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Topical Group on Few-Body  
Systems  
and Multiparticle Dynamics

Newsletter, February 2005



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## ● MESSAGE FROM THE CHAIR

As the time to elect the next vice-chair and executive committee members approaches, it is my pleasure to say hello and welcome to all members of the Few-Body Topical Group (GFB). Once again we are fortunate this year to be able to

introduce some 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 Daniel Phillips from Ohio University and Joseph Macek from the University of Tennessee.

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](http://www.aps.org/memb/unitapp.html)

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 Tampa on April 16-19, 2005. The business meeting will be held on Sunday, April 17 at 16:30 after Session M5.

Finally, I would like to congratulate Andris Stelbovics and Larry Weinstein who were all elected to APS Fellowship this year under GFB sponsorship.

Rocco Schiavilla, Chair GFB 2004-2005

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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 2005.

Don Madison and Bill Reinhardt are the candidates for Vice Chair. Candidates for the Executive Committee are Nora Berrah, Reinhold Blumel, Sabine Jeschonnek, and Bira van Kolck. Brief biographies and statements of the candidates are given below.

The present officers are Tom Rescigno, Past-Chair; Rocco Schiavilla, Chair; Colm Whelan, Chair-Elect; Werner Tornow, Vice-Chair; Charlotte Elster, Secretary-Treasurer. The current Executive Committee members (and the years their terms expire) are: Chris Greene (07), Ricardo Alarcon (07), Ben Gibson (06), Ravi Rau (06), Daniel Phillips (05), Joseph Macek (05).

As last year, this years 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 **3 April DEADLINE**.

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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/](http://www.aps.org/fellowship/)) or our own group home page (under Fellows). The DEADLINE for nominations for our Topical Group is 1 April each year. Please make sure the full package has been submitted to the APS before this date.

## **CONGRATULATIONS TO OUR NEW FELLOWS**

Congratulations to Andris Stelbovics and Lawrence Weinstein who were elected to Fellowship in the APS under the auspices of the GFB last year.

Stelbovics' fellowship citation reads citation reads

*For seminal contributions to electron-atom collision theory, including co-development of the convergent-close-coupling method."*

and Weinstein was cited

*"For his original contributions to the study of nucleon-nucleon correlations in nuclei"*

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## ● **APRIL MEETING**

The APS "April" Meeting will be held from April 16-19, 2005 in Tampa, Florida.

GFB was allocated 1.5 slots at the April Meeting in recent years which it can leverage through co-sponsorship with other APS units. At this Spring meeting we are sponsoring/co-sponsoring four invited sessions.

One session is a joint GFB/DNP symposium on the penta-quark, speakers will include Amarian (Old Dominion). There will be a joint session with DCOMP, speakers will include Stelbovics (Murdoch) and Walters (Belfast). Speakers at the other two sessions will be Schmidt-Boecking (Frankfurt), Stefani (Rome), Godunov (Old Dominion), Sulik (Hungarian Academy of Sciences), and King (Manchester).

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## ● **OTHER MEETINGS**

### **GFB at the DAMOP Meeting**

GFB will co-sponsor an invited session at the DAMOP meeting. Don Madison will be organizing the session. Please check [the DAMOP website](#) for further details.

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## ● **GORDON CONFERENCES**

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

- The Gordon Conference on Atomic Physics will take place June 26-July 1, 2005, at Tilton School in Tilton, NH (further details at the website [www.grc.org/programs/2004/atomic.htm](http://www.grc.org/programs/2004/atomic.htm)).
- The Gordon Conference on Nuclear Chemistry will be held June 26-July 1, 2005, at Colby-Sawyer College in New London, NH. Details are at [www.grc.org/programs/2004/nuchem.htm](http://www.grc.org/programs/2004/nuchem.htm).
- The Gordon Conference on Nuclear Physics will take place July 10-15, 2005, at Bates College in Lewiston, ME. For detail check out [www.grc.org/programs/2005/nucphys.htm](http://www.grc.org/programs/2005/nucphys.htm).

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## ● CANDIDATES BIOGRAPHIES AND STATEMENTS

## ● CANDIDATES FOR VICE-CHAIR

### **Don H. Madison**

University of Missouri-Rolla

#### **Biography**

**B.A. (Mathematics), Sioux Falls College, 1967; Ph.D. (Physics), Florida State University, 1972; Postdoctoral Research Associate, University of North Carolina (Eugen Merzbacher), 1972-74; Assistant, Associate and Professor of Physics, Drake University, 1974-1984; Ellis and Nelle Levitt Professor of Physics, Drake University, 1984-88; Professor of Physics, University of Missouri-Rolla; 1988-98; Curators' Professor of Physics, University of Missouri-Rolla, 1998-present; Visiting Scientist, University of Manchester, 1984; Visiting Scientist, Flinders U. of South Australia, 1988; Visiting Scientist, Institute of Theoretical Physics, Santa Barbara, 1991; Director of the**

Laboratory for Atomic, Molecular and Optical Research, University of Missouri-Rolla, 1999-2002; Fellow of the American Physical Society, 1993; President of TAMOC, 1994-1998; DAMOP Program Committee, 1994-1997; 2004-2006; Organizer of DAMOP Undergraduate Research Competition, 1994-2000; APS Committee on Education, 1997-1999; DAMOP Committee on Publications, 1996-1999; DAMOP Education Committee, 1999-2005; ICPEAC general committee, 1999-2003; International Chair for five different meetings in Australia, China and the US, treasurer of the GEC (2002-2006), Organizing committee for 18 different International meetings.

**Research Interests:** Perturbative and non-perturbative approaches to atomic scattering theory; Time-dependent scattering theory; Interaction of electrons, positrons and ions with atoms and molecules.

### Candidate's Statement

I learned scattering theory from nuclear books and papers in the late 60's and early 70's and have been working in AMO physics since. In spite of my best intentions, I have not managed to keep up with developments in other areas very well. On the other hand, it is inconceivable that my own work could not have benefited from advancements in related fields. For me, the primary appeal of the APS Topical Group on Few-Body Systems and Multiparticle Dynamics is to bring together people with similar interests from different specialties to provide both a forum for presenting the latest developments as well as for cultivating cross disciplinary collaborations. I think this is the strength of the forum and, if I were elected, I would encourage activities designed to promote and enhance this strength.

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## William P. Reinhardt

University of Washington

### Biography

Bill Reinhardt is Professor of Chemistry, and Adjunct Professor of Physics, at the University of Washington, Seattle. He has long been an active participant in the AMO and Few Body physics communities, having attended all of, and "chaired" one of, the original Few Body Gordon Conferences. His current interest is in the dynamics of Bose-Einstein condensates where the few body problems run from the use of "pseudo-potentials" to describe "cold-collision" pair interactions in the presence of correlations, and the dynamics of solitons and vortices as the "emergent" few body particle-like excitations in BECs. He is a Fellow of the AAAS, and APS, recently a Phi Beta Kappa Visiting Scholar, gives public lectures on chaos theory, and "physics and literature", and has co-authored a Cambridge University Press monograph (with Reinhold Blumel) on Chaos in Atomic Physics. He and his research group have published more than 200 journal papers. He has served on the AMOP National Research Council Advisory Panel, and on the nominating committees for the DCP and GFB, as well as Chairing the Theoretical Chemistry sub-Division of the American Chemical Society. He is currently on the Editorial Boards of J. Phys. B (IOPP, UK) and Phys. Rev. A.



## Candidate's Statement

The Few-Body topical group exists to maintain an active interface between workers in theoretical and computational physics who face similar problems but on energy and length scales differing by many orders of magnitude. Historical accident has led to different groups "owning" theoretical and computational knowledge of great sophistication, only to find that workers in other parts of physics (& chemistry!) need exactly what is known by different names and acronyms and applied to completely different systems, and can borrow and exploit this knowledge, rather than reinventing it from scratch. This requires an ongoing commitment to sharing knowledge, techniques, mathematical and computational skills, and the personal friendships and collaborations which make such sharing not only possible but highly stimulating and rewarding.

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# ● CANDIDATES FOR EXECUTIVE COMMITTEE

## Nora Berrah

Western Michigan University

### Biography

Nora Berrah has been a University Distinguished Professor of Physics at Western Michigan University since 2000. She received her PhD from UVA in 1987 and held a postdoc and assistant scientist positions in the physics division of ANL. Her publication list contains 2 book chapters and more than 121 research papers. She held a Humboldt fellowship position at the Fritz-Haber-Institut der Max Planck Gesellschaft in Berlin, Germany, was visiting scientist at LURE, Université d'Orsay, France, and is a Fellow of the American Physical Society. She has served for the APS, DAMOP executive committee, the CISA committee, and the selection committee for the I.I. Rabi prize. She also served in the NRC committee for CAMOS, as chair of the scientific user executive committee for the ALS, on BESAC for DoE, on the SAC for the LCLS, as co-team leader for AMOS at the LCLS, and for national and international scientific conference committees.

Her areas of interest are experimental studies of few- and many-electron systems, including studies of the electronic structure and dynamics in atoms, molecules, clusters and their ions. Recently, her work has focused to quantify the complex decay patterns and processes involving single, double and triple inner-shell photo-excitation, departure from L-S coupling, alignment and orientation, atomic and molecular resonant Raman Auger decay, interference between resonant and direct photo-ionization, vibrational excitation, molecular field splitting, atomic auto-ionization following molecular photo dissociation and spin resolved studies in atoms, molecules and clusters.

## Candidate's Statement



Few-body physics and multiparticle dynamics are important in many areas of physics, and chemistry, enabling GFB to play a special role in all scientific communities. Our responsibility should be to work at finding many ways to communicate advances in these areas as well as a sense of excitement about these topics and to organize sessions at various APS and ACS meetings. The GFB should work hard at disseminating its findings and activities to the broad scientific communities and cooperating with other topical groups and divisions of the APS and ACS.

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## Reinhold Blumel

Wesleyan University

### Biography

Reinhold Blumel obtained his Ph.D. in Nuclear Physics from the Technical University in Munich in 1983. He spent his Postdoc (1984) at the Weizmann Institute working on problems in localization theory and the nonlinear dynamics of atoms and molecules. His continued research in nuclear structure physics in 1985-86 was followed by a two-year stay (1987-89) at the Max-Planck-Institute for Quantum Optics, where he worked on crystallization and melting of ion crystals in a Paul trap. In 1989-90 he continued his studies of small atoms and molecules in Bill Reinhardt's research group at the University of Pennsylvania working primarily on the chaotic helium atom. In 1990 he obtained his Habilitation (Doctor of Science) Degree in Nuclear Physics from the Technical University in Munich. In 1991 he obtained a prestigious Heisenberg scholarship (roughly equivalent to a MacArthur "genius" award), which allowed him to focus entirely on research from 1991-1993. During this time, and until 1995, he worked at the University of Delaware and the University of Maryland on ion trapping, the application of nonlinear dynamics to atoms and molecules, and on a book (with Bill Reinhardt) on "Chaos in Atomic Physics" (published by Cambridge University Press in 1997). In 1995-98 he worked as a visiting scientist at the University of Freiburg, and joined Wesleyan University in 1999. In 2000 he obtained a Presidential PECASE award. A member of DAMOP, and president of TAMOC, he was elected Fellow of the American Physical Society in 2003.

### Candidate's Statement

The study of few-body systems is one of the great unifying themes of science. No matter what the field, be that astronomy, astro-physics, atomic physics, chemistry, mechanics, nuclear physics, etc., a serious attempt at understanding any of these fields invariably starts with an intensive investigation of the field's canonical few-body systems. Any complex systems can be approached from two different directions, starting at the thermodynamic limit toward fewer particles, or starting at its few-body side and onward towards more and more particles. No matter how we look at it, few-body physics is a key component of understanding any natural system ranging from simple classical mechanics to (molecular) biology. I am convinced that the GFB plays a crucial role in strengthening the few-body communities in these diverse fields and to act as a hub that stimulates, informs and educates the members of our discipline no matter what specific field of science they are engaged in.

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## **Sabine Jeschonnek**

The Ohio State University at Lima

### **Biography**

Sabine Jeschonnek is currently an Assistant Professor at The Ohio State University at Lima. She was a Postdoctoral Fellow in Jefferson Lab's Theory Group from 1998 - 2001, and a Feodor-Lynen Fellow at MIT from 1997 - 1998. She received her Ph.D. from Bonn University in Germany in 1996.

Her research is focused on electron scattering from nucleons and light nuclei. For her Ph.D. thesis and as a post-doc at MIT, she investigated the short-range structure in light nuclei, with an emphasis on final state interactions and relativistic current operators. She continued this line of research at Jefferson Lab, but also got interested in quark-hadron duality. Her main goal is the qualitative reproduction of the experimental signature of duality in valence quark models for hadrons; this search for the origins of duality will allow us to gain a better understanding of the applications of duality in the valence quark region.

Last year, Jeschonnek was elected to serve as Vice Chair of the Gordon Research Conference on Photonuclear Physics in 2006. She will become Chair of the conference in 2008. She is currently serving a three year term as Member-at-Large of the Ohio Section of the APS. She has also served a two-year term on the Jefferson Lab User Group Board of Directors from 2002 - 2004. In Lima, she has founded a Women in Science and Engineering group. She is also engaged in various outreach efforts.

### **Candidate's Statement**

The Few Body Topical Group provides a forum for interaction among physicists from different fields who share an interest in the many guises of the few-body system. Often, we have little opportunity to exchange ideas with colleagues from other fields. Thus, I see the GFB as a valuable enrichment. If elected, it will be my goal to increase the visibility of few-body physics by helping to organize few-body sessions at various meetings. I would also like to work with the other officers of the group to attract more members for our Topical Group, and to promote close interactions between theorists and experimentalists.

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## **Ubirajara (Bira) van Kolck**

University of Arizona

### **Biography**

Bira van Kolck is currently an Associate Professor of Physics at the University of Arizona. Bira got his Ph.D from the University of Texas at Austin in 1993, working under S. Weinberg. He held postdoctoral appointments at the University of Washington

and at the California Institute of Technology, before moving to Arizona in 2000. Since then, he has been a RHIC Physics Fellow at the RIKEN BNL Research Center, a DOE Outstanding Junior Investigator, and an Alfred P. Sloan Research Fellow. He was elected Fellow of the APS in 2004. He has participated in various committees of the APS Division of Nuclear Physics (Program, National Nuclear Physics Summer School, Home Page), and is currently a member of the APS Committee on International Scientific Affairs. In addition to other conferences and workshops, he organized the 2003 DNP Fall Meeting in Tucson (in the role of co-chair). His research interests center on effective field theories, in particular applications to few-body systems. His main contributions were to power counting, symmetries, and renormalization of few-body forces in systems with large scattering lengths and/or singular potentials.

### Candidate's Statement

Few-body systems provide the simplest examples of complexity, and form a link between high-resolution structure and large-scale aggregation. Precise experiment and controlled theory can reinforce each other as perhaps nowhere else in physics. It has been recognized for a long time that researchers in the GFB share many of the techniques ---such as the hyperspherical method--- used in the analyses of few-body systems. Even more importantly, many of the few-body features are remarkably universal and cut across physics subfields. Examples from my own experience include the three-body dynamics of systems (such as the triton and the  $4\text{He}$  molecular trimer) with large two-body scattering lengths, and the description of two-body systems with attractive, inverse-power potentials (such as pion exchange and van der Waals forces). Many of these universal features shape the behavior of many-body systems (for example, Bose-Einstein condensates near a Feshbach resonance), and the transition is increasingly amenable to study with computational methods (e.g., the nuclear no-core shell model). GFB should continue to foster interdisciplinary communication and collaboration on few-body physics, while striving to strengthen the interface with the many-body community.

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