Precision Measurement and Fundamental Constants

NEWSLETTER

A Topical Group of The American Physical Society *No. 23 February, 2000*
http://www.aps.org/units/pmfc

2000 Annual Meeting in Long Beach

The Annual Meeting of the Topical Group will be held in conjunction with the APS Spring Meeting, April 29 - May 2 at the Long Beach Convention Center and the Hyatt Long Beach Hotel, Long Beach, California. The Topical Group Program Committee, chaired by Peter Mohr, has organized two invited sessions:

Fundamental Precision Measurements (Joint with Division of Nuclear Physics)
Saturday afternoon, 2:30 PM

Testing Atomic Theory and Experiment with Helium Fine Structure, David Shiner (University of North Texas).
The Quest for a Penning Trap Mass Spectrometer with Accuracy Approaching 0.01 ppb, Robert Van Dyck, Jr. (University of Washington).
Planck Constant Determination from Power Equivalence, David B. Newell (National Institute of Standards and Technology) .
Quantum Jump Spectroscopy and the Electron Magnetic Moment, Gerald Gabrielse (Harvard University).
The anomalous Magnetic Moment of the Muon, Klaus Jungmann (University of Heidelberg)

Modern Measurements of *G*, the Newtonian Constant of Gravitation (Joint with Topical Group on Gravitation)
Monday morning, 11:00 AM

Two Measurements of *G*, One Parallel to and One Perpendicular to the Direction of Earth's Gravity, James E. Faller (JILA/NIST) .
On Measuring *G* with a Cryogenic Torsion Pendulum, Riley Newman (University of California, Irvine).
A Measurement of Newton's Constant using a Torsion Balance in Acceleration Feedback, Jens Gundlach (University of Washington)
Project S.E.E. (Satellite Energy Exchange), Alvin J. Sanders (Univ. of Tennessee & Oak Ridge National Lab).

The contributed session, Precision Measurements of Theory and Tests, will be Monday afternoon, 2:00 PM.

More information on the meeting can be found at http://www.aps.org/meet/APR00/ .

Annual Meeting Deadlines:

Abstracts:	14 January (past)
Early registration:	18 February (past)
Late registration:	31 March
Postdeadline Abstracts:	10 March
Housing:	31 March

Annual Topical Group Business Meeting

The annual PMFC Topical Group Business Meeting will be held in Room 202A of the Long Beach Convention Center, 5:30 PM Sunday, April 30, at the Long Beach APS Meeting. All Topical Group members are encouraged to attend. Check the final conference program for possible location or time changes.

INSIDE

Pipkin Award Nominations

The purpose of the Francis M. Pipkin Award, established by the Topical Group on Precision Measurement and Fundamental Constants, 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 award is given biennially every odd-number year and consists of $2,000 plus support of travel expenses to the APS Meeting at which the award is conferred. For detailed information on the nomination procedure, see http://www.aps.org/praw/Pipkin/descrip.html. The deadline for submission of nominations for the 2001 Award is **3 July 2000.**

Nominations should be sent to the Chair of the 2001 Award Selection Committee, Linda Young, 9700 South Cass Ave. Argonne National Laboratory, Argonne, IL 60439, Tel: 630-252-8878, FAX: 630-252-6210, E-mail: young@anlphy.phy.anl.gov.

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 group 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, 2000**. PMFCTG nominations will be reviewed by the Fellowship Committee, which consists of Richard Deslattes (chair), Richard Davis (BIPM, Sevres, France, E-mail: rdavis@bipm.fr), and Gordon W Drake (Univ. of Windsor, E-mail: A36@uwindsor.ca).

Please notify a committee member of relevant nominations or intent to nominate someone.

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Committee Chairs

Program Committee: Peter Mohr
Nominating Committee: Steven Lamoreaux
Fellowship Committee: Richard Deslattes
Pipkin Award: Linda Young

Candidate Biographies for 2000 Elections

This year, a new Vice-Chair and two Executive Committee Members-at-Large are to be elected. At the close of the 2000 Annual Meeting, the current Chair, Peter Bender, will become Past-Chair, the Chair-Elect, Peter Mohr, will advance to Chair, the Vice-Chair, Richard Deslattes, will advance to Chair-Elect, and two Members-at-Large, Harold Metcalf and Edward Fry, will rotate off the Executive Committee. The following candidates were selected by the Nominating Committee, consisting of Steven Lamoreaux (Chair), Larry Hunter, William Klipstein, and Luis Orozco (APS Council representative).

FOR VICE-CHAIR (ONE POSITION):

BLAYNE R. HECKEL

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

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.

PAUL D. LETT

Positions:
Physicist, Atomic Physics Division, NIST (1986-present), Ph.D. University of Rochester (1986).

Main Research Interests:
Laser cooling and trapping of neutral atoms with emphasis on the study of ultracold collisions and photoassociation spectroscopy. Quantum optics, frequency standards, quantum information processing, fundamentals of quantum mechanics.

Other Activities and Awards:
APS Fellow; Member APS DAMOP, DLS, TG/PMFC; Member, Optical Society of America; Department of Commerce Silver Medal (1996); Director, Physics Laboratory Summer Undergraduate Research Fellowship program (SURF) (1997-); NIST EEO/Diversity Award (1999); Editorial board "Quantum and Semiclassical Optics: Journal of the European Optical Society, B" (1997-8); Program committee, IQEC (1998); Member of NRC Committee on Atomic Molecular and Optical Science (CAMOS)(1999-).

FOR EXECUTIVE COMMITTEE MEMBER-AT-LARGE (TWO POSITIONS):

DANA J. BERKELAND

Positions:
J. Robert Oppenheimer Fellow, Los Alamos National Laboratory, 1998-present; National Research Council Postdoctoral Fellow, National Institute of Standards and Technology, 1995-1998; Ph.D., Yale University, 1995.

Main Research Interests:
I am generally interested in optical and microwave spectroscopy for precise tests and measurements of atomic systems. At Los Alamos, I am developing an experiment to investigate quantum optical effects in two-atom resonance fluorescence using strontium ions confined in a linear Paul trap. My past research has included: the laser cooled and trapped mercury ion microwave frequency standard at NIST; an all-optical

measurement of the ground state Lamb shift in hydrogen; optical measurements of the Stark shifts of the D1 lines in lithium and cesium.

Other Activities and Awards:
Member: APS-TGPMFC, APS-DAMOP, APS-DLS, OSA; R&D 100 Award for Significant Innovation, 1990.

DAVID P. DEMILLE

Positions:
Assistant Professor of Physics, Yale University (1998-present). Assistant Professor of Physics, Amherst College (1997-98). Postdoctoral Research Associate, Lawrence Berkeley National Laboratory (1994-97). Ph.D., University of California at Berkeley (1994).

Main Research Interests:
My work has centered on tests of discrete symmetries in atoms and molecules. This has included a search for the electric dipole moment of the electron (which would be evidence for violation of time-reversal symmetry), and a recent search for exchange-antisymmetric two-photon states (which would indicate violation of the spin-statistics relation). In addition, I have looked for novel systems with enhanced sensitivity to symmetry violations; this has led to developmental work towards measurements of parity violation in atomic Yb, and towards a new search for the electron EDM in the molecule PbO, as well as a variety of spectroscopic measurements in rareearth atoms. Currently, I am beginning a new project aimed at producing ultracold polar molecules; these would have applications in a number of precision measurements, and also possibly in quantum computation.

Other Activities and Awards:
Member, APS DAMOP, TG/PMFC; Member, Advisory Committee, SPIN 2000 Conference; Packard Foundation Fellowship 1999; Research Corporation Research Innovation Award 1998, Cottrell College Science Award 1997.

PROTIK K. MAJUMDER

Positions:
Assistant Prof. of Physics, Williams College (1994-present); Research Asst. Prof. of Physics, Univ. of Washington (1993-94); Postdoctoral Research Associate, Univ. of Washington (1989-1993); Ph.D., Harvard University (1989).

Main Research Interests:
Precision measurements of atomic structure in thallium and other heavy atoms using lasers, vapor cells, and atomic beams. Atomic measurements of parity nonconservation. Search for long range time-reversal violating forces in atoms.

Other activities and award:
Member APS, DAMOP, PMFCTG; Recipient of 1999 NIST Precision Measurement Grant.

JOHN D. PRESTAGE

Positions:
1986-Present: Senior Member of the Technical Staff, Jet Propulsion Lab, Pasadena, CA; Work Area Manager for Frequency and Timing Development for NASA's Deep Space Network. 1983-
86: Postdoctoral Work at the NIST Ion Storage Group, Boulder. 1983: Ph.D. Atomic Physics Yale University.

Main research interests:
Since 1983 my primary interest has been in atomic clock development based on trapped ions and fundamental physics tests based on ultra-stable clocks. I developed the first linear quadrupole rf ion trap to enable ultra-stable atomic ion clock operation. Clocks (at JPL) based on these traps have shown the best short-term frequency stability of any atomic clock. More recent interests have been in clock development based upon multi-pole linear ion traps where ion space-charge Doppler effects are very much reduced from that of a quadrupole trap. At JPL, clocks based on a 12-pole linear rf trap have recently shown frequency stability at the parts in 10^{16} level. Other interests involve Equivalence Principle tests based on precise atomic clock comparisons including Local Lorentz Invariance (1985) and Local Position Invariance (1995). I first showed that hyperfine frequency comparisons between atoms with different atomic number Z can be usedto search for time and spatial variations of the fine structure constant a. We subsequently compared a mercury ion clock to a hydrogen maser clock over a 140-day interval to make the most stringent laboratory limit on a time variation of a. We have also developed a mission plan for a 4 solar radii flyby with payload of three atomic clocks (of different Z) to search for a difference in rates of the clocks in the strong gravitational potential near the sun. This mission would test for a variations at the 10^{-20}/year level as predicted in some grand unified string theories.

Other activities and awards:
Member APS, Topical Groups on Gravitation, IMS, DAMOP, and PMFC. Member IEEE; Technical Program Chair for the IEEE Frequency Control Symposium, 2000-2001.

TOPICAL GROUP ON PRECISION MEASUREMENT AND FUNDAMENTAL CONSTANTS

2000 ELECTION BALLOT

For Vice-Chair (vote for one)

- ❑ **Blayne R. Heckel**
- ❑ **Paul D. Lett**

For Members-At-Large (vote for two)

- ❑ **Dana J. Berkeland**
- ❑ **David P. DeMille**
- ❑ **Protik K. Majumder**
- ❑ **John D. Prestage**

Please sign on the reverse side and **return this ballot by Friday, April 7, 2000.**

MEMBERSHIP RESPONSE FORM

This form is for your convenience. If you wish to send it separately from your ballot, photocopy it and mail 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 Secretary-Treasurer:

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. From the main page, go to “Society & Contact Info,” then to “APS Governance.”

Careers and 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 _____

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Signature

PLACE
STAMP
HERE

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Fold and seal with tape (no staples please).