SYMPOSIUM Q

Magnetoelectronics—Novel Magnetic Phenomena in Nanostructures
December 1 - 5, 2002

Chair: Ivan K. Schuller
Univ. of California-San Diego

Cemot Guntherodt
RWTH Aachen

Andrew D. Kent
New York Univ

Teruya Shinjo
International Inst for Advanced Studies

Shufeng Zhang
Univ. of Missouri-Columbia

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# Invited paper

TUTORIAL

PT Q: MAGNETOELECTRONICS AND NOVEL MAGNETIC PHENOMENA IN NANOSTRUCTURES
Sunday, December 1, 2002
10:00 a.m. - 5:00 p.m.
Room 200 (Hynes)

This tutorial will provide an introduction to the structural, magnetic,
and transport properties of artificially engineered magnetic structures,
consisting of tunneling devices, superlattices, molecular nanomagnets,
and other nanostructures. A focus will be on the phenomena of giant
magnetoresistance (GMR), tunneling magnetoresistance (TMR),
magnetic quantum tunneling, spin-dependent transport in confined
geometries, exchange bias, current-induced magnetic moment
rotations and spin polarization, and non-equilibrium spin transport
in metal systems. The speakers will coordinate their presentations
to cover these topics, providing background information, a discussion of central theoretical
ideas and experimental results, and the current state of the art in materials and devices.
A tutorial will also include discussion of applications to magnetic field sensors, magnetic recording, and
MRAM. The intention of the tutorial is to give attendees a basic and
broad introduction to this rapidly moving field of materials research.

Instructors:
Sadamichi Mochiku, Tohoku University
Stuart S.P. Parkin, IBM Almaden Research Center
Dan Ralph, Cornell University
Chris Leighton, University of Minnesota
David Hendrickson, University of California, San Diego

SESSION Q1: MAGNETIC SYSTEMS
Chair: Teruya Shinjo and Andrew D. Kent
Monday, December 2, 2002
Room 203 (Hynes)

8:30 AM *Q1.1
HALF-INTEGER SPIN MOLECULAR NANOMAGNETS
David N. Hendrickson, Shulim M.J. Aushin, Ziming Sun, University of California at San Diego, Dept. of Chemistry, La Jolla, CA; Wolfgang Weisendorfer, Laboratoire L. Néel, Grenoble, FRANCE; George Christou, Sumit Bhadrir, Nadira Ailina Alcalde, University of Florida, Dept. of Chemistry, Gainesville, FL.

9:00 AM *Q1.2
MAGNETIC STRUCTURES AND MAGNETORESISTANCE OF MAGNETIC NANODOTS AND NANOWIRES. Ko Mibu, Kyoto Univ, Research Center for Low Temperature and Materials Science, Uji, JAPAN; Tsuyuki Okuno, Kosako Mynke, Kyoto Univ, Institute for Chemical Research, Uji, JAPAN; Tetsuji Shigeto, RIKEN, Frontier Research System, Wako, JAPAN; Tetsu Ono, Osaka Univ, Graduate School of Engineering Science, Toyonaka, JAPAN; Teruya Shinjo, International Institute for Advanced Studies, Kioto, JAPAN.

9:30 AM *Q1.3
DEFECTS, TUNNELING, AND EPR. Kyungwha Park, Florida State Univ, Dept of Chemistry and School of Computational Science and Information Technology (CSIT), Tallahassee, FL; M.A. Newton, Mississippi State Univ, Dept of Physics and Astronomy, Mississippi State, MS; N.S. Dhal, Florida State Univ, Dept of Chemistry, Tallahassee, FL; S. Hill, Univ of Florida, Dept of Physics, Gainesville, FL; P.A. Rüchel, Florida State Univ, CSIT, Dept of Physics and Center for Materials Research and Technology, Tallahassee, FL.

10:00 AM BREAK

10:30 AM *Q1.4
SINGLE CRYSTAL EPR SPECTROSCOPY OF SINGLE MOLECULE MAGNETS. Stephen Hill, University of Florida, Dept. of Physics, Gainesville, FL; Naresh Dhal, Florida State University, Dept. of Chemistry and NHMFL, Tallahassee, FL; Kyungwha Park, Florida State University, Dept. of Physics and CSIT, Tallahassee, FL; George Christou, University of Florida, Dept. of Chemistry, Gainesville, FL; David Hendrickson, University of California at San Diego, Dept. of Chemistry, La Jolla, CA; Andrew Kent, New York Univ, Dept. of Physics, New York, NY.

11:00 AM *Q1.5
THE EXTRAORDINARY HIGH ROOM TEMPERATURE SPIN POLARIZATION OF EPITAXIAL CrO$_2$(100) AND Fe$_3$O$_4$(111) THIN FILMS. U. Bödinger, Y. Deslouis, M. Forline, C. König, and G. Güntherodt, H. Physikalisches Institut, RWTH Aachen, GERMANY.

11:30 AM Q1.6

11:45 AM Q1.7
INTERFACE INTERACTIONS IN FRACTIONAL-LAYER OXIDE SUPERLATTICES. Naoyuki Nakamura, Mikio Liglmans, Keesoke Shinoya, Univ of Tokyo, Dept of Solid State Materials, Kagawa, JAPAN; Hideomi Koizuma, Tokyo Inst of Tech, Materials and Structures Lab, Yokohama, JAPAN; Masashi Kawabata, Tohoku Univ, Inst for Materials Research, Sendai, JAPAN.

SESSION Q2: MAGNETIC MULTILAYERS
Chair: Jagadeesh S. Moodera and Haima-Ulrich J. Holmermeier
Monday Afternoon, December 2, 2002
Room 209 (Hynes)

1:30 PM Q2.1
EXPLODING MICROMAGNETIC INTERLAYER COUPLING BY LAYER-RESOLVED MAGNETIC MICROSCOPY. Wolfgang Kuch, L.I. Chered, K. Rukumoto, F. Ohi, X. Guo, M. Kotsugi, F. Kirschner, Max-Planck-Institut für Mikrostrukturphysik, Halle, GERMANY.

1:45 PM Q2.2
DOMAIN WALL MAGNETORESISTANCE AND COMPLEX MAGNETIC RESPONSE IN ANTIFERROMAGNETICALLY COUPLED Fe/Cr MULTILAYERS. Parkinson Alley, Raul Villar, Dept. de Fisica de la Materia Condensada, CIII, Universidad Autónoma de Madrid, SPAIN; Rainer Schad, CIMIT, University of Alabama, Tuscaloosa, AL; Jose Luis Martinez, ICM-MCSIC, Castellanico, Madrid, SPAIN.

2:00 PM Q2.3
STRUCTURAL, MAGNETIC AND MAGNETORESISTIVE PROPERTIES OF THE ELECTROCHEMICALLY DEPOSITED ARRAYS OF Co NANOWIRES AND Ag-Co NANOMULTILAYERS.
2:15 PM Q2.4
AB INITIO STUDY OF CPP TRANSPORT IN Fe/Cr/Fe TRILAYERS: INFLUENCE OF INTERDIFFUSION AND IMPURITIES. Heiko C. Harper, Peter Enkel, Gerhard Ermel, University of Theoretical Physics, Duisburg, GERMANY; Peter Weinberger, TU Vienna, Austria; University of Tennessee, Knoxville, TENNESSEE.

2:30 PM Q2.5
MICROSTRUCTURE AND MAGNETIC PROPERTY OF L12 GoP-24at. %C MAGNETIC THIN FILM. Dong Yean Oh, Joon Kyeom Park, Dept. of Materials Science and Engineering, Korea Advanced Institute of Science and Technology, Daejeon, KOREA.

3:00 PM BREAK

3:30 PM Q2.7
RELEVANTLY INDUCED NON-COLLINEAR MAGNETISM IN PERMALLOY. Markus Eisele, Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN; D.M. Nicholson, Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, TN; G. Malcolm Stocks, Metallurgy and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN.

3:45 PM Q2.8
BATCH-FABRICATION OF SUB-100NM SPIN-VALVE JUNCTIONS FOR SPIN-CURRENT-INDUCED MAGNETIC EXCHANGE STUDIES. J.Z. Sun, D.J. Mossman, D.W. Albrecht, M.J. Rocks, and R.H. Koch, IBM T.J. Watson Research Center, Yorktown Heights, NY; IBM Almaden Research Center, Present Address: Physics Department, Harvard University, Cambridge, MA.

4:00 PM Q2.9
LOW FREQUENCY NOISE AND DOMAIN WALL DYNAMICS IN Co20/20/Co20/20-TUNNEL JUNCTIONS. Ruben Guerrero, Vladimir Pryanik, Parkside Alice, Ray Villar, Dpto. Fisica Materia Condensada, University of De Madrid, SPAIN; and J. Moddel, Massachusetts Institute of Technology, Boston, MA.

4:15 PM Q2.10
BISTABLE MEMORY EFFECT IN CHROMIUM OXIDE JUNCTIONS. M. Sokolow, C. Yang, E. Ostrovsky, L. Yuan, S.H. Liu, B. Doudin, University of Nebraska, Lincoln, Department of Physics and Astronomy, Burke Laboratory, Lincoln, NE.

4:30 PM Q2.11
DIRECT OBSERVATION OF SHUNT EFFECTS IN THE EXTRAORDINARY MAGNETORESISTANCE (EMR) OF MSOS/CO/PVD/ FE/PAW PLATES. S.A. Schall, D.R. Hines, and A.C.H. Rowe, NEC Research Institute, Princeton, NJ; J.S. Tsui and Y. A. Pashkin, NEC Fundamental Research Laboratories, Tsukuba, JAPAN; N. Goel and M.B. Santos, Department of Physics and Astronomy, University of Oklahoma, Norman, OK.

4:45 PM Q2.12
FERROMAGNETIC SINGLE-LEVEL ELECTRON TRANSISTOR WITH RC GATE. Jun-ichi Shiraishi, Akita Prefectural University, JAPAN; Yasushi Takekura, Yokohama National University, JAPAN.

SESSION Q3: MAGNETOTRANSPORT
Chair: Shifeng Zhang and Sabamichi Macawara
Tuesday, December 3, 2002
Room 209 (Hynes)

8:30 AM Q3.1
AB INITIO THEORY OF CPP TRANSPORT. Peter Weinberger, Center for Computational Materials Science, Vienna, AUSTRIA.

9:00 AM Q3.2
MEAN FREE PATH EFFECTS IN CPP TRANSPORT B.J. Hickey, L. Michez and G.J. Merges, Department of Physics and Astronomy, E.C. Stoner Laboratory, University of Leeds, Leeds, UNITED KINGDOM; S. Shiz and N. Wiser, Department of Physics, Bar-Ilan University, Ramat-Gan, ISRAEL.

9:30 AM Q3.3
GIANT MAGNETORESISTANCE VERSUS INTERFACE STRUCTURE IN Fe/Cr SUPERLATTICES. J. Santamaria, M.E. Gomez, M.C. Cyrille, Dept. of Physics, University of California San Diego, CA; J.L. Vicent, U. Complutense, Madrid, SPAIN; K.M. Krishnan, Dept. of Materials Science and Engineering, Seattle, WA; Ivan Schuller, Dept. of Physics, University of California San Diego, CA; On leave from Universidad Complutense, Madrid, SPAIN; On leave from Universidad del Valle, Cali, COLOMBIA; Present address IBM Almaden.

10:00 AM BREAK

10:30 AM Q3.4
MAGNETIZATION REVERSAL PROVOKED BY SPIN INJECTION. Jean-Eric Wagoner, Andrea Bakker, Xavier Hoffer, Travis Wade, Laurent Greiner, and Jean-Philippe Ansermet, Institute of Nanophysics, Ecole Polytechnique Federal de Lausanne (EPFL), SWITZERLAND.

11:00 AM Q3.5
MECHANISMS BEHIND THE TEMPERATURE DEPENDENCE OF TUNNELING MAGNETORESISTANCE. John Akerman, Motorola, Hess Whig Dine, J. M. Super, and Societe Physique et Lecheres, Physical Sciences Research Laboratories, Tempoe, AZ; Igor V. Roschin, Ivan K. Schuller, Physics Department, UCSD, La Jolla, CA.

11:30 AM Q3.6
SPIN TRANSFER IN FERROMAGNET-NORMAL METAL SYSTEMS. Arne Bratf, Harvard University, Lynn Laboratory of Physics, Cambridge, MA.

SESSION Q4: MAGNETIC NANOSTRUCTURES
Chair: Alan S. Edelstein and Thomas Christoph Schultz
Tuesday Afternoon, December 3, 2002
Room 209 (Hynes)

1:30 PM Q4.1
SPIN POLARIZED TUNNELING AND MAGNETIC PROPERTIES OF MAGNETITE NANOCRYSTAL ARRAYS. Gil Markovi, Pankaj Poddar, T signop Fred, School of Chemistry, Tel Aviv University, Tel Aviv, ISRAEL.

1:45 PM Q4.2
NANG GLASSES OF PREVIOUSLY NEVER VITRIFIED CERAMICS AND METALS BY EXPOSURE TO A 2.45 GHZ MAGNETIC FIELD. Rustom Rej, Ramesh Pooledhu, Larry Hurt, Jinping Cheng, Dinesh Agrawal, Materials Research Institute, The Pennsylvania State University, University Park, PA.

2:00 PM Q4.3
EFFECT OF NANO-OXIDE IN SPINVALVES. Yi-hong Wu, Nat Univ of Singapore, Dept of ECE and Data Storage Institute, SINGAPORE; Kebin Li, Jinjun Qin, Guochang Xie, Ping Luo, Townchong Chong, Data Storage Institute, SINGAPORE.

2:15 PM Q4.4
INERT GAS CONDENSAION OF IRON AND IRON OXIDE NAPARTICLES. C. Baker, University of Delaware, Department of Materials Science and Engineering, Newark, DE; S. Ismail Shih, University of Delaware, Department of Materials Science and Engineering, University of Delaware, Department of Physics and Astronomy, Newark, DE; Frankofer Center, Newark, DE; K. Hasman, L. Shah, QUA University, Pakistan; G. Li, K.M. Unruh, University of Delaware, Department of Physics and Astronomy, Newark, DE.

2:30 PM Q4.5
SELECTIVE GROWTH OF COBALT NANOCLUSTERS IN DOMAINS OF BLOCK COPOLYMER FILMS AND IN SPIN COATED INVERSE MICELLES. Jeff Abers, Robert Cohen, Massachusetts Institute of Technology, Dept of Chemical Engineering, Cambridge, MA.

2:45 PM Q4.6
SYNTHESIS AND CHARACTERIZATION OF NANO-STRUCTURED IRON POWDERS. Heng Zhang, Shu Li Ge, Y.D. Zhang, Shiqiang Hui and Zong Genetic Zhang, Infin Int Corporation, Farmington, CT.
3:00 PM BREAK

3:30 PM Q4.7
TUNNEL SPLittings IN DEUTERATED Mn12-ACETATE SINGLE CRYSTALS. E. del Barco, A.D. Kent, Physics Department, New York University- New York, NY; F.M. Rumlerger, D.N. Hendrickson, Department of Chemistry and Biochemistry, University of California, San Diego, La Jolla, CA; G. Chrikto, Department of Chemistry, University of Florida, Gainesville, FL.

3:45 PM Q4.8

4:00 PM Q4.9
MAGNETIC PROPERTIES OF MONOATOMIC COBALT CHAINS IN PLATINUM. Markus Eisenbach, G. Malcolm Stocks, Oak Ridge National Laboratory, Oak Ridge, TN.

4:15 PM Q4.10
ELECTRONIC STRUCTURE AND MAGNETIC ANISOTROPY ENERGY OF Co4-BASED SINGLE MOLECULE NANOMAGNET. Tanna Basrai, Department of Physics, Georgetown University, Washington, DC; Mark R. Pederson, Center for Computational Materials Science, Naval Research Laboratory, Washington, DC.

4:30 PM Q4.11
FABRICATION OF PHOTONIC CRYSTALS AND PLASMONIC WAVEGUIDES WITH Au/SiO2 COLLOIDS AS BUILDING BLOCKS. Yu Lu, Dept. of Materials Science & Engineering, Univ. of Washington, Seattle, WA; Younan Xia, Dept. of Chemistry, Univ. of Washington, Seattle, WA.

SESSION Q6. IN-ROOM POSTER SESSION
NANOSTRUCTURED MAGNETS
Wednesday Afternoon, December 4, 2002
2:00 PM
Room 209 (Hyatt)

Q6.1
REORIENTATION TRANSITION OF Fe/Cu[111] THIN FILMS. B. Ujfalussy, University of Tennessee, Knoxville, TN; J. Shen, Oak Ridge National Laboratory, Oak Ridge, TN; G.M. Stocks, Oak Ridge National Laboratory, Oak Ridge, TN.

Q6.2
DOUBLE QUANTUM WIRE TUNNEL TRANSPORT AND MAGNETIC RESPONSE. Anadyu Yu. Smirnov, D-Wave Systems Inc., Vancouver, BC, CANADA; Leo G. Mourou, Norman J.M. Horning, Department of Physics and Engineering Physics, Stevens Institute of Technology, Hoboken, NJ.

Q6.3
METAL/SELF-ASSEMBLED MONOLAYERS/METAL JUNCTIONS FOR MAGNETOELECTRONICS APPLICATIONS. Yevgenyi A. Ochsenkow, Bernard Doudin, Department of Physics and Astronomy, University of Nebraska-Lincoln, Lincoln, NE; Chunjung Zhang, Jody Redpenning, Department of Chemistry, University of Nebraska-Lincoln, Lincoln, NE.

Q6.4
CHEMICALLY FUNCTIONAL ALKANETHIOL STABILIZED MAGNETIC NAPANOPARTICLES. David Fleming, Mike Nagelhoffer, Mary Elizabeth Williams, The Pennsylvania State University, Department of Chemistry, University Park, PA.

Q6.5
MAGNETIC PROPERTIES OF AMORPHOUS METAL/POLYMER NANOCOMPOSITES. Vincent H. Hammond, James M. O'Reilly, Nonmetallic Materials Division, University of Dayton Research Institute, Dayton, OH.

Q6.6
MAGNETIC PROPERTIES OF Ni NANOPARTICLES EMBEDDED IN AMORPHOUS SiO2. Fabio Corral-Remus, Gerardo Fabian Goya, Renato de Figueiredo Jordan, Instituto de Fisica, Universidad de Sao Paulo, Sao Paulo, SP, BRAZIL; Reginaldo Muccio, Centro Multidisciplinar de Desenvolvimento de Materiais Ceramicos CMDCM, CCTM-Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, SP, BRAZIL; N.L.V. Correia, Egon Longo, and Edison R. Leite, Centro Multidisciplinar de Desenvolvimento de Materiais Ceramicos CMDCM, Departamento de Quimica, Universidade Federal de Sao Carlos, Sao Carlos, SP, BRAZIL.

Q6.7
MAGNETOTRANSPORT AND HALL EFFECT IN ULTRA-THIN COLOLLOR MAGNETORESISTANCE FILMS. Trevor W. Oken, Department of Physics, Jonathan Chio, Jr., Eber, Yuri Suzuki, Dept. of Materials Science and Engineering, Cornell Univ, Ithaca, NY.

Q6.8

Hanna-Ulrich Habelmeier, Georg Cristiani, MPI-PK, Stuttgart, GERMANY.

11:30 AM Q5.8
SPIN DYNAMICS IN NICKEL NANOWIRES ARRAYS. Kornelius Nielsch, Ralf B. Wehrspohn, Ulrich Gösele, Max-Planck-Institute of Microstructure Physics, Halle, GERMANY; Zhi-Rui Wang, Meng-Hua Kuo, Ser-Choon Ng, Department of Physics, National University of Singapore, SINGAPORE; David J. Lockwood, Institute for Microstructural Sciences, Ottawa, CANADA; Michael G. Cottam, Department of Physics and Astronomy, University of Western Ontario, London, CANADA.

11:45 AM Q5.9
STUDY OF THE LOW FIELD MICROWAVE RESPONSE IN YTTRIUM ALUMINATES DILUTELY DOPED WITH MANGANESE. Rakhim Rakhimov, David Jones, George Louts, Norfolk State University, Center for Materials Research, Norfolk, VA.
LARGE MAGNETORESISTANCE IN Ni$_{2}$Al, S. P. Chen, Y. W. Du, S. P. Wong, Electronic Engineering Department of Chinese University, Hong Kong, CHINA, Physics Department of Nanjing University, Nanjing, CHINA.

NONSTOICHIOMETRY OF EPITAXIAL FeTiO$_{3}$ films. Tatsuo Fuji, Makoto Saito, Masakazu Kayano, Makoto, Nakahashi, Jun Takei, Okayama Univ, Dept of Applied Chemistry, Okayama, JAPAN.


SESSION Q7: EXCHANGE BIAS

Chairs: Gernot Guntherodt and Mark D. Stiles
Thursday Morning, December 5, 2002
Room 209 (Hynes)

8:30 AM *Q7.1

COMPLEX EXCHANGE ANISOTROPY IN Fe/Co/F2 LAYERS. E. Dan Dahlberg, I.N. Krivoruchko, C. Leigheben, J. Nogues, and Ivan K. Schuller, Department of Physics, University of Minnesota, Minneapolis, MN; Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN; Institut Catala de Recerca Estudis Avanats (ICREA) and Departament de Fisica, Universitat Autonoma de Barcelona, Bellaterra, SPAIN, Department of Physics, University of California-San Diego, La Jolla, CA.

9:00 AM *Q7.2

EXCHANGE BIAS AND COERCIVITY. M.D. Stiles, and R.D. McMichael, National Institute of Standards and Technology, Gaithersburg, MD.

9:30 AM *Q7.3

EXCHANGE BIAS STUDIES WITH MAGNETIC DICHROISM. Boris Sinkovic, Univ of Connecticut, Storrs, CT.

10:00 AM BREAK

10:30 AM *Q7.4

SIMULATIONS OF THE DOMAIN STATE MODEL. U. Novak, A. Marra and K.D. Usadel, Institute for Physics, Gerhard-Mercator University Duisburg, Duisburg, GERMANY.

11:00 AM *Q7.5

EFFECT OF ANISOTROPY ON THE CRITICAL ANTIFERROMAGNET THICKNESS IN EXCHANGE BIASED LAYERS. M.S. Lund, Dept. of Chemical Engineering and Material Science, University of Minnesota, Minneapolis, MN; W.A.A. Macedo, Physics Department, University of California-San Diego, La Jolla, CA; Kui Liu, Department of Physics, University of California-Davis, Davis, CA; J. Nogues, Inst Catla de Recerca Estudis Avanats (ICREA) and Departament de Fisica, Universitat Autonoma de Barcelona, Bellaterra, SPAIN; Ivan K. Schuller, Physics Department, University of California-San Diego, La Jolla, CA; C. Leigheben, Dept. of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN.

11:15 AM *Q7.6

EXCHANGE BIAS AND TRAINING EFFECT IN POLYCRYSTALLINE ANTIFERROMAGNETIC/FERROMAGNETIC LAYERS. D. Saee, T. Schrefl, J. Feidler, Vienna University of Technology, AUSTRIA, R.L. Stamps, J.V. Kim, University of Western Australia, Crawley, AUSTRALIA.

11:30 AM *Q7.7

ROTATING ANISOTROPIES WITHOUT SUPERPARAMAGNETIC GRAINS IN EXCHANGE BIAS SYSTEMS. Thomas C. Schrefl, Oak Ridge National Laboratory, Computer Science and Mathematics Division and Center for Computational Sciences, Oak Ridge, TN.

11:45 AM *Q7.8

EXCHANGE BIAS FLOP IN EPITAXIAL FeF$_{3}$/Co LAYERS. Hongtao Shi, David Lederman, Physics Department, West Virginia University, Morgantown, WV.