

# Precision Measurement and Fundamental Constants

# NEWSLETTER

A Topical Group of The American Physical Society

No. 17 February 1997

## Report of the Secretary-Treasurer

The current membership of the Precision Measurements and Fundamental Constants Topical Group (PMFCTG) stands at 458 members, down slightly from 482 last year. At our peak year we had approximately 500 members. We ask all of our current members to renew their membership again and to encourage others who are not yet members, or whose memberships have lapsed to join. We will continue to offer interesting symposia, innovative focus sessions, student participation, and biannual newsletters, that contain timely announcements of upcoming events, conferences, publications, news, and sometimes even grant availability.

## 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 1998 APS Spring Meeting
6. Centennial meeting
7. Presentation of APS Fellowship Certificates
8. Suggestions from the Membership for Additional TG Activities
9. Other Business
10. Adjourn

## PMFCTG Activities At The APS Spring Meeting

*April 18-21, 1997 Washington DC*

Registration, hotel and travel information, an up to date program of invited and contributed talks, and the time and location of the PMFCTG business meeting will be posted on the APS website at <http://www.aps.org>

## Francis M. Pipkin Award

The effort to raise funds for the establishment of the Francis M. Pipkin Award, the first Award or Prize to be sponsored by our Topical Group, is making good progress. The Award will recognize outstanding work related to Precision Measurements and Fundamental Constants by a young scientist in any area of physics.

Special thanks are due to the Topical Group members who responded to the announcement in the last newsletter of the \$7000 matching fund pledge by a group of Frank Pipkin's former Harvard colleagues. We have now raised over \$5000 in individual contributions towards that challenge, with two months still remaining until the May 1 deadline. There is still time for members who support the establishment of this award to contribute, and have their contributions matched from the challenge grant.

To insure credit towards the matching grant challenge, donation checks should be made payable to: "American Physical Society, F.M. Pipkin Award" and sent to: Steve Lundeen, Dept. of Physics, Colorado State University, Ft. Collins, CO 80523. Donations will be restricted to use towards the establishment of this award, and are usually tax deductible. If we succeed in meeting this challenge, the Award should become a reality this year! Questions and comments are welcomed by Steve Lundeen, at "lundeen@lamar.colostate.edu".

## INSIDE

Election of Executive Committee Members	
Candidate Biographies .....	2
APS Fellows Elected .....	4
Fundamental Constants Online .....	4
Upcoming Conferences .....	4
ICAMDATA .....	4
Cynthia Carter Remembered .....	4
Ballot .....	enclosed

# Election of Executive Committee Members for the PMFC Topical Group

This year a new Vice Chair 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, Geoffrey Greene will become Past Chair, replacing Eric Adelberger, Daniel Heinzen will become Chair, and Stephen Lundeen will move up to Chair Elect. Two New Executive Committee Members will replace Stuart Freedman, and Carol Tanner, who are rotating off after 3 year terms. We thank them all for their leadership and contributions.

The candidates listed below were nominated by the Nominating Committee, consisting of Edwin Williams, (Chair), Timothy Chupp and Rogers Ritter. The biographical information was supplied by the candidates and is reproduced below. A ballot is enclosed.

Next year we will be electing a new Secretary-Treasurer as well as a Vice Chair and two Executive Committee Members at Large. Suggestions for nominees 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**

#### **PETER BENDER**

*Positions:* Research Associate, JILA, University of Colorado; formerly, Physicist, Quantum Physics Division, National Institute of Standards and Technology. Main Research Interests: Space antenna for gravitational wave studies; geophysical studies of Mercury, the Moon, and the Earth's gravity field; and separated spacecraft interferometers for optical interferometry in space.

*Other Activities:*

Chair, Div. of Electron and Atomic Physics (now DAMOP) 1970-72; Council Member, APS 1973-77; Chair, NAS/NRC Comm. on Earth Science in Space 1977-79; Member of the following: NAS/NRC Space Science Board 1977-80; NASA Space Interferometry Science Working Group 1994-96; Technology, Working Group, NASA Structure and Evolution of the Universe Program 1996- present.

#### **ROBERT VESSOT**

*Positions:* 1969-Present: Senior Physicist, Smithsonian Astrophysical Observatory and Research Associate, Harvard College Observatory, 1960-69: Manager, Maser Research and Development, Varian Associates and at Hewlett-Packard, Beverly, Mass. 1956-60: Staff Member, Department of Sponsored Research, Massachusetts Institute of Technology, 1951-56: Royal Canadian Air Force, Flying Officer, Honourable Discharge

*Main Research Interests:*

Since 1969 Vessot has worked at the Harvard-Smithsonian Center for Astrophysics as P.I. on the development of atomic hydrogen masers. The SAO

Maser Group builds H-Masers for use in space, for time-keeping and for Very Long Baseline Interferometry (VLBI) Radioastronomy activity world-wide. SAO H-Masers are exclusively used in NASA's Deep Space Network and continue to be maintained by SAO. Since 1990, Vessot has headed a NASA project to place an Atomic Hydrogen Maser Clock system in space to test such a system for long term operation and to demonstrate extremely high precision world-wide time synchronization. Vessot continues investigations H-H collisions with an H-Maser at very low temperatures (0.5K), to research other high stability oscillators and to devise experimental tests of relativistic gravitation with space-borne clocks.

*Other Activities, Services and Awards:*

1978 Received NASA's "Exceptional Scientific Achievement" medal for work as P.I. Investigator on the Gravitational Redshift Experiment (NASA Gravity Probe-A); also NASA Group Achievement Award. 1990-93 APS Executive Committee of the Topical Group on Precise Physical Measurement; 1993 received the IEEE I.I. Rabi award, 1993 Elected APS fellow; 1989-95 NRC Panel on Assessment of NIST Physics Programs.

### **MEMBERS-AT-LARGE**

#### **EDWARD S. FRY**

Professor, Texas A&M University (1986-present); Director, Texas Laser Laboratory of The Houston Advanced Research Center (1994-present). Ph.D. University of Michigan (Hanle effect in 21P helium); Assistant Professor, Texas A&M University (1969-75); Associate Professor, Texas A&M University (1975-1986); Visiting Associate Professor, University of Michigan (1977-1979).

*Main Research Interests:*

- (a) Foundations of quantum mechanics: We made one of the first tests of the Bell inequalities. We now have underway an exact experimental realization of Bohm's version of the Einstein-Podolsky-Rosen gedankenexperiment that will provide a loophole free test.
- (b) Lasing without population inversion (LWI): We made the first observation of the effect and have built one of the only two operating laser oscillators based on LWI.
- (c) Ocean optics: Our measurements of the optical absorption of pure water are now being accepted in the oceanographic community as the most accurate available.
- (d) Brillouin scattering: A new approach is being developed that will, for the first time, provide a capability for the remote sensing of temperature and sound velocity profiles in the ocean. The concept is based on Brillouin scattering and a very robust high resolution spectroscopic technique.

*Other Activities and Awards:*

Fellow, Optical Society of America; Member, APS TG/PMFC and DAMOP; Past-chair, Texas Section of APS; EG&G PARC medal from the Society of Optical and Quantum Electronics; Distinguished teaching award from the Association of Former Students of Texas A&M University.

**ZEINA JABBOUR**

B.S. Engineering Physics, Lehigh University, 1988; M.S. 1990, Ph.D. 1994, Physics, Lehigh University. National Research Council Postdoctoral Fellow at the National Institute of Standards and Technology, 1994-95; Staff Physicist, National Institute of Standards and Technology, 1995-present; Guest Researcher, International Bureau of Weights and Measures (BIPM, France), 1996.

*Research interests:*

Precision mass and density measurements, mass standards, fundamental constants, atom-optics, electron-molecule collisions, atomic collisions, molecular spectroscopy.

**TOICHIRO KINOSHITA**

Goldwin Smith Professor of Physics, Emeritus, Newman Laboratory, Physics Department, Cornell University. Main research interests: High precision test of quantum electrodynamics and standard model, in particular, theoretical study of the anomalous magnetic moments of the electron and the muon, and the hyperfine structure of muonium.

*Other Activities and Awards:*

Technical Advisory Panel - University Program, Department of Energy, 1982 - 1983, Committee on Fundamental Constants, National Research Council, 1984 -

1986, Member, National Academy of Sciences, Fellow, American Physical Society, Fellow, American Association for Advancement of Sciences, John Simon Guggenheim Memorial Fellow, 1973 - 1974, American Physical Society, 1990 J. J. Sakurai prize

**HAROLD METCALF**

Physics Department Stony Brook, NY. Harold Metcalf was educated in the public schools of Newton, MA, was awarded an Sc.B. in Physics from MIT in 1962, and a Ph.D. in Physics from Brown University in 1967. His three children were born in 1964, 1967, and 1973.

*Summary of Professional Experience:*

1962-1967, Graduate Assistant, Brown University; 1967-1968, Research Associate, Brown University; 1968-1970, Research Associate, S. U. N. Y., Stony Brook; 1970-1974, Assistant Professor, S. U. N. Y., Stony Brook; 1974-1983, Associate Professor, S. U. N. Y., Stony Brook; 1977-1978, Visiting Associate Professor, M. I. T. ; 1983-present, Professor of Physics, S. U. N. Y., Stony Brook; 1986-1987, Visiting Professor, Ecole Normale Supérieure, Paris, France; 1988-1994, Director of Graduate Studies, Physics Dept., Stony Brook; June 1992, Visiting Professor, R.U. Utrecht, Netherlands; 1993-1994, Visiting Professor, Ecole Normale Supérieure, Paris, France; June 1994, Visiting Professor, R.U. Utrecht, Netherlands; 1997-1999, Alexander von Humboldt Fellow, Univ. at Konstanz.

*Principal Research Interests:*

1. Precision spectroscopy of simple atoms and molecules. Most recent work in triplet helium and the OH free radical.
2. Quantum beats and atomic coherence. Most recent work in OH, He, and Na. Detection by fluorescence as well as by photoionization.
3. Zeeman spectroscopy, especially level crossing spectroscopy.
4. Stark spectroscopy of Rydberg atoms. Work in field ionization of Na in states degenerate with the continuum. Interference narrowing, precision calibration of electric fields.
5. Deceleration and cooling of atoms with laser light; magnetic trapping of neutral atoms. Experiments with Na at NBS, Cs in Paris, Ne in Holland, and Rb, Li, and He at Stony Brook. Quantized states of atomic motion. Also, theory at Stony Brook.
6. Atom Optics, deBroglie wave optics, applications to fundamental questions in quantum mechanics.

*Member:*

A.P.S., O.S.A., A.A.P.T., L.I.P.T.A. Life Fellow of Am. Phys. Soc. Recipient of Chancellor's Award for Excellence in Teaching, 1974 Faculty Advisor to S. P. S. (Outstanding chapter awards, 1978, 1985 and 1986) #012#Topical Group on Precision Measurement and Fundamental Constants

## APS Fellows Elected

Two new Fellows of the American Physical Society were elected through our unit in 1996. They are:

*Steve K. Lamoreaux*, Los Alamos National Laboratory (previously at University of Washington) "For his contributions to the study of fundamental symmetries and precision tests of fundamental physical laws and especially for his contributions to improved experimental limits for the electric dipole moments of the neutron and atoms."

*Jonathan R. Sapirstein*, Notre Dame University "For contributions of fundamental importance to QED theory in atoms, and atomic physics tests of parity nonconservation."

Certificates will be presented at the Annual Business Meeting to be held in conjunction with the APS Spring Meeting, April 18-21 in Washington D.C..

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 1998). 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."

## Fundamental Constants Online

The bibliographic database on fundamental constants (version 1.0) is now online. The address is <http://physics.nist.gov/fundconbib>. It can also be reached through the Physics Lab home page via the Physical Reference Data link.

## Upcoming Conferences

### *CPEM 98*

Conference on Precision Electromagnetic Measurements (CPEM 98), organized by NIST, will be held in Washington DC, July 6-10, 1998. For more details, consult the website <http://www.eeel.nist.gov/cpem98>

### ICAMDATA

The first in what may become a series of international conferences, "International Conference on Atomic and Molecular Data and Their Applications" (ICAMDATA), will take place at NIST in Gaithersberg MD at the end of October 1997. It includes as a topic benchmark calculations and measurements which would be the connection to fundamental constants. For details, consult a website that is being prepared for the conference at <http://physics.nist.gov/icamdata>.

## Cynthia Carter Remembered

Cynthia Carter, whose dedication and hard work played a major role in bringing the Topical Group to its present, highly viable state, died in December 1996. She was a founding member, our first elected Secretary-Treasurer, and Newsletter editor, completing two three-year terms in 1995. The PMFCTG grew out of the National Academy of Sciences/National Research Council, Committee on Fundamental Constants which Cynthia oversaw when she was at the Academy. Cynthia worked at the Department of Energy in the Advanced Energy Projects Division. She was also very active in the American Society for Testing of Materials, and was a competitive fencer. After stepping down as Sect.-Treas., Cynthia remained active in the TG, serving as liaison to other APS units to organize joint symposia, gave much useful advice to the executive committee, and helped to edit the newsletter. Her warmth, contributions and encouragement will be greatly missed.