

## Charles Tahan

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### EDUCATION

2005 **Ph.D., Physics**

*University of Wisconsin-Madison*

Thesis: Silicon in the Quantum Limit: Quantum Computing and Decoherence in Silicon Architectures (advisor: R. Joynt)

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

09/09 – pres. **Quantum Physicist and Program Manager**

*Laboratory for Physical Sciences (College Park, MD)*

10/08 – 09/09 **Associate**

10/07 – 09/08 **Senior Consultant**

*Booz | Allen | Hamilton, Inc. (Arlington, VA)*

*Defense Advanced Research Projects Agency (DARPA-MTO)*

*(Chief science advisor to DARPA on quantum information science and technology programs in the Microsystems Technology Office.)*

09/05 – 10/07 **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 Graduate Research Assistant**

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

08/00 – 05/01 **Graduate Teaching Assistant**

*Physics Department, University of Wisconsin-Madison*

05/99 – 08/00 **Undergraduate Research Assistant**, Computational Materials Theory

*Physics Department, College of William and Mary*

05-08/98 **Summer Intern/Researcher**, Atmospheric Infrared Sounding Team

*NASA Goddard Space Flight Center, Code 910.4*

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

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

< 1996 **Summer Intern/Software Engineer**, ECOlogic Corp., Wash., DC

**Summer Intern/Researcher**, Einstein Planetarium

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

### PROFESSIONAL AND VOLUNTEER ACTIVITIES

12/09 – pres **Affiliate Member**, Center for Nanophysics and Advanced Materials, UMD  
11/07 – pres **Member**, *MIT Enterprise Forum of Washington DC/Baltimore*  
12/06 – 10/07 **Founding Member**, *Nanotechnology Task Force*, University of Surrey (UK), chaired by Dr. Ian Gibson MP (Advising UK government on nanotech.)  
12/06 – 03/06 **Member, i-Teams**, *Cambridge-MIT Institute*, New methods of incremental sheet metal forming and manufacturing.  
05/06 – 08/09 **Founding Member**, *Nanoethics Network*, Aarhus University (Denmark)  
01/06 – 08/09 **Advisory Board Member**, *The Nanoethics Group* (Santa Barbara, CA)  
current **Referee**, *Physical Review Letters, Physical Review B*  
current **Member**, *APS, AAAS, AIP, Sigma Xi*  
09/05 – 08/07 **Core Member**, *Cambridge PdOC (represents post-docs in Cambridge)*

### ARTICLES

- [18] O. O. SOYKAL, R. RUSKOV, and C. TAHAN, “Phononitons as a sound-based analogue of cavity quantum electrodynamics,” *submitted* (2011), <http://arxiv.org/abs/1106.1654>
- [17] C. TAHAN and R. JOYNT, “Relaxation of excited qubit states in single electron silicon quantum dots,” *in preparation* (2011)
- [16] M. AICHHORN, M. HOHENADLER, C. TAHAN, P.B. LITTLEWOOD, “Quantum and thermal fluctuation effects on solid-light systems,” *Phys. Rev. Lett.* **100**, 216401 (2008), <http://arxiv.org/abs/0803.3963>
- [15] M.I. MAKIN, J.H. COLE, C. TAHAN, L.C.L. HOLLENBERG, A.D. GREENTREE, “Quantum phase transitions in photonic cavities with two-level systems,” *Phys. Rev. A* **77**, 053819 (2008), <http://arxiv.org/abs/0710.5748>
- [14] 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](http://arxiv.org/abs/cond-mat/0609050)
- [13] 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), <http://arxiv.org/cond-mat/0611221>
- [12] M. FRIESEN, S. CHUTIA, C. TAHAN, and S.N. COPPERSMITH, “Valley splitting theory of Si/SiGe/Si quantum wells,” *Phys. Rev. B* **75**, 115318 (2007), <http://arxiv.org/cond-mat/0608229>
- [11] C. TAHAN, PhD Thesis (2005), “Silicon in the Quantum Limit: Quantum

Computing and Decoherence in Silicon Architectures,” <http://arxiv.org/abs/0710.4263>

[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), <http://arxiv.org/physics/0507065> (2005)

[8] “Si/SiGe Quantum Devices, Quantum Wells, and Electron-Spin Coherence,” J.L. Truitt, K.A. Slinker, K.L.M. Lewis, D.E. Savage, Charles Tahan, L.J. Klein, J.O. Chu, P.M. Mooney, A.M. Tyryshkin, D.W. van der Weide, Robert Joynt, S.N. Coppersmith, Mark Friesen, M.A. Eriksson, M. Fanciulli (Ed.): *Electron Spin Resonance and Related Phenomena in Low-Dimensional Structures, Topics Appl. Physics 115*, 101–127 (2009) Springer-Verlag Berlin Heidelberg 2009

[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," *Unpublished*; <http://arxiv.org/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," *Quant. Inform. Process.* **3**, 133 (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](http://arxiv.org/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](http://arxiv.org/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](http://arxiv.org/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](http://arxiv.org/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)," Chapter in *Nanoethics: Examining the Societal Impact of Nanotechnology*, edited by Fritz Allhoff, Patrick Lin, James Moor, and John Weckert (Wiley-Interscience, 10 August 2007, ISBN: 978-0470084175), [arxiv.org/physics/0612229](http://arxiv.org/physics/0612229) (2006)

[2] C. TAHAN, "Identifying Nanotechnology in Society," Chapter in *Advances in Computers 71: Nanotechnology*, edited by Marvin Zelkowitz (Elsevier, 6 July 2007, ISBN: 978-0-12-373746-5). [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**

[3] C. TAHAN, "Quantum Information Technology and Industry," *The Quantum Times*, newsletter of the American Physical Society's Topical Group on Quantum Information, Winter Issue 2008

[2] C. TAHAN, "Spookytechnology and Society," (12 October 2007), <http://arxiv.org/abs/0710.2537>

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

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

- Offer for program manager position in DARPA's Microsystems Technology Office, July 2009
- Math and Physical Sciences Distinguished International Postdoctoral Research Fellowship (MPS-DRF), National Science Foundation (NSF), 2005 (\$182,900)
- Nanotechnology Undergraduate Education (NUE) Teaching Fellowship in Nanotechnology and Society, National Science Foundation (NSF), 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

- [05/12/2011] *2<sup>nd</sup> Annual CNAM Symposium*, “Engineering quantum environments in silicon for quantum computing and new devices,” University of Maryland-College Park
- [03/22/2011] *APS March Meeting*, “Considerations for spin-based quantum computing in the solid-state,” Dallas, Texas
- [02/18/2011] *LPS Program Review*, “Engineering quantum environments in silicon for quantum computing and new devices,” College Park, MD
- [08/19/2010] *ARO/LPS Quantum Computing Program Review*, “Recent work on quantum computing,” Cincinnati, OH
- [06/10/2010] *Seminar*, “Spins in silicon quantum dots for quantum computing,” UCLA Physics Dept.
- [03/15/2010] *APS March Meeting*, “Review of spin and orbital relaxation in silicon quantum dot qubits,” Portland, OR
- [08/25/2008] *Poster*, “Solid Light – New physics and devices in engineered photon

cavity-QED arrays," Gordon Research Conference on QIS, Big Sky, MT  
[05/21/2008] *Colloquium*, "Spookytechnology and Society: The progress and implications of quantum information science and technology." EE380 Computer Systems Colloquium, Stanford University, CA  
[04/04/2007] *Invited Seminar*: "Quantum phase transitions of light: Using condensed matter physics to control photons," Naval Research Lab, Washington, D.C.  
[03/09/2007] *APS March Meeting*: "Quantum phase transitions of light," Denver, CO  
[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)