

# Topical Group on Few-Body Systems and Multiparticle Dynamics

Newsletter, February 1999

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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 (Virginia Brown, Ernest Henley, Bill Miller, Bill Reinhardt, and Eric Weigold) 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. Our membership has declined during the past year, standing at 312 present members compared to 340 at the beginning of the year. This is a reversal of the increasing trend of the past two years and is certainly a matter of concern that the present and future officers will address. If anyone has suggestions for further enhancements, please contact any of the officers. Most importantly, encourage your colleagues to join.

Our World Wide Web site (located at <http://qmc.lanl.gov/fewbody>) continues to function, thanks to the continued webmastership of Jim Friar, 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 Jim Friar: [friar@qmc.lanl.gov](mailto:friar@qmc.lanl.gov) or me: [chandler@unm.edu](mailto:chandler@unm.edu)).

Our web pages also have the latest information about our Group's program at the APS Centennial Meeting in Atlanta, GA, during 20-26 March 1999. This program is our Group's principal activity. Barry Schneider, Brad Keister, Steve Cotanch, and Charlotte Elster have worked hard to put together a very interesting program that is described below in detail. Be sure, however, to check our web pages for updates to that printed schedule.

Also this year is the next few-body Gordon Research Conference "Dynamics of Simple Systems in Chemistry and Physics" (11-16 July 1999 at Salve Regina University, Newport, RI). Details are given below. I hope to see many of you at Atlanta, and also next summer in Newport.

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## ELECTIONS --- ELECTRONIC VOTING NOW POSSIBLE

Enclosed is your ballot for our 1999 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 Spring Meeting.

Joe Sucher and Jim McGuire are the candidates for Vice Chair. Candidates for the Executive Committee are Bunny Clark, Eric Heller, Brad Keister, and Ravi Rau. Brief biographies and statements of the candidates are given below.

The present officers are Jim Friar, Past-Chair; Colston Chandler, Chair; Barry Schneider, 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/fbs\\_ballot99.html](http://www.physics.wm.edu/fbs_ballot99.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 10 March DEADLINE.

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## NEW FELLOWS

In November the American Physical Society announced that two of our candidates had become APS Fellows.

Wayne Nicholas Polyzou

``For contributions to understanding the formulation of Poincare invariant few body models."''

Stephen Robert Cotanch

``For sustained contributions to hadronic and electromagnetic studies of strangeness and theoretical advancements in nuclear and photonuclear reactions and hadron structure."''

Congratulations to both Wayne and Steve on their well deserved recognition. And many thanks to the Fellowship Committee: Barry Schneider (chair), Lee Collins, and Dick Drachman.

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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 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: Dennis Skopik (chair), Peter Tandy, and Henk Monkhorst.

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 1999. Please make sure the full package has been submitted to the APS before this date.

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## SPRING MEETING

The APS Centennial Meeting will be held from March 20-26, 1999 in Atlanta, Georgia. This meeting replaces both the annual March and April meetings and should prove to be an exciting experience for all those attending. The Few Body Topical Group will have two invited and one contributed session at the meeting as well as our Business Meeting. One of the two invited sessions, "The Three-Body Problem in Atomic, Molecular, and Nuclear Physics" has been designated as a special Centennial Symposium. A short schedule appears below. Members are urged to keep abreast of the latest developments via the APS Webpages and other APS announcements. Please note that this will be a very large meeting and you are urged to register and make your hotel reservations as early as possible to ensure accomodations.

Contributed papers:Few-Body Reactions in Atomic and Nuclear Systems

When:Wednesday, 3/24/99, 8-11am, GWCC, Room 310E

Chair:TBA

Number of Papers: 11

Invited session:From Fields to Few-Body Systems

When:Wednesday, 3/24/99, 2-5pm, GWCC, Room 205E

Chair:Bradley Keister

Synopsis:Few-body systems represent a fertile application and testing ground for field theories. That observation continues to be borne out by recent progress in both electromagnetic and strong-interaction physics. The presentations in this session will cover intellectually connected topics in QED, QCD, effective field theories of strong interactions, and the implications of strong-interaction theories for few-nucleon systems.

Speakers:G. Adkins, R. Perry, U. vanKolck, D. Phillips and R. Wiringa

Centennial session:The Three-Body Problem in Atomic, Molecular, and Nuclear Physics

When:Thursday, 3/25/99, 8-11 am, GWCC, Room

Synopsis:

The three body problem has and continues to be a fundamental, challenging and unsolved problem in atomic, molecular and nuclear physics. The talks will focus on the contributions made by researchers to unraveling the many complexities of three interacting particles using the insights and tools of classical, semiclassical and quantum mechanics.

Speakers:J. Friar, W. Reinhardt, D. Truhlar, J. Burgdoerfer and H. Tornow

Business Meeting:

When: Thursday, 3/25/99, 5pm, GWCC, Room TBA

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## FEW-BODY GORDON RESEARCH CONFERENCE

The next few-body Gordon Research Conference, "Dynamics of Simple Systems in Chemistry and Physics," will be held 11-16 July 1999 at Salve Regina University, Newport, RI.

In the tradition of its GRC predecessors, as well as that of the European and the International Few-Body meetings, this Conference will include topics from an enormous range of physics. There will be nine sessions: Experimental Frontiers of Few-Body Physics, Ultracold Phenomena, Three-Body Problem (I and II), Foundations of Quantum Mechanics, Few-Body Approaches to Hadron Structure, Few-Body Relativistic Theories, Beyond the Standard Three-Body Problem, Next Frontiers. An important goal of this conference is to enable people in diverse areas to find tools, approaches and concepts they can share, and in so doing, to find ways to solve important problems that might otherwise be intractable.

There are no parallel sessions and all afternoons are free for informal activities and discussions. While this schedule severely restricts the number of speakers, all participants are urged to make poster presentations of their research.

The conference particularly welcomes young scientists at postdoctoral and senior graduate student levels. Senior faculty unable to participate are strongly urged to send someone else from their groups. Some financial aid is available.

General questions about the conference should be directed to the chair (Colston Chandler, [chandler@unm.edu](mailto:chandler@unm.edu)) or vice chair (Paul S. Julienne, [pjulienne@nist.gov](mailto:pjulienne@nist.gov)). Questions about financial support should be directed to the chair. Applications, which are required of all participants, may be obtained from Gordon Research Conferences ([grc@grcmail.grc.uri.edu](mailto:grc@grcmail.grc.uri.edu) or <http://www.grc.uri.edu/apply.htm>). The most current details about the conference program will be found on the web pages of the Few-Body Topical Group (<http://qmc.lanl.gov/fewbody>) and of the Gordon Research Conferences (<http://www.grc.uri.edu>).

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## CANDIDATES BIOGRAPHIES AND STATEMENTS

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### *Candidates for Vice-Chair*

#### **Jim McGuire,**

#### **Murchison-Mallory Professor, Tulane University.**

APS Topical Group on Few Body Systems and Multiparticle Dynamics Executive Committee, 1996-8, Nominating Committee, 1991; APS Forum on Physics and Society Program Committee, 1996-8, Nominating Committee, 1998; Division of Atomic, Molecular and Optical Physics, Secretary-Treasurer 1990-3; Program Committee, 1988-93; Committee to Establish APS Award for Outstanding Ph.D. Thesis, 1991-2;

Executive Committee, 1990-3; Selection Committee for Best Undergraduate Research, 1997-8; TAMOC Secretary, 1987-90; AAPT Committee on Graduate Education, 1993-6;

Board of Advisors, Institute of Theoretical Atomic and Molecular Physics, 1999 - 2001. DOE Panel on Future of AMO Theory, Chair, DOE Review Panel for Oak Ridge National Laboratory, 1994; NSF Panel for Postdoctoral and Junior Investigator Research and JSPS Fellowships, 1994; Chair, Overview Report on AMO Theory for the National Academy of Sciences, 1985; APS Fellow, 1985-

Alexander von Humboldt Award, 1997-8; ICPEAC Secretary, 1995-, General Committee, 1985-9, Executive Committee, 1995-; Editor, Encyclopedia of Physics, 1992-6; Co-Organizer, Workshop on Manifestations of Electron Correlation, Harvard University, 1997; Co-Chair, Conference on Raman Emission by X-rays, 1995; National Research Council of the National Academy of Sciences Super-Committee for AMO Sciences, 1992; Panel for Preview of the NC Star Storage Ring, 1993; Organizing Committee AMO Workshop at Santa Barbara National Theory Institute, 1991; Organizing Committee, Workshop on Atomic Physics at High Brilliance Synchrotron Light Sources, Argonne National Laboratory, 1994; Local Committee, International Conference on Theoretical Chemical Physics, 1996; United States Coordinator, Monbusho International Research Program (Japan), 1994; International Co-Chair, ISIAC, 1989, 91; Member Am. Chem. Soc., 1989-; William L. Stamey Teaching Award, 1990; B.S., Rensselaer, 1964; Ph.D. Northeastern, 1969 (nuclear physics); previous faculty appointments at Texas A&M, 1969-72 and Kansas State University, 1972-91; 205 publications in atomic, nuclear, chemical and mathematical physics, 2 books on many body physics

STATEMENT:

*Few body physics is central to much of science, materials science and emerging technology. The topic is broadly cross disciplinary with roots embedded in methods developed in atomic and nuclear physics. Thus the GFB is in a special position to bring together people with a range of interest and expertise to provide a foundation for useful cross disciplinary dialogue. In some ways the GFB already does this by sponsoring invited talks, which are at present primarily in theoretical nuclear and atomic physics. I believe that the topic itself is broader than atomic and nuclear physics and that an opportunity exists to better relate what we do to the needs of others, including both key experimental observations and application in areas of practical interest. Funding for few body physics will follow increased understanding of how what we are doing relates and supports those methods and ideas that will guide thinking for key few and many body problems over the next twenty years. In some cases techniques now in use will expand to new problems and in other cases new challenges in the many body problem will provide demand and opportunity for growth in few and many body techniques. It is the job of the GFB to develop effective ways to articulate what we can do and to showcase the excellence and effectiveness of our work.*

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## Joe Sucher

Joe Sucher received his B.S. degree (summa cum laude) in 1952 from Brooklyn College and the Ph. D. Degree in 1957 from Columbia University. Since 1957 he has been on the physics faculty of the University of Maryland, retiring as professor emeritus in July 1998. His awards include an NSF Senior Postdoctoral Fellowship, a Guggenheim Fellowship, a National Research Council Senior Associateship, and an Ernest Kempton Adams Fellowship. He is a Fellow of the American Physical Society. He received a Distinguished Scholar Teacher award from the University of Maryland in 1990 and the Award for Outstanding Achievement in the Physical Sciences from the Washington Academy of Sciences in 1966. He has been a visiting professor or guest scientist at Columbia and New York Universities; the University of Washington and UC Berkeley; Cambridge, Chalmers, and Uppsala Universities; the University of Paris; and at CERN, Brookhaven National Laboratory, and Lawrence-Berkeley Laboratory.

Related activities include service as Associate Editor of *Surveys in High Energy Physics* (to 1985), as co-director of the Program on Relativistic, Quantum Electrodynamics and Weak Interaction Effects in Atoms (ITP, UC Santa Barbara, 1988) and as summary speaker at the 85th Nobel Symposium (1992). During 1993-1996 he served on the Executive Committee of the APS Topical Group on Few-Body Systems and Multi-Particle Dynamics.

His research has covered a broad area in atomic and particle physics, often concerned with the creation of new theoretical tools and their application to a variety of physical phenomena, with emphasis on field-theoretic and relativistic effects in composite systems. Specific contributions include development of an S-matrix approach to level-shift calculations, of the QED-based theory of helium and He-like ions, of the theory of forbidden magnetic-dipole transitions in such systems and in quarkonia, of the relativistic generalization of the eikonal approximation, of a dispersion-theoretic approach to the quantum theory of long-range forces with applications to Rydberg states, of delta-function identities for global operators useful in atomic and molecular calculations, and of the relativistic theory of many-electron atoms based on "no-pair Hamiltonians." This work appears in some 130 journal articles, conference proceedings, review articles, and book chapters.

### Statement:

*"I have long been interested in the interface between subfields, such as atomic and particle physics, and the use in one area of insights and techniques developed in another. Our topical group, which cuts across traditional divisions, offers excellent opportunities for interdisciplinary education and interaction in this regard. I would try to*

*emphasize this aspect in the organization of our symposia, and, having just retired from teaching, should have ample time to do justice to the task."*

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## *Candidates for the Executive Committee*

### **Bunny Clark**

Bunny C. Clark is a Distinguished University Professor in the Physics Department at The Ohio State University. Her research interest is theoretical nuclear physics. In particular she has focused her research on the relativistic treatment of nuclear reactions and nuclear structure.

Her recent service includes serving as Vice-Chair, Chair-Elect, Chair and now Past-Chair of the APS Division of Nuclear Physics, she is currently chairing the DNP Committee on Public Information, she was chair the MGM Award committee in 1995-1996, chair of the APS committee on the status of women in physics 1991-1994, member of the APS committee on Education, 1995-1997, Ohio section representative to the APS Council, 1988-1996, a member of the APS fellowship committee and has just been elected to serve on the APS Nominating Committee. She is a fellow of APS and AAAS. She joined the faculty at Ohio State in 1981 becoming Full Professor in 1986. She was named a Distinguished University Professor in 1989. She has served on the advisory committee of the NSF and on the Nuclear Science Advisory Committee. She received The Ohio State University Rosalene Sedgwick Faculty Service Award in 1995, University Distinguished Affirmative Action Award in 1989 and the University Distinguished Research Award in 1983. In 1994 she was elected to the Ohio Woman's Hall of Fame and in 1993 she was chosen as a YWCA Woman of Achievement.

Clark earned a Bachelor of Science degree in physics and math in 1958, and a master's degree in physics in 1963, from Kansas State University. In 1995 she was named an Alumni Fellow of this University. In 1973, she earned a doctorate in theoretical physics from Wayne State University.

#### **Statement:**

*"The Few-Body Topical Group plays a critical role in providing a forum for the exciting interdisciplinary work of physicists, chemists and mathematicians who focus on the few-body problem. The range of interest of our members encompasses many fields. This is our greatest strength. We are an inclusive group and because of this we can bring together physicists from different sub-disciplines. This is certainly the best way to foster new ideas and new research directions. I would do my best to make these interdisciplinary activities more prominent and visible to the larger community of scientists."*

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### **Eric J. Heller**

Professor of Physics, Harvard University

Ph.D. 1973, Harvard University

Eric Heller's research focuses on few body quantum mechanics, scattering theory and quantum chaos. Recurrent but not universal themes are semiclassical approximations, classical nonlinear dynamics and time-dependent quantum mechanics. Recent progress in semiclassical methods has allowed a wide range of new quantum problems to be understood in terms of classical mechanics, greatly aiding physical insight. At the other end of the spectrum, the extreme quantum limit (e.g. ultracold collisions, proximity resonances and related effect such as Dicke super- and sub-radiance, and Bose-Einstein condensation) have come to the forefront.

Specifically, current investigations include ultracold atom-atom, atom-surface, and three body collisions; two-dimensional scattering theory of quantum dots, surface state electron "quantum corral"; scattering from defects and adsorbed atoms on metal surfaces, localization theory of eigenstates, semiclassical theory of tunneling and diffraction, and quantum correspondence to classical chaos (scars, spectra, wavefunctions, dynamics).

### Statement:

*"I have been a DAMOP Divisional Councilor to the APS for the past two years, and have just been elected to the Executive Board for a two year term. As DAMOP Divisional Councilor, I have promoted the interests of AMO physics within the APS.*

*"DAMOP and the APS Few-Body Topical Group have much in common. I believe it could be useful to have someone with an eye on both.*

*"Few body physics is my field, realized through scattering theory, cold collisions, quantum chaos theory, molecular spectroscopy and dynamics, and quantum mesoscopic structures. As past Director of ITAMP, I have a broad perspective on the AMO and few-body community which I would like to bring to bear on the Few-Body Topical Group Executive Committee.*

*"In my view few-body physics is in a strong growth phase and has a bright future and much relevance to society. We need aggressive approaches to keep our profile at the proper height within APS and in the eyes of the public and funding agencies as well."*

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## Bradley Keister

Bradley Keister is Program Director for Nuclear Physics at the National Science Foundation. He received his B.S. degree in Engineering Physics from Cornell University in 1971, and his M.S. and Ph.D. degrees from Stanford University in 1973 and 1975. He then went to Carnegie Mellon University as a postdoctoral fellow, and joined the faculty in 1979. He was Professor of Physics there at the time he joined the NSF in 1997. He has had visiting appointments at TRIUMF and the University of Illinois, and was also a Program Director for Theoretical Physics at the NSF on a two-year rotator basis. He has been a Divisional Associate Editor for Physical Review Letters (1996-1998), and is a Fellow of the American Physical Society.

### STATEMENT:

*"Few-body systems represent important common ground among a wide variety of disciplines, and thus provide a clear model for interdisciplinary discovery. The commonalities should be pursued vigorously. The Topical Group can (and should) of course do this by organizing and promoting its own APS sessions and meetings, but it is also critically important that the interdisciplinary connections be impressed upon the disciplines themselves, through frequent contact with their respective communities and their associated APS divisions and topical groups."*

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## A. Ravi P. Rau

A. Ravi P. Rau is Professor of Physics and Astronomy at Louisiana State University, Baton Rouge, LA 70803, 225-388-6841; fax: 225-388-5855; e-mail: [arau@phys.lsu.edu](mailto:arau@phys.lsu.edu)

Born: 9 August 1945. Degrees: B.Sc.(1964) and M.Sc.(1966), University of Delhi, India; Ph.D. 1971 University of Chicago.

Field: Atomic Theory and Mathematical Physics.

Employment: Associate Research Scientist, New York University, 1970-72; Visiting Fellow, TIFR, Bombay, India, 1972-73; Assistant-, Associate- and Professor, LSU, 1974-present;

Visiting Associate Professor, Yale University, 1978-79; Visiting Professor, Raman Research Institute, Bangalore, India, 1983; Visiting Fellow, JILA, 1984; Visiting Professor, Australian National University, 1987-88.

Honors and Awards: Fellow of the American Physical Society; Alfred P. Sloan Fellow, 1977-80; Distinguished Research Master, LSU, 1988.

My research interests are in the study of strongly correlated motion and of phenomena that are far from being perturbative. Time-independent problems of this type are the three-body problem of highly excited two-electron states, whether in autoionizing states or in the nearby double continuum, and the study of high Rydberg states in static electric or magnetic fields of laboratory strength. More recently, I have also been interested in time-dependent problems involving intense laser fields on atoms. Partly for such problems, I have also worked on general techniques of constructing variational principles and of solving time-dependent operator equations that are useful across physics. Among other publications are two books co-authored with U. Fano: Atomic Collisions and Spectra (1986) and Symmetries in Quantum Physics (1996).

### Statement:

*"One of the appealing aspects of physics to me is its coherence and unity across its various subdisciplines. The few-body problems that interest us arch across nuclear, atomic, chemical and condensed matter physics in terms of ideas and techniques. Our topical group is, therefore, a natural one to highlight this unity of physics, particularly for graduate students and younger members in our subject. As a result, one of our primary activities should be to organize exciting sessions at national meetings of the American Physical Society that speak to this theme."*

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