Kenneth J. Segall

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Education

- ***Ph.D.*** – Yale University, *Applied Physics*, October 1999 (GPA 3.7/4.0)
- ***B.S.*** – Fairfield University, *Physics* (minors: *Mathematical Analysis, Computer Science, Philosophy*), June 1993, magna cum laude (GPA 3.7/4.0)

Experience

- ***Assistant Professor of Physics*** (July 2003 – present)
  Department of Physics and Astronomy, Colgate University.
  Research on nonlinear and quantum dynamics in superconducting circuits. Performed experiments on the ratchet effect and vortex-breather collisions in Josephson arrays. Conceived, developed and tested a new idea for biasing superconducting single photon detectors without a magnetic field. *Five-course teaching load per year*, including full lectures for Solid State Physics (Physics 420) and Classical Mechanics (Physics 302); full lectures and laboratory supervision for Electronics and Instrumentation (Physics 282), General Physics III (Physics 122) and General Physics II (Physics 121); laboratory supervision and recitation instruction for General Physics I and II (Physics 120 and 121). Developed a new course, "Real-time Nonlinear Dynamics and Chaos," (Physics/Math 407) with a professor in the Math department (D. Schult). Developed another new course, "Sports and the Scientific Method," (CORE 100) which teaches the scientific method to non-scientists through the use of sports statistics. Supervisor of senior research "Capstone" projects (approximately 3 students per academic year).

- ***Postdoctoral Associate*** and ***Instructor*** (September 2000 – July 2003)
  Department of Electrical Engineering and Computer Science, MIT.
  Research on quantum effects and nonlinear dynamics in superconducting circuits. Measured thermal activation and quantum tunneling in a niobium Persistent-Current Qubit. Started experiments on Josephson ratchets in the classical and quantum regime. Co-instructor of course 6.763 (Introduction to Superconductivity), 2001.
  Supervisor: Professor Terry P. Orlando.

- ***Postdoctoral Associate*** (January 2000 – August 2000)
  Department of Applied Physics, Yale University.
  Research on a novel low-temperature amplifier made from a Radio-Frequency Single Electron Transistor (RF-SET), and also on sub-millimeter bolometers made from superconducting tunnel junctions.
  Supervisor: Professor Robert J. Schoelkopf.

- ***Graduate Research Assistant*** (January 1994 – October 1999)
  Department of Applied Physics, Yale University.
  Research on superconducting imaging x-ray detectors for x-ray astronomy. Measured dynamics and fluctuations of radiation-induced quasiparticles in superconducting tunnel junctions. Predicted and measured new noise sources for imaging x-ray detectors. Member of Clean Room Committee (CRC) of Yale student-run clean room. Teaching Assistant (TA) for graduate classes in solid state physics and an undergraduate introduction to technology class.
  Supervisor: Professor Daniel E. Prober.

- ***Undergraduate Research Assistant*** (June 1990 – May 1993)
  Department of Physics, Fairfield University.
  Research on diamond films and detectors for High Energy Physics experiments. Measured photoconductivity of Chemical Vapor Deposited (CVD) diamond films.
  Supervisor: Professor David R. Winn.

Honors/Awards

- Yale Harding-Bliss Award for Excellence in Engineering, May 2000.
  - Annual award for a Ph.D. graduate who demonstrates excellence in Engineering and Applied Science and does the most to further the intellectual life of the department
- NASA Graduate Student Research Program (GSRP) Fellowship, 1994-1997.
- Department Award for Excellence in Physics, Fairfield University, May 1993.
- Presidential Scholar (Full Tuition Scholarship), Fairfield University, 1989-1993.
- Salutatorian, Mahwah High School, 1985-1989.

Invited Talks

1) ***"Fluxons, Ratchets, Breathers and Detectors: Nonlinear Dynamics in Josephson Arrays,"*** invited presentation at Yale University, New Haven, CT, October 2007.
2) "***Vortices, Ratchets and Breathers: Nonlinear Dynamics in Josephson Arrays,"*** invited presentation at Amherst College, Amherst, MA, February 2007.
3) "***Vortices, Ratchets, Breathers and Detectors: Nonlinear Dynamics in Josephson Arrays,"*** invited presentation at Syracuse University, Syracuse, NY, November 2006.
4) ***"Nonlinear Dynamics in Josephson Arrays,"*** invited presentation at University of Erlangen, Erlangen, Germany, November 2006.
5) ***"Nonlinear Dynamics in Josephson Arrays,"*** invited presentation at SUNY Binghamton, Binghamton, NY, May 2006.
6) ***"Intrinsically Localized modes in Josephson Arrays,"*** invited presentation at the Focus Meeting on Intrinsic Localized Modes at the Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, March 2006.
7) ***"Schrödinger's Cat meets the Butterfly Effect,"*** invited presentation at Ithaca College Physics Department Colloquia, Ithaca, New York, November, 2005.

8) ***"Josephson Junctions for Quantum Ratchets,"*** invited presentation at the "Physics of Quantum Electronics," workshop, Snowbird, Utah, January 2004.
9) ***"Fluxon ratchet dynamics in a 1-D circular array of Josephson junctions,"*** invited presentation at the "Hot topics in Quantum Statistical Physics" workshop, Lorentz Center, Leiden, Netherlands, August 2003.
10) ***"Superconducting Circuits for Quantum Bits,"*** invited presentation at the U.S.-Australia workshop on quantum information and quantum computing, Newport, Australia, January 2003.
11) ***"Interaction of intrinsically localized modes with moving vortices in a Josephson ladder,"*** invited presentation at the EU-US conference on Discrete Breathers and Intrinsically Localized Modes, Heraklion, Crete, June 2001.
12) ***"Single-photon superconducting x-ray detectors with spatial imaging and spectral resolution,"*** invited presentation at the March Meeting of the American Physical Society, Los Angeles, CA, March 1998.

Other Talks/Presentations

13) ***"Fluxon Ratchet Dynamics in a Josephson Junction Array,"*** presented at the March Meeting of the American Physical Society, Denver, CO, March 2007.
14) ***"Two-state dynamics in a superconducting persistent-current qubit,"*** presented at the Applied Superconductivity Conference, Houston, TX, August 2002.
15) ***"Josephson junction arrays for quantum ratchets,"*** presented at the March Meeting of the American Physical Society, Indianapolis, IN, March 2002 (in absence of Terry P. Orlando).
16) ***"Two-state dynamics in a superconducting persistent-current qubit,"*** presented at the March Meeting of the American Physical Society, Indianapolis, IN, March 2002.
17) ***"Motion of vortices in a ratchet potential in a 1-D circular array of Josephson junctions,"*** presented at the March Meeting of the American Physical Society, Seattle, WA, March 2001.
18) ***"Interaction of intrinsically localized modes with kinks in a Josephson ladder,"*** presented at the March Meeting of the American Physical Society, Seattle, WA, March 2001 (in absence of Enrique Trias).
19) ***"Instrumentation for single photon imaging x-ray spectrometers,"*** presented at the March Meeting of the American Physical Society, Atlanta, GA, March 1999.
20) ***"Single photon imaging x-ray spectrometers,"*** presented at the Applied Superconductivity Conference, Palm Springs, CA, September 1998.
21) ***"Imaging x-ray spectrometers for astrophysical applications,"*** presented at the conference for Low Temperature Detectors, Munich, Germany, July 1997.
22) ***"Non-equilibrium quasiparticle dynamics in superconducting films,"*** presented at the March Meeting of the American Physical Society, Kansas City, MO, March 1997.
23) ***"Diffusion of non-equilibrium quasiparticles in superconducting Ta and Al films,"*** presented at the March Meeting of the American Physical Society, St. Louis, MO, March 1996.

Previous/Current Support

"Nonlinear Dynamics in Superconducting Networks" Research Corporation Cottrell Science Award, 6/2005 – 5/2007, $36,109.

"RUI: Classical and Quantum Ratchets in Josephson Arrays," NSF Research Award, DMR Condensed Matter, 7/2005 – 6/2008, $165,000.

"Modeling Neuron Synchronization Using Josephson Junctions," Research Award from the Harvey Picker Institute for Interdisciplinary Studies in Science and Mathematics, 4/2008 – 3/2009, $78,000; 4/2009-3/2010, $83,500.

"RUI: Classical and Quantum Ratchets in Josephson Arrays," NSF Research Award, DMR Condensed Matter, 7/2008 – 6/2011, $175,000.

"RUI: Nonlinear and Neural Dynamics in Superconducting Networks," NSF Research Award, DMR Condensed Matter, 7/2011-6/2013, $255,000

Publications

1) ***"Josephson junction simulation of neurons,"*** P. Crotty, D. Schult and K. Segall, *Physical Review* **E 82**, 011914 (2010)

2) ***"Experimental observation of Fluxon Diffusion in Josephson Rings,"*** K. Segall, A. Dioguardi, N. Fernandes and J.J. Mazo, *Journal of Low Temperature Physics* **154**, 41-54 (2009).

3) ***"Thermal depinning of Josephson Fluxons in superconducting rings,"*** J.J. Mazo, F. Naranjo and K. Segall, *Physical Review* **B78**, 174510 (2008).

4) ***"Subgap biasing of Superconducting Tunnel Junctions without a Magnetic Field,"*** K. Segall, J. Moyer and J.J. Mazo, *Journal of Applied Physics* **104**, 043920 (2008).

5) ***"Multiple-junction biasing of superconducting tunnel junction detectors,"*** K. Segall, J.J. Mazo and T.P. Orlando, *Applied Physics Letters* **86**, 153507 (2005).

6) ***"Numerical simulation of multi-junction bias circuits for superconducting detectors,"*** K. Segall, J.J. Mazo and T.P. Orlando, *IEEE Transactions on Applied Superconductivity* **15**, 583-586 (2005).

7) ***"Dynamics and energy distribution of non-equilibrium quasiparticles in superconducting tunnel junctions,"*** K. Segall, C.M. Wilson, L. Li, L. Frunzio, S.

Friedrich, M.C. Gaidis, and D.E. Prober, *Physical Review* **B70**, 214520 (2004).

8) ***"DC measurements of macroscopic quantum levels in a superconducting qubit structure with a time-ordered meter,"*** D.S. Crankshaw, K. Segall, D. Nakada, T.P. Orlando, L.S. Levitov, S. Lloyd, S.O. Valenzuela, N. Markovic, M. Tinkham, and K.K. Berggren, *Physical Review* **B69**, 144518 (2004).

9) ***"Impact of time-ordered measurements of the two states in a niobium superconducting qubit structure,"*** K. Segall, D.S. Crankshaw, D. Nakada, T.P. Orlando, L.S. Levitov, S. Lloyd, N. Markovic, S.O. Valenzuela, M. Tinkham, and K.K. Berggren, *Physical Review* **B67** *(Rapid communications)*, 220506 (2003).

10) ***"Experimental characterization of the two current states in a Nb persistent-current qubit,"*** K. Segall, D.S. Crankshaw, D. Nakada, B. Singh, J. Lee, T.P. Orlando, N. Markovic, S.O. Valenzuela and M. Tinkham, *IEEE Transactions on Applied Superconductivity* **13**, 1009-1012 (2003).

11) ***"A high performance cryogenic amplifier based on a radio-frequency single electron transistor,"*** K. Segall, K.W. Lehnert, T.R. Stevenson, R.J. Schoelkopf, P. Wahlgren, A. Aassime and P. Delsing, *Applied Physics Letters* **81**, 4859 (2002).

12) ***"Fluxon ratchet potentials in superconducting circuits,"*** F. Falo, P.J. Martinez, J. Mazo, T.P. Orlando, K. Segall and E. Trias, *Applied Physics* **A75**, 263 (2002).

13) ***"Quantum partition noise in a superconducting tunnel junction,"*** K. Segall and D.E. Prober, *Physical Review* **B64** *(Rapid Communications)*, 180508 (2001).

14) ***"Noise mechanisms in single photon, superconducting tunnel junction detectors,"*** K. Segall, C.M. Wilson, L. Frunzio, L. Li, S. Friedrich, M.C. Gaidis, D.E. Prober, A.E. Szymkowiak, S.H. Moseley, *Applied Physics Letters* **76**, 3998 (2000).

15) ***"Single photon imaging x-ray spectrometers,"*** K. Segall, C.M. Wilson, L. Li, A. Davies, R. Lathrop, M.C. Gaidis, D.E. Prober, A.E. Szymkowiak, and S.H. Moseley, *IEEE Transactions on Applied Superconductivity* **9**, 3326 (1999).

16) ***"Experimental quasiparticle dynamics in a superconducting, imaging x-ray spectrometer,"*** S. Friedrich, K. Segall, M.C. Gaidis, C.M. Wilson, D.E. Prober, A.E. Szymkowiak, and S.H. Moseley, *Applied Physics Letters* **71**, 3901 (1997).

17) ***"Spatial uniformity of single photon 1-D imaging detectors using superconducting tunnel junctions,"*** L. Li, L. Frunzio, C.M. Wilson, K. Segall, D.E. Prober, A.E. Szymkowiak, and S.H. Moseley, *AIP Conference Proceedings 2002*, 145 (2002).

18) ***"Single photon imaging spectrometers using superconducting tunnel junctions,"*** L. Frunzio, C.M. Wilson, K. Segall, L. Li, S. Friedrich, M.C. Gaidis and D.E. Prober, *EUCAS Proceedings* **2**, 615 (2000).

19) ***"RF single electron transistor readout amplifiers for superconducting astronomical detectors of x-ray to sub-mm wavelengths,"*** T.R. Stevenson, A. Aassime, P. Delsing, R.J. Schoelkopf, K. Segall, C.M. Stahle, *IEEE Transactions on Applied Superconductivity* **11**, 692 (2001).

20) ***"X-ray single photon 1-D imaging spectrometers,"*** L. Li, L. Frunzio, C.M. Wilson, K. Segall, D.E. Prober, A.E. Szymkowiak and S.H. Moseley, *IEEE Transactions on Applied Superconductivity* **11**, 685 (2001).

21) ***"A new noise source in superconducting tunnel junction photon detectors,"*** C.M. Wilson, L. Frunzio, K. Segall, L. Li, D.E. Prober, D. Schiminovich, B. Mazin, C. Martin and R. Vasquez, *IEEE Transactions on Applied Superconductivity* **11**, 645 (2001).

22) ***"Optical/UV single-photon imaging spectrometers using superconducting tunnel junctions,"*** C.M. Wilson, K. Segall, L. Frunzio, L. Li, D.E. Prober, D. Schiminovich, B. Mazin, C. Martin and R. Vasquez, *Nuclear Instruments & Methods A* **444,** 449 (2000).

23) ***"Single-photon 2-D imaging X-ray spectrometer employing trapping with four tunnel junctions,"*** L. Li, L. Frunzio, K. Segall, C.M. Wilson, D.E. Prober, A.E. Szymkowiak, S.H. Moseley, *Nuclear Instruments & Methods A* **444**, 228 (2000).

24) ***"Single-photon imaging x-ray spectrometers using low noise current preamplifiers with dc voltage bias,"*** S. Friedrich, K. Segall, M.C. Gaidis, C.M. Wilson, D.E. Prober, P.J. Kindlmann, A.E. Szymkowiak, S.H. Moseley, *IEEE Transactions on Applied Superconductivity* **7**, 3383 (1997).

25) ***"A superconducting x-ray spectrometer with a tantalum absorber and lateral trapping,"*** M.C. Gaidis, S. Friedrich, K. Segall, D.E. Prober, A.E. Szymkowiak, S.H. Moseley, *IEEE Transactions on Applied Superconductivity* **6**, 1 (1996).

26) ***"Superconducting Nb-Ta-Al-AlOx-Al x-ray detectors with spatial resolution,"*** S. Friedrich, K. Segall, M.C. Gaidis, D.S. Toledano, D.E. Prober, A.E. Szymkowiak, S.H. Moseley, *Nuclear Instruments & Methods A* **370**, 44 (1996).

27) ***"Cerenkov fiber sampling calorimeters,"*** K. Arrington, D. Kefford, J. Kennedy, R. Pisani, C. Sanzeni, K. Segall, D. Wall, D.R. Winn, R. Carey, S. Dye, J. Miller, L. Sulak, W. Worstell, Y. Efremenko, Y. Kamyshkov, A. Savin, K. Shmakov, E. Tarkovsky, *1993 IEEE Conference Record Nuclear Science Symposium and Medical Imaging Conference*, Cat. No. 93CH3374-6 **1**, 119 (1993).

28) ***"Electron bombarded semiconductor gain in CVD diamond,"*** B.Y. Lin, C.P. Beetz, D.R. Winn, K. Segall, *International Electron Devices Meeting 1992 Technical*

Digest, Cat. No. 92CH3211-0, 747 (1992).

29) ***"Copper-scintillating fiber hadron calorimeter tower prototypes,"*** D. Brown, R. Carey, S. Dye, E. Hazen, D. Higby, J. Miller, L. Sulak, J. Sullivan, W. Worstell, W. Brower, H. Paar, D. Kefford, R. Pisani, K. Segall, D. Wall, D.R. Winn, N. Akchurin, J. Langland, Y. Onel, J. Sandro, C. Bromberg, R. Miller, B. Moore, J. Reidy, W. Bugg, R. Kroeger, R. Wigmans, F. Ayer, C. Elder, H. Cohn, Y. Kamyshkov, F. Placil, M. Rennich, A. Savin, K. Shmakov, A. Smirnov, K. Young, *Conference Record of the 1992 IEEE Nuclear Science Symposium and Medical Imaging Conference*, Cat. No. 92CH3232-6 **1**, 274 (1992).

30) ***"Scintillating fiber calorimeters with cast absorbers,"*** D. Brown, R. Carey, S. Dye, E. Hazen, D. Higby, J. Miller, B.L. Roberts, L. Sulak, C. Wang, W. Worstell, C. Lane, D. Boccuzzi, D. Scrofani, K. Segall, D. Wall, D.R. Winn, C. Bromberg, J. Huston, R. Miller, C. Yosef, A. David, N. Diaczenko, S. Zaman, A. Sanzgiri, R. Webb, D. Acosta, J. Branson, B. Ong, H. Paar, M. Sivertz, D. Thomas, F. Ayer, C. Elder, D. Sullivan, *Conference Record of the 1991 IEEE Nuclear Science Symposium and Medical Imaging Conference*, Cat. No. 91CH3100-5 **1**, 274 (1991).

31) ***"Diamond film optical x-ray and particle detectors,"*** C.P. Beetz, B. Lincoln, D.R. Winn, K. Segall, M. Vasas, D. Wall, *IEEE Transactions on Nuclear Science* **38**, 107 (1991).

32) ***"Diamond film optical semiconductors,"*** K. Segall, *Proceedings NCUR VI (1991)*, Vol. II, by Univ. of North Carolina at Asheville, Robert D. Yearout ed. (1992).

Recent Conferences Attended

1) "Hot Topics in Quantum Statistical Physics" workshop in Leiden, The Netherlands, in August of 2003 (Oral presentation).
2) "Physics of Quantum Electronics" workshop in Snowbird, Utah, in January of 2004 (Oral presentation).
3) "Focus Meeting on Intrinsic Localized Modes" at the Max Planck Institute for the Physics of Complex Systems, in Dresden, Germany in March of 2006 (Oral presentation).
4) March Meeting of the American Physical Society in Denver, Colorado in March of 2007 (Oral presentation).
5) Applied Superconductivity Meeting in Chicago, Illinois in August of 2008 (Poster presentation).
6) March Meeting of the American Physical Society in Portland, Oregon, in March of 2010 (no presentation)
7) Applied Superconductivity Meeting in Washington, D.C. in August of 2010 (Poster presentation).