

Topical Group on Magnetism and its Applications

<http://units.aps.org/units/gmag/>

A Note From the Chair

It is already time to start thinking about the 2009 March Meeting. GMAG organizes the Magnetism sessions at the March Meeting, and over the next month we need your input on invited speakers for focus sessions and nominations for the three GMAG-sponsored symposia.

Last year we had seven symposium proposals submitted to GMAG. We also encourage nominations for APS fellows, for Ph. D. student Dissertation Awards, and for members of the GMAG Executive Committee. Deadlines and further information on these and other opportunities to help GMAG and the physics community are given in the following pages of this newsletter.

We always welcome suggestions for new activities and programs you would like to see GMAG initiate. Please send ideas to me or to one of the other GMAG officers. Lastly, please bring the Topical Group on Magnetism (GMAG) to the attention of your colleagues and urge them to join.

—Bill Butler, GMAG Chair





GMAG Highlights of 2008 March Meeting

Nobel Reception The tremendous progress of magnetism and spintronics over the past two decades was highlighted by last year's Nobel Prize in physics which was awarded to Albert Fert and Peter Grünberg for their discovery of Giant Magnetoresistance. To help celebrate this event, GMAG hosted a reception honoring the newest Nobel Laureates at the APS 2008 March Meeting in New Orleans. The reception was followed by lectures by the honorees. We do not have a reliable count for the attendance, but the huge ballroom was completely filled. The lectures were excellent.

**Nobel Prize Reception Honoring
Albert Fert and Peter Grünberg**

5:30 PM Wednesday March 12
Bissonet Room, Marriott Hotel (555 Canal Street)

Specialized Discussions by Nobel Laureates Begin at 6:30PM

Peter Grünberg
Interlayer exchange coupling: new results, unresolved questions

Albert Fert
Spin transport between spin-polarized sources and drains: advantage of carbon nanotubes over semiconductors

Sponsored by APS Topical Group on Magnetism and its Applications (GMAG)

Focus Topics

GMAG sponsored or co-sponsored 7 focus topics as well as two additional contributed sessions at the 2008 March Meeting. These focus topics encompassed 61 sessions with a total of 39 invited talks. GMAG was responsible for Sorting Category #6 (Magnetism) which had 839 contributed abstracts in 63 sessions. The focus topics are an important way that GMAG helps to place contributed papers into appropriate sessions. This is extremely important in helping authors find an interested and receptive audience. Special thanks are due the abstract sorters who worked hard to place contributed papers into appropriate sessions. Based on experience with the 2008 abstract submissions, the huge category on complex oxides (6.11.3 in 2008) will be divided into bulk properties and thin films (6.13.3 and 6.13.4 for 2009).

Invited Symposia

In addition to the focus topics, GMAG also sponsored three symposiums consisting of invited talks. The symposium topics were: (1) Magnetism in Semiconductors: New Frontiers, (2) Artificial and Tunable Realizations of Spin Systems and (3) Tunnel Magnetoresistance: Yesterday, Today and Tomorrow.

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Upcoming Meetings

GMAG Outreach

Outreach Funding from GMAG:

GMAG invites applications from its members to support outreach activities involving magnetism. Limited funds (up to \$2500 per project) are available to cover supplies and expenses associated with activities that aim to educate non-scientists about magnetism and its applications. Preference will be given to innovative activities that will be documented so that they can be reproduced elsewhere. The outcome of the activities will be disseminated to the GMAG membership through the Newsletter and to the broader magnetism community through the GMAG website. Interested GMAG members should prepare a 1-2 page summary of the proposed activity (including expected duration and outcome) along with a 1 page CV and a list of anticipated expenses. These should be mailed as a single file in .pdf format to the GMAG Chair, Bill Butler (wbutler@mint.ua.edu). The GMAG Executive Board will review proposals on an ongoing basis, beginning August 1, 2008. Further details will appear on the GMAG web site.

An example of GMAG Outreach:

The first award for outreach went to Renee Horton a graduate student working in the MINT Center at the University of Alabama. A preliminary report of Renee's activities:

The MINT Scientific Outreach Program, (MINT SOUP) is a two component program, with one component dedicated to educating the middle school students on magnetism and other basic physics principles like Newton's law, friction, thrust, force, motion, center of mass, and molecular motion. There is a strong focus on magnetism and how it relates to the MINT Center.

The second component of MINT SOUP will be to set up a display at the local Children's Hands on Museum (CHOM) with a Saturday morning demonstration once every three months that talks about the principles and the importance of magnetism in our world. The funds from the GMAG outreach proposal were used to purchase items for both components of MINT Soup and an additional group of students that is an all girls group consisting of high school and middle school students, which are affiliated with Delta Sigma Theta Sorority, Inc.

Supplies purchased from the grant:

1. Warp Drive Levitator kits to be used with the Maglev track
2. Class pack of Magnetic mousetrap vehicle class pack
3. Class pack of Solar Car kits
4. Magnet sets
5. 10 Magnet Romp sets
6. Magnetic Buzzing Balls (rattling snake eggs)
7. Iron Fillings
8. Magnetic rocks
9. Interactive Earth Model set
10. Timer for race tracks

We have conducted two activities with the middle school group, one on learning about the earth's magnetic field and one on the different magnetic fields of different types of magnets. Using the iron fillings the students were able to see the magnetic field of different shapes, sizes and types of magnets. They were able to explore permanent magnets and induced magne-

tization by hands on exploration and open experiments. More structured activities consisted of constructing solar cars, magnetic mousetrap cars and the standard mousetrap cars and racing them against each other to observe the performance.

We have conducted one activity as part of a scientific training program with Delta Sigma Theta Sorority, Inc. as part of their science training for an NSF funded project. Magnetic field viewers and different types of magnets were experimented with to observe the field lines. The women experimented with magnetic paint, iron fillings, paper clips and magnetic stones during a one hour session on understanding magnetic fields.

Two additional activities were completed during the grant period. The first of these two activities was completed during the later part of March at a girl's conference for 175 African American middle school and high school girls from across the state of Alabama entitled "Exploring Magnetism". The second was an activity with the Children's Hands on Museum in Tuscaloosa. This activity is part of the show and tell section of the museum where the students come and explore all the types of magnets that are a part of our world.

We are still in the process of preparing a "cookbook" on where to buy products, different activities that can be done with the magnets and different organizations that can be contacted to get involved with.

The grant helped facilitate purchasing the much needed materials to be able to do the outreach and provide supplies to the students of the classroom we work with, as well as creating an inventory for the ongoing project with the Children's Hands on Museum. They are very appreciative of the time we give through the program as well as the extra activities the students are allowed to engage in.



Nanodays at the Children's Hands On Museum



"Gowning up" for a tour of the MINT Center Clean Room

2009 March Meeting Program

The Chair-Elect, Axel Hoffmann (hoffmann@anl.gov) is the GMAG program chair for the 2009 March Meeting in Pittsburgh. He is coordinating the organization of both GMAG sponsored (or co-sponsored) Focus Topics and the GMAG invited symposia.

Focus Topics – Nominations for invited speakers

For the 2009 meeting, GMAG is co-sponsoring nine focus topics. Each focus topic consists of multiple sessions of contributed talks on a common theme. Each session can also include one invited talk. Suggestions for invited speakers are welcome and should be sent to one of the organizers of the focus topic (see below) before August 31, 2008. Contributed talks relating to a focus topic should be submitted under the focus topic sorting category (number given below) and not to a general category. The deadline for contributed talks submissions is Friday, November 21, 2008. The GMAG focus topics (co-sponsors are shown in parenthesis) for 2009 are:

6.13.1 *Theory and Simulation of Magnetism and Spin-Dependent Properties* (DCOMP/DMP/GMAG) - Organized by: Kirill Belashenko, University of Nebraska (kdbel@unlserve.unl.edu), Aldo Romero, CINVESTAV – Unidad Queretaro, Mexico (aromero@qro.cinvestav.mx), Dieter Suess, Vienna University of Technology, Austria (suess@magnet.atp.tuwien.ac.at)

6.13.2 *Magnetic Nanostructures: Materials and Phenomena* (DMP/GMAG) - Organized by: Matthias Bode, Argonne National Laboratory (mbode@anl.gov), Yumi Ijiri, Oberlin College (yumi.ijiri@oberlin.edu)

6.13.3 *Bulk Properties of Complex Oxides* (DMP/GMAG) – Organized by: Jaime Fernandez-Baca, Oak Ridge National Laboratory (jfn@ornl.gov) Karin Rabe, Rutgers University (rabe@physics.rutgers.edu)

6.13.4 *Complex Oxide Thin Films* (DMP/GMAG) – Organized by Dimitri Basov, University of California, San Diego (dbasov@physics.ucsd.edu), Marc Ulrich, Army Research Office (marc.ulrich@us.army.mil), Maria Varela, Oak Ridge National Laboratory (mvarela@ornl.gov)

6.13.5 *Spin Transport & Magnetization Dynamics in Metal-Based Systems* (GMAG/DMP/FIAP)- Organized by: Yaroslav Bazaliy, University of South Carolina (yar@caprine.physics.sc.edu), Casey Miller, University of South Florida (cmiller@cas.usf.edu)

6.13.6 *Spin Dependent Phenomena in Semiconductors* (GMAG/DMP/FIAP) – Organized by: Ian Appelbaum, University of Delaware (appelbaum@mail.eecis.udel.edu), Scott Crooker, Los Alamos National Laboratory (crooker@lanl.gov), Lu Sham, University of California – San Diego (lsham@ucsd.edu)

6.13.7 *Frustrated and Low Dimensional Magnetism* (GMAG) – Organized by: Art Ramirez, Bell Labs, Alcatel-Lucent (apr@LGSInnovations.com), Matthew Stone, Oak Ridge National Laboratory (stonemb@ornl.gov)

6.13.8 *Spin Dependent Physics in Organic Materials* (GMAG/DMP) – Organized by: Joaquin Fernandez-Rossier, Universidad de Alicante, Spain (jfrossier@ua.es), Andrew Kent, New York University (andy.kent@nyu.edu), Jagadeesh Moodera, MIT (moodera@MIT.EDU)

6.13.9 *Hybrid Magnetic-Superconducting Systems* (DMP/GMAG) – Organized by: Jose Martin, Universidad de Oviedo – CINN, Spain (jmartin@condmat01.geol.uniovi.es), Charles Reichhardt, Los Alamos National Laboratory (charlesr@cnls.lanl.gov), Jacobo Santamaria, Universidad Complutense de Madrid, Spain (jacsan@fis.ucm.es)

GMAG Symposia – Suggestions for topics

GMAG can sponsor three invited symposia at the March Meeting. GMAG members are encouraged to recommend topics for these symposia. The nomination should include the names of the organizer(s) and a tentative list of invited speakers (usually 5 per session). Please send nominations to the GMAG program chair, Axel Hoffmann (hoffmann@anl.gov) before August 31, 2008. Hint: Your nominations will have a much higher chance of success (and greatly please the program chair) if they include the following: (1) A paragraph describing the theme of the symposium (2) A list of 5 speakers with full contact information for each and a very short tentative abstract of what they might talk about. (3) Names and contact information for a couple of “back-up” speakers in case some on your “A” list are not available.

Nominations for GMAG Officers and members of the Executive Committee

Each year GMAG requests nominations for Vice-Chair (who succeeds to Chair-Elect, Chair, and Past Chair) and for two new at-large members of the Executive Committee. Nominations for these positions should be sent to David Ledermann (David.Lederman@mail.wvu.edu), chair of the Nominating Committee, before September 1, 2008.

Nominations for APS Fellowship and Prizes/Awards

The nominations deadlines for APS fellowship and most prizes have passed for this year. However, it is a good time to consider nominations for next year. GMAG nominates 2-3 people for APS Fellowship each year. The next deadline is April 1, 2009 and nominations should be made on-line at <http://www.aps.org/fellowship/>. APS prize descriptions and nomination deadlines are at <http://www.aps.org/praw/>.

Student Dissertation Awards

Outstanding Dissertation in Magnetism Awards: GMAG will present up to three dissertation awards at the next March Meeting. These awards will recognize students who have conducted outstanding research leading to their dissertation and will consist of an invited talk in an appropriate session at the March APS Meeting, a \$500 prize to the student, and up to \$250 toward his/

her travel expenses to the March meeting. The student must be in the final year before graduating with a Ph.D., and both the student and the advisor must be current members of GMAG. Nominations will consist of: a nominating letter; an extended abstract of the research; the student's CV and publication list; and contact information for the student, all submitted by the student's advisor or another senior researcher who knows the student's work well. The nominating letter must address these issues:

- quality and independence of the student's work;
- student's speaking ability;
- year the student began graduate school;
- student's expected completion date (must be after Sept. 1, 2008 but before Sept. 1, 2009 to be eligible for the 2009 March Meeting);
- assessment of the student's future potential as a research scientist.

Nominations should be sent by email as a single pdf file to Bill Butler (wbutler@mint.ua.edu) by September 12, 2008. Evaluation of the nominations will be conducted by the GMAG Executive Committee.

Descriptions of GMAG-sponsored/cosponsored Focus Topics, March 2009 APS Meeting

6.13.1 Theory and Simulation of Magnetism and Spin-Dependent Properties (DCOMP/DMP/GMAG)

This focus topic centers on recent advances in the theory and numerical simulations of static and dynamical spin-dependent properties of magnetic materials and structures. This is a broad topic including, in particular, basic theory of magnetism, spin-dependent transport, magnetic phase transitions, magnetic hysteresis, spin waves, spin relaxation, spin transfer torques, exchange bias, interlayer magnetic coupling, novel concepts in magnetic recording, dynamics of domain walls and other topological defects. Particular interest is in low-dimensional magnetic systems and nanostructures such as interfaces, multilayers, thin films, nanowires, nanodots, and molecular magnets. Approaches include first-principles techniques, multiscale modeling, many-body theory, effective spin Hamiltonians, Monte Carlo simulations, Langevin dynamics, micromagnetic modeling, and combinations of these techniques. We especially encourage contributions showing benefits of cross-pollination between analytical and numerical approaches for explaining and predicting specific experimental results and materials or systems properties.

6.13.2 Magnetic Nanostructures: Materials and Phenomena (DMP/GMAG)

This topic focuses on magnetic nanostructures, including thin films, multilayers, nanoparticles, nanowires, nanorings, nanocomposites, core-shell structures, hybrid structures, magnetic point contacts and self-assembled as well as patterned magnetic arrays. This session will cover both experimental and theoretical advances in investigating these materials for proximity and structural disorder effects, magnetic quantum confinement,

interlayer magnetic coupling, exchange spring, exchange bias, magnetic anisotropy, inter-particle interactions, and relaxation dynamics as well as modeling of hysteresis, thermal and quantum fluctuations, and other nanoscale magnetic phenomena. Of special interest is the fabrication of nanostructures with atomic-scale control using new/improved physical and/or chemical methods, high-resolution characterization methods with site and/or element specificity, and unusual physical phenomena present in these systems.

6.13.3 Bulk Properties of Complex Oxides (DMP/GMAG)

Transition metal oxides exhibit a wide range of novel phenomena, which originate from the complexity induced by competing interactions and the presence of multiple ground states. Associated with this complexity is a tendency for short range order such as the formation of stripes, ladders, checkerboards, or phase separation, and an enhanced response to external fields that gives rise to giant and colossal effects with potential for applications. This Focus Topic explores the nature of the various ground states observed in bulk specimens of complex oxides and their competing interactions, the ways in which the spin, lattice, charge and orbital degrees of freedom respond on a variety of length scales, and how they interact and compete with each other to produce novel phenomena. It provides a forum to discuss recent developments and results covering basic aspects (experiment, theory and simulation) of bulk complex oxides, including multiferroics, manganites, nickelates, cobaltites, and ruthenates.

6.13.4 Complex Oxide Thin Films (DMP/GMAG)

A rich variety of intriguing behaviors has been observed in complex oxides, many of which remain still far from understood. High T_c superconductivity, ferroelectricity or colossal magnetoresistance are just a few of them. When grown in the form of thin films, heterostructures or nanostructured systems, they often exhibit additional effects resulting from epitaxial strain, reduced dimensionality, charge transfer, proximity effects or phase competition across interfaces. Since all this phenomenology can deeply alter the macroscopic physical properties, their understanding acquires a special relevance. This Focus Topic explores the physical properties of thin complex oxide films and heterostructures, paying special attention to the role of interfaces. It also will focus on the mechanisms by which the macroscopic properties are affected, which may include strain, electronic phase separation, charge transfer or localization, structural defects, etc. These mechanisms have an important role in the interaction between spin, charge, lattice and orbital degrees of freedom in films. This Focus Topic will provide a forum to discuss recent developments in both theoretical and experimental work on these issues, including growth, characterization (by x-ray, neutron or electron scattering, scanning probe microscopy techniques, etc) and physical properties (transport, thermodynamic measurements, magnetometry, etc) of complex oxide films, heterostructures and nanostructured systems.

6.13.5 Spin Transport & Magnetization Dynamics in Metal-Based Systems (GMAG/DMP/FIAP)

This topic focuses on the experimental and theoretical aspects of spin transport, spin transfer, and magnetization dynamics

in metal-based systems; related phenomena in semiconductor systems will be covered in a separate focus topic. Topics of interest include all aspects of spin-dependent transport and scattering in the diffusive, ballistic, tunneling and hot electron regimes. These are spin diffusion, relaxation, and accumulation, spin transport through interfaces, spin injection and detection, mechanisms for magnetic damping (especially in magnetic nanostructures), etc. A major topic is the interplay between spin currents and magnetization dynamics in magnetic nanostructures: spin-transfer, spin pumping and related phenomena. Also included are the studies on spin transport in ferromagnetic-normal metal and ferromagnetic-superconductor systems. Relevant phenomena include giant magnetoresistance (GMR), tunneling magnetoresistance (TMR), spin polarization measurements, spin filtering, current-induced magnetization dynamics: magnetization switching, driven oscillations, motion of magnetic domain walls, vortices and other defects and related processes, studied in time and frequency domains.

6.13.6 Spin Dependent Phenomena in Semiconductors (GMAG/DMP/FIAP)

The field of spin-dependent phenomena in semiconductors is developing rapidly, with significant advances recently in a widening range of material systems (e.g., silicon, diamond, carbon nanotubes, graphene), in semiconductor nanostructures (e.g., self-assembled and lithographically-defined quantum dots), and in hybrid ferromagnetic/semiconductor device structures. This series of Focus Sessions solicits contributions aimed at understanding spin-dependent processes in magnetic and non-magnetic structures incorporating semiconducting materials. Topics include: (i) growth, characterization, electrical, optical and magnetic properties of (ferro-)magnetic semiconductors and hybrid ferromagnet-semiconductor structures including quantum dots, nanocrystals, and nanowires; (ii) transport and dynamical effects in semiconductors with or without spin-orbit interactions; (iii) electrical and optical spin injection, spin Hall effects, spin interference, spin filtering, spin lifetime effects, spin dependent scattering, and spin torque; (iv) manipulation, detection, and entanglement of electrical and nuclear spins in quantum systems such as dots, impurities and point defects; and (v) spin-dependent devices and device proposals involving ferromagnets and semiconductors.

6.13.7 Frustrated and Low Dimensional Magnetism (GMAG)

There is a robust framework for describing the low temperature structures, phase transitions, and excitations of conventional three dimensional magnetic materials. However, when fluctuations are enhanced by low dimensionality or competing interactions, qualitatively new behavior can emerge. This is well established in one and two dimensions where controlled theory and experiment have uncovered phases lacking long-range magnetic order but exhibiting novel statistical and quantum phenomena. Such phenomena include valence bond solids and various forms of spin liquid and spin ice phases. This Focus Topic solicits abstracts for presentations that explore both theoretical and experimental aspects of the field. Topics of interest include: one dimensional quantum magnetism, geometri-

cal frustration and associated effects of quantum spin liquid and spin ice, magnetism in artificial structures, including 1D atomic chain or 2D monolayer film, order by disorder, the role of magnetoelastic coupling, quantum critical two dimensional spin systems and magnon Bose condensation. Also of interest are the effects of strongly fluctuating spins on properties beyond magnetism including transport, thermal transport and ferroelectricity.

6.13.8 Spin Dependent Physics in Organic Materials (GMAG/DMP)

This focus topic is on spin transport and dynamics in organic materials including organic semiconductors, graphene, carbon nanotubes and molecular magnets. Research at the intersection of several forefront areas in condensed matter and material physics are of interest: spin electronics, carbon-based materials and molecular magnetism. Organic materials are of particular interest for spin transport and dynamics because weak spin orbit interactions and hyperfine interactions may lead to long spin lifetimes. Phenomena/ materials of interest include, hybrid ferromagnetic/organic structures, spin transport in graphene, Kondo effect, spin qubits in diamond, quantum tunneling and coherence in molecular nanomagnetism, organic magnetoresistance and all related topics.

6.13.9 Hybrid Magnetic-Superconducting Systems (DMP/GMAG)

The focus topic will highlight experimental, theoretical and computational work on hybrid superconducting/magnetic structures. The main subjects will include: vortex motion control and imprinting of the ferromagnetic response on superconducting films with arrays of magnetic nanostructures such as dots and nanowires; proximity effects, Andreev reflections, spatial modulation of the order parameter, non-collinear magnetization effects, and spin injection in both conventional and complex oxide superconducting/ferromagnetic multilayers and heterostructures; and pi-phases, proximity and triplet states in hybrid Josephson junctions. Also, superconducting-magnetic nanocomposites, reentrant superconductors and novel hybrid devices will be considered.

GMAG Executive Committee

Chair: William Butler (wbutler@mint.ua.edu)

Chair-Elect: Axel Hoffmann (hoffmann@anl.gov)

Vice-Chair: Berend Jonker (jonker@nrl.navy.mil)

Past Chair: Daniel Reich (dhr@pha.jhu.edu)

Secretary-Treasurer: Maria Varela (mvarela@ornl.gov)

Executive Committee Members-at-Large

(Term ends March of year)

David Lederman, David.Lederman@mail.wvu.edu (2009)

Stephen Hill, hill@phys.ufl.edu (2009)

Michael Pechan, pechanmj@muohio.edu (2010)

Michael Fitzsimmons, fitz@lanl.gov (2010)

John Freeland, freeland@anl.gov (2011)

Evgeny Tsymbal, tsymbal@unl.edu (2011)

Upcoming Meetings

IEEE Magnetics Society Summer School August 3-8, 2008

International Conference on Superconductivity and Magnetism August 25-29, 2008

Gordon Research Conference on Magnetic Nanostructures August 31-September 5, 2008

Trends in Nanotechnology Conference September 1-5, 2008

International SPINSWITCH Workshop on Spin Momentum Transfer September 3-5, 2008

Highly Frustrated Magnetism 2008 September 7-12, 2008

Joint European Magnetic Symposia September 14-19, 2008

Magnetic Measurements 2008 Conference September 21-24, 2008

Data Storage System Center (DSSC) Fall 2008 Technical Review September 23 - 24, 2008

Carnegie Mellon University
Pittsburgh, Pennsylvania, USA

Attendance is limited to Center Members and invited guests

For info: Contact Pat Grieco pg1q@andrew.cmu.edu or <http://www.dssc.ece.cmu.edu/news/events/review/2008/fall/>

18th International Spin Physics Symposium October 6-11, 2008

The 10th International Conference on Ferrites (ICF10) October 10-14, 2008

MINT Center Fall Review and Workshop October 14-15, 2008

2008 Workshop Topic: Materials for Spin-Torque MRAM

University of Alabama • Tuscaloosa, Alabama, USA

For info: Contact Tabatha Jarnagin (205) 348-2516 or <http://www.mint.ua.edu/reviews.asp>

10th International Symposium on Magnetic Materials, Processes & Devices October 12-17, 2008

55th AVS Meeting October 19-24, 2008

Center for Magnetic Recording Research (CMRR) Fall Review October 29 - 30, 2008

University of California San Diego (UCSD) • La Jolla, California, USA

Attendance limited to CMRR Sponsors and Invited Guests

For info: Contact Iris Villanueva, CMRR, (858)534-6196 or <http://cmrr.ucsd.edu/>

53rd Annual Conference on Magnetism and Magnetic Materials November 10-14, 2008

Materials Research Society (MRS) 2008 Fall Meeting December 1-5, 2008

APS March Meeting 2009 March 16-20, 2009

Materials Research Society (MRS) 2009 Spring Meeting April 13-17, 2009

APS April Meeting 2009 May 2-5, 2009