

Dr. Franck Rose

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- PERSONAL** French Citizen
Married, 32
- EDUCATION** **UNIVERSITÉ PIERRE ET MARIE CURIE PARIS VI, FRANCE**
PhD in Condensed Matter Physics, 2000.
Master in Condensed Matter Physics, 1997.
- AWARDS & HONORS** Japan Society for the Promotion of Science Fellowship for Foreigners, 2004-2006.
European Community Marie Curie Fellowship, 2001-2002.
French Ministry of Research Doctoral Scholarship, 1997-2000.
- RESEARCH RECORD** **UNIVERSITY OF TOKYO, INSTITUTE OF INDUSTRIAL SCIENCE (IIS), TOKYO, JAPAN**
NC-AFM true atomic resolution/MEMS-AFM for sensing and lithography
2004-2006, JSPS Postdoctoral Fellow. Advisor, **Prof. Dr. H. Kawakatsu**.
Laboratory for Integrated Micro Mechatronic Systems (LIMMS),
Centre National de la Recherche Scientifique (CNRS).
- UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN (UIUC), ILLINOIS, USA**
Spin Interactions and Spin Dynamics in Electronic Nanostructures
2002-2003, Visiting Research Assistant Professor. Advisor, **Prof. Dr. A. Yazdani**.
Physics Seitz Material Research Laboratory & Loomis Laboratory of Physics.
- FREIE UNIVERSITÄT (FU) & PAUL-DRUDE-INSTITUT (PDI), BERLIN, GERMANY**
Building and Installation of a New STM Laboratory
2000-2002, Marie Curie Fellow. Advisor, **Dr. G. Meyer**.
FU Department of Physics, Prof. Dr. K.-H. Rieder's group, & PDI Nano-Acoustics group.
- CNRS & UNIVERSITÉ PARIS-SUD (PARIS XI), ORSAY, FRANCE**
● **Manipulation of Individual Atoms and Molecules with the STM**
1997-2000, PhD Student. Advisor, **Dr. G. Dujardin**.
Laboratoire de Photophysique Moléculaire (LPPM).
● **Synchrotron Radiation Experiment on Ge(111)-c(2×8):H at Super-ACO**
1998, PhD Student. Advisor, **Dr. G. Dujardin**.
Laboratoire pour l'Utilisation du Rayonnement Electromagnétique (LURE).
● **Atom manipulation on the Ge(111)-c(2×8) surface studied with the RT-UHV STM**
1996-1997, Undergraduate Honor Thesis. Advisor, **Dr. G. Dujardin**.
Laboratoire de Photophysique Moléculaire (LPPM).
- UNIVERSITÉ PIERRE ET MARIE CURIE PARIS VI, FRANCE**
Non ergodic evolution of the dielectric constant in dipolar glasses of $K_{1-x}Li_xTaO_3$.
1996, Undergraduate Student. Advisor, **Prof. Dr. P. Doussineau**.
Laboratoire d'Optique et d'Acoustique de la Matière Condensée.

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ACADEMIC ACTIVITIES

ORGANIZER & SESSION CHAIR, *BIO NANO ROBO SEMINAR SERIES*

2005-2006 (monthly) University of Tokyo, Japan.

URL: <http://toshi.fujita3.iis.u-tokyo.ac.jp/limms/>

Among many distinguished speakers: **S.Iijima**, inventor of carbon nanotubes,
A.Fujishima, inventor of photocatalysis, **N.Hirokawa**, inventor of molecular motors,
H.Sakaki, inventor of quantum dots, and **T.Ohtsu**, inventor of nanophotonics.

Past: Organizing Activities

Co-organizer, European Community Marie Curie Workshop, Berlin, Germany (2001).

Session chair, TMR network Atom/Molecular Manipulation, Berlin, Germany (2000).

DEPARTMENTAL & UNIVERSITY SERVICE

TEACHING ASSISTANT (ORSAY)

- Quantum Mechanics and Atomic Theory, Physics Department (1999-2000).
- Numerical Methods, Chemistry Department (1999-2000).
- Microsoft Office, Chemistry Department (1999-2000).

RESEARCH HIGHLIGHTS

CURRENT RESEARCH PROJECTS WITH LIMMS

- NC-AFM true atomic resolution of GaAs(100), AlNiCo Quasi-crystals, and HOPG nanosheets (2005-2006).
- Fabrication of HOPG cantilevers, bridges, and membranes (2005-2006).
- AFM investigations of DNA and microtubules adsorption on HOPG (2005-2006).
- FIB micropatterning of HOPG/Si heterostructures for DNA biosensors (2005-2006).
- FIB-created ripples on HOPG, Si, GaAs, and CaF₂ (2005-2006).
- FIB-synthesized nanolaces on suspended HOPG nanosheets (2005-2006).
- NC-AFM, STS, STM, and Adsorption studies (H, O₂) of coexisting Si(111)-c2×8, -7×7, and -2×1 reconstructions (2005).
- Positively used stiction for precise lateral displacement, alignment, and locking of self-assembled micro-cantilevers (2004-2005).
- Single atom mass sensors (2004-2006).

PREVIOUS ACHIEVEMENTS (STM)

- STM lateral manipulation of magnetic atoms (Mn) on GaAs(110) at 4K (2002).
- Molecular Manipulations with the LT- STM: Nanotube/Au(111) (2002).
- Atomic Manipulations with the LT- STM: Xe and Cu/Cu(211) (2001).
- Controlled and reproducible method for STM induced desorption of individual hydrogen atoms on the Ge(111) (2001).
- Use of STM manipulations to understand the electronic properties and configurations (Silicate type) of oxygen adsorbates on Si(111) (2001).
- Hydrogen adsorption was found to modify, at the atomic level, the work function of the Ge(111) surface (2001).
- STM made individual active sites can trigger an oxidation chain reaction on the Ge(111) surface (1999).
- Demonstration of a new method for vertical manipulation of individual atoms on the Ge(111) surface, namely that of direct STM tip-surface contact (1998).

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TECHNICAL REALIZATIONS

CONSTRUCTION & SET UP OF A STM LABORATORY (PDI)

- Complete room installation.
- Fully designed constructed and tested 4K UHV STM system.
- Purchase, installation, and test of scientific equipments.

SCANNING TUNNELING MICROSCOPY (STM)

- Fully designed and constructed systems: Dr. G.Meyer-type STM, 4K, UHV (marketed by VTS-Createc). Prof. Dr. R.Wiesendanger/Dr. Pan-type STM, RT, in air, with ESR system (Prof. Dr. M.Welland type-ESR-STM: electron-spin resonance).
- Modified system: Dr. D.Eigler-type STM, 4K, UHV.
- Installed tested and operated system: Omicron VT-STM, RT-25K, UHV.
- Operated systems: Prof. Dr. W.Ho-type STM, 4K, UHV. Omicron STM1, RT, UHV.
- Tip preparation (W, Au, PtIr), etching in NaOH/C₃H₈O₃.

TECHNICAL SKILLS

SCANNING PROBE MICROSCOPIES (SPM)

- Non-Contact Atomic Force Microscopy (NC-AFM: JEOL).
- Atomic Force Microscopy (AFM: JEOL, Digital Instruments).
- Field Emission Scanning Electron Microscope (FE-SEM: JEOL, Hitachi).
- Focused Ion Beam (FIB: Hitachi).
- Synchrotron Source Facility, LURE: UV Photoelectron Spectroscopy (UPS), Near-Edge X-Ray Adsorption Fine Structure (NEXAFS), and Photon Stimulated Desorption (PSD).

CLEAN ROOM MICROFABRICATION

- Photolithography.
- Deep Reactive Ion Etching, Chemical Etching.
- Electron Beam Draw.
- Soft-lithography (PDMS stamping).

SURFACE SCIENCE

- Semiconductors: Ge(111), Si(111)&(110), GaAs(110)&(100), SiC(111), HOPG.
- Magnetic heterostructures, quantum dots, δ dopant in III/V.
- Metals: Cu(211) & (100) & (111), Au(111), Ag(110), NiAl(110).
- High-T_c superconductors: Bi₂Sr₂CaCu₂O_x.
- Quasi-crystals: AlNiCo.
- Nanotubes: single-wall carbon nanotube, carbon peapods.

BIOLOGICAL SAMPLES

- λ -Phage DNA.
- Microtubules.
- Cells.

LT-UHV SYSTEMS

- Surface Techniques: LEED, Auger, Ionic Sputtering, Adsorption.
- Chemical preparation of surfaces & Cleavage of wafers for UHV purpose.
- Ultra High Vacuum (UHV 10⁻¹¹ T), Turbo & Ionic Pumps.
- Low Temperature (LT), Liquid Helium & Hydrogen, Cryostat.

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TALKS

& POSTERS WITH LIMMS

NATIONAL & INTERNATIONAL CONFERENCES

- F.Rose, S.Kawai, T.Ishii, and H.Kawakatsu
Poster presentation: "NC-AFM, STS, and adsorption studies on Si(111)-c(2×8)",
Japan Nano 2006, Tokyo, Japan.
- P.Martin, F.Rose, and H.Kawakatsu
Poster presentation: "Focused Ion Beam patterning of Si/HOPG heterostructures
and its application to nanobiology", Japan Nano 2006, Tokyo, Japan.
- P.Martin, F.Rose, F.Morin, H.Fujita and H.Kawakatsu
Poster presentation: "FIB-created HOPG/SiO₂ heterostructures for auto-assembled
and suspended DNA", International Conference on Microtechnologies in Medicine
and Biology (MMB2006), Okinawa, Japan.
- F.Rose, S.Kawai, T.Ishii, and H.Kawakatsu
Oral presentation: "NC-AFM and STM study of coexisting Si(111)-c(2×8), 2×1,
and 7×7", International Symposium on Surface Science and Nanotechnology
(ISSS-4, 2005), Tokyo, Japan.
- M.Hattori, D.Kobayashi, F.Rose, A.Higo, H.Toshiyoshi, H.Fujita, and H. Kawakatsu
Poster presentation: "A new fabrication method of small cantilevers", 12th
International Colloquium on Scanning Probe Microscopy, 2004, Attagawa, Japan.

INVITED TALKS

SEMINARS & COLLOQUIUMS AT UNIVERSITIES AND RESEARCH INSTITUTIONS

- IAMS, Academia Sinica, Taipei, Taiwan (2006).
Manchester University, Manchester, UK (2004).
Queen's University, Belfast, Northern Ireland (2004).
University of Neuchatel, Neuchatel, Switzerland (2004).
University of Illinois, Urbana-Champaign, USA (2002).
University of Cambridge, Cambridge, UK (2002).
Paul-Drude-Institut, Berlin, Germany (2001).
Freie Universität, Berlin, Germany (2001).
German Ministry of Research, Berlin, Germany (2001).
National Research Council Canada, Ottawa, Canada (2001).
Pennsylvania State University, University Park, Pennsylvania, USA (2001).
IBM Research Division, Zurich, Switzerland (2000).
Fritz-Haber Institute, Berlin, Germany (2000).
Centre National de la Recherche Scientifique (CNRS), Paris, France (1997-2000).
LPPM, Université Paris-Sud, Orsay, France (1997-2000).
Ecole de Physique des Houches, Les Houches, France (1998).
Ecole Supérieur de Physique Chimie Industrielle (ESPCI), Paris, France (1997).

TALKS

NATIONAL & INTERNATIONAL CONFERENCES

- European Community Marie Curie Workshop, Berlin, Germany (2001).
TMR network Atom/Molecular Manipulation, Berlin Germany (2000).
TMR network Atom/Molecular Manipulation, Toulouse, France (1999).
Congrès Général de la Société Française de Physique, Clermont-Ferrand, France (1999).
TMR network Atom/Molecular Manipulation, Paris, France (1998).

POSTERS

NATIONAL CONFERENCES

- ISARD, LAL, Orsay (1999).
Journées Surfaces Interfaces, LAL, Paris (1999).
Journées Surfaces Interfaces, ESPCI, Paris (1998).
Interaction des Surfaces avec les Ions, les Atomes, et les Molécules, Bombannes (1998).

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- PUBLICATIONS**
- F.Rose, P.Martin, and H.Kawakatsu
DNA-templated fractal self-assembly and directed synthesis of NaCl nanocrystals
Submitted to NanoLetters (2006)
- F.Rose, A.Debray, P.Martin, H.Fujita, and H.Kawakatsu
Suspended HOPG nanosheets for HOPG nanoresonators engineering and new carbon nanostructures synthesis
Submitted to Nanotechnology (2006)
- F.Rose, S.Kawai, T. Ishii, and H.Kawakatsu
Scanning Tunneling Spectroscopy and Topography of Si(111)-c(2×8) and Coexisting 7×7 and 2×1 Reconstructions: Surface Electronic Band Structure
Physical Review B **73**, 045309 (2006)
- F.Rose, S.Kawai, and H.Kawakatsu
Low Reactivity of Molecular Oxygen with Si(111)-c(2×8)
Surface Science **600**, 106 (2006)
- S.Kawai, F.Rose, and H.Kawakatsu
Atomically Resolved Observation of the Quenched Si(111) Surface with Small Amplitude Dynamic Force Microscopy
Journal of Applied Physics **99**, 104312(2006)
- F.Rose, P.Martin, H.Fujita, and H.Kawakatsu
Adsorption and Combing of DNA on HOPG Surfaces of Bulk Crystals and Nanosheets: Application to the Bridging of DNA between HOPG/Si Heterostructures
Nanotechnology **17**, 3325 (2006)
- F.Rose, M.Hattori, D.Kobayashi, H.Toshiyoshi, H.Fujita, and H.Kawakatsu
Application of Capillarity Forces and Stiction for Lateral Displacement, Alignment, Suspension, and Locking of Self-Assembled Microcantilevers
Journal of Micromechanics and Microengineering **16**, 2077 (2006)
- P.Martin, F.Rose, F.Morin, H.Fujita and H.Kawakatsu
FIB-created HOPG/SiO₂ Heterostructures for Adsorbed and Suspended DNA
IEEE Technical Digest of International Conference on Microtechnologies in Medicine and Biology (MMB2006) Okinawa, Japan, 173 (2006)
- H.Kawakatsu, S.Kawai, D.Kobayashi, M.Hattori, S.Nishida, F.Rose, S.Kitamura, S.Meguro
Atomic Force Microscopy Utilizing Sub-Angstrom Cantilever Amplitudes
Seisan-Kenkyu, **58**(2), 93 (2006) Cover Story
- Y.A.Chapuis, F.Rose, and A.Debray
Self-Assembly and Surface Science Techniques Used in MEMS/NEMS Fabrication
Book Chapter to be Published in "MEMS and its Material Technologies", edited by M. Ichiki, *Research Signpost*, Trivandrum, Kerala, India (2006)

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PUBLICATIONS (CONTINUED)

- F.Rose, T.Ishii, S.Kawai, and H.Kawakatsu
Non-Contact Atomic Force Microscopy and Scanning Tunneling Microscopy of
Coexisting Reconstructions on Si(111)
e-Journal of Surface Science and Nanotechnology **3**, 258 (2005)
- A.J.Mayne, F.Rose, G.Comtet, L.Hellner and G.Dujardin
Variable Temperature STM Studies of the Adsorption of Oxygen on the
Si(111)-7×7 surface
Surface Science **528**, 132 (2003)
- A.J.Mayne, F.Rose, and G.Dujardin
An STM Study of the Growth Behavior of the Oxidation of the Ge(111) Surface
Surface Science **523**, 157 (2003)
- G.Dujardin, A.J.Mayne, and F.Rose
Temperature Control of Electronic Channels Through a Single Atom
Physical Review Letters **89** (3) 036802 (2002)
- A.J.Mayne, F.Rose, C.Bolis, and G.Dujardin
An Scanning Tunneling Microscopy Study of the Diffusion of a Single or a Pair of
Atomic Vacancies,
Surface Science **486** (3), 226 (2001)
- G.Dujardin, F.Rose, J.Tribollet and A.J.Mayne
Inelastic Transport of Tunnel and Field Emitted Electrons Through a Single Atom
Physical Review B **63**, 081305 (R) (2001)
- G.Dujardin, F.Rose, and A.J.Mayne
Toggling the Local Surface Work Function by Pinning Individual Promoter Atoms
Physical Review B **63**, 235414 (2001)
- A.J.Mayne, F.Rose, and G.Dujardin
Inelastic Interactions of Tunnel Electrons with Surfaces
Faraday Discussions **117**, 241 (2000)
- G.Dujardin, A.J.Mayne, and F.Rose,
Surface Molecular Chain Reaction Initiated at STM-Made Individual Active Sites
Physical Review Letters **82** (17), 3448 (1999)
- G.Dujardin, A.J.Mayne, O.Robert, F.Rose, C.Joachim, and H.Tang
Vertical Manipulation of Individual Atoms by a Direct STM Tip-Surface Contact
on the Ge(111) Surface
Physical Review Letter **80** (14), 3085 (1998).

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PUBLICATIONS (CONTINUED)

G.Dujardin, A.J.Mayne, and F.Rose
Handling the Atom
Seeds of Science: Advances of Science, 92 (1999)

G.Dujardin, A.J.Mayne, and F.Rose
Manipuler l'Atome
Plein Sud Spécial Recherche 1999, 74 (1999)

Collaborations to:

Pour la Science, Science et Vie Junior, Sciences et Avenir Hors-série (1999-2001)

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REFEREES

Dr. Christian Bergaud

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31077 Toulouse Cedex 4, France.
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URL: <http://www2.laas.fr/laas/>

Dr. Gerald Dujardin

Laboratoire de Photophysique Moleculaire, Batiment 210, Université Paris-Sud 91405
Orsay Cedex, France.
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Prof. Dr. Hiroyuki Fujita

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Dr Christian Joachim

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Prof. Dr. Bruno Le Pioufle

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Dr. Gerhard Meyer

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