Adrian Bachtold

Contact

Centro de investigación en nanociencia y nanotecnología (CSIC-ICN)
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Education

University of Basel (Switzerland), Ph.D. Physics Summa Cum Laude	June 1999
Ecole Polytechnique Fédérale de Lausanne (Switzerland), Dipl. Ing. EPFL,	March 1996

Experience and employment

Professor of CSIC at the Centro de investigación en nanociencia y nanotecnología (CSIC-ICN) in Barcelona.	2005-present
Principal investigator of the Quantum NanoElectronics group.	2005-present
Chargé de recherche CNRS (permanent position) at the Ecole Normale Supérieure in Paris	2001-2004
Post doctoral Research, Delft university of technology	2000-2001
Post doctoral Research, University of California at Berkeley	1999-2000
PhD Research and Teaching Fellow, University of Basel	1996-1999

Awards and Honours

EURYI award (2005)

Bronze Medal of the CNRS (2004)

First author of one of the five papers on molecular electronics considered by Science as the scientific breakthrough of the year (2001)

IBM award of the Swiss Physical Society (2000)

Research Field

Nanophysics, quantum transport
Novel fabrication techniques at the nanometer scale
Carbon nanotubes, graphene
Electron transport at helium temperatures in nanostructures contacted by electrodes
Scanned probe microscopy of nanostructures

Graduate Student Advisor: Christian Schönenberger (Basel)
Postdoc Advisors: Paul McEuen (Berkeley, now at Cornell), Cees Dekker (Delft)
Previous coworkers in Paris: Christian Glattli, Bernard Placais, Jean-Marc Berroir
Coworker in Barcelona: Maria-Jose Esplandiu
Graduate Student Advising: Giuseppe Schiavone, Marianna Sledzinska, Amelia Barreiro, Daniel Garcia, Bo Gao (Paris 2006), Bertrand Bourlon (Paris 2005)
Postdoc Advising: Julien Chaste, Mariusz Zdrojek, Joel Moser, Benjamin Lassagne

Publications

Number of citations: 3400 (ISI)

38- J. Moser, A. Bachtold
Fabrication of large addition energy quantum dots in graphene
Appl. Phys. Lett. **95**, 173506 (2009)

37- B. Lassagne, Y. Tarakanov, J. Kinaret, D. Garcia-Sanchez, A. Bachtold
Coupling Mechanics to Charge Transport in Carbon Nanotube Mechanical Resonators
Science **325**, 1107 (2009)

36- A. Barreiro, M. Lazzeri, J. Moser, F. Mauri, A. Bachtold
Transport properties of graphene in the high-current limit
Phys. Rev. Lett. **103**, 076601 (2009)

35- M. Zdrojek, M.J. Esplandiu, A. Barreiro, and A. Bachtold
Electron Counting Spectroscopy of CdSe Quantum Dots
Phys. Rev. Lett. **102**, 226804 (2009)

34- G.M. Sacha, M. Cardellach, J.J. Segura, J. Moser, A. Bachtold, J. Fraxedas, A. Verdaguer
Influence of the macroscopic shape of the tip on the contrast in scanning polarization force microscopy images
Nanotechnology **20**, 285704 (2009)

33- A. Verdaguer, M. Cardellach, J.J. Segura, G.M. Sacha, J. Moser, M. Zdrojek, A. Bachtold, J. Fraxedas
Charging and discharging of graphene in ambient conditions studied with scanning probe microscopy
Appl. Phys. Lett. **94**, 233105 (2009)

32- L. Shi, J. Zhou, P. Kim, A. Bachtold, A. Majumdar, and P.L. McEuen
Thermal probing of energy dissipation in current-carrying carbon nanotubes
J. Appl. Phys. **105**, 104306 (2009)

31- S. Zippilli, G. Morigi, A. Bachtold
Cooling Carbon Nanotubes to the Phononic Ground State with a Constant Electron Current
Phys. Rev. Lett. **102**, 096804 (2009)

30- B. Lassagne, D. Garcia-Sanchez, A. Aguasca, and A. Bachtold
Ultra Sensitive Mass Sensing with a Nanotube Electromechanical Resonator,
Nano Letters **8**, 3735 (2008).

(Highlighted in: Nature Nanotechnology, Chemistry World, nanowerk, ScienceDaily, El Pais)

29- A. Barreiro, R. Rurali, E.R. Hernández, J. Moser, T. Pichler, L. Forro, A. Bachtold
Subnanometer Motion of Cargoes Driven by Thermal Gradients along Carbon Nanotubes,
Science **320**, 775 (2008)

(Highlighted in: New Scientist, Physics World, Nature, Nature Nanotechnology, Nature Materials, NanoToday, Spektrum, El Pais, El Periodico, Lavanguardia)

28- D. Garcia-Sanchez, A.M. van der Zande, A. San Paulo, B. Lassagne, P.L. McEuen, A. Bachtold
Imaging mechanical vibrations in suspended graphene sheets,
Nano Letters **8**, 1399 (2008)

27- J. Moser, A. Verdaguer, D. Jiménez, A. Barreiro, and A. Bachtold
The environment of graphene probed by electrostatic force microscopy,
Appl. Phys. Lett. **92**, 123507 (2008)

26- A. Gruneis, M. J. Esplandiu, D. Garcia-Sanchez, and A. Bachtold
Detecting Individual Electrons Using a Carbon Nanotube Field-Effect Transistor,
Nano Letters **7**, 3766 (2007).

(Highlighted in: Nature Nanotechnology)

25- J. Moser, A. Barreiro, and A. Bachtold
Current-induced cleaning of graphene
Appl. Phys. Lett. **91**, 163513 (2007)

24- D. Garcia-Sanchez, A. San Paulo, M. J. Esplandiu, F. Perez-Murano, L. Forró, A. Aguasca, and A. Bachtold
Mechanical Detection of Carbon Nanotube Resonator Vibrations
Phys. Rev. Lett. **99**, 085501 (2007)

23- A. Barreiro, C. Kramberger, M.H. Rommeli, A. Grueneis, D. Grimm, S. Hampel, T. Gemming, B. Buechner, A. Bachtold and T. Pichler,
Control of the single-wall carbon nanotube mean diameter in sulphur promoted aerosol-assisted chemical vapour deposition
Carbon **45**, 55 (2007).

22- B Bourlon, C Miko, L Forro, D C Glattli, and A Bachtold ,
Beyond the linearity of current-voltage characteristics in multiwalled carbon nanotube
Semicond. Sci. Technol. **21**, S33 (2006).

21- A. Barreiro, S. Hampel, M.H. Rommeli, C. Kramberger, A. Gruneis, K. Biedermann, A. Leonhardt, T. Gemming, B. Buchner, A. Bachtold, and T. Pichler ,
Thermal Decomposition of Ferrocene as a Method for Production of Single-Walled Carbon Nanotubes without Additional Carbon Sources
J. Phys. Chem. B **110**, 20973 (2006)

(Highlighted in: Nature Nanotechnology)

20- B. Gao, D. C. Glattli, B. Placais, and A. Bachtold
Cotunneling and one-dimensional localization in individual disordered single-wall carbon nanotubes: Temperature dependence of the intrinsic resistance
Phys. Rev. B **74**, 085410 (2006).

19- B. Gao, Y. F. Chen, M. S. Fuhrer, D. C. Glattli, and A. Bachtold
Four-Point Resistance of Individual Single-Wall Carbon Nanotubes
Phys. Rev. Lett. **95**, 196802 (2005)

18- B. Bourlon, C. Miko, L. Forró, D.C. Glattli, A. Bachtold,
Determination of the Intershell Conductance in Multiwalled Carbon Nanotubes,
Phys. Rev. Lett. **93**, 176806 (2004).

17- B. Gao, A. Komnik, R. Egger, D.C. Glattli, A. Bachtold,
Evidence for Luttinger liquid behavior in crossed metallic single-wall nanotubes,
Phys. Rev. Lett. **92**, 216804 (2004).

16- B. Bourlon, D.C. Glattli, L. Forró, A. Bachtold,
Carbon Nanotube Based Bearing for Rotational Motions,
Nano Letters, **4**, 709 (2004).

15- B. Bourlon, D.C. Glattli, B. Plaçais, J.M. Berroir, L. Forró, A. Bachtold,
Geometrical Dependence of High-Bias Current in Multiwalled Carbon Nanotubes,
Phys. Rev. Lett. **92**, 026804 (2004).

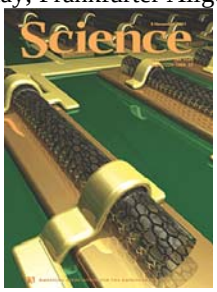
14- A. Bachtold
Carbon nanotubes speed up,
Physics world **15**, 22 (2002)

13- T. Nakanishi , A. Bachtold, and C. Dekker,
Transport through the Interface between a Semiconducting Carbon Nanotube and a Metal Electrode,
Phys. Rev. B **66**, 073307 (2002).

12- M.R. Buitelaar, A. Bachtold, T. Nussbaumer, M. Iqbal, C. Schönenberger,
Multi-wall carbon nanotubes as quantum dots,
Phys. Rev. Lett. **88**, 156801 (2002).

11- A. Bachtold, P. Hadley, T. Nakanishi, and C. Dekker,
Logic circuits with carbon nanotube transistors,
Science **294**, 1317 (2001).

(Highlighted in: Science, Nature, Scientific American, Physics World, New-York Times, USA Today, Frankfurter Allgemeine)



10- A. Bachtold, M. de Jonge, K. Grove-Rasmussen, P.L. McEuen, M. Buitelaar and C. Schönenberger,
Suppression of Tunneling into multi-wall carbon nanotubes,
Phys. Rev. Lett. **87**, 166801 (2001).

9- C. Schönenberger and A.Bachtold,
Comment on "Magnetoresistance and differential conductance in mutliwalled carbon nanotubes",
Phys. Rev. B **64**, 157401 (2001).

8- L. Shi, S. Plyasunov, A. Bachtold, P.L. McEuen and A. Majumdar,
Scanning Thermal Microscopy of Carbon Nanotubes Using Batch-Fabricated Probes,
Appl. Phys. Lett. **77**, 4295 (2000).

7- A. Bachtold, M. S. Fuhrer, S. Plyasunov, M. Forero, A. Zettl and P. McEuen,
Scanned probe microscopy of electronic transport in carbon nanotubes,
Phys. Rev. Lett. **84**, 6082 (2000).

6- C. Schönenberger, A. Bachtold, C. Strunk, J.-P. Salvetat and L. Forró,
Interference and interaction in multiwall carbon nanotubes,
Applied Physics A **69**, 283 (1999).

5- A. Bachtold, C. Strunk, J.-P. Salvetat, J.-M. Bonard, L. Forró, T. Nussbaumer and C. Schönenberger,
Aharonov-Bohm oscillations in carbon nanotubes,
Nature **397**, 673 (1999).

Highlighted in: Physics World

4- A. Bachtold, M. Henny, C. Terrier, C. Strunk, C. Schönenberger, J.-P. Salvetat, J.-M. Bonard and L. Forró,
Contacting carbon nanotubes selectively with low-ohmic contacts for four-probe electric measurements,
Applied Physics Letters **73**, 274 (1998).

3- A. Bachtold, C.Terrier, M. Kruger, M. Henny, T. Hoss, C. Strunk, R. Huber, H. Birk, U.Staufer and C. Schönenberger,
Contacting single template synthesized nanowires for electric measurements,
Microelectronic Engineering **41/42**, 571 (1998).

2- M. Henny, H. Birk, R. Huber, C. Strunk, A. Bachtold, M. Kruger and C. Schönenberger,
Electron heating effects in diffusive metal wires
Applied Physics Letters **71**, 773 (1997).

1- C. Schönenberger, B. M. I. van der Zande, L. G. J. Fokkink, M. Henny, C. Schmid, M. Kruger, A. Bachtold , R. Huber, H. Birk and U. Staufer,
Template-synthesis of nanowires in porous polycarbonate membranes: electrochemistry and morphology,
Journal of Physical Chemistry **B 101**, 5597 (1997).

Proceeding, application note

20- ER Hernandez, R. Rurali, A. Barreiro, A. Bachtold, T. Takahashi, T. Yamamoto, K. Watanabe
Using Thermal Gradients for Actuation in the Nanoscale
IUTAM Symposium on Modelling Nanomaterials and Nanosystems 13, 141 (2009).

19- A. San Paulo, J. Black, D. García-Sanchez, M. J. Esplandiu, A. Aguasca, J. Bokor, F. Perez-Murano, and A Bachtold
Mechanical detection and mode shape imaging of vibrational modes of micro and nanomechanical resonators by dynamic force microscopy
Journal of Physics: Conference Series **100,** 052009 (2008).

18- G. Rius, I. Martin, P. Godignon, A. Bachtold, J. Bausells, E. Lora-Tamayo, F.B. Perez-Murano
Response of carbon nanotube transistors to electron beam exposure
Microelectronic Engineering **84**, 1596 (2007).

17- B. Gao, Y.F. Chen, M.S. Fuhrer, D.C. Glattli, A. Bachtold
Four-terminal measurements of SWNTs using MWNTs as voltage electrodes
phys. stat. sol. (b) **243**, 3399 (2006)

16- B. Bourlon, C. Miko, L. Forró, D.C. Glattli, A. Bachtold
Intershell Transport in Multiwall Carbon Nanotubes
Proceedings of the XIXth International Winterschool on Electronic Properties of Novel Materials (eds H. Kuzmany, J. Fink, M. Mehring and S. Roth), (AIP New-York 2005).

15- A. Bachtold, B. Gao, D.C. Glattli, A. Komnik, R. Egger,
Luttinger liquid behavior in crossed metallic single-wall nanotubes
Proceedings of the Moriond Meeting in La Thuile (eds M. Sanquer, D.C. Glattli), 2004.

14- A. Bachtold, P. Hadley, T. Nakanishi, and C. Dekker,
Logic circuits based on carbon nanotubes,
Proceedings of the XVIth International Winterschool on Electronic Properties of Novel Materials (eds H. Kuzmany, J. Fink, M. Mehring and S. Roth), (AIP New-York 2002).

13- A. Bachtold, P. Hadley, T. Nakanishi, and C. Dekker,
Logic circuits based on carbon nanotubes,
Physica E **16**, 42 (2003).

12- L. Shi, P. Kim, S. Plyasunov, A. Bachtold, P.L. McEuen and A. Majumdar,
Scanning Thermal Microscopy Study of Dissipation in Current-Carrying Carbon Nanotubes,
Proceedings ASME Int. Mech. Eng. Congress & Exposition, HTD-24401 (2001).

11- A. Bachtold, M. S. Fuhrer, and P. McEuen,
Electrostatic force microscopy of electronic transport in carbon nanotubes,
Proceedings of the Moriond Meeting, Les Arcs 2001.

10- P. L. McEuen, J. Park, A. Bachtold, M. Woodside, M.S. Fuhrer, M. Bockrath, L. Shi, A. Majumdar, P. Kim,
Nanotube Nanoelectronics,
Proceedings Device Research Conference. Conference Digest, p. 07 (2001)

9- R. Egger, A. Bachtold, M.S. Fuhrer, M. Bockrath, D.H. Cobden and P.L. McEuen,
Luttinger liquid behavior in metallic carbon nanotubes,
Interacting Electrons in Nanostructures, (R. Haug and H. Schoeller, editors), Springer, (2001).

8- L. Shi, S. Plyasunov, A. Bachtold, P.L. McEuen and A. Majumdar,
Scanning Thermal Microscopy of Carbon Nanotubes,
Proceedings ASME Int. Mech. Eng. Congress & Exposition, HTD-Vol. 366-2, p.399 (2000).

7- C. Strunk, A. Bachtold, T. Nussbaumer, and C. Schönenberger,
Interference and interaction in multiwall carbon nanotubes,
Physica B **280**, 384 (2000).

6- L. Forró, J.-P. Salvetat, J.-M. Bonard, R. Bacsa, N.H. Thomson, S. Garaj, L. Thien-Nga, R. Gaál, A. Kulik, B. Ruzicka, L. Degiorgi, A. Bachtold, C. Schönenberger, S. Pekker, K. Hernadi, *Electronic and Mechanical Properties of Carbon Nanotubes*, Science and Application of Nanotubes, (D. Tomanek and R. J. Enbody, editors) page 297, Kluwer Academic/Plenum Publishers, (1999).

5- C. Schönenberger, A.Bachtold, C. Strunk, T. Nussbaumer, J.-P. Salvetat and L. Forró, *Quantentransport in multiwall carbon nanotubes*, Proceedings of the XIIIth International Winterschool on Electronic Properties of Novel Materials (eds H. Kuzmany, J. Fink, M. Mehring and S. Roth), (AIP New-York 1999).

4- C. Schönenberger, A.Bachtold, C. Strunk, T. Nussbaumer, J.-P. Salvetat and L. Forró, *Quantentransport in multiwall carbon nanotubes*, Proceedings of the Morriond Meeting, Les Arcs 1999.

3- A. Bachtold, A.Genkinger, M. Henny and C. Schönenberger, *Single carbon nanotube bridging four electric contact fingers*, Raith Application Note (1999).

2- J.-P. Salvetat, J.-M. Bonard, L. Forró, A. Bachtold and C. Schönenberger, *Physics of carbon nanotubes*, SGNT-News (1998).

1- A. Bachtold, C. Strunk, C. Schönenberger, J.-P. Salvetat and L. Forró, *Electrical properties of single carbon nanotubes*, Proceedings of the XIIth International Winterschool on Electronic Properties of Novel Materials (eds H. Kuzmany, J. Fink, M. Mehring and S. Roth) 65, (AIP New-York 1998).

Patent

1- A. Bachtold and C. Dekker, electronic device using carbon nanotubes Application No./ Patent No.: 01967854.9-2203-NL0100577

Talks

74- Invited talk at TNT09 in Barcelona, September 09
73- Colloquium at ICFO (Prof. Eschner), June 09
72- Invited talk at the EMRS in Strasbourg, June 09
71- Seminar in Grenoble (Dr. Houzet), May 09
70- Seminar at the Vienna university (Prof. Pichler), April 09
69- Invited talk at the Nanotech Insight conference 2009 in Barcelona, March 09
68- Invited talk at the DPG meeting in Dresden, March 09
67- Invited talk at the APS march meeting in Pittsburgh, March 09
66- Colloquium at the Vienna university (Prof. Pichler), December 08
65- Invited talk at NanoSWEC in Bordeaux, November 08
64- Colloquium at the Warsaw university of technology (Prof. Adamowicz), October 08
63- Invited talk at the 2nd INSTANS Summer Conference in Florence, Septembre 08
62- Invited talk at ECOSS 25 in Liverpool, July 08
61- Talk at NT08 in Montpellier, July 08
60- Seminar at Parc Cientific Barcelona (Dr. Gorostiza), June 08
59- Invited talk at the workshop Quantum Coherence and Controllability at the Mesoscale, San Sebastian, May 08
58- Seminar at the CIN2 Barcelona, May 08
57- Seminar at the ICMM Madrid (Prof. Vozmediano), April 08
56- Invited talk at The Capri Spring School on Transport in Nanostructures, April 08
55- Invited talk at the XXIIth winterschool on novel materials in Kirchberg, March 08
54- Seminar at Ulm (Prof. Schmidt-Kaler), November 07
53- Invited talk at the Spanish-Taiwan NanoElectronics workshop in Barcelona, November 2007
52- Colloquium at the TU Munich (Dr. Fontcuberta), November 07
51- Invited talk at the GDRI nanotubes in Autrans, October 2007
50- Invited talk at the GK-Workshop in Frauenchiemsee, October 2007
49- Invited talk at the International School Nanosciences Ile-de-France in Tremblay, June 07
48- Talk at the Workshop on Graphene and Nanotubes in Alicante, June 07
47- Talk at the EMRS in Strasbourg, May 07
46- Invited talk at NanoSpain in Sevilla, March 07
45- Seminar at Parc Cientific Barcelona (Dr. Huarte), February 07
44- Invited talk at the TNT 2006 in Grenoble, September 06
43- Invited talk at the ICSM in Dublin, July 06
42- Invited talk at the EMRS in Nice, June 06
41- Colloquium at Delft (Dr. Jarillo-Herrero), May 06
40- Seminar at Mallorca (Dr. Lopez), May 06
39- Seminar at ICMAB Barcelona (Dr. Hernandez), March 06
38- Invited talk at the XXth winterschool on novel materials in Kirchberg, March 06
37- Seminar in Zaragoza (Dr. Gopar), February 06
36- Invited talk at GEFES, Alicante, February 06
35- Seminar in Cambridge, Engineering department (Dr. Ferrari), May 05
34- Seminar in Cambridge, Cavendish Lab (Dr. Buitelaar), May 05
33- Seminar in Lille (Dr. Wirtz), May 05
32- Seminar in Dresden (Dr. Pichler), May 05
31- Invited talk at the “day of nanophysics” in Marseille, April 05
30- Invited talk at the XIXth winterschool on novel materials in Kirchberg, March 05
29- Seminar in Madrid (Prof. Gómez), March 05
28- Seminar in Louvain (Prof. Charlier), March 05
27- Seminar in Grenoble (Dr. Pistolesi), January 05
26- Talk at the MRS conference in Boston, December 04
25- Invited talk at the conference on “Correlation Effects in Nanowires” in Venezia, September 04
24- Invited talk at IVC-16/ICSS-12/NANO-8 in Venezia, June-July 04
23- Invited talk at the meeting “JNMO” in La Grande Motte, June 04
22- Seminar at the GPS Jussieu (Dr. Roditchev), Mars 04
21- Seminar in Barcelona (Dr. Perez-Murano), February 04
20- Talk at the Vth Rencontres de Moriond in Mesoscopic Physics in La Thuile, January 04
19- Seminar in Orsay (Dr. Trauzettel), January 04
18- Invited talk at the meeting “Molecular Electronics” in Paris, December 03
17- Talk at the GDR meeting “Mesoscopic Physics” in Aussois, September 03
16- Invited talk in EMRS in Strasbourg, June 03

15- Seminar in Stuttgart (Prof. Wrachtrup), 25/6/02
14- Invited talk at the GDR “Transport quantique et Nanotubes de C” in Grenoble, June 02
13- Seminar in EPFL Lausanne (Dr. Wegrowe), 24/5/02
12- Invited talk at the European Physical Society Meeting in Brighton, April 02
11- Invited talk at the XVIth winterschool on electronic properties of novel in Kirchberg, Mars 02
10- Invited talk at the 12th Winterschool on Developments in Solid State Physics Mauterndorf, February 02
9- Colloquium in Dusseldorf (Prof. Egger), 6/12/01
8- Seminar in CEA (Dr. Glattli), 28/3/01
7- Seminar in Grenoble (Dr. Pannetier), 26/3/01
6- Invited talk at the Moriond Meeting in Les Arcs, March 01
5- Invited talk at the conference in Bad Honnef, Germany, June 00
4- Talk at the APS Meeting in Minneapolis, 22/3/00
3- Seminar at Stony Brook (Prof. Likharev), 29/1/99
2- Seminar at IBM Yorktown (Dr. Avouris), 26/1/99
1- Talk at the Swiss Physical Meeting in La Chaux-de-Fonds, 10/10/97