Natalio Mingo

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Summary of research interests

- Theory of thermal and electronic transport.
- Nanomaterials. Nanotechnology. Surface Science.
- Computational physics.

Professional experience

2006-present	permanent senior scientist, **CEA-Grenoble.**
2007-present	adjunct professor, **UC Santa Cruz.**
2004-2006:	staff scientist, **University of California at Santa Cruz**, and **NASA-Ames Center for Nanotechnology**
1999-2004:	research scientist, **NASA-Ames research center**.
1998-1999:	postdoctoral European Union fellow, **Himeji Institute of Technology, Japan**.
1997:	visiting scholar, **Lawrence Berkeley National Laboratory**.

Education

2007:	**diplôme d'habilitation à diriger des recherches** (DHDR), U. Joseph Fourier, Grenoble.
1997:	**PhD, physics**, Universidad Autónoma de Madrid, Spain. *Summa cum Laude*. Outstanding Ph.D. Thesis Award for year 1997.
1993:	**MSc, physics,** Universidad Autónoma de Madrid, Spain.

Proposals funded and directed

- 2009-2012 (awarded): *Ab initio coupled charge and thermal transport in nanostructures,* PI. **Agence Nationale de la Récherche, France.**
- 2008-2011 (awarded): *Computational modeling of novel nanostructured thermoelectric materials.* PI. **RTRA foundation, France.**
- 2007-2010 (ongoing): *First-principles calculations of phonon thermal transport in bulk and nanostructured materials.* PI. **National Science Foundation, U.S.A.**
- 2007-2009 (ongoing): Nanothermoelectrics. **PI**. IRG from the **E.U.**
- 2005: **subgroup leader** (supervising over one postdoc and one research scientist). Title: *Thermoelectric Nanowire Composites for Energy Efficient Refrigeration and Power Generation in Space Applications.* Agency: **NASA**..

- 2004-2005: **principal investigator**. Title: *Vertical surround gate transistors and non-volatile memories by computer aided design and experimental prototyping.* Agency: **NASA**. Amount: **$ 200K**.

- 2002-2003: **principal investigator**. Title: *Nanowire based thermoelectric refrigeration.* Agency: **NASA**. Amount: **$ 80K**.

Patents

N. Kobayashi, N. Mingo, M. Plissonnier, and A. Shakouri, PCT/2008/001020, 11 July 2008.

Awards

- European Union Postdoctoral Fellowship for researchers in Japan (1998-1999).
- Outstanding PhD Thesis award for year 1997, Universidad Autónoma de Madrid.
- PhD fellowship from the Ministry of Education of Spain (1994-1997).
- Postgraduate fellowship from the Autonomous University of Madrid (1993).
- Summer scholarship from the Foreign Ministry of Spain (1994).
- Summer ERASMUS-TEMPUS (EU) scholarship (1993).

Teaching and mentoring

- Lecturer and co-organizer at the Spring School on "Thermics of Nanomaterials and Nanosystems", Cargèse, France, 2008.
- Course: "Nanoscale thermal and thermoelectric transport", UC Santa Cruz, Fall 2007.
- Course: "Energy transport at the nanoscale", CEA-Grenoble, October 2007.
- Postdoctoral adviser for: I. Savic (2007-present), S. Wang (2007-present).
- Mentor for undergraduates: Y. Chalopin (grad. student, EC Paris), summer 2007; W. Zhang (graduate student, Purdue University), summer and winter 2005; J. O'Keeffe (grad. student, Stanford University): 2000-2004.
- Tutor at the St. Quentin College Program (Patten University) 2002.

Invited talks and research stays

- **Invited talk,** at Minatec Crossroads, Grenoble, 2008.
  First-principles thermal transport calculations.
- **Invited talk,** CECAM workshop on structural, electronic and transport properties of quantum wires, Lyon, 2008.
- **Invited talk**, MRS meeting, San Francisco, 2007.
- **Invited talk,** APS March meeting, Denver, 2007.
- **Invited talk,** CECAM workshop on inelastic effects in transport, Lyon 2006.
- **Colloquium of the Physics Department**, Univ. of California at Riverside, 2006. *The flow of interacting phonons through nanowires, nanotubes, and molecular junctions.*
- **Invited talk**, MRS meeting, Boston, 2004. *Thermal conductivity of nanowhiskers and nanowires: insights from theory.*
- **Invited talk**, at Nanoconduction Inc., 2005.
- **Invited seminar**, Lawrence Berkeley Laboratory, 1999. *Theory of Inelastic Scanning Tunneling Spectroscopy.*

- **Invited talk**, EMRS 1997 spring meeting, Strasbourg, France. *Theoretical study of electric field manipulation of adsorbates using a Scanning Tunneling Microscope.*
- **Visiting researcher**, Heyrovský Institute of Physical Chemistry, Czech Academy of Sciences, Prague, January-February 1996.
- **Visiting researcher**, Department of Physics, University of Wrocław, Poland, December 1995.

Synergistic Activities

- **Co-organizer** of symposium on first principles methods in nanoscale transport, JMC11, Strasbourg 2008.
- **Co-organizer** of "GDR nanothermique" meeting for French groups working on nanoscale thermal transport, with 30 participants, Grenoble, March 2008.

Non-degree certificates

- Polish language, Servicio de Idiomas, Univ. Autónoma de Madrid, 1991-3.
- Modern Standard Arabic, Servicio de Idiomas, Univ. Autónoma de Madrid, 1991-3.
- Classical Arabic (5 year), Darek Nyumba centre (University of Comillas), 1996.

Other activities

- Member of the Nishi-Harima amateur symphonic orchestra, Japan (1998-1999).
- Volunteer for Habitat for Humanity International, Honduras, November 2003.

References

Dr. Meyya Meyyappan
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Hyogo 678-1297, Japan
makoshi@sci.u-hyogo.ac.jp, +81-7915-8-0151.

Publications

Book chapters

50. N. Mingo, to appear within the series "**Topics in Applied Physics**", **Springer (2009)**.
Phonon transport through nano-contacts by Green's function methods.

Journal articles:

49. S. Wang and N. Mingo, submitted **(2008)**.
Effects of interface roughness and superlattice period length on thermoelectric electron filtering.

48. D. A. Stewart, I. Savic, and N. Mingo, submitted **(2008)**.
First-Principles Calculation of the Magnitude of the Isotope Effect on Boron Nitride Nanotube Thermal Conductivity.

47. I. Savic, D. A. Stewart, and N. Mingo, submitted **(2008)**.
Thermal conduction mechanisms in boron nitride nanotubes: few-shell or all-shell?

46. I. Savic, N. Mingo, and D. A. Stewart, to be published in **Phys. Rev. Lett. (2008)**.
Quantum features in phonon transport in disordered nanotubes.

45. N. Mingo, D. A. Stewart, D. A. Broido, and D. Srivastava, **Phys. Rev. B** 77, 033418 **(2008)**.
Phonon transmission through defects in carbon nanotubes from first principles.

44. D. A. Broido, M. Malorny, G. Birner, Natalio Mingo, D. A. Stewart, **Appl. Phys. Lett.** 91, 231922 **(2007)**.
Intrinsic lattice thermal conductivity of semiconductors from first principles.

43. S. De Franceschi and N. Mingo, **Nature Nanotechnology** 2, 538 **(2007)**.
Cooling electrons one by one.

42. W. Zhang, N. Mingo, and T. S. Fisher, **Phys. Rev. B**, 76, 195429 **(2007)**.
Simulation of phonon transport across a non-polar nanowire junction using an atomistic Green's function method.

41. N. Mingo and D. A. Broido, **J. Appl. Phys.**, 101, 014322 **(2007).**
Thermoelectric power factor of nano-porous semiconductors.

40. J. H. Seol, A. L. Moore, S. K. Saha, F. Zhou, L. Shi, Q. Ye, R. Scheffler, N. Mingo, and T. Yamada, **J. Appl. Phys.** 101, 023706 **(2007)**.
Measurement and analysis of thermopower and electrical conductivity of an indium antimonide nanowire from a vapor-liquid-solid method.

39. W. Zhang, N. Mingo, and T. S. Fisher, **Numerical Heat Transfer**, 51, 333 **(2007).**

The Atomistic Green's Function Method: An Efficient Simulation Approach for Nanoscale Phonon Transport.

38. W. Zhang, N. Mingo, and T. S. Fisher, **Journal of Heat Transfer**, 129, 483, **(2007)**.
Simulation of interfacial phonon transport in Si-Ge heterostructures using an atomistic Green's function method.

37. D. A. Broido and N. Mingo, **Phys. Rev. B** 74, 195325 **(2006)**.
Theory of the thermoelectric power factor in nanowire nanocomposite matrix structures.

36. N. Mingo, **Phys. Rev. B,** 74, 125402 **(2006)**.
Anharmonic phonon transport through molecular-sized junctions.

35. N. Mingo and D. A. Broido, **Phys. Rev. Lett.** 95, 096105 **(2005)**.
Carbon nanotube ballistic thermal conductance, and its limits.

34. D. A. Broido, A. Ward, and N. Mingo, **Phys. Rev. B** 72, 014308 **(2005)**.
Lattice thermal conductivity of silicon from empirical interatomic potentials

33. N. Mingo and D. A. Broido, **Nano Letters** 5, 1221 **(2005)**.
Length dependence of carbon nanotube thermal conductivity, and the "problem of long waves".

32. N. Mingo and D. A. Broido, **Phys. Rev. Lett.** 93, 246106 **(2004)**.
Lattice thermal conductivity crossovers in semiconductor nanowires

31. N. Mingo, **Appl. Phys. Lett.** 85, 5986 **(2004)**.
Thermoelectric figure of merit of II-VI semiconducting nanowires

30. N. Mingo, **Appl. Phys. Lett.** 84, 2652 (**2004**).
Thermoelectric figure of merit and maximum power factor of III-V semiconducting nanowires

29. L. Shi., Q. Hao, Ch. Yu, N. Mingo, X. Kong, and Z. L. Wang, **Appl. Phys. Lett.** 84, 2638 (**2004**).
Thermal conductivities of individual tin dioxide nanobelts

28. N. Mingo, **Phys. Rev. B** 68, 113308 (**2003**).
Calculation of Si nanowire thermal conductivity using complete phonon dispersion relations

27. N. Mingo and Liu Yang, **Phys. Rev. B** 68, 245406 (**2003**); also **Phys. Rev. B** 70, 249901.
Phonon transport in nanowires coated with an amorphous material: an atomistic Green's function approach

26. N. Mingo, L. Yang, D. Li, and A. Majumdar, **Nano Letters** 3, 1713 (**2003**).
Predicting the thermal conductivity of Si and Ge nanowires

25. N. Mingo, Q. Hao, Ch. Yoon, and L. Shi, **IEEE-**nano proceedings, 2, 259 (**2003**).
Theoretical analysis of SnO_2 nanobelt thermal conductivity

24. C. W. Bauschlicher, A. Ricca, N. Mingo, and J. Lawson, **Chem. Phys. Lett.** 372 (**2003**) 723.
On the current flow for benzene-1,4-dithiol between two Au contacts

23. K. Makoshi, N. Mingo, **Surface Science**, 502-503 (**2002**) 34.
Theory of inelastic scanning tunneling spectroscopy

22. N. Mingo and Jie Han, **Phys. Rev. B (rapid communications)** , 64, 201401/1-4 (**2001**).
Conductance of metallic carbon nanotubes dipped into metal

21. N. Mingo, Liu Yang and Jie Han, **J. Phys. Chem. B**, 105, 11142 (**2001**).
Current induced forces upon atoms adsorbed on conducting carbon nanotubes

20. S. Tikhodeev, Mingo N., K. Makoshi, T. Mii, and H. Ueba, **Surf. Sci.** 493, 63 (**2001**).
Contribution to a theory of vibrational scanning tunneling spectroscopy of adsorbates. Nonequilibrium Green's function approach

19. K. Makoshi, N. Mingo, T. Mii, H. Ueba and S. Tikhodeev, **Surf. Sci.** 493, 71-77 (**2001**).
Theory of vibrational excitations of adsorbates by the scanning tunneling spectroscopy

18. N. Mingo, Liu Yang, Jie Han and M.P.Anantram, **Phys. Stat. Sol. B**, 226, 79-85 (**2001**).
Resonant versus anti-resonant tunneling at carbon nanotube A-B-A heterostructures

17. N.Mingo, J.Han, M.P.Anantram and L.Yang, **Surf. Sci.**, 482-485, 1130-4 (**2001**).
Potential drop along carbon nanotube devices with current flow

16. N.Mingo, K.Makoshi, T.Mii and H.Ueba, **Surface Science** , 482-485, 96 (**2001**).
Theory of the relation between Inelastic Scanning Tunneling Spectroscopy of adsorbates and their vibrational deexcitation

15. N.Mingo and K.Makoshi, **Phys. Rev. Lett.** 84 (**2000**) 3694.
Calculation of the Inelastic Scanning Tunneling Image of Acetylene on Cu(100)

14. N. Mingo and K. Makoshi, **Applied Surface Science**,162-163(**2000**)227-232.
Calculation of Scanning Inelastic Tunneling Profiles of Adsorbates: acetylene on Cu(100)

13. N. Mingo and K. Makoshi, **Surface Science** 438(**1999**)261-270.,
Excitation of vibrational modes of adsorbates with the Scanning Tunneling Microscope: many orbital theory

12. L. Jurczyszyn, N. Mingo and F. Flores, **Surface Science**, Volumes 402-404, (**1998**) 459-463.
Influence of the atomic and electronic structure of the tip on STM images and STS spectra

11. N. Mingo and F. Flores, **Thin Solid Films** 318 (**1998**), 69-72.
Theoretical study of the electric field manipulation of adsorbates using a Scanning Tunnelling Microscope

10. N. Mingo, M. Rose and M. Salmeron, **Journal of Surface Analysis**, Vol. 3, No. 2 (**1998**).
STM induced rotation of acetylene molecules adsorbed on Pd(111)

9. N. Mingo and F. Flores, **Surface Science**, volume 395, nos. 2 and 3 (**1998**).
Lateral forces and atomic desorption induced by the electric field created by STM tips on metal surfaces

8. A.L. Vazquez de Parga, O.S. Hernan, R. Miranda, A. Levy-Yeyati, N. Mingo and F. Flores, **Phys. Rev. Lett**., (**1998**), vol. 80 (no. 2) 357-60.
Electron resonances in sharp tips and their role in tunneling spectroscopy

7. L. Jurczyszyn, N. Mingo and F. Flores, **Czech. J. of Phys.** Vol 47 (**1997**), No.4 p.407-413.
The influence of the geometry of the tip on STM images

6. N. Mingo and Z. Knor, **Chemical Physics Letters** 263 (**1996**) 8.
Trigonal images of transition metal atoms adsorbed on transition metal FCC (111) surfaces and their availability for Scanning Tunneling Microscope

5. C.Sirvent, S.Vieira, L.Jurczyszyn, N.Mingo and F.Flores **Phys. Rev. B**, 53 (**1996**) 16086.
Conductance step for a single atom contact at the STM: noble and transition metals

4. L. Jurczyszyn, N. Mingo and F.Flores, **Mat. Sci. and Engeneering B** 37 (**1996**) 93.
Conductance Simulation through Single Atom Junctions at the Scanning Tunnelling Microscope

3. N. Mingo et al., **Phys. Rev. B**, 54 (**1996**) 2225.
Theory of the STM: Xe on Ni and Al

2. F.Flores, P.L.de Andres, F.J.Garcia-Vidal, L.Jurczyszyn, N.Mingo and R.Perez. **Progress in Surface Science**, Vol.48, Nos.1-4, pp27-38, **1995**.
Adsorption of noble gases on metal surfaces and the scanning tunneling microscope

1. N.Mingo, J.A.Porto and J.Sanchez-Dehesa, **Phys. Rev. B**, 50, 11884-11894 (**1994**).
Doping-profile effects on the tunneling times of electrons confined in double-barrier heterostructures