

Final Project Report: DE-FG02-08ER46551

Joint International Conference:
Nanoscale Spectroscopy and Nanotechnology 5/
Spin-Polarized Scanning Tunneling Microscopy 2

Investigator
Ohio University (educational, non-profit institution)
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Funding Provided by DOE:
\$7,000

Project Duration:
6 months: 07/15/2008 – 01/14/2009

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Conference Event Summary

The NSS5/SP-STM2 conference was held in Athens, Ohio July 15-19, 2008. The conference brought together a prestigious group of scientists from all over the globe to focus for 3 ½ days on a variety of nanoscience topics, particularly on nanoscale spectroscopy and spin-polarized scanning tunneling microscopy.

The conference was attended by many young scientists as well as senior scientists. Attendees to the conference were drawn from more than 10 countries and included 28 invited speakers, who are the leading scientists in their respective research areas. Included among the invited speakers were 4 plenary speakers - eminent scientists in their fields. The conference was divided into two parallel sessions – the NSS5 session and the SP-STM2 session. The detailed conference program is attached to this report.

The conference kicked off with an informal reception at Ohio University's new Baker University Center Ballroom. The second full day was also concluded with a formal welcome dinner at which there were some introductory speeches including one by Ohio University Executive Vice President and Provost Kathy Krendl.

Conference coordinator Ms. Mala Braslavsky was key to making the event a smoothly running success from start to finish. As the event approached, two additional staff plus graduate students were brought on board to ensure that every facet of the event was carried out without any problem. The conference booklet itself was professionally-designed and presented to the attendees in high resolution color due to the high graphical content contained in the abstracts submitted.

The conference technical sessions were lively forums of scientific presentation and discussion by the world-class scientists present, many of whom represent the top of the field in nanoscale spectroscopy and spin-polarized STM.

A conference outing/networking opportunity took place on the 3rd day of the event in the afternoon, and a formal conference banquet was held on the eve of the final day which included the final plenary lecture. On the occasion of the conference networking outing, a professional group picture was taken by the Ohio University photographer.

At the end of the event, many of the attendees praised the smooth running of the well-organized conference. The success of the conference inspires us to consider hosting more conferences at Ohio University in the future.

Invited Speaker List

The conference included 28 invited talks from many well-known and top-of-their-field scientists in nanoscale spectroscopy and spin-polarized STM. Following is a list of the invited speakers with plenary speakers in **bold**:

Alex Otte	(NIST, USA)	Kiyoshi Kanisawa	(NTT, Japan)
Axel Hoffmann	(ANL, USA)	Klaus Ensslin	(ETH, Zurich, Switzerland)
ChunLei Gao	(MPI, Halle, Germany)	Maki Kawai	(RIKEN, Japan)
Cristina Africh	(ELETTRA, Trieste, Italy)	Paul S. Weiss	(Penn State Univ, USA)
David Keavney	(ANL, USA)	Peter W. Sutter	(BNL, USA)
Dirk Sander	(MPI, Halle, Germany)	Randy Feenstra	(Carnegie Mellon, USA)
Gerhard Meyer	(IBM, Zurich, Switzerland)	Roland Wiesendanger	(Hamburg, Germany)
Giridhar U. Kulkarni	(JNCASR, India)	Stefan Bluegel	(Julich, Germany)
Hiroki Hibino	(NTT, Japan)	Stefan Krause	(Hamburg, Germany)
Ignacio Pascual	(FU Berlin, Germany)	Talat S. Rahman	(Central Florida Univ, USA)
Igor V. Shvets	(Trinity College, Ireland)	Timofey Balashov	(Karlsruhe, Germany)
Jacek Prokop	(MPI, Halle, Germany)	Tomohiro Matsushita	(SPRING 8, Japan)
Jong Sou Park	(KAU, Soul, Korea)	Toshihisa TOMIE	(AIST, Japan)
Karl-Heinz Rieder	(EMPA, Switzerland)	Victor Brar	(UC Berkeley, USA)

Contributed Presentations

In total, there were 37 contributed oral presentations as well as 36 contributed poster presentations.

Benefit to Attendees

The NSS-5/SP-STM2 joint international conference brought together the latest research in the topics covered by the event, as presented by some of the most famous and successful scientists in these fields. Attendees greatly benefited by hearing the latest in both experimental and theoretical work in the fields of STM/electron/photon spectroscopy of nanostructures as well as spin-polarized scanning tunneling microscopy. Many young scientists at Ohio University, as well as throughout the U.S. and abroad, were especially well-benefited by the access to the renowned international group.

Press Received

The conference was covered thoroughly by the local press. And stories about the conference are posted at the Ohio University *Outlook* website – see <http://www.ohio.edu/outlook/07-08/July/637.cfm> and at the Nanoscale & Quantum Phenomena Institute website – see <http://www.ounqpi.org/international-conference>.

Scientific Conference Outlook

The conference was highly successful as judged by the attendees and by the decisions to continue both series (NSS and SP-STM) of conferences. It was decided to hold the next NSS conference (NSS-6) in Japan in 2010. And it has been settled that the next SP-STM (SP-STM-3) will be held in South Korea, also in 2010.

Thanks to the DOE

The support of the DOE made it possible to hold this focused joint international conference event, which by the words of the very attendees themselves was a notable success. Many young scientists, both from the U.S. and abroad, attended the event, as well as senior people without whom the conference would not have been at the highest level which it was. The DOE funds were put to very good use, including supporting the following areas (note: no funds were used to support food/drink costs):

Young scientist registration \$ 2,000.00

Transportation \$ 1,900.00
(from Columbus airport to Athens, Ohio)

Travel support for invited speakers:

A. Otto (young scientist) \$ 387.85
T.S. Rahman (female scientist) \$ 452.00

Lodging support for conference attendees \$2,198.56

Total Funds Utilized: **\$ 6,938.41**

Conference Photo



Session A: July 15 - 16

Plenary Lectures (both sessions, at theater)	Invited Lectures 40 Minutes	Breaks
15 July (Tuesday)	Reception 5 to 7 pm	Ballroom / Baker Center
16 July (Wednesday)	Early registration	Theater / Baker Center
7:00	Registration	
8:00	Opening remarks by chairs: Saw-Wai Hla, Arthur R. Smith	
8:10 P.S. Weiss	Designing, measuring and controlling molecular- and supramolecular-scale properties for molecular devices (Chair: S.-W. Hla)	
8:55 BREAK		
Session A1	Synchrotron Applications to Nanostructures	(Chair: A. Hoffmann)
9:00 T. Tomie	Top surface analysis of nanomaterials by EUV photoelectron spectroscopy, EUPS	
9:40 T. Matsushita	Single-energy electron holography for analysis of atomic arrangements	
10:20 COFFEE	Sponsored by Omicron Nanotechnology	
Session A2	Carbon Based Nanostructures I	(Chair: N. Sandler)
10:50 P. Sutter	Metal catalyzed sp^2 bonded carbon assemblies- from nanoscale pipettes to macroscopic graphene sheets	
11:30 H. Hibino	Number of layers dependence of electronic properties of epitaxial graphene investigated by SPELEEM	
12:10	LUNCH	
Session A3	Semiconductor Nanostructures	(Chair: S. Heun)
2:00 R.M. Feenstra	Transport of carriers in semiconductors probed by scanning tunneling spectroscopy	
2:40 K. Kanisawa	Imaging surface states bound to native donors at the epitaxial InAs surface	
3:20 COFFEE		
Session A4	Scanning Probe Spectroscopies	(Chair: I. Pascual)
3:50 M. Passoni	Progress in understanding scanning tunneling spectroscopy	
4:10 Y.H. Liu	Nanoscale electronic inhomogeneity and periodic charge order in a high-temperature superconductor Bi2212	
4:30 O. Kurnosikov	Scanning tunneling spectroscopy of near-surface nanoobjects in metals	
4:50 L.A. Bumm	Broadband near-field interference spectroscopy of flat gold nanoparticles	
Poster Viewing		Rooms: 230, 233, 235
5:10		
6:00 Welcome Dinner		Ballroom / Baker Center
Music: Classical Piano by Richard Syracuse		
Complementary drinks and a cash bar, sponsored by SPECS Scientific Instruments		
7:00 Provost Kathy Krendl Welcome Message		
Poster Viewing		Rooms: 230, 233, 235
7:30		
8:30		

***** Exploring Athens Uptown

Session B: July 15 - 16

Plenary Lectures (both sessions, at theater)	Invited Lectures 40 Minutes	Breaks
15 July (Tuesday)	Reception Early registration	5 to 7 pm
16 July (Wednesday)		Theater / Baker Center
7:00	Registration	
8:00	Opening remarks by chairs: Saw-Wai Hla, Arthur R. Smith	
8:10 P.S. Weiss	Designing, measuring and controlling molecular- (Chair: S.-W. Hla) and supramolecular-scale properties for molecular devices	
8:55 BREAK		
Session B1	Magnetic Excitations	(Chair: M. Bode) 240/242 Room
9:00 S. Krause	Current-Induced magnetization switching with a spin-polarized scanning tunneling microscope	
9:40 T. Balashov	Magnetic excitations in thin films and atomic clusters probed by inelastic scanning tunneling spectroscopy	
10:20 COFFEE	<i>Sponsored by Omicron Nanotechnology</i>	
Session B2	SP-STM Techniques	(Chair: D. Sander)
10:50 A. L. Bassi	Bulk Cr tips for spin-polarized scanning tunneling microscopy	
11:10 M. Gyamfi	A new scanning tunneling microscope for spin-sensitive measurements in a fully rotatable magnetic field	
11:30 I. V. Chvets	Tunneling through STM tip with transition metal termination	
12:10	LUNCH	
Session B3	SP-STM Theory	(Chair: T.S. Rahman)
2:00 S. Heinze	New playground to observe complex magnetism at surfaces by SP-STM	
2:20 M. Wasniowska	Evolution of the electronic state of Fe on Pd(111): experiment and theory	
2:40 S. Blügel	Homochiral magnetic structures at surfaces	
3:20 COFFEE		
Session B4	Atom/Molecule Manipulation-I	(Chair: R. Wiesendanger)
3:50 G. Meyer	Scanning probe microscopy of adsorbates on insulating films: first steps towards a modular molecular logic	
4:30 G. Goryl	Atomic scale interconnects between PTCDA molecules and metallic nanowires assembled on KBr covered InSb(001)	
4:50 M. Parschau	Electron-induced manipulation, vibrational excitation and chemistry of single molecules at surfaces	
Poster Viewing		Rooms: 230, 233, 235
5:10		
6:00 Welcome Dinner		Ballroom / Baker Center
Music: Classical Piano by Richard Syracuse		
Complementary drinks and a cash bar, sponsored by SPECS Scientific Instruments		
7:00 Provost Kathy Krendl Welcome Message		
Poster Viewing		Rooms: 230, 233, 235
7:30		
8:30		

***** **Exploring Athens Uptown**

Session A July 17

17 July (Thursday)

Theater / Baker Center

8:10 R. Wiesendanger Oscillatory magnetic exchange coupling at the atomic level: (Chair:
a direct real-space study by a subkelvin spin-polarized STM) (A.R. Smith)

8:55 BREAK

Session A5

Low Dimensional Quantum Structures

(Chair: R.M. Feenstra)

9:00 K. Ensslin

Electrons in quantum dots - one by one

9:40 S. Heun

Surface compositional profiles of InAs/GaAs quantum rings

10:00 E. Stinaff

Optical spectroscopy of excitons in coupled quantum dots

10:20 COFFEE

Session A6

Carbon Based Nanostructures II

(Chair: P. Sutter)

10:50 C.H. Chen

Local electronic structure of laser modified carbon nanotubes

11:30 A. Hassanien

STM on functionalized carbon nanotubes and nanobuds

11:50 L. Chen

Scanning probe studies on dielectric responses of individual
single-walled carbon nanotubes

12:10

LUNCH

Session A7

Carbon Based Nanostructures III

(Chair: H. Hibino)

1:30 M. Zarea

Physics of graphene nano-ribbons

1:50 H. Golastaniyan

Prediction of optimum diameter of single-wall carbon
nanotube tori by finite element simulation

3:00 Buses Depart from Baker Center

SOCIAL (Conference Picnic) and TECUMSEH! Show

Session B July 17

17 July (Thursday)

8:10 R. Wiesendanger Oscillatory magnetic exchange coupling at the atomic level: a direct real-space study by a subkelvin spin-polarized STM

Theater / Baker Center
(Chair: A.R. Smith)

8:55 BREAK

Session B5 **Magnetic Film on Non-magnetic Materials** (Chair: S. Blügel) Room 240/242
9:00 M. Bode Structure and magnetism of ultra-thin chromium layers on W(110)
9:20 S. Meckler Bloch- or Neel-like walls in Fe double-layer nanowires ?
9:40 J. Prokop Magnetic coupling in Au - Fe/Mo(110) nanostructures

10:20 COFFEE

Session B6 **Spins** (Chair: T. Balashov)
10:50 A. Schwarz MExFM – a force based spin-sensitive method
11:10 D. Lee STM studies of spin-spin interactions between Mn acceptors in p-type GaAs
11:30 C.L. Gao Investigation of antiferromagnetic thin films with scanning tunneling microscopy: from statics to dynamics

12:10

LUNCH

Session B7 **Kondo Physics** (Chair: S.E. Ulloa)
1:30 A. Otte The anisotropic splitting of a Kondo peak
2:10 L.D. da Silva Conductance Fano lineshapes for Kondo impurities on surfaces:
A numerical renormalization-group description

**3:00 Buses Depart from Baker Center
SOCIAL (Conference Picnic) and TECUMSEH! Show**

Session A: July 18 -19

18 July (Friday)

9:10 M. Kawai	Inelastic electron tunneling spectroscopy of single molecules using STM	Theater / Baker Center (Chair: K.-H. Rieder)
9:55 BREAK		
Session A8	Magnetic Nanostructures	(Chair: T. Tomie)
10:00 D. Keavney	Imaging magnetization dynamics using synchrotron-based magnetic microscopy	
10:40 A. Hoffmann	Pure spin currents in lateral spin-valves	
11:20 COFFEE		
Session A9	Molecular Nanoscience	(Chair: M. Kawai)
11:50 I. Pascual	Electron induced heating and cooling of a C60 molecular junction	
12:30 N. Levy	Self-patterned molecular photoswitching in nanoscale surface assemblies	
12:50 G. Perera	A molecular switch made of charge transfer complexes on Au(111)	
1:10	LUNCH	
Session A10	Nanoreaction and Growth	(Chair: L. Chen)
3:00 C. Africh	Dynamics of surface reactions studied by STM	
3:40 C.S. Casari	Pd cluster nucleation mechanisms on Au(111)	
4:00 I. Braslavsky	The control of growth and melt of ice crystals by ice binding proteins	
4:20 COFFEE		
Session A11	Nanoscale and Quantum Phenomena	(Chair: I. Braslavsky)
4:50 S. Kaya	Nanocircuits for Sensors and On-Chip Analog Signal Processing	
5:10 W.J. Jadwisienczak	Spectroscopy of III-Nitride low dimensional quantum structures implanted with lanthanides for optoelectronic applications	
5:30 S. Jungpil	Anisotropic dipolar interactions in ordered Fe nanodot arrays	
Poster Viewing	Rooms: 230, 233, 235	
6:00		
7:00		
7:30 Conference BANQUET	Rotunda, Walter Hall	
Music: Harp by Wenda Williamson		
8:30 K.-H. Rieder	Seeing and doing: The STM as an imaging and operative tool	
(After Dinner Lecture)		

19 July (Saturday)

8:00 BREAKFAST		
9:00 J.S. Park		
Session A+B 12	Nanotechnology Applications (Combined Session)	
9:40 G. U. Kulkarni	Wireless sensor network data mining by using particle swarm optimization for nanorobot	(Chair: N. Yamamoto)
Fabrication of Raman Biochip		
10:20 Discussions and comments		
10:40 Welcome message by the next conference chairs (NSS-6 and SP-STM-3)		
11:00 Ending remarks by the NSS-5 and SP-STM2 chairs.		

Session B: July 18 -19

18 July (Friday)

9:10 M. Kawai	Inelastic electron tunneling spectroscopy of single molecules using STM	Theater / Baker Center (Chair: K.-H. Rieder)
9:55 BREAK		
Session B8	Atom/Molecule Manipulation-II	(Chair: G. Meyer) Room 240/242
10:00 T.S. Rahman	Microscopic processes responsible for the diffusion of Cu/Ag adatom islands on Ag(111)/Cu(111): insights from theory	
10:40 E. Zupanič	LT-STM manipulation and spectroscopy of single copper and cobalt atoms	
11:00 S. Godlewski	LT-STM imaging and controlled manipulation of single Violet Lander (VL) molecules assembled on clean and KBr covered InSb surface	
11:20 COFFEE		
Session B9	Atom/Molecule Manipulation-III	(Chair: S. Kaya)
11:50 C. Sykes	A Quantitative Single-Molecule Analysis of Thioether Rotors	
12:10 R. Yamachika	Bottom-up creation of hybrid organic-inorganic magnetic molecules with a STM	
12:30 T. Choi	STM studies of transport through single azobenzene molecules	
12:50 T. Skeini	Single Molecule Investigation of β -Carotene on Au(111) with STM	
1:10		
LUNCH		
Session B10	Nanomagnetism	(Chair: E. Stinaff)
3:00 D. Sander	Electron confinement and magnetic properties of Co nanoislands studied by in-field low temperature spin-STM	
3:40 R. Mishima	Scanning tunneling microscopy and spectroscopy of Mn alloys on Au(111)	
4:00 V. Brar	Studying exchange coupling behavior of individual magnetic adatoms with spin-polarized STM	
4:20 COFFEE		
Session B11	Nano Instrumentation	(Chair: I. V. Shvets)
4:50 A.-P Li	Study of electronic property of epitaxial silicide nanowires with a cryogenic quadraprobe scanning tunneling microscope	
5:10 M. Maier	Qplus AFM on single crystal insulators with small oscillation amplitudes at 5K	
5:30 S. Suzuki	Energy tunable X-ray induced force change between a NC-AFM tip and a surface	
Poster Viewing		Rooms: 230, 233, 235
6:00		
7:00		
7:30 Conference BANQUET		Rotunda, Walter Hall
	Music: Harp by Wenda Williamson	
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