
Topical Group on Few-Body
Systems
and Multiparticle Dynamics

Newsletter, March 2006



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● **MESSAGE FROM THE CHAIR**

Greetings to all members of the Few-Body Topical Group (GFB) and best wishes for the coming year.

It is once again election time. We are fortunate to be able to introduce strong candidates for your consideration. To indicate their specialized field and personal expertise, each candidate has provided a biographical history and written a brief statement outlining their intentions and aspirations for you to read. Please consider the merits of each candidate before voting online. You will get a separate e-mail via APS with your access link to the electronic ballot. The exiting members of the committee are Ben Gibson from Los Alamos National Laboratory and Ravi Rau from Louisiana State University. A big thanks for their service.

GFB provides an important forum to voice support for research in few-body physics, and it is therefore vital to keep the interest and membership thriving. Please, encourage your colleagues and students to join GFB. It can be done online at the address

www.aps.org/memb/unitapp.html

Finally, congratulation to "HM" Hofmann, Janine Shertzer, and Michele Viviani who were all elected to APS Fellowship this year under GFB sponsorship.

For the Chair: Charlotte Elster, Secretary Treasurer

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● ELECTIONS --- ELECTRONIC VOTING

We will elect a Vice-Chair and two members of our Executive Committee. The Vice-Chair serves a term of one year, becomes Chair-Elect the next year, and assumes the Chair the following year. The Members-at-large of the Executive Committee serve three-year terms. The newly elected officers will assume their positions beginning May 2006.

Barry Berman and Wayne Polyzou are the candidates for Vice Chair. Candidates for the Executive Committee are Doerte Blume, Ralf Wehlitz, Jeff Krause, and Brett Esry. Brief biographies and statements of the candidates are given below.

The present officers are Rocco Schiavilla, Past-Chair; Colm Whelan, Chair; Werner Tornow, Chair-Elect; Bill Reinhardt, Vice-Chair; Charlotte Elster, Secretary-Treasurer. The current Executive Committee members (and the years their terms expire) are: Sabine Jeschonnek (08), Bira van Kolck (08), Chris Greene (07), Ricardo Alarcon (07), Ben Gibson (06), Ravi Rau (06).

As last year, this year's elections will be carried out electronically. All current GFB members will receive a separate email message which gives the Web Site for elections and instructions about voting. Please make sure to vote before the **DEADLINE, April 17** .

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● CALL FOR APS FELLOWSHIP NOMINATIONS

A major benefit to the members of the topical group is that the group can nominate members to become Fellows of the Society. The number of nominations the group can put forward depends predominantly on its total membership. The choice of our candidate(s) from among those next nominated will be made by our current Fellowship Committee: Werner Tornow, Charlotte Elster, and Chris Greene. I urge you to think about colleagues worthy of Fellowship who have never been elected and get together the necessary material for nomination to APS. Current APS members and their affiliations can be found on the APS website. Bear in mind that the few-body community, which is quite active outside the United States, has a number of distinguished physicists from foreign institutions who are not APS Fellows. If we nominate two of these members for APS Fellowship, we may be able to promote two GFB members to fellowship using the leverage of co-sponsorship with the International Forum. I also ask you to consider worthy candidates from under-represented minority groups. We had two new Fellows (see below) elected through our group last year. Our Fellowship Committee can only make recommendations on the nomination packages that are submitted by our membership, so let's do our part and nominate deserving candidates.

Information regarding the nomination procedure and the necessary forms can be easily obtained through the APS home page (www.aps.org/fellowship/) or our own group home page (under Fellows). The DEADLINE for nominations for our Topical Group is this year April 3. Please make sure the full package has been submitted to the APS before this date.

CONGRATULATIONS TO OUR NEW FELLOWS

Congratulations to Hartmut Hofmann, Janine Shertzer, and Michele Viviani, who were elected to Fellowship in the APS under the auspices of the GFB last year.

Hartmut Hofmann's fellowship citation reads

"For significant contributions to the understanding of nuclear reaction mechanisms, and for developing the refined resonating group model to do state-of-the-art scattering calculations in light nuclei using realistic nuclear forces."

Janine Shertzer was cited

"For her ground-breaking introduction of novel finite-element techniques in calculations of bound state and scattering properties of atomic and molecular systems."

and Michele Viviani was honored

"For his theoretical studies of three and four-nucleon bound and scattering states and electroweak capture reactions using realistic interactions and hyperspherical harmonic methods."

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● APRIL MEETING

The APS "April" Meeting will be held from April 22-25, 2006 in Dallas, Texas. GFB was allocated 1 slots at the April Meeting this year. It is Session Q4 "Three-Body Systems" on Monday, April 24, 2006 starting at 13:30 in the Hyatt Regency, Room Marsalis A, and featuring Y. Ilieva (Jlab), M. Sargsian (Florida Int.), and E. Epelbaum (Univ. of Bonn).

Please attend the GFB annual business meeting which will, as usual, be held at the Spring Meeting of the American Physical Society, this year in Dallas, TX on April 22-25, 2006. The business meeting will be held on Monday, April 24 at 17:30, Session T11 in the Hyatt Regency, Room Cumberland E.

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● OTHER MEETINGS

The 18th International IUPAP Conference on Few-Body Problems in Physics (FB18) will take place in Santos, Brazil, August 21-26, 2006

FB18 is intended to bring together scientists interested in few-body aspects of physics, emphasizing recent developments in nuclear, particle, atomic, and molecular physics.

Further information can be obtained at the official website for [FB18](#).

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● GORDON CONFERENCES

There is not currently a Gordon Conference on Few Body Problems. However, there are Gordon Conferences on Atomic and Molecular Interactions, Nuclear Chemistry, and Photonuclear Reactions that will be of interest to some of our membership.

- The Gordon Conference on Atomic and Molecular Interactions will take place July 9-14, 2006, at Colby Sawyer College in New London, NH (further details at the website www.grc.org/programs/2006/atomic.htm).
- The Gordon Conference on Nuclear Chemistry will be held June 4-9, 2006, at Colby-Sawyer College in New London, NH. Details are at www.grc.org/programs/2006/nuchem.htm.
- The Gordon Conference on Photonuclear Reactions will take place July 30 - Aug 4, 2006, at Tilton School, in Tilton, NH. For details check out www.grc.org/programs/2006/photonuc.htm.

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● CANDIDATES BIOGRAPHIES AND STATEMENTS

● CANDIDATES FOR VICE-CHAIR

Barry Berman

George Washington University

Biography

Barry Berman has been Professor of Physics at GWU since 1985 and Columbian Professor of the Natural and Mathematical Sciences since 1998; he chaired the Physics Department 1993-98. From 1963 to 1985 he was a research physicist at Lawrence Livermore National Laboratory. His physics degrees are from Harvard and Illinois. He has held visiting positions at six major universities and four national laboratories in the U.S. and abroad. He has been an APS Fellow since 1970 and has a number of other awards and prizes. He chaired the International Conference on Photonuclear Reactions and Applications in 1973 and the International Symposium on the Three-Body Force in the Three-Nucleon System in 1986. His work has included both basic nuclear physics studies, many on few-body nuclei, and various studies in applied physics as well. He has co-authored well over 300 papers and conference reports, about 200 in refereed journals. His recent research is centered on photonuclear reactions on few-body nuclei at GeV energies at Jefferson Lab.

Candidate's Statement

I have devoted a major fraction of my research career, starting with my Ph.D. thesis, to the study of few-body nuclei as the first step towards a better understanding of the many-body force in the strong interaction. This line of experimentation has taken me in recent years to the GeV energy range at Jefferson Lab, the realm where three-body forces are about as

strong as two-body forces, for wavelengths of the order of a few tenths of a Fermi, and to the use of real, monoenergetic, and now polarized photon beams in order to exploit the simplicity of the electromagnetic interaction as the exciting probe for the excitation of exclusive reaction channels. I believe that until we understand the nature of many-body forces, for atoms, for nucleons, or for their subnucleonic constituents, our knowledge of the structure of matter will be incomplete. As a leader of the Few-Body Systems Group I would aspire to be a strong advocate of such studies, both experimental and theoretical, in all their forms. We need to continue to organize and participate in all forms of conferences and symposia, and above all we need to try our best to attract bright young people to the field and to lobby for adequate support for them from the funding agencies. I look forward to a bright future for our unique interdisciplinary field.

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Wayne N. Polyzou

University of Iowa

Biography

B.S. Physics, The Pennsylvania State University, 1974, M.S. Physics, The University of Maryland, 1978, Ph.D., Physics, The University of Maryland, 1979, Director's Post Doc, The Los Alamos National Laboratory, 1979-1981, Post Doctoral Fellow, The Massachusetts Institute of Technology, 1981-1982, Assistant Professor, The University of Iowa, 1982, Associate Professor, The University of Iowa, 1986, Professor, The University of Iowa, 1991, Departmental Executive Officer, The University of Iowa Department of Physics and Astronomy, 1997-2001, Fellow, American Physical Society, 1999, Executive Committee, Few-Body Topical Group, American Physical Society, 2000-2003.

My research involves a number of problems directed at understanding few-body nuclear physics at scales where subnuclear degrees of freedom become relevant. These include the formulation of mathematically well-defined Poincaré invariant quantum models of systems of a finite number of degrees of freedom. The formulation of cluster separability and the study of its role in the relation between the relativistic few and many-body problems. The formulation of numerical methods (based on wavelets) to construct sparse matrix approximations of momentum space relativistic few-body equations. The role of scattering equivalences in identifying equivalent Hamiltonians and understanding the nature of quantum mechanical observables. Applications of these methods to study few-nucleon or few-quark systems and their interactions with leptonic probes.

Candidate's Statement

I have worked in few-body physics for thirty years. My research program and perspective on physics have benefited enormously from my interactions with the diverse membership of the few-body community. For me, the beauty of few-body physics is that it is one area of physics where it is possible to constrain few-body Hamiltonians by comparing (numerically) exact predictions of theories to precise measurements of complete sets of experimental observables, completely eliminating uncertainties associated with mathematically uncontrolled approximations. One of the most impressive achievements of few-body physics during that thirty year period is how the combined efforts of many scientists resulted in a quantitative understanding of low-energy nuclear physics. This is an important milestone in

nuclear physics that could not have happened without contributions from members of the few-body community with different research interests. This success is an example of the value of a strong, interdisciplinary few-body community. A healthy few-body topical group will continue to facilitate the kind of interactions that contribute to progress on important few-body problems in chemistry and physics.

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● **CANDIDATES FOR EXECUTIVE COMMITTEE**

Doerte Blume

Washington State University

Biography

Doerte Blume earned her Ph.D. in Physics from the Georg-August University in Goettingen, Germany, in 1998. Her theoretical research on doped superfluid helium clusters was jointly supervised by Birgitta Whaley from the Chemistry Department, Berkeley, and Peter Toennies from the Max-Planck Institute for Fluid Dynamics, Goettingen. During her stay at JILA as a postdoctoral associate in Chris Greene's group, she explored the behaviors of van der Waals clusters and Bose-Einstein condensates using Monte Carlo techniques. She has been an Assistant Professor in Physics at Washington State University since 2001, and will be an Associate Professor starting in August 2006. In spring 2007, Doerte will spend five months at JILA as a visiting fellow. She received a Max-Planck graduate fellowship, a DAAD graduate fellowship and a DFG postdoctoral fellowship. She co-organized a four-week program on "Quantum Gases and Liquids" at the INT, Seattle, in August 2005, and is currently a member of the DAMOP Program Committee.

Her research interests lie at the interface of chemical physics, atomic and molecular physics, and condensed matter physics. In particular, she studies atomic Bose and Fermi gases under varying confinement, scattering in low-dimensional systems, Bose liquids such as atomic helium and molecular para-hydrogen clusters, and the near-threshold behaviors of self-bound Bose liquids.

Candidate's Statement

My theoretical research focuses on an in-depth understanding of dilute and strongly-interacting inhomogeneous Bose and Fermi systems. Starting from well-characterized two-body potentials, my goal is to develop and apply treatments that describe these systems accurately in terms of a few key quantities. In particular, understanding the bound state and scattering properties of "simple" few-atom systems lies at the heart of my research efforts. In this endeavor, I much enjoy the interdisciplinary possibilities. Many of the techniques that I apply were pioneered in nuclear physics, have later found applications in chemical, atomic and molecular physics, and more recently have started to impact how condensed matter systems are being studied. The few-body community provides a bridge between these different subdisciplines of physics, and my efforts are aimed at providing platforms, through extended workshops and conferences, that facilitate cross-disciplinary exchange of ideas.

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Ralf Wehlitz

University of Wisconsin

Biography

Ralf Wehlitz is currently an Associate Scientist at the Synchrotron Radiation Center of the University of Wisconsin-Madison since 2002. He received his Ph.D. from the Technical University in Berlin, Germany, in 1991 for his studies of the double-ionization process in atoms and molecules using synchrotron radiation. He continued these studies as a postdoc at the Fritz-Haber Institute of the Max-Planck-Society. With a Feodor-Lynen Fellowship (sponsored by the Humboldt Foundation) he was working at the University of Tennessee-Knoxville from 1994 to 1997. During that time he conducted various experiments concerning electron correlations in atoms at the National Synchrotron Light Source, the Advanced Light Source, and the European Synchrotron Radiation Facility. He then received a fellowship from the Japan Society for the Promotion of Science (JSPS), sponsored by the Japanese Government, and worked at the Photon Factory from 1997 to 1999, where he investigated double- and triple photoionization processes in simple atomic systems. In 1999 he became staff scientist at the Synchrotron Radiation Center.

His areas of interest are experimental studies of atomic few-electron systems (such as, e.g., Li and Be) using synchrotron radiation. Of particular interest are quantitative measurements of the relative double- and triple-photoionization probability as a function of photon energy. As simple few-electron systems are now in reach of theoretical calculations, these measurements provide benchmark data for theory. Recently, he extended his research to a more complex system, C₆₀. His research is published in more than 80 papers.

Candidate's Statement

The interaction of just a few particles with each other is an extremely interesting regime between "too simple" and "too complex". Interestingly, this regime exists in various areas of physics. For example, I have been studying the interaction of two (or three) electrons in a Coulomb field of an ion. While the members of the Few Body Topical Group do already know of the importance of few-body phenomena, it is important to make this group more visible in the scientific community at, for example, the March Meeting and DAMOP Meeting, possibly by hosting special events. It is also important to enhance the communication among the members of this group, particularly between scientists of different areas of physics. If elected, I will work to accomplish the goals mentioned above.

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Jeffrey L. Krause

University of Florida

Biography

Jeff Krause is an Associate Professor of Chemistry, and Director of the Quantum Theory Project at the University of Florida. He received his Ph.D. in Chemistry from The University of Chicago in 1987, and then did postdoctoral research at the Weizmann Institute of Science, Lawrence Livermore National Laboratory and the University of California, San Diego. He

joined the faculty at Florida in 1995. His thesis research involved electron correlation in two-electron atoms, and postdoctoral studies included quantum control of atomic and molecular systems and the dynamics of atoms in intense laser fields. Current research in his group involves energy transfer in extended systems, transport in molecular electronic devices, and wave packet dynamics in molecules and on surfaces. He was elected a Fellow of the APS in 2002 (through GFB), and is a member of DAMOP, DCOMP and DCP. He is a co-organizer and Symposium Coordinator of the annual Sanibel Symposium, and has served as Chair of the Florida Section of the American Chemical Society.

Candidate's Statement

My research involves theoretical studies of the interaction of light with matter, ranging from atoms to small molecules to macromolecules. Although my training and degrees are in Chemistry my research is by nature interdisciplinary, and cuts across the boundaries between physics and chemistry. The Few-Body Systems and Multiparticle Dynamics Topical Group is an ideal forum to foster the interactions among these disciplines. As an executive committee member, I would strive to increase the membership in GFB by reaching out to related fields of research, particularly within the chemical physics community.

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Brett Esry

Kansas State University

Biography

B.S. (Physics), Kansas State University, 1993; Ph.D. (Physics), University of Colorado with Chris Greene, 1997; ITAMP Postdoctoral Fellow, 1997-1999; Assistant and Associate Professor of Physics, Kansas State University, 1999-present. Goldwater Scholar, 1991-1993; DAMOP Thesis Award, 1999; Research Corporation Innovation Award, 1999-2004. Member and Chair, DAMOP Thesis Award Committee, 2003-2005; Member, ICPEAC general organizing committee, 2001-2005; Organizer, ITAMP workshop on "Fragmentation and Recombination in Novel Three- and Four-body Systems", 1999; Organizer, ITAMP workshop on "Quantum Degenerate Gases in Low-Dimensionality".

Research Interests: Theoretical treatment of ultracold few-body collisions, especially those relevant for Bose-Einstein condensates and degenerate Fermi gases; ab initio calculations of intense laser interactions with atoms and molecules, leading to breakup (ionization and dissociation); Efimov states and resonances in three-body systems; coherent matter wave propagation through waveguides; many-body theory of Bose-Einstein condensates.

Candidate's Statement

My training in few-body physics comes primarily from atomic physics, but I have worked on many problems at the interfaces with different fields --- chemical and nuclear physics, especially. These problems, such as the existence and characterization of Efimov states as well as the many other manifestations of Efimov-related physics, have brought me into close contact with the techniques of these fields as well as with their practitioners. Through this experience, I have gained a healthy respect for these other viewpoints. In this same vein, some years ago I co-organized an ITAMP workshop that focused exactly on bringing together people from diverse fields who were working on few-body problems and have

attended several other similar meetings. I like the idea of such meetings, and I like the idea of being able to encourage such interactions through this topical group.

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