize.

The following contributed sessions are in the topic areas of the PMFC Topical Group:

Monday 10:30. **Session EB19:** Fundamental Constants & Tests of Physics Laws.

Monday 13:15. **Session FB19:** Precision Measurements: Atoms, Ions, Lasers.

Tuesday 18:00. **Session NP07:** Poster Session: Precision Measurements and Fundamental Constants.

Wednesday 11:00. **Session QB19:** Tests of Physics Laws.

Wednesday 13:00. **Session RP06:** Poster Session: Basic Physics Tests.

It's always a good idea to check the final conference information for last-minute changes in times and locations.

The Topical Group will have an exhibit on the fundamental constants, including access to the NIST WWW database and probably some historical equipment from NIST.

Annual Topical Group Business Meeting

The annual PMFC Topical Group Business Meeting is scheduled for 3:00 - 3:45 PM Tuesday, March 23. Check the final conference program for the location and possible time changes.

New APS Fellows

The following new APS Fellows were elected through the PMFC Topical Group in 1998.

Gregory Scott Adkins, Franklin & Marshall College

For numerous contributions to the theory of the hyperfine splitting and decay rate of positronium.

Siu Au Lee, Colorado State University

For contributions to the field of high resolution laser spectroscopy, and for precision experiments in hydrogen and in tests of special relativity.

The following PMFC Topical Group members were also selected as Fellows in 1998.

Ronald W. P. Drever, California Institute of Technology (Gravitational Topical Group)

For his fundamental experiment to test the isotropy of space, and for his pioneering contributions to laser interferometry as a tool for gravitational-wave detection.

Mark Douglas Havey, Old Dominion University (DAMOP)

For development and explication of novel one- and two-photon spectroscopies of bound and dissociative electronic states of diatomic molecules; also for development of precision atomic two-photon polarization spectroscopy for determination of atomic matrix elements and novel sum rules.

Arthur Eugene Livingston, University of Notre Dame (DAMOP)

For his contributions to the understanding of relativistic, QED, and Rydberg state atomic structures through the spectroscopy of highly-charged ions, and for precise determinations of excited-state lifetimes involving allowed and forbidden atomic transitions.

Bernard Fredrick Schutz, Albert Einstein Institute, (Gravitational Topical Group)

For his pioneering work in the theory of gravitational radiation, for the discovery of new instabilities in rotating, relativistic stars, and for elucidating how gravitational-wave observations can reveal astrophysical and cosmological information.

Anton Zeilinger, University of Innsbruck (DAMOP)

For elucidating and extending the mystery of the quantum phenomena of interference and entanglement by elegant experiments with neutrons, atoms, and photon pairs together with new theoretical insights.

Nominations for Fellowship

Members of the Precision Measurement and Fundamental Constants Topical Group are invited to nominate candidates for Fellowship in the APS. Our topical group is delegated the opportunity to select approximately two new APS Fellows from nominations submitted to the APS and designated as our topical candidates.

A description of the mechanism for submitting a nomination to the APS and nomination forms are available at the APS Web page: http://www.aps.org/fellowship/index.html. The deadline for submission of nominations for our unit is April 1, 1999.

PMFCTG nominations will be reviewed by the group Fellowship Committee which consists of Eric Adelberger, Peter Bender, and Peter Mohr. Please notify Peter Mohr, mohr@nist.gov of relevant nominations or intent to nominate someone. If suitable candidates are not identified by the membership at large, nominations will be initiated by the Fellowship Committee.

Current Topical Group Executive Committee

Chair:
Stephen R. Lundeen
Department of Physics
Colorado State University
Fort Collins, CO 80523
Phone: (970) 491-6647
FAX: (970) 491-7947
E-mail: lundeen@lamar.colostate.edu

Chair-elect:
Peter L. Bender
JILA
University of Colorado
Boulder, CO 80309-0440
Phone: (303) 492-6793
FAX: (303) 492-5235
E-mail: pbender@jila.colorado.edu

Vice Chair:
Peter J. Mohr
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001
Phone: (301) 975-3217
FAX: (301) 975-4578
E-mail: mohr@nist.gov

Past Chair:
Daniel J. Heinzen
Department of Physics
University of Texas
Austin, TX 78712
Phone: (512) 471-3960
FAX: (512) 471-9637
E-mail: heinzen@physics.utexas.edu

Secretary-Treasurer:
Wayne M. Itano
National Institute of Standards and Technology
325 Broadway St.
Boulder, CO 80303-3328
Phone: (303) 497-5632
FAX: (303) 497-7375
E-mail: witano@nist.gov

Members-at-Large (Year term expires in parentheses):

Ralph S. Conti (2001)
Department of Physics
University of Michigan
Ann Arbor, MI 48109
Phone: (734) 936-1132
FAX: (734) 764-5153
E-mail: rconti@umich.edu

Steve K. Lamoreaux (2001)
Los Alamos National Laboratory
Los Alamos, NM 87545
Phone: (505) 667-5005
FAX: (505) 665-4121
E-mail: lamore@lanl.gov

Edward S. Fry (2000)
Department of Physics
Texas A&M University
College Station, TX 77843
Phone: (409) 845-1910
FAX: (409) 845-2590
E-mail: fry@phys.tamu.edu

Harold J. Metcalf (2000)
Department of Physics and Astronomy
SUNY-Stony Brook
Stony Brook, NY 11794-3800
Phone: (516) 632-8185
FAX: (516) 632-8176
E-mail: hmetcalf@ccmail.sunysb.edu

Edwin R. Williams (1999)
National Institute of Standards and Technology
Gaithersburg, MD 20899
Phone (301) 975-4206
FAX: (301) 926-2115
E-mail: williams@eeel.nist.gov

Linda Young (1999)
Argonne National Laboratory
9700 S Cass Ave.
Argonne, IL 60439
Phone: (630) 252-8878
FAX: (630) 252-6210
E-mail: young@anlphy.phy.anl.gov

Committee Chairs

Nominating Committee: Linda Young
Fellowship Committee: Peter Mohr
Program Committee: Peter Bender
Membership Committee: Edward Fry
Education Committee: Harold Metcalf
Centennial Unit Display Committee: Peter Mohr

Election of Officers and Executive Committee Members

This year, a new Vice-Chair and two Executive Committee Members-at-Large are to be elected. At the close of the 1999 Annual Meeting, the current Chair, Steve Lundeen, will become Past-Chair, the Chair-Elect, Peter Bender, will advance to Chair, the Vice-Chair, Peter Mohr, will advance to Chair-Elect, and two Members-at-Large, Edwin Williams and Linda Young, will rotate off the Executive Committee. The following candidates were selected by the Nominating Committee, consisting of Linda Young (Chair), Gene Sprouse, Ernest Kessler, and Samuel Werner.

Candidate Biographies

FOR VICE-CHAIR

Richard D. Deslattes

Positions:
1983-present: senior NIST fellow and leader, Quantum Metrology Group; at NBS/NIST since 1962; Director, Division of Physics, National Science Foundation, 1980-81; visiting scientist, Universität Heidelberg, 1983-84.

Main Research Interests:
Precision measurements and fundamental constants determinations based on extending the optically-based wavelength scale to the x-ray and gamma-ray regions; investigation of x-ray and inner-shell processes in atoms, molecules and simple solids; accelerator-based precision x-ray measurements of H- and He-like heavy ions; reference wavelengths for exotic atom spectroscopy; development and application of high accuracy x-ray and gamma-ray instrumentation; synchrotron radiation investigation of geometric and electronic microstructures; and, application of x-ray diffraction to production of reference materials, and analysis of thin film mesostructures.

Other Activities and Awards:
Current: Member, Editorial Board, Physical Review A, 1999-2001; International Advisory Board, Journal of Physics B; Working Group on the Avogadro Constant, BIPM. Prior service: Chair, APS DEAP (DAMOP), 1986-87. Awards include: Honorary Fellowship, Russian Academy of Metrology (1996); von Humboldt Senior Scientist Award, 1983; and, SUN-AMCO Medal, ICSU (1990).

Blayne Heckel

Positions:
Professor, University of Washington, 1991; Associate Professor, University of Washington, 1987; Assistant Professor, University of Washington, 1983; Ph.D., Harvard University, 1981.

Main Research Interests:
(1) Tests of time reversal symmetry violation through the measurement of the electric dipole moments of atoms. Our efforts in Seattle have set upper bounds on the electric dipole moments of Xe and 199 Hg atoms.
(2) Measurements of the bare neutron-nucleon weak interaction coupling constants. Our recent efforts have been to send a beam of polarized cold neutrons from the NIST reactor through a target of liquid helium. We measure the parity violating rotation of the beam polarization, analogous to optical rotation.
(3) Laboratory tests of the gravitational principle of equivalence. We use torsion balances to compare the acceleration of different materials toward local and astronomical sources. Our results provide tests of the weak and strong principles of equivalence, the gravitational properties of dark matter, and the presence of new weak forces.

Other Activities and Awards:
APS Fellow, Program Advisory Committee of the LANSCE Users Group, Program Advisory Committee of the NIST Cold Neutron Beam Facility, member of various NSF and DOE review panels, member of the Executive Committee of the APS Topical Group on Precision Measurements and Fundamental Constants.

FOR EXECUTIVE COMMITTEE MEMBER-AT-LARGE

Siu-Au Lee

Positions:
Professor of Physics, Colorado State University (1993-present), Assoc. Prof. (1988-93) and Asst. Prof. (1982-87), Colorado State University. Senior Research Fellow, Caltech (1980-82); Assistant Physicist, Argonne National Laboratory (1979); Postdoctoral Research Associate, JILA (1976-78). Ph.D., Stanford University (1976).

Main Research Interests:
Laser manipulation of atoms with application to quantum wire and quantum dot structures; atom interferometry; atom lithography; precision QED test of magnetically induced birefringence of vacuum.

Other Activities and Awards:
Member, APS DAMOP, DLS, TG/PMFC. Fellow, OSA. Member, CAMOS (93-96); Member, Program Committee, CLEO/QELS 98; Member, NSF Physics Committee of Visitors, 1997.

Luis Orozco

Positions:
Associate Professor, Department of Physics and Astronomy State University of New York at Stony Brook (1996-present), Asst. Prof. (1991-1996).

Main Research Interests:
(1) Precision spectroscopy of trapped radioactive Fr.
(2) Optical cavity QED.

Other Activities and Awards:
Guggenheim Fellowship 1998-99, Precision Measurement Grant from NIST 1994-1997, Member of the program committee DAMOP 1998-2000.

Guy Savard

Positions:
Physicist, Argonne National Laboratory, 1997-present, Physicist, Chalk River Laboratory, 1991-1997, Research Associate, CERN/Mainz University, 1988-1991.

Main Research Interests:
Weak interaction physics using high-precision low-energy nuclear/atomic physics probes (tests of CVC, precise determination of the weak vector coupling constant from beta-decay, search for non V-A terms in the interaction). Development of ion trapping techniques for unstable isotopes and their applications to high-precision mass measurements, fundamental interaction studies and trace analysis.

Other activities and award:
Member, program committee APS-DNP; AECL Discovery Award (1994).

Anton Zeilinger

Positions:
1980 - present: Professor of Experimental Physics, University of Innsbruck; earlier affiliations including visiting professorships: Technical University Vienna, Technical University Munich, University of Melbourne, Massachusetts Institute of Technology, Hampshire College, College de France, Oxford University.

Main research interests:
Experiments on the foundations of Quantum Mechanics; this includes precision tests of the theory and of possible alternative variants. Experiments on entanglement including long-distance photon correlations, tests of Bell's inequality, quantum non-locality, quantum teleportation, most recently realization of three-photon entanglement. Experiments in neutron and atom optics: quantum interferometry, coherence and decoherence in matter wave optics, application to the measurement of gravity and rotation sensing. Earlier work also puts a limit on any hypothetical magnetic monopole charge of the neutron.

Other activities and awards:
Coordinator, European TMR Network "The Physics of Quantum Information;" President, Austrian Physical Society; Member, Austrian Academy of Sciences; Fellow, American Physical Society. Austrian Scientist of the Year 1996, European Quantum Optics Prize 1997.

Maria Goeppert-Mayer Distinguished Scholar

Argonne National Laboratory has established the position of Maria Goeppert-Mayer Distinguished Scholar to attract leading women scientists and engineers to the Laboratory. This position has been established to recognize outstanding achievement by a woman scientist or engineer and to provide opportunities for her to conduct innovative research utilizing the special environment and capabilities offered by Argonne. Candidates should be scientists or engineers of proven talent and accomplishment, at points of very high promise or distinction in their careers. Creativity, plus recognized accomplishment in a field of current or potential interest to Argonne will be two prime factors in judging candidates. The award is for a period of one year, typically starting in October. Applications are due February 28 for appointments starting the following October. Information is available at http://www.anl.gov/CMB/mgm.html. For additional information, interested parties should contact Maryka Bhattacharyya, bhatt@anlcmb.bim.anl.gov.

contd from pg 1

Dr. Lamoreaux is a Fellow of the American Physical Society and received the Henderson Prize for an outstanding Ph.D. Dissertation.

The next Pipkin Award will be presented in 2001. The deadline for submission of nominations for the 2001 Award is July 1, 2000. Nominations should be sent to the Chair of the 2001 Award Selection Committee, Linda Young (Contact information given elsewhere in this newsletter).

Travel Support for Young Scientists

The Education Committee, chaired by Harold Metcalf, has awarded travel grants to three graduate students, post-docs, and recently graduated physicists, for travel to the APS Centennial Meeting. The grantees are presenting papers in the area of precision measurement and fundamental constants.

MEMBERSHIP RESPONSE FORM

This form is for your convenience. Please mail it to Wayne Itano, PMFCTG Secretary-Treasurer, or E-mail the information to witano@nist.gov. You can make suggestions at any time to the relevant Committee Chairs or Executive Committee members.

Suggestions for symposium topics:

Suggestions for symposium speakers:

Nominations for Topical Group Vice-Chair:

Nominations for Executive Committee Members-at-Large:

Nominees for APS Committees:
Each year the APS solicits nominations from the Topical Group for several committees. If you would like to suggest a Topical Group member (including yourself) to be considered for appointment to one of the following APS committees, please write the name to the right of the committee name below. Information on the duties of these committees is in the APS Bylaws, which can be found at the APS website www.aps.org, under "Governance."

Careers & Professional Development_____

Constitution and Bylaws_____

Education_____

Fellowship_____

International Freedom of Scientists_____

International Scientific Affairs_____

Investments_____

Meetings_____

Membership_____

Minorities_____

Lilienfeld Prize_____

Physics Planning_____

Publications Oversight_____

Status of Women in Physics_____

Wayne Itano, PMFCTG Secretary -Treasurer, National Institute of Standards and Technology, Mail Stop 847.10, 325 Broadway, Boulder CO 80303-3328

_____
_____
_____
_____
Signature

PLACE
STAMP
HERE

Wayne Itano
National Institute of Standards and Technology
Mail Stop 847.10
325 Broadway
Boulder, CO 80303-3328

Fold and seal with tape (no staples please).

Precision Measurement and Fundamental Constants
1999 Election Ballot

VICE CHAIR (vote for one)

❒ RICHARD D. DESLATTES

❒ BLAYNE HECKEL

MEMBERS - AT - LARGE (vote for two)

❒ SIU-AU LEE

❒ LUIS OROZCO

❒ GUY SAVARD

❒ ANTON ZEILINGER

Please sign on the reverse side and return this ballot by Friday February 19, 1999:

Wayne Itano
National Institute of Standards
and Technology
Mail Stop 847.10
325 Broadway
Boulder, CO 80303-3328

Signature

PLACE
STAMP
HERE

Wayne Itano
National Institute of Standards and Technology
Mail Stop 847.10
325 Broadway
Boulder, CO 80303-3328

Fold and seal with tape (no staples please).