

Edited by Allen Goldman



A Division of the American Physical Society

DCMP Newsletter

The Division of Condensed Matter Physics

Summer 2008

IMPORTANT DEADLINES & DATES

DCMP Invited Symposia Nominations | Monday, September 8, 2008

Vote: DCMP Officers & Executive Committee | September 15, 2008

Pittsburgh Contributed Abstracts | Friday, November 21, 2008

Contributed Abstracts, Post Deadline | Monday, December 29, 2008

APS Fellow Nominations | Monday, February 2, 2009

Pittsburgh APS Meeting | March 16-20, 2009

A Note from the DCMP Chair

Condensed matter physics is one of the largest subfields of physics. Research, which falls under the rubric of condensed matter, spans a range from the extremely applied to that which may be characterized as truly fundamental. The umbrella is so broad that it includes activities that are effectively indistinguishable from those in materials and biological physics. There is a strong interchange with other fields. Many experimental, theoretical, and simulation techniques are shared with other scientific disciplines. A feeling for the centrality of condensed matter physics, its connection to other areas of science, and its vitality can be gotten from two recent reports, the National Research Council's report, CMMP 2010: An Assessment of and Outlook for Condensed-Matter and Materials Physics (<http://www7.nationalacademies.org/bpa/CMMP2010.html>), and the Department of Energy Basic Energy Sciences Advisory Committee report, Directing Matter and Energy: Five Challenges for Science and the Imagination (<http://www.sc.doe.gov/bes/reports/abstracts.html#GC>).

The CMMP 2010 report emphasizes the continued vitality of the field and the need for state-of-the-art facilities. It also explores how best to educate physicists and how government and industry should best cooperate to meet the needs of society with technology based on condensed matter and materials physics.

Ulrich Strom of the NSF has been kind enough to provide us with a short piece on the NSF's perspective on the CMMP 2010 report, and Harriet Kung of the DOE has given us with

some insight on the DOE's vision of the role of fundamental research in energy issues.

As you all know, the implementation of exciting science depends upon federal funding. Expectations were high during the summer and early fall of 2007, with the passage by Congress and the signing by the President of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (America COMPETES). The act authorized an increase in research investment in areas relevant to condensed matter physics by

- Doubling funding for the National Science Foundation (NSF) from approximately \$5.6 billion in Fiscal Year 2006 to \$11.2 billion in Fiscal Year 2011.
- Setting the Department of Energy's Office of Science on track to double in funding over ten years, increasing from \$3.6 billion in Fiscal Year 2006 to over \$5.2 billion in Fiscal Year 2011.
- Establishing the Innovation Acceleration Research Program to direct federal agencies funding research in science and technology to set as a goal dedicating approximately 8% of their Research and Development (R&D) budgets toward high-risk frontier research.
- Authorizing the National Institute of Standards and Technology (NIST) from approximately \$703 million in Fiscal Year 2008 to approximately \$937 million in Fiscal Year

(continued on page 3)

A Note from the DCMP Chair	1
The 2009 March Meeting	2
Tackling our Energy Challenges in a New Era of Science — the View from the DOE Office of Basic Energy Sciences	3
A Road Less Traveled—Funding Opportunities for Condensed Matter & Materials Physics at the NSF....	4
Vote for DCMP Officers & Executive Committee.....	5
APS Fellow Nominations.....	5
DCMP Web Site	5
Join DCMP!	5

The 2009 March Meeting

The March Meeting will be held in Pittsburgh, PA, March 16-20, 2009. This year DCMP will organize 36 of the 106 Invited Sessions. There will be more than 40 parallel sessions and the complete bulletin will be available in electronic form only. The March Meeting was last held in Pittsburgh in 1994. It was the largest physics meeting up to that time, with 4,400 contributed and invited sessions, and an attendance of about 4,500. The 2009 meeting will likely be substantially larger.

Invited Symposia Nominations

The deadline for Invited Symposia nominations is Monday, September 8, 2008. In order to submit a nomination of an Invited Symposium for the March Meeting go to: http://meetings.aps.org/aps_invited/invited/LoginForm.cfm?MT=MAR09&UNIT=DCMP

The Executive Committee as a whole selects invited talks only from those proposed by the community. It cannot substitute speakers of its own choosing. This procedure is unique among APS units.

Suggestions for Creating a Successful Proposal

1. Propose a symposium on a timely topic with five strong talks. Generally the Executive Committee favors symposia (preferably with five talks, rather than fewer) over individual invited talks. There are very few of the latter.
2. Choose an appropriate title and provide a clear justification. This will aid the committee in making its decision.
3. Choose titles of individual talks carefully.
4. Provide an informative abstract for each talk. This will underpin the central theme of the symposium and aid the committee in reaching a decision. Speakers who are invited will be asked to submit their own abstracts later.
5. Provide references to published work in refereed journals. This will aid the committee in determining whether the work is current and whether it has some level of acceptance by the scientific community.
6. Include an alternate speaker in the abstract to provide a substitute in the event the first choice is unavailable. Problems for the organizer of the program of symposia, the Chair-Elect, would be greatly reduced if you would also ask individuals who you plan to propose as speakers if they plan to participate in the meeting.
7. Enter the proposed symposium under a relevant sorting category (given below). This will ensure that the correct subcommittee examines the proposal. Multiple submissions of a proposal are counterproductive and ineffective.

Contributed Abstract Submission

The deadline for the receipt of abstracts of contributed papers is Friday, November 21, 2008 at 5 P.M. EST. Complete abstract submission instructions can be found at: <http://www.aps.org/meetings/march/categories.cfm>.

List of Invited Symposia Sorting Categories

1. Metals
2. Semiconductors
3. Insulators and Dielectrics
4. Polymeric and Organic Materials
5. Superconductors
6. Magnetism
7. Complex Structured Materials
8. Fluids and Soft Matter
9. Phase Transitions and Strongly Correlated Systems
10. Biological Physics
11. Chemical Physics
12. Statistics and Nonlinear Physics
13. Artificially Structured Materials
14. Surfaces, Interfaces & Thin Films
15. Instrumentation and Measurements
16. Applications
17. General Theory (Methods)
18. General
19. High Pressure Physics
20. Quantum Fluids and Solids
21. Atomic, Molecular & Optical (AMO)
22. Physics Education
23. Quantum Information, Concepts and Computation

Tackling our Energy Challenges in a New Era of Science

By Harriet Kung, Associate Director of the Office of Science for the Office of Basic Energy Sciences

The 21st century brings with it staggering challenges for more advanced energy technologies that are abundant, clean, and economical. Transforming the ways we generate, supply, transmit, store, and use energy are the paramount opportunities for the world in the coming decades. Innovations in energy technologies are expected to stem from discovering new fundamental energy science phenomena that can be developed into commercial energy systems. Some truly disruptive changes will be required to meet the doubling to tripling of global energy demands projected for the next fifty to one-hundred years. The community of condensed matter physics has played a pivotal role in the information technology revolution and has much to offer in addressing these energy challenges of the 21st century.

The search for scientific breakthroughs is at the core of the Department of Energy's (DOE's) mission. The Basic Energy Sciences (BES) program in the Office of Science supports fundamental research in focused areas of the natural sciences in order to expand the scientific foundations for new and improved energy technologies and for understanding and mitigating the environmental impacts of energy use. Since 2001, BES has engaged the community in establishing a decades-to-century basic research strategy to help chart a course for a secure and clean energy future through the sponsorship of a series of eleven "Basic Research Needs" workshops (<http://www.sc.doe.gov/bes/reports/list.html>). Together, these workshops attracted more than 1,500 participants, and the reports collectively highlight the remarkable scientific journeys that took place during the past few decades in these critical topic areas. The scientific challenges identified in the reports describe a new era of science—an era in which materials functionalities would be designed to specifications and chemical transformations would be manipulated at will.

This goal to direct and control matter at the quantum, atomic, and molecular levels requires a change in our fundamental understanding of how nature works. A Grand Challenges Subcommittee was convened under the auspices of the BES Advisory Committee to define critical needs in our scientific knowledge of matter and energy. The results of that examination are presented in the report, *Directing Matter and Energy: Five Challenges for Science and the Imagination*, where a new era for energy science is posed as five challenges (<http://www.sc.doe.gov/bes/reports/abstracts.html#GC>). Solving such challenges may result, for example, in our ability to directly manipulate the charge, spin and dynamics of electrons to control and imitate the behavior of physical systems, such as digital memory and logic using a single electron spin. Similarly, we may also imagine an ability to

orchestrate the behavior of billions of electrons and atoms to create new phenomena, like superconductivity at room temperature, or new functionality combining contradictory properties like optically transparent yet highly electrically conducting glasses. Addressing science grand challenges provides a path forward to the transition from observation to control of matter—a central theme that echoes many of the intellectual questions identified in the decadal survey of condensed matter and materials physics (CMMP2010).

The Office of Science proposed Energy Frontier Research Centers (EFRCs) as part of our FY 2009 budget request to Congress (<http://www.sc.doe.gov/bes/EFRC.html>) based on the research opportunities identified in the aforementioned reports. Pending Congressional appropriations, up to \$100 million will be set aside for EFRCs, with each award being funded at \$2–5 million per year for five years. The EFRCs are designed to foster and accelerate high-risk, high-reward research by bringing together the skills and talents of a critical mass of investigators to enable energy relevant, basic research. They will complement the standard single-investigator or small-group awards in the BES core research program (<http://www.sc.doe.gov/bes/SISGR.html>). Together, these new efforts aim at attracting the best and the brightest minds to conduct innovative basic research for accelerating scientific breakthroughs needed to create advanced energy technologies. They will also provide an opportunity to inspire, train, and support leading scientists of the future who have a deep and sincere appreciation for the global energy challenges of the 21st century. For further information on the BES program, please visit: <http://www.sc.doe.gov/bes/bes.html>.

Notes from DCMP Chair continued from page 1

2011 and requiring NIST to set aside no less than 8 percent of its annual funding for high-risk, high-reward innovation acceleration research.

In late summer of 2007, Congress passed a budget, which actually would have begun the processes envisioned in the America COMPETES act, but it was vetoed, and the eventual budget that was passed at the end of the year was very damaging for the scientific enterprise. Some of the damage was only slightly mitigated by the supplemental appropriations bill that was just enacted into law.

The events of last year highlight the importance of lobbying efforts. Fundamental research has bipartisan support, but making that support a reality in the face of other demands on the budget is uncertain, and can only be helped by continuing lobbying efforts. The impact of the community on the political sector depends upon the aggregate of all the voices. If the percentage of US resident attendees at the March Meeting were to increase from the 30 to 35% or so that has been the case in the past, to 80 or 90%, it could have a major impact on the process.

—Allen Goldman

A Road Less Traveled — Funding Opportunities for CMMP at the National Science Foundation (NSF)

By Ulrich Strom, Acting Executive Officer, NSF Division of Materials Research

In the DCMP 2007 Newsletter Jim Eisenstein summarized key conclusions and recommendations identified in the CMMP 2010 decadal survey. In the following I outline a personal perspective of the NSF response.

The CMMP 2010 report identifies six science challenges for the next decade, summarized as (1) complexity; (2) the physics of life; (3) far from equilibrium processes; (4) the nanoworld; (5) energy / sustainability; (6) extending the information technology revolution. The report also urges to increase funding and funding success rates, especially for younger investigators, aggressively broadening participation, and upgrading of and access to the nation's facility infrastructure.

The Mathematical and Physical Science (MPS) Directorate supports a large fraction of the Nation's condensed matter and materials programs. A part of this support comes from programs in the Physics Division, but the bulk of the support is concentrated in the Division of Materials Research (DMR). Approximately 35% of the FY 2008 \$260M DMR budget supports CMMP related research through individual investigator, group, center, facility, and instrumentation awards.

Areas of emphasis highlighted in the request for the FY 2008 MPS budget parallel several of the CMMP 2010 science challenges, including a focus on Complex Systems, Physical Science at the Nanoscale, Cyber enabled Discovery and Innovation (CDI), Science and Engineering Beyond Moore's Law; and Sustainability/Energy. Additional areas of emphasis for FY 2009 include the Interface between the Physical and Life Sciences; Quantum Information Science (QIS); and Adaptive Systems and Technology (AS&T). Some of these areas of emphasis feature solicitations for proposals. For FY 2009 solicitations are expected for CDI and possibly in areas such as QIS, AS&T, and Sustainability/Energy. Continued opportunities for international collaborations are also available through the very successful DMR supported Materials World Network program. However, support for many of these activities come from core programs in response to unsolicited proposals.

DMR is committed to the concept of the integration of research and education, and the division continues to place a high priority on CAREER awards. In order to increase the

diversity of the awardees pool, encouraging improvements have been made in the support for underrepresented groups. For FY2005-2007, the average success rates in the DMR Condensed Matter Physics program were 34% for women and 26% for minority principal investigators, compared to 26% for all PIs in CMP and 21% for all PIs in DMR. DMR programs are committed to further increase the number of applicants from and success rates for members of underrepresented groups. A FY 2009 solicitation, featuring partnerships in materials research involving minority institutions with DMR supported centers (PREM program), is likely to enhance opportunities for minority students and faculty. Further improvements require increased funding. The FY 2008 DMR budget is only 4% higher than the FY 2004 budget of \$250.65M. Optimistic budget forecasts for FY 2009 are awaiting final congressional appropriations.

DMR is making continuing progress in increasing access to outstanding light source, neutron, and magnetic field facilities and nanofabrication facilities. A \$40M per year DMR facilities budget supports operations and user programs at various academic institutions and national laboratories. With DMR support over 4,500 users were able to conduct experiments at the National High Magnetic Field Laboratory, the Cornell High Energy Synchrotron Source, the Wisconsin Synchrotron Radiation Center, the Center for High Resolution Neutron Scattering at the NIST Center for Neutron Research, and the National Nano Infrastructure Network. Approximately 2,700 of these users can be identified with the CMMP community.

A most important decision, to be made in the near future, is on the role that NSF should play in the construction and operation of a next generation coherent x-ray light source. The scientific basis for transformational new science has been presented. An MPS advisory panel has been convened and charged with providing guidance to the Directorate regarding future NSF stewardship and/or partnership in support of coherent light source facilities. A recommendation is expected within the next few months. The final NSF decision will have major implications on program balance within DMR. The CMMP 2010 report refers to Robert Frost's "a road less traveled" in describing the unpredictable path between scientific discovery, understanding, and application. But it is also an apt description for possible approaches to be considered by the materials community and the funding agencies that would assure continued strong support for all areas of fundamental and applied materials and condensed matter research, while remaining internationally competitive in the area of instrumentation with ready access to leading facilities such as next generation light sources. A road less traveled may indeed make all the difference.

Vote for DCMP Officers and Executive Committee Members

Please participate in the election of DCMP officers and members of the executive committee. You will be asked to elect a new Vice Chair (who will become in successive years, Chair Elect, Chair and Past Chair), and three members-at-large. The election will occur during August and early September. Members will receive detailed instructions about voting from the APS. Candidate biographies and statements will be available on both the APS and DCMP web sites before and during the election. You can go to the DCMP website: <http://dcmp.bc.edu> and click the link which will appear there shortly, or go to the link in an email that you receive from APS once the elections site opens. Paper ballots will be mailed to those who cannot be reached by email.

The DCMP Executive Committee performs several functions. One of its most important responsibilities is to lead the organization of the APS March Meeting. It is the body that selects the division's Invited Symposia from those nominated by the community, and thus a proper balance of expertise on the Committee is essential for a successful meeting. The Executive Committee helps to lobby Congress on science policy issues. Finally, the DCMP Members-at-Large nominate new Fellows to be forwarded for consideration by the APS Fellowship Committee and Council.

The current membership of the Executive Committee can be found at <http://dcmp.bc.edu/page.php?name=exec>. The outgoing committee members are Members-at-Large, David Awschalom (UCSB), Seamus Davis (Cornell), Jacqueline Krim (NC State) and past chair, Julia Phillips (Sandia National Laboratories). A ballot will be published in the near future with Shirley Chiang (UC Davis), Melissa Hines (Cornell), Heinrich Jaeger (U. of Chicago), Steve Simon (Alcatel-Lucent), Eric Weeks (Emory) and Jorg Zegenhagen (Grenoble) contending for the three Member-at-Large Positions, and with Sam Bader (Argonne) and Harold Baranger (Duke) contending for Vice-Chair.

Nominations for APS Fellowship

Members are encouraged to nominate individuals for Fellowship in the APS. The Division is able to elect each year one-half of one percent of its current membership. Nominations may be made at any time, but only those received by the deadline, February 2, will be considered for action in 2009. Nomination instructions and advice for preparing a strong nomination are available at: <http://www.aps.org/programs/honors/fellowships/nominations.cfm>.

Unsuccessful nominees are automatically reconsidered in the second year after nomination. Updated information from sponsors is recommended.

In March the DCMP Fellowship Committee, made up of the Members-at-Large and the DCMP member of the APS Council, reviews the nominations referred to the DCMP by the APS and makes recommendations to the APS Fellowship Committee.

Tips for Successful Nominations

The selection process is very competitive; when preparing nominations, the sponsor should ensure that the achievements of the candidate are genuinely reflected in the material submitted. The Fellowship Committee looks for sustained contributions to the field, and successful nominees generally have over ten years of professional experience beyond the Ph.D. The eight representative publications and ten other contributions should be chosen with care. The supporting letters, which evaluate the candidate's work and discuss which of the candidate's achievements are "exceptional," aid the committee considerably.

The DCMP Web Site

The DCMP web site at <http://dcmp.bc.edu> provides general information and announcements of potential interest to members as well as detailed information on the division by-laws and operating procedures. The site also informs the general public of the role and value of condensed matter physics in their lives. There is an impressive collection of images in the gallery at: <http://dcmp.bc.edu/page.php?name=gallery>.

We welcome contributions to the site from the DCMP membership involving any subject matter that may help achieve these goals. Please send your comments, suggestions, and contributions to Dr. Irina Bariakhtar, at the DCMP Webmaster, at dcmp@bc.edu.

Join DCMP

Most people reading this newsletter are already DCMP members. However, there may be other APS members whose research is in the area of condensed matter physics who are not yet members of the division. The size of the membership of the division determines both the number of invited symposia that we can organize at the March Meeting, and the number of Fellows that we can recommend to the Society. As a consequence, any increase in these numbers benefits our community.

Please ask your condensed matter colleagues and graduate students if they are members of the DCMP. The reality is that many are not. It costs only \$7 to join, and a person can join at any time. Student membership in DCMP is free. See <http://dcmp.bc.edu/page.php?name=unitappl> for details.

APS physics
American Physical Society
Division of Condensed Matter Physics
One Physics Ellipse
College Park, MD 20740-3844