

Biographical sketch
Clayton C. Williams

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EDUCATION

Brigham Young University	Mathematics	1972-73
University of Utah	Physics, Honors B.A.,	1975-79
Stanford University	Electrical Engineering, M.S.	1979-81
Stanford University	Electrical Engineering, Ph.D.	1981-84

PROFESSIONAL EXPERIENCE

Visiting Scientist, Agilent Technologies (sabbatical)	2008-2009
Department of Physics, University of Utah, Associate Chair	2001-02
Department of Physics, University of Utah, Dir. of Graduate Studies	1998-03,07-08
Department of Physics, University of Utah, Professor	1998 - present
Department of Physics, University of Utah, Associate Professor	1990-97
Center for Biopolymers at Interfaces, U. of Utah, Faculty member	1991-2002
IBM T.J. Watson Research Center Research Staff Member	1984-90
Dept. of Applied Physics, Stanford University, Post Doctoral Scholar	1984

RESEACH ACTIVITES

The current research interests of Professor Williams include the characterization of electronic and spintronic materials on an atomic scale, including the exploration of the electronic properties of point defects, quantum states and devices, and single molecules and nanoclusters. He is also developing methods for single electron spin detection and is interested in modifying dielectric surfaces on the atomic scale.

ENTREPRENEURIAL ACTIVITIES

2003-present - Founder / owner - Rocky Mountain Nanotechnology, LLC, a company which manufactures Atomic Force Microscopy (AFM) probes for electrical measurements. Probes are sold all over the world to universities, high technology industry researchers and research institutes. The company also specializes in nanoscale materials characterization by AFM and consulting, reverse engineering measurements and patent infringement analysis.

AWARDS / ACCOMPLISHMENTS

Fellow, American Physical Society (FIAP) 2009

15 Patents

Semiconductor Research Corporation Inventor Recognition Award (1998, 2003,2005).

IBM Research Division Award, 1989.

Phi Beta Kappa, Mortar Board, Phi Kappa Phi.

Outstanding Undergraduate Physics Student, University of Utah, 1979.

SYNERGISTIC ACTIVITIES

Developed two graduate courses entitled "Optical Instrumentation and Sensors," and "Physical Measurements and Sensor Systems," in which students learn principles of physical measurement, sensing and instrumentation. The Williams research group has developed a windows based software package for converting cross-sectional Scanning Capacitance Microscopy measurements to 2-dimensional dopant and carrier concentration profiles. This program was transferred to several major semiconductor companies.

SELECTED RELEVANT PUBLICATIONS

1. K. Ambal, P. Rahe, A. Payne, J. Slinkman, C.C. Williams and C. Boehme, "Electrical coupling through individual pairs of phosphorus donor atoms and silicon dangling bonds," *Sci. Reports (Nature)*, (published online, January 13, 2016).
2. Philipp Rahe, Ryan P. Steele and Clayton C. Williams, "Consecutive Charging of a Molecule-on-Insulator Ensemble Using Single Electron Tunneling Methods," *Nano Lett.* 16, 911–916 (2016).
3. R. Wang and C.C. Williams, "Dynamic tunneling force microscopy for characterizing electronic trap states in nonconductive surfaces," *Rev. Sci. Inst.* 86, 093708 (2015)
4. K. Ambal, A. Payne, D.P. Waters, C.C. Williams and C. Boehme, "Spin-Relaxation Dynamics of E' Centers at High Density in SiO₂ Thin Films for Single-Spin Tunneling Force Microscopy," *Phys. Rev. Appl.* 4 024008 (2015).
5. A. Payne, K. Ambal, C. Boehme and C.C. Williams, "An atomic resolution, single-spin magnetic resonance detection concept based upon tunneling force microscopy," *Phys. Rev B* 91, 195433 (Feb 2015).
6. R. Wang, S.W. King and C.C. Williams, "Atomic scale trap state characterization by dynamic tunneling force microscopy," *Appl. Phys. Lett.* 105, 052903 (2014).
7. C.C. Williams, "Atomic scale imaging of dielectric point defects," Chapter of book entitled *Fundamentals of Picoscience*, Taylor and Francis Group, LLC, published 2013.
8. D. W. Winslow and C.C. Williams, "Local density of trap states in SiO₂ and Si₃N₄ films studied by single electron tunneling force spectroscopy," *J. Appl. Phys.* 110, 114102 (2011).

9. D.W. Winslow, J.P. Johnson and C.C. Williams, "Nanometer scale study of HfO₂ trap states using single electron tunneling force spectroscopy," *Appl. Phys. Lett.* **98**, 172903 (2011).
10. J.P. Johnson, D.W. Winslow and C.C. Williams, "Measurement of depth and energy of buried trap states in dielectric films by Single Electron Tunneling Force spectroscopy," *Appl. Phys. Lett.* **98**, 052902 (2011).
2010
11. N. Zheng, J.P. Johnson, C.C. Williams and G. Wang, "Electronic characterization of individual monolayer protected Au clusters by single electron tunneling force spectroscopy," *Nanotechnology* **21**, 295708 (2010).
12. J.P. Johnson and C.C. Williams, "Atomic scale imaging and spectroscopy of individual trap states by force detected dynamic tunneling," *Nanotechnology* **20**, 055701 (2009).
13. N. Zheng, C.C. Williams and E.G. Mishchenko, "Comparison of a three dimensional model and experimental measurements of single electron tunneling between a scanning probe and a localized electronic state in a dielectric sample," *J. Appl. Phys.* **101**, 093702 (2006).
14. E. Bussmann and C.C. Williams, "Single Electron Tunneling Force Spectroscopy of an Individual Electronic State in a non-conducting Surface," *Appl. Phys. Lett.* **88**, 263108 (2006).
15. E. Bussmann, N. Zheng and C.C. Williams, "Single electron manipulation to and from a silicon dioxide surface by electrostatic force microscopy," *Appl. Phys. Lett.*, **86**, 163109 (2005).

RECENT COLLABORATORS (last 48 months)

Sean King (Intel), C. Boehme (U. of Utah), A. Kuhnle (U. of Mainz), M. Reichling (U. of Osnabruck), G. Wang (GSU)

GRADUATE AND POSTDOCTORAL ADVISORS

Professor Calvin Quate (Stanford), Department of Applied Physics