

## **Charles G. Tahan** (Dated: January 1, 2007)

1. University of Cambridge, Cavendish Laboratory, Theory of Condensed Matter (TCM), JJ Thomson Ave, Cambridge, CB3 0HE, UK; email: ct320 at cam.ac.uk
- Citizenship: U.S.A., Born in Washington, D.C. (1978)
  - General contact information: <http://tahan.com/charlie/>

### **EDUCATION**

2005 **Ph.D., Physics**

University of Wisconsin-Madison (Madison, WI)  
Thesis Advisor: Robert Joynt. Topic: Quantum Computing and Spintronics in Silicon Heterostructures.

2000 **B.Sci., Physics and Computer Science** with Highest Honors

College of William and Mary (Williamsburg, VA)

1996 Gonzaga College High School (Washington, D.C.)

### **EMPLOYMENT - POSITIONS**

09/05 – pres. **NSF Distinguished International Postdoctoral Research Fellow**

*Cavendish Laboratory, University of Cambridge (UK)*

Host/Advisor: *Prof. Peter Littlewood*

07/06 – 09/06 **Visiting Scientist**

*University of Tokyo, Department of Physics and NTT (Japan)*

Host: *Prof. Seigo Tarucha*

11/05 – 02/06 **Visiting Scientist**

*Centre for Quantum Computer Technology and School of Physics, University of Melbourne (Australia),*

Host: *Prof. Lloyd Hollenberg*

08/04 – 05/05 **Teaching Fellow in Nanotechnology and Society** (*new course*)

*Sociology Department, University of Wisconsin-Madison*

05/01 – 05/05 **R. G. Herb Fellow and Research Assistant**

*Physics and ECE Departments, University of Wisconsin-Madison*

08/00 – 05/01 **Teaching Assistant**

*Physics Department, University of Wisconsin-Madison*

05/99 – 08/00 **Researcher**, Computational Materials Theory Group

*Physics Department, College of William and Mary*

05-08/98 **Researcher**, Atmospheric Infrared Sounding (AIRS) Team

*NASA Goddard Space Flight Center, Code 910.4*

05-08/96 **Researcher**, Laboratory for Astrophysics

*National Air & Space Museum, Smithsonian Institution, Wash. DC*

< 1996 **Software Engineer**, *ECologic Corp.*, DC (earth science visualization)

**Researcher**, *Einstein Planetarium, National Air & Space Museum, SI*

### **PROFESSIONAL ACTIVITIES**

12/06 – pres. **Member, i-Teams Project** (New methods of manufacturing metal products). A joint initiative of the Cambridge-MIT Institute, the Cambridge University Technology and Enterprise Club, and the Institute for Manufacturing, the goal of i-Teams is to explore, identify and analyze the commercial potential for a Cambridge-produced

emerging, breakthrough technology.

12/06 – pres. **Invited Member**, *Nanotechnology Task Force*, University of Surrey (UK)

05/06 – pres. **Invited Member**, *Nanoethics Network*, Aarhus University (Denmark)

01/06 – pres. **Advisory Board Member**, *The Nanoethics Group* (Santa Barbara, CA)

current **Referee**, *Physical Review Letters*, *Physical Review B*

current **Member**, *APS*, *AAAS*, *AIP*, *Sigma Xi*

current **Core Member**, *Cambridge PdOC* (represents post-docs in Cambridge)

## OBJECTIVES

To work in an intellectually exciting and challenging environment in subjects ranging from theoretical physics to applied technologies to science policy. To apply my creativity and problem solving skills, my science knowledge, as well as technical expertise, to difficult problems as yet unsolved and to gain new abilities in the process.

## INTERESTS

Quantum nanoscience and nanotechnology, spin and entanglement-based solid-state and photonic devices, plasmonics, diamond-based technology, information science and technology (including quantum computing and communication), entanglement and measurement physics, condensed matter theory and novel materials, advanced energy technology, upper atmospheric phenomena, computational techniques, implications and applications of advanced technology, science policy/ethics, and informal science education, intellectual property and patent law, industrial outreach and development.

## TECHNICAL ARTICLES

[14] S. GOSWAMI, K.A. SLINKER, MARK FRIESEN, L.M. MCGUIRE, J.L. TRUITT, C. TAHAN, L.J. KLEIN, J.O. CHU, P.M. MOONEY, D.W. VAN DER WEIDE, ROBERT JOYNT, S.N. COPPERSMITH, and MARK A. ERIKSSON, “Control of Valley Splitting in Silicon Quantum Devices,” *Nature Physics* **3**, 41 – 45 (January, 2007), arxiv/cond-mat/0611221

[13] A.D. GREENTREE, C. TAHAN, J.H. COLE, and L.C.L. HOLLENBERG, “Quantum phase transitions of light,” *Nature Physics* **2**, 856 - 861 (December, 2006), arxiv/cond-mat/0609050

[12] M. FRIESEN, S. CHUTIA, C. TAHAN, and S.N. COPPERSMITH, “Valley splitting theory of Si/SiGe/Si quantum wells,” *submitted to Phys. Rev. B* (2006), arxiv/cond-mat/0608229

[11] C. TAHAN, M. FRIESEN, and R. JOYNT, “Fast orbital relaxation and long-lived spin and valley states in lateral silicon quantum dots,” *in prep for Phys. Rev. B* (2005)

[10] G.M. ZENNER, W.C. CRONE, C.A. MILLER, K.D. ELLISON, C. TAHAN, and R. LEUNG, “Introducing Nano and Society Issues into the Undergraduate and Graduate Classrooms,” R2A-7, *9<sup>th</sup> International Conference on Engineering Education* (San Juan, Puerto Rico, July 23-28, 2006)

[9] C. TAHAN, R. LEUNG, G.M. ZENNER, K.D. ELLISON, W.C. CRONE, and C.A. MILLER, "Nanotechnology and Society: A discussion-based undergraduate course," *Am. J. Phys.* **74**, 443 (April 2006), arxiv/physics/0507065 (2005)

[8] J.L. TRUITT, K.A. SLINKER, K.L.M. LEWIS, D.E. SAVAGE, CHARLES TAHAN, L.J. KLEIN, ROBERT JOYNT, M.G. LAGALLY, D.W. VAN DER WEIDE, S.N. COPPERSMITH, M.A. ERIKSSON, A.M. TYRYSHKIN, J.O. CHU, and P.M. MOONEY, "Electron spin coherence in Si/SiGe quantum wells," arxiv/cond-mat/0411735

[7] S. GOSWAMI, MARK FRIESEN, J.L. TRUITT, C. TAHAN, L.J. KLEIN, J.O. CHU, D.W. VAN DER WEIDE, S.N. COPPERSMITH, ROBERT JOYNT, and MARK A. ERIKSSON, "Spectroscopy of valley splitting in a Si/SiGe two-dimensional electron gas," arxiv/cond-mat/0408389 (2004)

[6] M.A. ERIKSSON, M. FRIESEN, S.N. COPPERSMITH, R. JOYNT, L.J. KLEIN, K. SLINKER, C. TAHAN, P.M. MOONEY, J.O. CHU, and S.J. KOESTER, "Spin-based quantum dot quantum computing in silicon," *Quantum Information Processing* (Kluwer, 2004)

[5] C. TAHAN and R. JOYNT, "Rashba spin-orbit coupling and spin relaxation in silicon quantum wells," *Phys. Rev. B* **71**, 075315 (2005); arxiv/cond-mat/0401615 (2004)

[4] L.J. KLEIN, K. SLINKER, J. TRUITT, S GOSWAMI, K. LEWIS, S.N. COPPERSMITH, D. VAN DER WEIDE, M. FRIESEN, R. BLICK, D. SAVAGE, M.G. LAGALLY, C. TAHAN, R. JOYNT, M.A. ERIKSSON, J.O. CHU, J.A. OTT, and P.M. MOONEY, "Coulomb blockade in a SiGe two-dimensional electron gas quantum dot," *Appl. Phys. Lett.* **84**, 4047 (2004); cond-mat/0404399

[3] M. FRIESEN, C. TAHAN, R. JOYNT, and M.A. ERIKSSON, "Spin readout and initialization in a semiconductor quantum dot," *Phys. Rev. Lett.* **92**, 037901 (2004), arxiv/cond-mat/0304422

[2] C. TAHAN, M. FRIESEN, and R. JOYNT, "Decoherence of electron spins in Si-based quantum computers," *Phys. Rev. B* **66**, 035314 (2002), arxiv/cond-mat/0203319

[1] C. TAHAN, M. SUEWATTANA, P. LARSEN, S. ZHANG, and H. KRAKAUER, "Kinetic Monte Carlo simulations of crystal growth in ferroelectric materials," *AIP Conference Proceedings* **582**, 118 (2001)

## **PATENTS**

[1] SPIN READOUT AND INITIALIZATION IN SEMICONDUCTOR QUANTUM DOTS, M. Friesen, C. Tahan, R. Joynt, and M.A. Eriksson (USPTO #7,135,697; 2006)

## **CHAPTERS IN BOOKS**

[3] C. TAHAN, "The Nanotechnology R(evolution)," *in press for Chapter in Nanoethics:*

*Examining the Societal Impact of Nanotechnology*, edited by Fritz Allhoff, Patrick Lin, James Moor, and John Weckert (John Wiley & Sons, 2007), [arxiv.org/physics/0612080](http://arxiv.org/physics/0612080) (2006)

[2] C. TAHAN, "Identifying Nanotechnology in Society," *in press for Chapter in Advances in Computers*, edited by Marvin Zelkowitz (Elsevier, 2007). [arxiv.org/abs/physics/0612080](http://arxiv.org/abs/physics/0612080)

[1] M.A. ERIKSSON, M. FRIESEN, S.N. COPPERSMITH, R. JOYNT, L.J. KLEIN, K. SLINKER, C. TAHAN, P.M. MOONEY, J.O. CHU, and S.J. KOESTER, "Spin-based quantum dot quantum computing in silicon," Chapter in *Experimental Aspects of Quantum Computing*, edited by Henry Everitt, Springer (2005)

### **COLUMNS, PUBLIC WRITING**

[1] C. TAHAN, "A Physics Walkabout," *Nature* **441**, 904 (June 2006)

### **HONORS, AWARDS, AND SCHOLARSHIPS**

- Math and Physical Sciences Distinguished International Postdoctoral Research Fellowship (MPS-DRF), USA National Science Foundation (NSF), 2005
- Nanotechnology Undergraduate Education (NUE) Teaching Fellowship in Nanotechnology and Society, USA National Science Foundation, 2004
- R.G. Herb Distinguished Graduate Fellowship in Materials Physics, University of Wisconsin-Madison, 2001
- Van Vleck Scholarship, University of Wisconsin-Madison, 2000
- Highest Honors, B.Sci. Thesis: Growth Simulations of Single Crystal Perovskite Alloys, College of William and Mary, 2000
- Westinghouse Science Talent Search semifinalist, 1996 – "The El Niño Southern Oscillation: A Computation Model Utilizing Satellite Data"

### **TEACHING, COURSE DEVELOPMENT, AND OUTREACH**

#### *Courses and Guest Lectures*

- **Teaching Fellow/Lecturer** (Spring 2005); Science and Technology Studies 201: *Nanotechnology and Society*, 3 credits (New undergraduate course on nanotechnology and its societal implications. Find the syllabus at <http://tahan.com/charlie/nanosociety/>)
- **Teaching Assistant** (Fall 2000 and Spring 2001); Physics 104: General Physics II. 60 students, 3 labs/3 discussion sections per week plus 3 office hours. Student evaluations/Faculty review rating: Very Good both semesters.
- **Guest Lecturer** (Dec. 2, 2004); "Nanotechnology, Medicine, and the Body," *Medical History and Bioethics* 559
- **Guest Lecturer** (Nov. 17&18, 2004); "Nanotechnology, Society, and the Engineer,"

Introduction to Engineering 160

- **Guest Lecturer** (Oct. 26, 2004); "A new *spin* on semiconductor electronics," ECE 746: Quantum Electronics
- **Guest Lecturer** (Oct. 9, 2003); "Quantum dot quantum computing: the ultimate in quantum electronics," ECE 746: Quantum Electronics

*Education and Training*

- DELTA (<http://delta.wisc.edu/>) certificate program in research, teaching, and learning
- Journalism 880: Informal Science Education for Scientists
- Engineering Professional Development 654: Teaching Science and Engineering: The College Classroom

*Outreach and Community Involvement*

- Maintained and created quantum computing information website for UW-Madison: <http://qc.physics.wisc.edu/> (2001-2005).
- Elected representative for the Graduate Studies Committee, Physics Dept., U. Wisconsin, 2001.

**PRESENTATIONS**

[12/20/2006] *QIBEC Seminar*: "Quantum phase transitions of light," NIST, Gaithersburg, VA

[09/06/2006] *Seminar*: "Quantum phase transitions of light," Department of Applied Physics, University of Tokyo (Japan)

[08/09/2006] *Seminar*: "Quantum phase transitions in a photonic superlattice," Riken, (Wakoshi, Japan)

[07/26/2006] *Seminar*: "Quantum Dot Quantum Computing and Spintronics in Silicon Architectures," Department of Applied Physics, University of Tokyo (Japan)

[11/17/2005] *Seminar*: "Quantum Computing and Decoherence in Silicon Architectures," School of Physics, University of Melbourne (Melbourne, AU)

[03/22/2005] *Conference*: "Long-lived spin and valley states in lateral silicon quantum dots for quantum information processing," APS March Meeting (Los Angeles, CA)

[03/23/2005] *Conference*: "Nanotechnology and Society," APS March Meeting (Los Angeles, CA)

[02/28/2005] *Poster*: "Quantum Computing in Lateral Silicon Quantum Dots," Gordon Research Conference, Quantum Information (Ventura, CA)

[12/16/2004] *Invited Talk*: "The Ambassadors of Nano," Fall 2004 Delta Forum (University of Wisconsin-Madison)

[11/09/2004] *Seminar*: "Quantum dot quantum computers and other entanglement-based devices," Physical Chemistry Seminar, University of Wisconsin-Madison, Chemistry Dept.

[10/12/2004] *Invited Talk*: "Spin-Based Quantum Dot Quantum Computing in Silicon," Cavendish Laboratory, University of Cambridge, UK

[12/15/2003] *Poster*: "Spin and Valley States in Silicon for QC," Solid State QIP Conference (Amsterdam, Netherlands)

[03/28/2004] *Conference*: "Spin and pseudo-spin states in silicon for QC: lifetimes," APS March Meeting (Montreal, CA)

[09/30/2003] *Seminar*: "Amazing feats with artificial atoms: single spin readout and fast initialization," Atomic Physics Seminar, University of Wisconsin-Madison, Physics Dept.

[08/09/2003] *Conference*: "Spin Readout and Initialization in a Semiconductor Quantum Dot," 2nd International Workshop on Quantum Dots for Quantum Computing and Classical Size Effects Circuits, Notre Dame, IN

[03/07/2003] *Conference*: "Single Qubit Spin Readout and Initialization in a Quantum Dot Quantum Computer: Design and Simulation," APS March Meeting (Austin, TX)

## **COLLABORATORS AND AFFILIATION**

*Within the last 2 years*

- S. Tarucha, M. Pioro-Ladriere, O. Akira, C. Beizurt, *University of Tokyo and NTT*
- P. Littlewood, P. Eastham, *Cavendish Laboratory, University of Cambridge*
- L. Hollenberg, C. Wellard, J. Cole, A. Greentree (Physics), *University of Melbourne (AU)*
- S. N. Coppersmith, M. A. Eriksson, M. Friesen, R. Joynt, L. J. Klein, K. Slinker (Physics); R. Blick, H. Qin, R. Toonen, D. van der Weide (Comp. & Elec. Eng.); D. Savage, M. Lagally (Mat. Sci.); W. Crone (Eng. Phys.); C. Miller (Public Affairs); G. Zenner (MRSEC), *University of Wisconsin-Madison*
- A. Rimberg (Physics), *Dartmouth College*
- G. Klimeck (Elec. Eng.), *Purdue University*

*Over 2 years ago*

- Shiwei Zhang, Henry Krakauer (Physics), *College of William and Mary*

## **ADVISORS**

- Peter Littlewood, *Professor of Physics, University of Cambridge*  
01223 (3)32987, [pbl21@cam.ac.uk](mailto:pbl21@cam.ac.uk), Cavendish Laboratory
- Robert Joynt, *Professor of Physics, University of Wisconsin-Madison*,  
(608) 263-4169, [rjjoynt@wisc.edu](mailto:rjjoynt@wisc.edu), Department of Physics

## **OTHER ACTIVITIES**

- Trumpet and Violin Performance
- Violin Making – Cambridge Violin Workshop
- Dance (Ballroom and Salsa) – Cambridge Dancers' Club