

# Topical Group on Few-Body Systems and Multiparticle Dynamics

Newsletter, February 2000

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## MESSAGE FROM THE CHAIR

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

It is time to elect officers again, and I hope that all of you will vote. We are all in the debt of the Nominating Committee (Colston Chandler, Lee Collins, Charlotte Elster, Brad Keister, and Gerry Payne) for presenting us with such an

outstanding slate of candidates. A list of the candidates, their short biographical statements, and a statement of their goals in office are to be found below. The candidates come from many of the disciplines that comprise our Group, reflecting the fact that our members come from atomic, molecular, nuclear, mathematical, chemical, particle .... physics. Please vote for the new leadership that will continue our partnership. I would like to urge all of our members to encourage their colleagues to join our group. There has been a decline in our membership over the past few years and it would be nice to reverse this trend. Please contact any of the officers if you have suggestions.

Our World Wide Web site (located at <http://www.phy.ohiou.edu/~gfb> ) continues to function, thanks to our webmaster Charlotte Elster, and this is the best source of current information about the group. You will find there the group statement of purpose, the bylaws, a complete list of officers and committee members, a list of the group's APS Fellows for the previous few years, previous newsletters (thanks to Carl Carlson), meetings of interest, links to related organizations, and useful sites. There is also a nascent Picture Gallery that is always on the lookout for new interesting graphics (contact Barry Schneider or Charlotte Elster at <http://www.phy.ohiou.edu/~gfb/docs/gallery.html>

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## ELECTIONS --- ELECTRONIC VOTING NOW POSSIBLE

Enclosed is your ballot for our 2000 election of officers. 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 Secretary-Treasurer and the Members-at-large of the Executive Committee serve three-year terms. The newly elected officers will assume their positions following the Topical Group's Business Meeting, which will be held during the April Meeting in Long Beach, California.

Joe Carlson and Viginia Brown are the candidates for Vice Chair. Candidates for the Executive Committee are Mike Cavagnero, Bill McCurdy, Wayne Polyzou, and Steve Wender. Brief biographies and statements of the candidates are given below.

The present officers are Colston Chandler, Past-Chair; Barry Schneider, Chair; Dennis Skopik, Chair-Elect; Dennis Skopik, Vice-Chair; Carl Carlson, Secretary-Treasurer. The Executive Committee members are: Charlotte Elster(99), Bob Wiringa (99), Peter Mohr (00), Steve Cotanch (00), Jerry Feldman (01), and John Morgan (01).

You may vote electronically by going to Web Site

<http://www.physics.wm.edu/~carlson/ballot00.html>

or you may vote by paper ballot submitted by regular mail (but not both!). Either way please ensure your ballot is received before the 5 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 our total membership. The choice of our candidate(s) from among those next nominated will be made by our current Fellowship Committee: Jim McGuire (chair), David Ernst, and Kate Kirby. 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. We had no new nominees last year and I think this should not happen again. We have too many qualified group members who are not yet Fellows, so lets not have a repeat of last year.

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 2000. Please make sure the full package has been submitted to the APS before this date.

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## APRIL MEETING

The APS April Meeting will be held from April 29- May 3, 2000 in Long Beach, California. The Few Body Topical Group will have two invited and one contributed session at the meeting as well as our Business Meeting. A short schedule appears below. Members are urged to keep abreast of the latest developments via the APS Webpages and other APS announcements.

### GFBS

Session Title: Probing QCD at Low Energies

\*Compton Scattering from the Deuteron

David L. Hornidge

Saskatchewan Accelerator Laboratory/Mainz

\*An Effective Field Theory Calculation of Deuteron Compton Scattering

Roxanne P. Springer

Duke University

\*Applications of Chiral Perturbation Theory to Nuclear Few-Body Systems

Bira Van Kolck

California Institute of Technology

\*Meson-Photoproduction in the Few Nucleon System

Reinhard Beck

Mainz

Joint DAMOP/GFBS

Session Title: Few-body effects and multiparticle dynamics in atoms, molecules and solids

\*CODATA Fundamental Physical Constants

Peter J. Mohr

National Institute of Standards and Technology

\*Fragmentation Processes in Atomic Collision Physics

Colm Whelan

University of Cambridge

\*X-ray Atomic Physics with Next Generation Light Sources

Linda Young

Argonne National Laboratory

\*Divergence and Accurate Resummation of Density Functional Perturbation Theory, with Applications to Atoms and Molecules

John P. Perdew

Tulane University

Joint DNP/GFBS

SessionTitle: Few-Body Systems in Nuclear Physics

\*Recent Results on Bremsstrahlung and virtual pair production from KVI

Dr.A Nasser Kalantar-Nayestanaki

Groningen

\*New Calculations of pp Weak Capture

J. A. Carlson

Los Alamos

\*Progress in Tri-Nucleon Photodisintegration with the Lorentz Integral Transform Method

E. L. Tomusiak

University of Saskatchewan

\*Pion Production as a Test of Nucleon-Nucleon Interaction Models

Barbara von Przewoski

Indiana University Cyclotron Facility

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## FEW-BODY GORDON RESEARCH CONFERENCE

The few-body Gordon Research Conference, "Dynamics of Simple Systems in Chemistry and Physics," has been cancelled due to lack of attendance. It would be useful to get suggestions as to whether the group should try to resurrect this in another form. Send ideas to Barry Schneider

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## CANDIDATES BIOGRAPHIES AND STATEMENTS

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## *Candidates for Vice-Chair*

### **Joe Carlson,**

T-5 Los Alamos National Laboratory.

#### BIOGRAPHY

Joseph Carlson's research centers on the structure and reactions of light nuclei and in advancing the techniques used to understand these processes. An important goal of this work is to create a realistic consistent picture that can be used to help understand a variety of intriguing physical phenomenon, including, for example, studies of primordial nucleosynthesis and weak interactions in nuclei.

He is a scientist in the Theoretical Division of Los Alamos National Laboratory. He received his Ph.D. in 1983 from the U. of Illinois, was a junior research scientist at the Courant Institute of New York University from 1983-1986, and came to Los Alamos as a J. Robert Oppenheimer fellow in 1986.

Joseph Carlson serves on the Advisory Committee for the National Institute of Nuclear Theory in Seattle, the program advisory committee of the Indiana University Cooler Facility, and as a member of the Physical Review C Editorial Board.

He is a Fellow of the American Physical Society, where his past service includes membership on the Div. of Nuclear Physics Program Committee (1991-93) and the Nominations Committee (1998).

#### CANDIDATE'S STATEMENT

Few-body physics plays an important role in a host of exciting forefront topics in physics. The Few-Body Topical Group should strive to communicate a sense of this excitement through its own meetings and sessions, and to demonstrate it through close contact and cooperation with the other divisions and topical groups of the American Physical Society.

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### **Virginia Brown,**

MIT and University of Maryland.

#### BIOGRAPHY

Virginia R. Brown holds the positions of Research Scientist at the Massachusetts Institute of Technology (1992-present) and Visiting Professor in the Physics Department at the University of Maryland at College Park (1998-present).

She received her Ph.D. in theoretical nuclear physics from McGill University in 1964. She did postdoctoral work at Yale University in 1963-64 and at Lawrence Livermore National Laboratory until 1966, at which time she joined the permanent staff, where she served as a Senior Scientist until 1993. She remained at LLNL as a Laboratory Associate until 1995. She served as an NSF Program Officer for Theory in the Physics Division (1995-98). While at the NSF, she held an appointment as Research Professor at the University of Connecticut (1996-98). She is a Fellow of the American Physical Society (1982-present). Her major research interests include nuclear structure, nuclear reactions, and the study of the NN system in the presence of weak and electromagnetic fields, in particular nucleon-nucleon bremsstrahlung.

Dr. Brown has been active in the American Physical Society. A partial list of APS positions in which she has served include General Councilor (1995-98), Executive Board Member (1997-98), Committee on Committees (1997-99), Audit Committee (1996-97), Program Chair of the APS Spring Meeting (1996), Task Force on Forums (1996-98), and the APS Committee on Constitution and Bylaws (1992-94).

She has been very active in the Division of Nuclear Physics, where she served as Secretary-Treasurer (1986-95). She has served on numerous DNP committees, including the DNP Economic Concerns Committee (1973-77), the DNP Executive and Program Committees (1980-82 and 1986-96), DNP Bylaws Committee (1991-92), DNP "Nuclear Physics Serving Society" Brochure Committee (1992-95), DNP Asilomar Meeting Organizing Committee (1988-89) & (1992-93), APS/DNP Liaison and Centenary Committee (1996-99), and Chair of the DNP Fellowship Committee (1997). She has also served on the Few Body Topical Group (GFB) Nominating Committee (1998-99) and the Nuclear Physics Summer School Steering Committee (1992-94).

## CANDIDATE'S STATEMENT

My experience as an APS General Councilor and Executive Board member and my long tenure with the Division of Nuclear Physics give me a broad as well as a detailed view of the functioning of the American Physical Society. The Few Body Systems and Multiparticle Dynamics Topical Group (GFB) provides a valuable forum for the exchange of ideas among physicists from different sub-fields. I am in favor of enhancing the environment in the APS that fosters "unity" in physics. Unity among physicists, chemists and mathematicians helps achieve common goals such as working together to promote basic research and to obtain general increases in research funding. Propitious in promoting unity among physicists in diverse fields in our search to understand nature is the deepening appreciation of common underlying physical principles and beauties of the mathematical foundations, which have so many cross-field applications. I have been a strong proponent of high visibility, joint sessions at APS and Divisional meetings as a means of achieving this goal. More can be done. As Chair of the GFB, I would work towards strengthening the GFB base by increasing the membership, encouraging broad participation including incentives for young and aspiring scientists, improving communication and increasing visibility through meetings and the web, and setting a goal of providing mechanisms for the advancement and diffusion of knowledge about the "unity" of physics as viewed by the GFB.

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## *Candidates for Executive Committee*

### **Mike Cavagnero,**

**Associate Professor, University of Kentucky.**

#### BIOGRAPHY

Michael Cavagnero received a B.S. degree from the University of Connecticut (1981) and M.A. (1984) and Ph. D. (1987) degrees from the University of Chicago. After post-doctoral positions at the University of Nebraska (1987-1989) and at JILA (1989-1990), he joined the University of Kentucky faculty (1990). He was appointed an ITAMP Visiting Scientist in 1997-1998, and currently serves as Secretary of the Theoretical Atomic, Molecular and Optical Community.

His research interests center on the structure and dynamics of weakly-bound states of quantum systems. Weakly-bound atoms, molecules and clusters share certain important characteristics that stem from their energetic proximity to fragmentation limits; they are particularly sensitive both to fine details of the forces between fragments as well as to external interactions. As a result of this sensitivity, they provide stringent tests of quantum theory and serve as excellent probes of their local electromagnetic, gaseous or plasma environments. However, most weakly-bound quantum systems are also highly-excited and so provide important challenges to theory that are shared by systems ranging from Rydberg atoms to ultracold molecules to exotic atoms and molecules and to clusters.

## CANDIDATE'S STATEMENT

Many of the important new advances in physics are arising at the boundaries between traditional disciplines and so benefit substantially from cross-disciplinary workshops and symposia. Furthermore, researchers pushing on these boundaries need more opportunities to display their discoveries, both for professional advancement and in order to foster new ideas. The GFB is in an excellent position to assist intrepid researchers who are not afraid to step across disciplinary lines, and by so doing, to promote the general vitality of physics.

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## C. William McCurdy

### Lawrence Berkeley National Laboratory, Berkeley, California

#### BIOGRAPHY

C. William McCurdy received his B.S. (1971) from Tulane University and his Ph.D. in chemistry (1976) from the California Institute of Technology. From 1978 to 1991 he was a member of the faculty at Ohio State University, where as Professor of Chemistry he also served as the founding director of the Ohio Supercomputer Center. From 1991 to 1995 he was the Director of the National Energy Research Supercomputer Center at Lawrence Livermore National Laboratory. He is a Fellow of the American Physical Society and has been an Alfred P. Sloan Research Fellow and Camille and Henry Dreyfus Teacher-Scholar.

Currently Professor McCurdy is the Associate Laboratory Director for Computing Sciences at Lawrence Berkeley National Laboratory in Berkeley, California. McCurdy is also a Professor in the Department of Applied Science, University of California, Davis, and Adjunct Professor of Chemistry at the University of California, Berkeley.

His research interests in the area of few-body systems and multiparticle dynamics are in the theory of atomic and molecular collisions and have recently centered in particular on the problem of electron-impact ionization of atoms and molecules. He and his coworkers developed an approach to the collisional breakup of systems of charged particles that allows a complete computational solution while avoiding the barriers associated with applying the three-body Coulomb asymptotic form for breakup.

In the area of electron-molecule scattering, he has worked extensively on the role of electron correlation in both elastic and inelastic collisions of electrons with polyatomic molecules in the context of calculations using the complex Kohn variational principle. He has applied the method of complex electronic coordinates to resonances in electron-atom and electron-molecule collisions, and has also developed methods for treating vibrational motion of molecules during resonant collisions. He is the author of more than 100 articles in the areas of atomic, molecular, chemical and computational physics. He has served on the Committee on Atomic, Molecular and Optical Sciences (CAMOS), and is currently a member of two federal advisory committees to the Department of Energy, the Basic Energy Sciences Advisory Committee (BESAC) and the Nuclear Nonproliferation Advisory Committee (NNAC). In his capacity as director of two supercomputer centers he has served on numerous advisory and review committees and has worked with both federal and state governments to increase the funding for computational science.

## CANDIDATE'S STATEMENT

The theoretical community in some areas of physics, chemistry and engineering has made dramatic use of modern computational hardware and theoretical methods to address ever more complicated systems, and that theme is a common one in justifications of increased investment in computational theory. While it is currently in vogue to appeal to the new scientific challenges offered by complex systems as arguments to increase the funding for scientific research, it is my belief that a rich variety of physics associated with fundamental processes remains to be understood. Moreover, those

fundamental processes, all of which lie in the area of this Topical Group are critical to a number of physical applications that are important to the country. My goal is to help our community make that argument more successfully to funding agencies and to also make it more persuasively to new students entering physics and chemistry.

As part of that effort I co-organized a workshop at the national computing facility at Berkeley Lab on "Electron and Photon Initiated Chemistry" to make the case for theoretical research on fundamental collision processes that are important to plasma processing of materials as well environmental remediation. The report of that workshop, which can be found on the web at;

[http://www.lbl.gov/icsd/mccurdy/epic\\_home.htm](http://www.lbl.gov/icsd/mccurdy/epic_home.htm)

was presented both to the Department of Energy and the National Science Foundation. This spring the Department of Energy will sponsor a workshop on the same topic from the experimental point of view in an exploration of the possibility of expanding its programs in this area.

I have been long committed to the campaign to gain more visibility for our community in the larger arena of computational science. Two years ago at the DAMOP meeting in Sante Fe, the computing center for which I am responsible, the National Energy Research Scientific Computing Center in Berkeley, sponsored a large luncheon meeting to discuss the potential role of the AMO community in the new computational initiatives being considered at that time by DOE and NSF. Some of the attendees are preparing a workshop for next summer at the Institute for Atomic and Molecular Physics on this topic. It is true that the theory of few-body systems and multiparticle dynamics are among the best candidates for the fruitful application of the largest scale of computing, but it is also true that the case is not widely appreciated. Making it more widely understood is a key to gaining more resources for our community.

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## **Wayne Polyzou**

### **Professor, University of Iowa**

#### **BIOGRAPHY**

B.S. 1974. The Pennsylvania State University

M.S. 1978. The University of Maryland

Ph.D. 1979. The University of Maryland

Postdoctoral Fellow, Los Alamos National Laboratory - 1979-1981

Postdoctoral Fellow, The Massachusetts Institute of Technology, Center for Theoretical Physics - 1981-1982

Assistant Professor, The University of Iowa - 1982-1986

Associate Professor, The University of Iowa - 1986-1991

Professor, The University of Iowa - 1991-present

Chair, Department of Physics and Astronomy, University of Iowa- 1997- present

Fellow, American Physical Society, 1999



Co-organizer (with ANL) - 1996 - Midwest Theory Get Together

Research Interests: Relativistic formulations of quantum mechanics and applications to few-nucleon and few-quark systems. Mathematical physics, theoretical descriptions of systems of an infinite number of degrees of freedom, and dynamical systems.

#### CANDIDATE'S STATEMENT

I enjoy few-body physics because few-body systems are the simplest systems where predictions of realistic models can be accurately computed and the results compared to complete experimental measurements. It is very satisfying that in the forty years since the Faddeev equations were first written down, the interplay between theory and experiment in the few-body program has done more to help our quantitative understanding of nuclear structure and dynamics than any other sub-discipline of nuclear physics. It is a rich field because its success is due to parallel advances in physics, mathematics, computational science, and technology. The cross disciplinary nature of the field has broadened my skill base and contributed materially to my own research. With the rapid advances in computational power, it is even more important to continue facilitating, and perhaps broadening, interdisciplinary communications. The many challenging fundamental, computational, and technological problems that remain unsolved make few-body physics a very exciting field. I believe that one of the most important goals for the Few-Body Topical group is generate interest among young physicists and chemists in the many challenging problems that remain unsolved in the field.

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## Steve Wender

### Los Alamos National Laboratory

#### BIOGRAPHY

Steve Wender is presently the Group Leader of the Neutron and Nuclear Science Group at the Los Alamos Neutron Science Center at the Los Alamos National Laboratory. His research interests include using neutrons to address issues in basic and applied science. His current basic research efforts involve inelastic neutron-proton scattering (neutron-proton Bremsstrahlung) and radiative neutron-proton capture experiments in the energy range of interest for cosmology.

He received his BS degree from the City College of the City University of New York in 1968 and a doctorate degree from the University of Iowa in 1973. He has worked at McMaster University, Duke University-Triangle Universities Nuclear Laboratory, and the Svedberg Laboratory (Sweden).

He was the chairman of the organizing committee for the 10th International Symposium on Neutron Capture Gamma Spectroscopy and Related Topics (1999); Member of the Program Committee of this conference 1990, 1993,1996; Organizer of the LANSCE workshop on High-Energy Neutron Irradiation of Electronics (1998); Member of the Program Committee for the International Conference on Accelerator-Driven Transmutation Technologies (1994,1996); Chairman of the Neutron Program Advisory Committee (1992,1993); Organizer of the Workshop on Neutron-Proton Bremsstrahlung (1990); Organizer of Workshop on Fast Neutron Capture (1990).

Fellow of American Physical Society 1995; Award for Excellence in Industrial Partnerships 1996 (LANL).

#### CANDIDATE'S STATEMENT

In addition to its own intrinsic intellectual value, understanding few-body systems is the first step towards a deeper understanding of more complex phenomena. The interdisciplinary nature of the "Few-Body Topical Group" is one of its greatest strengths. By integrating ideas from different fields, greater advances in science may be made. I would work to promote this field through continued presentations at scientific meetings and dissemination of information about

advances in this field to the public.

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