



APS Topical Group for
Precision Measurement and Fundamental Constants

GPMFC NEWSLETTER

March, 2020

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GPMFC Membership,

It has been a while since the last GPMFC newsletter. In this one, we will focus on upcoming events but also try to recap some recent highlights. As always, our executive and business meetings alternate between DAMOP and the April APS meeting. This year these meetings will be held at DAMOP (see below). All members are invited to attend the business meeting. Dates and times will be emailed as soon as they become available.

Eric Burt, GPMFC Secretary/Treasurer

Chair's Message

Welcome to a new year and decade with the APS GPFMC! APS has announced new publication opportunities within the Physical Review family of journals. There is now a special "precision measurements" section within Physical Review A, and an entirely new journal, PRX Quantum, is now accepting papers for research connected to quantum information science and technology.

No doubt many of you are aware that this year's March meeting has been cancelled due to public health concerns related to the [corona virus](#) (N.B. the linked page contains useful links to CDC and WHO web sites.) Please follow the advice of [Ignaz Semmelweis](#) and wash your hands often. Please note that viruses can live on (as opposed to in) your cell phone; recommended treatments can be found [here](#).

Good Luck! Please note that the April meeting is not cancelled altogether, but shall, rather, be held as a virtual meeting. Details will be forthcoming soon from the APS. Hope to "see" you there, as well as at DAMOP!

Best Regards,
Susan Gardner

APS Fellows from GPMFC

Congratulations to our Topical Group's 2019 APS Fellows:

- **Andrew Geraci**, Northwestern University, for developing new precision measurement techniques to search for weakly coupled interactions of mesoscopic range and demonstrating the precision sensing capability of optically levitated nanoparticles.
- **Holger Mueller**, University of California, Berkeley, for advances in the manipulation of matter waves, including their application to precision measurement of the fine structure constant, to constraint on forces from light scalar fields posited to be dark energy candidates, and to the development of a phase plate for electron microscopy.

The Topical Group is entitled to propose candidates for Fellowship in the APS. **Please consider nominating a member of our group to honor their contributions to our field.** Nomination instructions can be found [here](#). This year, the Fellowship Committee is chaired by David Hanneke (dhanneke@amherst.edu) and includes Stefan Schamminger (NIST) and Chris Polly (Fermilab). The deadline for nominations is May 1, 2020.

GPMFC Prizes and Awards

We would like to congratulate all of the recent winners of GPMFC prizes:

The winner of the 2020 Norman F. Ramsey Prize was Phillip Bucksbaum of Stanford University, "*For pioneering explorations of ultrafast strong field physics from the optical to the X-ray regime.*"

The winner of the 2019 Norman F. Ramsey Prize was Jun Ye of JILA, NIST/University of Colorado "*For ground-breaking contributions to precision measurements and the quantum control of atomic and molecular systems, including atomic clocks.*"

The winner of the 2019 Francis M. Pipkin Award was Tanya Zelevinsky of Columbia University, "*For pioneering research on producing ultracold molecules confined in optical lattices and using them for precision spectroscopy, molecular clock techniques, and tests of fundamental physics.*"

We're grateful to our members who have agreed to serve on our prize committees.

Francis M. Pipkin Award Committee (nomination deadline, June 1, 2020):
Steve Lundeen (chair), John Doyle (vice-chair), Brad Plaster, John Wilkerson, and Tanya Zelevinsky (2019 recipient).

Norman F. Ramsey Prize Committee (nomination deadline, June 1, 2020):

Ron Walsworth (chair), Phil Bucksbaum (2020 recipient), Kang-Kuen Ni, Linda Young, John Bohn, Blayne Heckel, and Mike Snow.

GPMFC Elections

Congratulations to the newly elected incoming GPMFC officers: David Hanneke (Vice Chair), Eric Burt (Secretary/Treasurer), Jaideep Singh (Member At Large), and Lindley Winslow (Member At Large). Their terms commenced on Oct 1, 2019.

For 2020 we will be electing two new Members-at-Large of the Executive Committee as well as a new Vice Chair, who is in the succession line for Chair. Please contact the chair of the Nominating Committee, Shannon Hoogerheide (shannon.hoogerheide@nist.gov) to suggest nominees. The deadline for nominations is April 3, 2020.

GPMFC at the April APS Meeting

As of the writing of this newsletter, the in-person April APS meeting has been cancelled and will be replaced by a virtual meeting. We will send out details to the membership as soon as we receive them. For now, we list here the previously planned April APS GPMFC co-sponsored invited sessions (see also: [here](#)):

Session C04: New insights from precision measurements of weak interaction phenomena

- **Stefan Baessler**, *Results from the aSPECT experiment.*
- **Thomas Papenbrock**, *Discrepancy between experimental and theoretical β -decay rates resolved from first principles.*
- **Elena Aprile**, *Measurement of two-neutrino double electron capture in ^{124}Xe .*

Session G03: Precision tests of fundamental physics

- **Gerald Gabrielse**, *Tabletop tests of the standard model and beyond: a tale of two electron dipole moments.*
- **Natasha Sachdeva**, *New limit on the permanent electric dipole moment of ^{129}Xe using ^3He Comagnetometry and SQUID detection.*
- **E. A. Hessels**, *A measurement of the Lamb shift in atomic hydrogen: Towards a resolution of the proton-radius puzzle*

Session R03: New approaches to H_0

- **Wendy Freedman**, *Local distance ladder measurements and determination of the Hubble constant.*
- **Suzanne Staggs**, *CMB measurements of H_0 and new results from ACT+WMAP.*
- **Kenneth Wong**, *An independent measurement of H_0 from lensed quasars.*

Session D03: AMO frontiers in astrophysics

- **Jason Hogan**, *Atomic gravitational wave detectors*
- **David Phillips**, *Mapping the dark matter distribution via stellar accelerations.*

- **Scott Diddams**, *Precision astronomical spectroscopy with laser frequency combs*

GPMFC at DAMOP

The GPMFC will be holding its Executive Committee meeting and its Business meeting at DAMOP in 2020 (Portland, OR). The Business meeting is open to all GPMFC members. There will also be a social event as well. Details on all of these will follow by email to the membership.

The following invited sessions, organized by the precision measurement section of the DAMOP program committee, will take place at DAMOP in 2020. The detailed schedule is not yet available. See <https://www.aps.org/units/damop/meetings/annual/> for details.

New developments in atomic clocks:

- **David Lebrandt**
- **Hidetoshi Katori**
- **Robert McConnell**

Searches for exotic physics

- **Andrew Geraci**
- **Ben Safdi**
- **Andrei Derevianko**
- **Andrey Surzhykov**

Nuclear physics experiments using AMO techniques

- **Klaus Blaum**
- **Jaideep Singh**

Ultrasensitive atomic sensors

- **Danielle Braje**
- **James Shaffer**

Fifth annual workshop of the Group on Precision Measurements and Fundamental Constants

“Precision-measurement searches for new physics” is a one-day workshop organized by the APS Topical Group on Precision Measurements and Fundamental Constants (GPMFC) and Dmitry Budker, Holger Müller, and Marianna Safronova. It will take place in Portland, Oregon on June 1, 2020 – the day before the DAMOP meeting begins. It will be held at the same venue as the DAMOP meeting. The goal of the workshop is to survey forefront efforts in searches for physics beyond the Standard Model with precision measurements. The workshop will be complemented by invited talks at the DAMOP meeting on the same subject.

1. David Moore, Yale - Precision searches for new physics using optically levitated microspheres
2. Marcus Arndt, University of Vienna, Quantum superpositions of macroscopic objects
3. Ariel Zhitnitsky, University of British Columbia, Axion-Quark-Nugget dark matter
4. Jacob Talor, JQI Review on tabletop experiments on the connection between gravity and quantum mechanics
5. Gilad Perez, Weizmann Institute, Ultralight Bosonic Dark Matter
6. Nergis Mavalvala, MIT, Advanced LIGO: future perspectives and new physics searches
7. Nick Hutzler, Caltech Searching for New Particles and Forces with Polyatomic Molecules
8. Peter Thirolf, LMU, Germany, Development of the nuclear clock & future perspectives
9. Alex Sushkov, Boston University, Dark matter searches using precision NMR techniques
10. Piet Schmidt, University of Hannover, Highly-charged ion clocks for fundamental physics

Please see the following link for more information:

<https://www.aps.org/units/damop/meetings/annual/gpmfc-workshop.cfm>

Student Poster Competition

Congratulations to Chandler Schuplf and Tanya Roussy, winners of the 2019 GPMFC student poster competition.

GPMFC will award two “Best Student Posters” at the DAMOP 2020 poster session, with a prize of \$500 each. The categories will be in “Measurements of Constants and Novel Interactions” and “Clocks, Squeezing, and Precision Techniques”. Eight finalists have been selected to take part; we thank everyone for their many excellent submissions!

We thank the student poster competition committee for the work they have done to put this together. They are Matt Dietrich and Andrew Geraci.

2020 Annual APS Leadership Meeting

From January 29 to February 1, Susan Gardner, David Hanneke, and Eric Burt (GPMFC chair, vice chair, and secretary treasurer respectively) attended the Annual APS Leadership Meeting in Washington, DC. This year there was a focus on current challenges in international scientific collaborations. Speakers included Ernie Moniz, Steve Chu, David Reitze, and Chris Monroe and ranged from public policy, to interactions with China, to large international collaborations such as LIGO, and the National Quantum Initiative. See <https://leadership2020.aps.org> for more details.

The day before the start of the meeting, Eric Burt attended the Congressional Visit Day. This was an opportunity for about 80 APS members to visit with their representatives in Washington DC and advocate for the support of science. This year the APS focused on increasing the budget for science; Senate act 1067 and House resolution 36 addressing sexual harassment in the sciences; the “Keep STEM Talent Act of 2019”, which addresses the visa situation faced by promising foreign graduate students attempting to study in the US; methane emissions from natural gas and oil production, and the growing crises in liquid helium availability/cost.

Precision Measurement Job Announcement

A position in experimental precision physics at the assistant professor level has opened at Arizona State University. Please go to the following link for more information:

<https://www.nature.com/naturecareers/job/assistant-professor-experimental-physics-arizona-state-university-asu-711043>

The contact person for questions or nominations is Ricardo Alarcon, Ricardo.Alarcon@asu.edu