

JOSHUA R. SMITH

Curriculum Vitae

Computer Science & Engineering

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EDUCATIONAL HISTORY

Massachusetts Institute of Technology, Cambridge, MA

PhD, Media Arts and Sciences

1999

Electric Field Imaging

Massachusetts Institute of Technology, Cambridge, MA

MS, Media Arts and Sciences

1995

Toward Electric Field Tomography

University of Cambridge, Cambridge, UK

MA, Natural Sciences (Physics and Theoretical Physics)

1997

Information Processing in Fraunhofer Diffraction: A Case Study in the Physics of Information

Williams College, Williamstown, MA

BA, Magna Cum Laude, Computer Science, Philosophy

1991

Evolving Dynamical Systems with the Genetic Algorithm

EMPLOYMENT HISTORY

University of Washington

Seattle, WA

Associate Professor

Department of Computer Science and Engineering & Electrical Engineering, 2/11 – Present

Intel Research Seattle

Seattle, WA

Principal Engineer, 4/08 – 1/11

Intel Research Seattle

Seattle, WA

Senior Research Scientist, 7/05 - 4/08

Intel Research Seattle
Seattle, WA
Research Scientist, 7/04 – 7/05

TiAx LLC (formerly Arthur D. Little)
Cambridge, MA
Senior Technologist, 1/04 – 7/04

Escher Group LTD.
Cambridge, MA
Chief Scientist & Director, Escher Labs, 4/01 – 12/03
Vice President & Director, Escher Labs, 4/00 – 4/01
Founding Director, Escher Labs 11/98 – 4/00

Other Research Experience

- **Santa Fe Institute**, Santa Fe, NM & **Los Alamos National Laboratory**, Los Alamos, NM. *Research student*, 6/92-9/92, 7/93-8/93. Created Lattice Gas Automata model of polymer dynamics, with application to origin of life studies.
- **Yale University**, New Haven, CT. *NECUSE Undergraduate research fellow in department of Computer Science*, 6/89 - 8/89. Implemented multigrid method for fast modeling of Hopfield Neural Networks; implemented 3d visualization code.
- **SMALL Geometry Research Group**, Williams College, Williamstown, MA. 6/88 – 8/88. *Undergraduate researcher*. Worked on Art Gallery theorems in computational geometry; wrote interactive graph editor.
- **School for Field Studies**, Marine Biology program, St. John, USVI. *Student*. 9/86 – 12/86. Devised and tested underwater method for experimental measurement of fractal dimension of coral.
- **NASA Goddard Institute for Space Studies**, New York, NY. *Graphics Programmer for Global Climate Modeling project*, 6/85-8/85. Wrote visualization software for output of global climate model.

AWARDS AND HONORS

Non-Intel

Best paper award, for “An Ultra-Low-Power Human Body Motion Sensor Using Static Electric Field Sensing,” Ubicomp 2012, September 2012.

Nominated for best paper, for “Optical Localization of Passive UHF RFID Tags with Integrated LEDs” at IEEE RFID 2012, April 2012.

Sezai Innovation Award, for "Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD)," at the 19th congress of the International Society of Rotary Blood Pumps, Louisville, KY September 8th to 10th, 2011.

Willem Kolff/Donald B. Olsen Award, for most promising research in the development of artificial hearts, for paper “Innovative Free-Range Resonant Electrical Energy Delivery System (Free-D System) for a Ventricular Assist Device Using Wireless Power,” presented at American Society for Artificial Internal Organs (ASAIO), June 2011.

CIF Postdoctoral Fellow Supervision award, 2010-2011, CRA/CCC

Best Paper, “A Capacitive Touch Interface for Passive RFID Tags,” May 2009, IEEE RFID 2009

Best Demo, “RFID Sensor Networks with the Intel WISP,” Nov. 2008, Sensys 08

Motorola Fellow, 1995 – 1997, MIT Media Laboratory

Herchel Smith Scholar, 1991 – 1993, Emmanuel College, University of Cambridge

Phi Beta Kappa, 1991, Williams College

Sigma Xi, 1991, Williams College
NECUSE summer research fellowship, 1989, Yale University

Intel

Divisional Recognition Award, Q4 2009, Intel Labs,

“For rapid resolution of key technical challenges to mobile platform intercept of WREL technology leading to JPF definition with PCCG”

Divisional Recognition Award, Q2 2009, Intel Labs,

“For a team effort on the WISP Challenge that exceeded expectations in creating a thriving WISP Community”

Special Intel Employee Retention Award, Oct. 2008

Divisional Recognition Award, Q4 2008, Corporate Technology Group

“For delivering first-rate results on aggressive and risky targets to provide three captivating IR technology demonstrations for Justin’s stage demos at IDF”

Divisional Recognition Award, Q3 2008, Corporate Technology Group,

“For leading the formation of a new Personal Robotics community by organizing the inaugural Workshop on Personal Robotics, thereby establishing Intel as a leader in this important emerging field”

Divisional Recognition Award, Q3 2008, Corporate Technology Group

“For innovation in wireless power with a circuit-based theory that enabled the transmission of 21 watts over 2 feet at 70% efficiency”

Divisional Recognition Award, Q4 2007, Corporate Technology Group

“For role modeling customer orientation in developing the first Phase Change Memory prototype that could be read, written, and powered wirelessly with no external antenna”

Divisional Recognition Award, Q2 2007, Corporate Technology Group

“For developing a wireless read-write capability for flash memory that led to joint pathfinding with FMG and could lead to wireless capabilities for our future PCM products”

Best Poster, June 2007, Intel Research Symposium,

Award for “Electric Field Pretouch for Robotic Grasping”

Best Short Talk, Dec. 2006, Intel Fellows Mini-Conference on Power

Award for short talk “RF Power Harvesting for Power Efficiency”

AFFILIATIONS AND OTHER APPOINTMENTS

Affiliate Associate Professor, Computer Science & Engineering and Electrical Engineering, *University of Washington, 7/10-2/11*

Affiliate Assistant Professor, Computer Science & Engineering and Electrical Engineering, *University of Washington, 6/06 – 7/10 (CSE), 7/05 – 7/10 (EE)*

Graduate Faculty Member, *University of Washington, 7/08 – 7/13*

PUBLICATIONS

H-index 28, i10-index 47. [Source: Google Scholar \(9/25/2012\)](#), includes citations to patents. Citations listed when 10 or more. Citation count from Google Scholar, 9/25/2012.

Refereed archival journal publications

1. **Enabling Seamless Wireless Power Delivery in Dynamic Environments**, Alanson P. Sample, Benjamin H. Waters, Scott Wisdom, Joshua R. Smith, Proceedings of the IEEE (To appear 2013).
2. **Evaluation of Wireless Resonant Power Transfer Systems with Human Electromagnetic Exposure Limits**, Andreas Christ, Mark G. Douglas, John Roman, Emily B. Cooper, Alanson P. Sample, Benjamin H. Waters, Joshua R. Smith, Niels Kuster, IEEE Transactions on Electromagnetic Compatibility, to appear, 2012.
3. **Physical Human Interactive Guidance: Identifying Grasping Principles From Human-Planned Grasps**, Ravi Balasubramanian, Ling Xu, Peter Brook, Joshua R. Smith, Yoky Matsuoka, IEEE Transactions on Robotics (T-RO), Vol. 28 No. 4, pp. 899-910, Aug. 2012.
4. **Toward Total Implantability Using Free-Range Resonant Electrical Energy Delivery System: Achieving Untethered Ventricular Assist Device Operation Over Large Distances**, Benjamin Waters, Alanson Sample, Joshua Smith, and Pramod Bonde, Cardiology Clinics, Volume 29, Number 4, pp. 609-625. November 2011.
5. **Wireless strain measurement for structural testing and health monitoring of carbon fiber composites**, Federico Gasco, Paolo Feraboli, Jeff Braun, Joshua Smith, Patrick Stickler, Luciano DeOto, Composites: Part A 42, pp. 1263–1274, 2011.
6. [Analysis, Experimental Results, and Range Adaptation of Magnetically Coupled Resonators for Wireless Power Transfer](#), Alanson P. Sample, David T. Meyer, Joshua R. Smith, IEEE Transactions on Industrial Electronics, Vol. 58, No. 2, pp 544-554, Feb 2011. Citations: 112
7. [RFID: From Supply Chains to Sensor Nets](#), S. Roy, V. Jandhyala, J.R. Smith, D.J. Wetherall, B.P. Otis, R. Chakraborty, M. Buettner, D.J. Yeager, Y.-C. Ko, A.P. Sample, Proceedings of the IEEE, vol.98, no.9, pp.1583-1592, Sept. 2010. Citations: 15
8. [NeuralWISP: A Wirelessly Powered Neural Interface with 1-m Range](#), Daniel J. Yeager, Jeremy Holleman, Richa Prasad, Joshua R. Smith, and Brian Otis, IEEE Transactions on Biomedical Circuits and Systems Volume 3, Issue 6, pp. 379-387, Oct 2009. Citations: 18
9. [Design of an RFID-Based Battery-Free Programmable Sensing Platform](#). A.P. Sample, D.J. Yeager, P.S. Powledge, A.V. Mamishev, J.R. Smith. IEEE Transactions on Instrumentation and Measurement, Vol. 57, No. 11, Nov. 2008, pp. 2608-2615. Citations: 128
10. [RFID MAC Performance Evaluation Based on ISO/IEC 18000-6 Type C](#). You-Chang Ko, Sumit Roy, Joshua R. Smith, Hyong-Woo Lee, and Choong-Ho Cho, IEEE Communications Letters, Vol. 12, No. 6, June 2008. Citations: 14
11. [Energy scavenging for inductively coupled passive RFID systems](#). B. Jiang, J. R. Smith, M. Philipose, S. Roy, K. Sundara-Rajan, and A. Mamishev. IEEE Transactions on Instrumentation and Measurement, February 2007, Vol. 56, No. 1, pp. 118-125. Citations: 49
12. [RFID-Based Techniques for Human Activity Detection](#). Joshua R. Smith, Kenneth P. Fishkin, Bing Jiang, Alexander Mamishev, Matthai Philipose, Adam Rea, Sumit Roy, Kishore Sundara-Rajan. Communications of the ACM, v48, no. 9, Sep 2005, pp. 39-44. Citations: 119
13. [Battery-Free Wireless Identification and Sensing](#). Matthai Philipose, Joshua R. Smith, Bing Jiang, Kishore Sundara-Rajan, Alexander Mamishev, Sumit Roy. IEEE Pervasive Computing, Vol. 4, No. 1, January-March 2005, pp. 37-45. Citations: 127
14. [Code Division Multiplexing of a Sensor Channel: A Software Implementation](#). Joshua R.

- Smith, Christopher Salthouse, and Neil Gershenfeld. IEEE Journal on Selected Areas in Communications, Vol. 17, No. 4, April 1999, pp 725-731.
15. [Distributing Identity](#). Joshua R. Smith. IEEE Robotics and Automation Magazine, Vol. 6, No. 1, March 1999, pp 49-56. Citations: 15
 16. [Electric Field Sensing for Graphical Interfaces](#). Joshua R. Smith, Tom White, Christopher Dodge, David Allport, Joseph Paradiso, and Neil Gershenfeld. Computer Graphics and Applications, Vol. 18, No. 3, 1998, pp 54-61. Citations: 79
 17. [Field Mice: Extracting Hand Geometry From Electric Field Measurements](#). Joshua R. Smith. IBM Systems Journal, Vol. 35, No. 3&4, 1996, pp 587-608. Citations: 79
 18. [Lattice Polymer Automata](#) Steen Rasmussen and Joshua R. Smith. Berichte der Bunsengesellschaft für Physikalische Chemie 98, No. 9., pp. 1185-1193. 1994, pp 1185-1193. Citations: 21

Conference proceedings and other non-journal articles

1. **Hybrid Analog-Digital Backscatter Platform for High Data Rate, Battery-Free Sensing**, Vamsi Talla, Michael Buettner, David Wetherall and Joshua R. Smith. IEEE Topical Conference on Wireless Sensors and Sensor Networks (RWW 2013), to appear.
2. **Design Considerations for Asymmetric Magnetically Coupled Resonators used in Wireless Power Transfer Applications**, Gunbok Lee, Benjamin H. Waters, Chen Shi, Wee Sang Park, Joshua R. Smith, 2013 IEEE Topical Conference on Biomedical Wireless Technologies, Networks & Sensing Systems (BioWireless 2013), to appear.
3. **A Wireless Sensing Platform Utilizing Ambient RF Energy**, Aaron Parks, Alanson Sample, Yi Zhao, Joshua R. Smith. IEEE Topical Conference on Wireless Sensors and Sensor Networks (RWW 2013), to appear.
4. **Towards falls prevention: a wearable wireless and battery-less sensing and automatic identification tag for real time monitoring of human movements**, Damith Ranasinghe, Roberto Luis Shinmoto Torres, Alanson P. Sample, Joshua R. Smith, Keith Hill, and Renuka Visvanathan. 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2012), San Diego, 2012.
5. **An Ultra-Low-Power Human Body Motion Sensor Using Static Electric Field Sensing**, Gabe Cohn, Tien-Jui Lee, Sidhant Gupta, Dan Morris, Josh Smith, Matt Reynolds, Desney Tan, Shwetak Patel. Ubicomp 2012, Pittsburgh, PA. *Winner of best paper award.*
6. **Adaptive Impedance Matching for Magnetically Coupled Resonators**, Benjamin H. Waters, Alanson P. Sample, Joshua R. Smith. Progress in Electromagnetics Research Symposium (PIERS 2012), Moscow, Russia, 19-23 August 2012.
7. **Biologically Inspired Grasp Planning Using Only Orthogonal Approach Angles**, Eric Rombokas, Peter Brook, Joshua R. Smith, Yoky Matsuoka, Proceedings of the 4th IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechanics (BioRob2012), June 24-27, 2012, Rome Italy.
8. **Seashell Effect Pretouch Sensing for Robotic Grasping**, Liang-Ting Jiang, Joshua R. Smith, Proceedings of ICRA 2012, May 5-12, 2012.
9. **Interactive Singulation of Objects from a Pile**, Lillian Chang, Joshua R. Smith, Dieter Fox, Proceedings of ICRA 2012, May 5-12, 2012.
10. **Automatic Extraction of Command Hierarchies for Adaptive Brain-Robot Interfacing**, Matthew Bryan, Griffin Nicoll, Vibinash Thomas, Mike Chung, Joshua R. Smith, Rajesh P. N. Rao, Proceedings of ICRA 2012, May 5-12, 2012.
11. **Optical Localization of Passive UHF RFID Tags with Integrated LEDs**, Alanson Sample, Craig Macomber, Liang-Ting Jiang, Joshua R. Smith, Proceedings of the 2012 IEEE RFID Conference, April 3-5, 2012. *Nominated for best paper award.*

12. **Towards Hierarchical Brain-Computer Interfaces for Humanoid Robot Control**, Matthew Bryan, Joshua Green, Mike Chung, Joshua Smith, Rajesh Rao, Reinhold Scherer, Humanoids 2011, 11th IEEE-RAS International Conference on Humanoid Robots, Bled, Slovenia, October 26th - 28th, 2011
13. **Photovoltaic Enhanced UHF RFID Tag Antennas for Dual Purpose Energy Harvesting**, Alanson P. Sample, Jeffrey Braun, Aaron N. Parks, Joshua R. Smith, IEEE RFID 2011.
14. **Wireless Power for Ventricular Assist Devices: Innovation with the Free-Range Resonant Electrical Energy Delivery System (FREE-D) for Mechanical Circulatory Assist**, Pramod Bonde, Alanson Sample, Benjamin Waters, Emily Cooper, Yoshiya Toyoda, Robert Kormos, Joshua R. Smith. Proceedings 91st Annual Scientific Meeting of American Association of Thoracic Surgeons, Philadelphia, May 7-11, 2011
15. **Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD)**, B. Waters, A. Sample, J. Smith, P. Bonde, 19th congress of the International Society of Rotary Blood Pumps, Louisville, KY September 8th to 10th, 2011. **Winner of the Sezai Innovation Award.**
16. **Innovative Free-range Resonant Electrical Energy Delivery System (FREE-D system) for a Ventricular Assist Device (VAD) using wireless power**, Joshua R. Smith, Alanson Sample, Benjamin Waters, Yoshiya Toyoda, Robert Kormos, Pramod Bonde. Proceedings 31st Annual Scientific meeting of the American Society for Artificial Internal Organs (ASAIIO), Washington, DC, June 10-12, 2011. **Winner of ASAIIO Willem J. Kolff / Don B Olsen Award.**
17. **Gambit: An Autonomous Chess-Playing Manipulator**, Cynthia Matuszek, Brian Mayton, Roberto Aimi, Lifeng Bo, Marc Peter Deisenroth, Robert Chu, Michael Kung, Joshua R. Smith, Dieter Fox, To appear, Proceedings of ICRA, Shanghai, China, May 9-13, 2011.
18. **Numerical Electromagnetic Analysis of Human Exposure for Wireless Power Transfer Systems**, Andreas Christ, Mark G. Douglas, John Roman, Emily B. Cooper, Alanson P. Sample, Joshua R. Smith, Niels Kuster. Proceedings of the Tenth International Congress of the European Bioelectromagnetics Association (EBEA 2011), Rome, Italy Feb 21-24, 2011.
19. **Robot, Feed Thyself: Plugging In to Unmodified Electrical Outlets by Sensing Emitted AC Electric Fields.** Brian Mayton, Louis LeGrand, Joshua R. Smith. Proceedings of ICRA May 2010.
20. **Human-Guided Grasp Measures Improve Grasp Robustness on Physical Robot.** Ravi Balasubramanian, Ling Xu, Peter Brook, Joshua R. Smith, Yoky Matsuoka. Proceedings of ICRA May 2010. Citations: 22
21. **An Electric Field Pretouch System for Grasping and Co-Manipulation.** Brian Mayton, Louis LeGrand, Joshua R. Smith. Proceedings of ICRA, May 2010. Citations: 12
22. **A Spotlight on Security and Privacy Risks with Future Household Robots: Attacks and Lessons**, Tamara Denning, Cynthia Matuszek, Karl Koscher, Joshua R. Smith, Tadayoshi Kohno. In the Proceedings of the 11th International Conference on Ubiquitous Computing (UbiComp 2009). Citations: 17
23. **A Capacitive Touch Interface for Passive RFID Tags**, Alanson Sample, Daniel Yeager, Joshua R. Smith, 2009 IEEE International Conference on RFID (IEEE RFID 2009), April 27-28, 2009. **Winner of Best Paper award** Citations: 18
24. **Experimental Results with two Wireless Power Transfer Systems**, Alanson Sample, Joshua R. Smith, 2009 IEEE Radio and Wireless Symposium (RawCon 2009). January 18-22, 2009. Citations: 49
25. **NeuralWISP: An Energy-Harvesting Wireless Neural Interface with 1-m Range**, Jeremy Holleman, Dan Yeager, Richa Prasad, Joshua R. Smith, and Brian Otis, IEEE Biomedical Circuits and Systems Conference (BioCAS 2008), November 20-22, 2008.
26. **RFID Sensor Networks with the Intel WISP**, Michael Buettner, Ben Greenstein, Richa Prasad, Alanson Sample, Joshua R. Smith, Daniel Yeager, David Wetherall. 6th ACM Conference on

- Embedded Networked Sensor Systems (Sensys 2008), November 5-7 2008. ***Winner of Best Demo award.*** Citations: 13
27. **[RFIDs and Secret Handshakes: Defending Against Ghost-and-Leech Attacks and Unauthorized Reads with Context-Aware Communications](#)**, Alexei Czeskis, Karl Koscher, Joshua R. Smith, Tadayoshi Kohno. 15th ACM Conference on Computer and Communications Security, October 27-31, 2008. Citations: 37
 28. **[Revisiting Smart Dust with RFID Sensor Networks](#)** Michael Buettner, Ben Greenstein, Alanson Sample, Joshua R. Smith, David Wetherall. Seventh ACM Workshop on Hot Topics in Networks (HotNets-VII), Alberta, Canada, Oct 6-7 2008. Citations: 43
 29. **[Electric Field Servoing for Robotic Manipulation](#)**, Ryan Wistort, Joshua R. Smith. Proceedings of IEEE/RSJ 2008 International Conference on Intelligent Robots and Systems (IROS 2008). Citations: 11
 30. **[Wirelessly-Charged UHF Tags for Sensor Data Collection](#)**, Daniel Yeager, Richa Prasad, David Wetherall, Pauline Powledge, Joshua Smith. IEEE International Conference on RFID 2008. Citations: 43
 31. **[An Enhanced RFID Multiple Access Protocol for Fast Inventory](#)**. You-Chang Ko, Sumit Roy, Joshua R. Smith, Hyung-Woo Lee, Choong-Ho Cho. Proc. IEEE Globecom 2007.
 32. **[Electric Field Imaging Pretouch for Robotic Graspers](#)**. Joshua R. Smith, Eric Garcia, Ryan Wistort, Ganesh Krishnamoorthy. Proceedings of IEEE/RSJ 2007 International Conference on Intelligent Robots and Systems (IROS 2007).
 33. **[Maximalist cryptography and computation on the WISP UHF RFID tag](#)**. Hee-Jin Chae, Daniel J. Yeager, Joshua R. Smith, Kevin Fu. In Proceedings of the Conference on RFID Security, July 2007. Citations: 41
 34. **[Design of a Passively-Powered, Programmable Sensing Platform for UHF RFID Systems](#)**. Alanson P. Sample, Daniel J. Yeager, Pauline S. Powledge, and Joshua R. Smith. Proceedings IEEE RFID 2007, March 26-28, 2007, Gaylord, Texas, USA. Citations: 63
 35. **[A wirelessly powered platform for sensing and computation](#)**. Joshua R. Smith, Alanson Sample, Pauline Powledge, Alexander Mamishev, Sumit Roy. Proceedings of Ubicomp 2006: 8th International Conference on Ubiquitous Computing. Orange Country, CA, USA, September 17-21 2006, pp. 495-506. Citations: 68
 36. **[Energy Harvesting in RFID Systems](#)** Alanson P. Sample, Daniel J. Yeager, Joshua R. Smith, Pauline S. Powledge, Alexander V. Mamishev. International Conference on Actual Problems of Electron Devices Engineering (APEDE), Saratov, Russia, September 2006.
 37. **[Sensor Applications in RFID Technology](#)** Daniel J. Yeager, Alanson P. Sample, Joshua R. Smith, Pauline S. Powledge, Alexander V. Mamishev. International Conference on Actual Problems of Electron Devices Engineering (APEDE), Saratov, Russia, September 2006.
 38. **[ID Modulation: Embedding Sensor Data in an RFID Timeseries](#)**. Joshua R. Smith, Bing Jiang, Sumit Roy, Matthai Philipose, Kishore Sundara-Rajan, Alexander Mamishev. Proceedings of the Information Hiding Workshop 2005, LNCS 3727, pp 234-246. Citations: 18
 39. **[Energy Scavenging for Inductively Coupled Passive RFID Systems](#)**. Bing Jiang, Sumit Roy, Kishore Sundara-Rajan, Matthai Philipose, Joshua R. Smith, and Alexander V. Mamishev. Proceedings of the IEEE Instrumentation and Measurement Technology Conference, Ottawa, Canada, May 17-19 2005, pp. 984-989. Citations: 33
 40. **[FiberFingerprint Identification](#)**. Eric Metois, Paul M. Yarin, Noah Salzman, and Joshua R. Smith. Proceedings of the Third Workshop on Automatic Identification, Tarrytown, NY, March 2002, pp. 147-154. Citations: 21
 41. **[Developments in Steganography](#)**. Joshua R. Smith and Christopher Dodge. Proceedings of Information Hiding: Third International Workshop, Dresden, Germany, September/October 1999. Springer-Verlag Lecture Notes in Computer Science Vol. 1768, pp. 77-87. Citations: 27

42. [Microstructure-Based Indicia](#). Joshua R. Smith and Andrew V. Sutherland. Proceedings of the Second Workshop on Automatic Identification Advanced Technologies, Morristown, NJ, October 1999, pp 79-83. Citations: 10
43. **Stealth Barcodes**. Joshua R. Smith and Barrett Comiskey. Proceedings of the First Workshop on Automatic Identification Advanced Technologies, Stony Brook, N.Y., November 1997.
44. **Distributed Protocols for ID Assignment**. Joshua R. Smith. Proceedings of the First Workshop on Automatic Identification Advanced Technologies, Stony Brook, N.Y., November 1997.
45. [Modulation and Information Hiding in Images](#). Joshua R. Smith and Barrett O. Comiskey. Presented at the Workshop on Information Hiding, Isaac Newton Institute, University of Cambridge, UK, May 1996; Springer-Verlag Lecture Notes in Computer Science Vol. 1174, pp 207-226. Citations: 277
46. [Applying Electric Field Sensing to Human-Computer Interfaces](#) Tom Zimmerman, Joshua R. Smith, Joe Paradiso, David Allport, and Neil Gershenfeld. Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI-95), May 1995. Citations: 158
47. **Evolving Models of Dynamical Systems with a Genetic Algorithm**. Joshua R. Smith and Donald House. Proceedings of IEE Colloquium on Genetic Algorithms for Control and Systems Engineering, London, April 1992. IEE Digest 1992/106.
48. [Designing Biomorphs with an Interactive Genetic Algorithm](#). Joshua R. Smith. Proceedings of the Fourth International Conference on Genetic Algorithms, San Diego, June 1991. Interactive evolution code from this paper is open source and downloadable via menu option in Ubuntu Linux. Citations: 89

Parts of books (chapters in edited books)

1. [WISP: A Passively Powered UHF RFID Tag with Sensing and Computation](#), D.J. Yeager, A.P. Sample, J.R. Smith, in S.A. Ahson, M. Ilyas Ed., "[RFID Handbook: Applications, Technology, Security, and Privacy](#)," CRC Press, March 2008. Citations: 20
2. [Development of Sensing and Computing Enhanced Passive RFID tags Using the Wireless Identification and Sensing Platform](#), A.P. Sample, D.J. Yeager, M. Buettner, J.R. Smith, *Development and Implementation of RFID Technology*, Christina Turcu, Ed. , pp. 127-144, InTech, January 2009.

Books edited

1. [Wirelessly Powered Sensor Networks and Computational RFID](#), Joshua R. Smith (Ed.), Springer SBM, to appear, 2013.

U.S. Patents awarded

	Patent number and date * denotes issued	Title	Inventors	Assignee
20	*US 8,299,652 – 10/30/2012	Wireless power transfer apparatus and method thereof	Alanson P. Sample, Joshua R. Smith	Intel Corporation
19	*US 8,222,996 – 7/17/2012	Radio frequency identification tags adapted for localization and state indication	Joshua R. Smith, Daniel Yeager, Ali Rahimi	Intel Corporation
18	*US 8,149,120 – 4/3/2012	Temporary non-responsive state for RFID tags	Joshua D. Posamentier, Joshua R. Smith	Intel Corporation
17	*US 7,956,725 – 6/7/2011	RFID tag with accelerometer	Joshua R. Smith	Intel Corporation
16	*US 7,825,776 – 11/2/2010	Device configuration with RFID	Joshua R. Smith and Dirk Haehnel	Intel Corporation

15	*US7,646,214 -- 1/12/10	Power harvesting signal line termination	Joshua R. Smith	Intel Corporation
14	*US7,633,025 --- 12/15/09	Inertial switch using fully released and enclosed conductive contact bridge	Joshua R. Smith, Kishore Sundara-Rajan	Intel Corporation
13	*US7,411,505 --- 8/12/08	Switch status and RFID tag	Joshua R. Smith, Anthony Lamarca, Matthai Philipose	Intel Corporation
12	*US7,336,184 --- 2/26/08	Inertially controlled switch and RFID tag	Joshua R. Smith, Matthai Philipose	Intel Corporation
11	*US7251347 --- 7/31/07	System and method for authentication of a workpiece using three dimensional shape recovery	Joshua R. Smith	Escher Group LTD
10	*US7035428 --- 4/25/06	Workpiece authentication based upon one or more workpiece images	Joshua R. Smith	Escher Group LTD
9	*US6584214 --- 6/24/03	Identification and verification using complex, three-dimensional structural features	Ravikanth Pappu, Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
8	*USD450759 --- 11/20/01	Postal indicia for an envelope	Will Crosby, Michael J. Murphy, Joshua R. Smith, Andrew Sutherland	Escher Group LTD
7	*US6210771 --- 04/03/01	Electrically active textiles and articles made therefrom	E. Rehmi Post, Margaret Orth, Emily Cooper, Joshua R. Smith	Massachusetts Institute of Technology
6	*US6066954 --- 05/23/00	Apparatus for resolving presence and orientation within a defined space	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
5	*US6051981 --- 04/18/00	Method and apparatus for characterizing movement of a mass within a defined space	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
4	*US6025726 --- 02/15/00	Method and apparatus for determining three-dimensional position, orientation and mass distribution	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
3	*US5936412 --- 08/10/99	Method for resolving presence, orientation and activity in a defined space	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
2	*US5914610 --- 06/22/99	Apparatus and method for characterizing movement of a mass within a defined space	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology
1	*US5844415 --- 12/01/98	Method for three-dimensional positions, orientation and mass distribution	Neil Gershenfeld, Joshua R. Smith	Massachusetts Institute of Technology

Patent applications (Filed or published US or PCT patent applications, not already listed above)

Application number	Title	Inventors	Assignee
	Adaptive Impedance Matching for Wireless Power	Benjamin H. Waters, Alanson P. Sample,	University of Washington

		Joshua R. Smith	
	Seashell effect proximity sensing	Joshua R. Smith, Liang-Ting Jiang	University of Washington
	Dynamic wireless power control	Jim Walsh, Gamil Cain, Issy Kipnis, Joshua R. Smith	Intel Corporation
	Presence and range detection of wireless power receiving device and method thereof	Jim Walsh, Gamil Cain, Issy Kipnis, Joshua R. Smith	Intel Corporation
2012-0153739	Range adaptation mechanism for wireless power transfer	EB Cooper, S Yang, CJ Bonsavage, JR Smith, AP Sample, AS Konanur	Intel Corporation
WO-2011-037777	HAUT-PARLEUR ALIMENTE SANS FIL	EB Cooper, JR Smith, AP Sample	Intel Corporation
2010-0187913	Wireless power transfer apparatus and method thereof	Joshua R. Smith and Alanson P. Sample	Intel Corporation
2010-0081379	Wirelessly powered speaker	Emily B. Cooper, Joshua R. Smith, Alanson P. Sample	Intel Corporation
2010-0052811	Flat, asymmetric, and E-Field confined wireless power transfer apparatus and method thereof	Joshua R. Smith, Alanson P. Sample, Emily B. Cooper	Intel Corporation
2010-0045114	Adaptive wireless power transfer apparatus and method thereof	Alanson P. Sample, Joshua R. Smith	Intel Corporation
2009-0243813	Wireless programming of non-volatile memory with near-field UHF coupling	Joshua R. Smith, Daniel Yeager, Mostafa N. Abdulla, Sean Eilert	Intel Corporation
2008-0238680	Temporary non-responsive state for RFID tags	Joshua D. Posamentier, Joshua R. Smith	Intel Corporation
2008-0143192	Dynamic radio frequency power harvesting	Alanson P. Sample, Joshua R. Smith	Intel Corporation
2008-0041930	Device configuration with RFID	Joshua R. Smith, Dirk Haehnel	Intel Corporation
2007-0132587	Time domain embedding of application information in an RFID response stream	Joshua R. Smith, James A. Landay	Intel Corporation
2003-0197878	Data encoding and workpiece authentication using halftone information	Eric Metois, Joshua R. Smith, Paul M. Yarin	Escher Group
2003-0063772	System and method for authentication and tracking of a workpiece that includes an optically active medium	Joshua R. Smith, Eric Metois, Michael J. Murphy	Escher Group
2003-0026448 WO/2003/012727	Data encoding and decoding using angular symbology	Eric Metois, Joshua R. Smith	Escher Group
2002-0095306 WO-2002/027618	Personal mail piece tracing and tracking mechanism	Joshua R. Smith, Paul M. Yarin, Michael J. Murphy, Andrew Victor Sutherland II, Eric Metois	Escher Group
2002-0042808 WO-2002/027617	Method and apparatus for linking data and objects	Joshua R. Smith, Paul M. Yarin, Michael J. Murphy, Andrew V. Sutherland II	Escher Group
WO-2003/032110	System for combining postage, mailing address information, and payment services	Michael J Murphy, Joshua R. Smith, Paul M. Yarin	Escher Group

WO-2000/078032	Data encoding and decoding	Joshua R. Smith	Escher Group
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Abstracts, letters, non-refereed papers, technical reports

- [Printed Low Power Amperometric Gas Sensors Employing RF Energy Harvesting](#), M.T. Carter, J.R. Stetter, J.R. Smith, A.N. Parks, Y. Zhao, M.W. Findlay, V. Patel. 221st Electrochemical Society Meeting, 2012, Seattle
- [Powering a Ventricular Assist Device \(VAD\) with the Free-range Resonant Electrical Energy Delivery \(FREE-D\) System](#), B. H. Waters, A. P. Sample, P. Bonde, J.R. Smith. (Invited) Proceedings of the IEEE, vol. 100, No. 1, pp. 138-149, January 2012.
- [Physicality: Interacting with the Physical World, From Atoms to Humans](#), Joshua R. Smith, Beverly L. Harrison, Xiaofeng Ren, Siddhartha Srinivasa. Intel Technology Journal, Volume 14, Issue 1, pp. 46-61. 2010
- [Imperceptible Sensory Channels](#). Joshua R. Smith. IEEE Computer, Vol. 37, No. 6, pp. 84-85, June 2004.
- [Sensors, Tags, and Security](#). Joshua R. Smith. In Proceedings of the State of Technology Conference on Mobile Wireless Technologies for Persons with Disabilities, Atlanta, GA, May 11-12 2004, pp. 60-66.

Other significant research dissemination (web sites, software, Wikis, etc.)

- Wisp Challenge: Wisp hardware awarded to qualifying academic applicants. Over 30 groups using Wisp. Community website: wisp.wikispaces.com.
- [WISP Summit](#), a workshop on WISP organized in conjunction with Sensys 2009. [Videos of talks are posted](#).
- BUGSX artificial evolution software is available free online. It is downloadable through Ubuntu Linux Software Center.

OTHER SCHOLARLY ACTIVITY

Invited lectures and seminars.

1. IEEE International Conference on RFID-Technology and Applications 2012, [Invited keynote](#) talk, "Wirelessly powered sensor systems and computational RFID," Nice, France, November 5-7, 2012. Host: Prof. Gaetano Marrocco
2. 2012 CMOS Emerging Technologies Conference, [Invited plenary](#) talk, "Wirelessly powered sensing platforms," July 18-20, 2012, in Vancouver, BC, Canada.
3. Semiconductor Research Corporation (SRC) /Science Foundation Ireland (SFI) / National Science Foundation (NSF) Forum on Integrated Sensors for Cybersystems - FISC 2030, "Wirelessly powered sensor systems" March 22-23, Carton House, Maynooth, Co. Kildare, Ireland. [Invitation only workshop](#).
4. Western Washington American Society of Mechanical Engineers, "Artificial Hearts," Feb 16, 2012.
5. UW EE 592, "Connecting Physical and Digital with Sensor Systems." November 4, 2011.
6. Google (Fremont) Colloquium, "Connecting Physical and Digital with Sensor Systems." April 27, 2011. Host: Matt Welsh.

7. Northeastern University, Communications and Digital Signal Processing Center (CDSP), Annual CDSP Research Workshop, **Invited keynote** talk: “Connecting Physical and Digital with Sensor Systems”, March 25, 2011. Previous (2010) keynote: Russ Tedrake. Host: Kaushik Chowdhury.
8. MIT Enterprise Forum, Seattle WA, March 16, 2011. One of 4 invited to participate in panel entitled “The internet of things.” Moderated by Brier Dudley of the Seattle Times.
9. Georgia Institute of Technology, Robotics and Intelligent Machines (RIM) Seminar, “Connecting Physical and Digital with Sensor Systems”, February 2011. Host: Charlie Kemp
10. Columbia University Nanoscale Science and Engineering Center Seminar, “Connecting Physical and Digital with Sensor Systems”, January 2011. Host: John Kymissis
11. ICySSS conference, Cypress Semiconductor, Lynnwood, WA, **Invited keynote** talk: “Connecting Physical and Digital with Sensor Systems,” September 2010
12. Google, Mountainview, CA “Connecting Physical and Digital with Sensor Systems,” April 2010
13. University of Washington, Computer Science and Engineering Colloquium, “Connecting Physical and Digital with Sensor Systems,” April 2010
14. Seattle Robotics Society, “Wireless Power and Personal Robotics,” March 2010
15. University of Washington, Electrical Engineering Colloquium, “Mapping the space of wirelessly powered systems,” January 2010
16. Microsoft Research Colloquium, “Personal Robotics and Wireless Power,” February 2009.
17. Northwestern University, McCormick Lecture in Mechanical Engineering, “Electric Field Pretouch for Robotic Manipulation,” Nov. 2008.
18. Seattle Robotics Society, “Personal Robotics at Intel,” November 2008
19. Semiconductor Research Corporation / National Science Foundation forum on Nanomorphic Systems (invitation only workshop), “Wirelessly-powered platform for sensing and computation: Radiative and resonant-non-radiative wireless power transfer,” November 2007. Stanford University, Palo Alto, CA
20. University of Washington, Computer Science and Engineering Colloquium, “New Approaches to Identification and Sensing,” May 2005.
21. Stanford University, “Computational Sensing and Perception,” April 2004.
22. Intel Corporation, “Computational Sensing and Perception,” April 2004.
23. Georgia Institute of Technology, “Computational Sensing and Perception,” March 2004.
24. Olin College, “Computational Sensing and Perception,” February 2004.
25. MediaLabEurope, “Alien Sensing,” January 2004.
26. Massachusetts Institute of Technology, AI Lab Colloquium, “Computational Sensing and Perception,” April 2003.
27. University of Cambridge (UK), Department of Physics, Cavendish Laboratory, Inferential Sciences Colloquium, “Intelligent Documents,” May 2001.
28. Microsoft Research Colloquium, “Electric Field Imaging,” June 1998.
29. IBM Research Colloquium, “Electric Field Imaging,” June 1998.
30. Microsoft Research Colloquium, “Modulation and Information Hiding,” April 1998.
31. University of Cambridge (UK), Department of Physics, Cavendish Laboratory, Inferential Sciences Colloquium, “Toward Electric Field Imaging,” 1997.

Talks, demonstrations, ads, etc. (not already listed as conference publications)

“Wireless Resonant Energy Link,” TED Global, Oxford, UK, July 2010.

“Range adaptation of the Wireless Resonant Energy Link,” student Josh Erickson co-presented demo, Research at Intel Day, Computer Museum, Mountainview, CA, July 2010.

I am featured by name in several Intel TV ads in Intel's "Sponsors of Tomorrow" ad campaign. In one, I am identified by name: "Joshua Smith, Pretouch Robotics Inventor." The ad references my CeBIT demo (described below). [Click here to view Intel television ad referencing my robotics research.](#) (I am played by an actor). Another ad that aired in China features a Chinese actor playing me as an "Intel Rockstar" (this is a version of the popular rockstar ad that was played in the U.S., but localized to China). The text of the ad reads "J. Smith: Pulls power from atmosphere." [Click here to see Intel television ad referencing my wireless power research.](#)

"Sponsors of Tomorrow" I appeared in a press conference with Intel CTO Justin Rattner and Intel Fellow Ajay Bhatt (inventor of USB) to discuss my role as a "rockstar" in Intel's ad campaign, Computer Museum, Mountainview, CA, July 2009.

"A wirelessly powered speaker," student David Meyer co-presented demo, Research at Intel Day, Computer Museum, Mountainview, CA, July 2009.

"Launching CeBIT with E-Field Pretouch," robotics demonstration with Chancellor of Germany Angela Merkel, Governor of California Arnold Schwarzenegger, and Intel Chairman Craig Barrett. Our robot "Marvin" helped the VIPs cut the ribbon to launch the CeBIT tradeshow. [Click here to view video.](#) Student Brian Mayton participated in demo. CeBIT, Hannover, Germany, March 2009.

"Robotics: Progress and Prospects," Presentation to Intel CEO Paul Otellini, February 2009.

"Wireless Resonant Energy Link," Intel Developer Forum, San Francisco, CA, Intel CTO Justin Rattner demos WREL in his keynote, Aug 2008. Student Alanson Sample included in demo. IDF Taipei, Demo repeated in research keynote, Oct 2008.

"Electric Field Pretouch," Intel Developer Forum, San Francisco, CA, Intel CTO Justin Rattner demos E-Field Pretouch in his keynote, Aug 2008. IDF Taipei, Demo repeated in research keynote, Oct 2008.

"Personal Robotics at Intel," Presentation to leading academic roboticists at Intel Personal Robotics workshop, which I organized. Santa Clara, CA, July 2008.

"Electric Field Pretouch for Robotic Grasping," student Ryan Wistort co-presented his novel robot hand design. Research at Intel Day, Computer Museum, Mountainview, CA, July 2008.

"E-Field Pretouch Robotic Grasper," demonstrated to Intel CEO and Management Committee as part of Technology Strategic Long Range Plan presentation on Computational Perception. October 2007.

"Personal Robotics," Corporate Technology Group Strategic Staff, October 2007.

"Wisp," demonstration at Intel Developer Forum (IDF) San Francisco. Student Dan Yeager co-presented, September 2007.

"Futures for RFID in Healthcare," Federal Trade Commission's "Protecting Consumers in the Next Tech-ade," Washington, D.C. November 6-8 2006.

"WISP," U.W. Department of Computer Science and Engineering Industrial Affiliates Day, Oct. 2006.

“Wisp” Research at Intel Day, Santa Clara, CA June 2006.

Intel Capital / Intel Corporate Technology Group Oregon Venture Capital Day “WISP,” demo. October 2005.

Intel Country Fair, Jones Farm, OR, “WISP v0: RFID + 1 bit accelerometer,” August 2004.

PostExpo, Hamburg Germany, “New Technologies for postage.” October 2001.

America’s Millennium (U.S. National Millennium Celebration), Hirschorn Museum, Smithsonian Institution, “FiberFingerprint technology.” December 2000.

“FiberFingerprint technology,” demonstration in keynote of US Postal Service CTO Norm Lorenz, National Postal Forum, Chicago, IL, September 1999.

Presentations given at conferences (not already listed as conference publications).

1. **Brian Mayton**, Eric Garcia, Louis LeGrand, Joshua R. Smith, “Electric Field Pretouch: Towards Mobile Manipulation,” RSS 2009 Workshop on Mobile Manipulation in Human Environments
2. **Joshua R. Smith**, Ryan Wistort, “Controlling a minimal dynamically stable structure.” Poster presentation, *Dynamic Walking*, Delft, Netherlands, May 2008.
3. **Joshua R. Smith**, Neil Gershenfeld. “Activating Space with Electric Field Sensing,” Talk, *Siggraph Technical Sketches*, Los Angeles, August 1995.
4. **Joshua R. Smith** and Donald House, “Evolving Models of Dynamical Systems with a Genetic Algorithm.” Poster presentation, *Artificial Life 3*, Santa Fe, New Mexico, June 1992.

Professional society memberships.

IEEE, 1999-Present
AAAS, 1999-Present
ACM, 2004-Present

Other

Selected Press Coverage

Daily Distrupction, June 2012, [Disruptor of the Day: Joshua Smith – A Researcher on The Cutting Edge of Sensor Technology \[Q&A\]](#).

Technology Review, April 2012, [The Computing Trend that Will Change Everything.](#)

GreenBiz, March 2012, [What innovations are possible with ultra-efficient sensors?](#)

IEEE Spectrum, March 2012, [Is There a Moore’s Law for Energy Efficiency?](#)

Technology Review, July 2011, [A Heart Pump Without a Cord.](#)

Economist, Print: June 4th 2011, online: April 12, 2011. [A wireless heart](#)

New York Times, June 18, 2010. [Bye-Bye Batteries: Radio Waves as a Low-Power Source](#)

Economist, June 10, 2010. [Power from thin air](#)

New York Times, January 30, 2010. [Smart Dust? Not Quite, but We’re Getting There](#)

The Times (UK), January 25, 2010. [Meet Marvin, the robot that can plug itself in](#)

Technology Review, November 25, 2009. [A Battery-Free Implantable Neural Sensor](#)

Seattle Times, June 15, 2009. [Intel aims to capture wild electricity](#)

New York Times, August 20, 2008. [Intel Moves to Free Gadgets of Their Recharging Cords](#) on WREL & EF Pretouch. Many other press & blog stories were generated along with this one.

TechnologyReview.com, September 17, 2007. [Robots That Sense Before They Touch](#) on EF Pretouch Grasping.

CNET News.Com, May 24, 2006. [Sensors: Living off scraps of energy](#). Story covers WISP.
TechnologyReview.com, May 15, 2006. [Sensors without batteries](#). Story on WISP.
New York Times Magazine, June 11, 2000. [The Document That Can't Be Forged](#). Story on FiberFingerprint.
CBS, The Early Show TV coverage of NEC's Occupant Position Detection System.

GRADUATE STUDENTS

Chaired Doctoral Degrees

Student Name	Dissertation Title	Completed (Year)	Current Employer
Michael Buettner (Co-chaired with David Wetherall)	Backscatter Protocols and Energy-Efficient Computing for RF-Powered Devices	2012	Google
Alanson Sample	Cutting the last cord with wireless power	2011	Intel

Doctoral Degrees, Committee

Student Name	Dissertation Title	Completed (Year)	Current Employer
Liang-Ting Jiang	TBD	2014 Expected	UW
James Snyder, Northwestern University	Robotic active and passive electrolocation	2014 Expected	Northwestern Univ. Biomedical Engineer.
Eric Rombokas, UW Electrical Engineering	Dynamic Manipulation For Tendon-Driven Hands	2012	UW (Postdoc with Tom Daniel)
Bing Jiang UW Electrical Engineering	Ubiquitous Monitoring of Distributed Infrastructures	2006	

Masters Degrees Committees

Student Name	Level of Supervision ("thesis," "project" or "coursework only")	Thesis/Paper Title (if applicable)	Completed (Year)	Current Employer
Aaron Parks	Thesis	TBD	2013 expected	UW
Justin Reina	Thesis	TBD	2012 expected	Intel
Ben Waters	Project	Adaptive Impedance matching for wireless power	2012	UW
Vamsi Talla	Project	Analog backscatter	2012	UW
Jeffrey L. Braun, UW Electrical Engineering	Thesis, co-Chair Sumit Roy	Design and Application of Wirelessly Powered and Hybrid Powered Sensor Nodes	2010	MIT Lincoln Labs
Dan Yeager, UW Electrical Engineering	Thesis, co-Chair Brian Otis	Development and Application of Wirelessly Powered Sensor Nodes	2009	U.C. Berkeley EE grad student

Ying Su, UW Electrical Engineering	Thesis, co-Chair Brian Otis	Physical Chip Identification Using Process Variations for Ultra-Low Power SoCs	2009	
Alanson Sample, UW Electrical Engineering	Thesis, co-Chair Alex Mamishev	Design of a Battery Free Wireless Identification and Sensing Platform	2008	UW EE

Other significant student supervision & Postdoctoral supervision

Student Name	Level of Supervision (“thesis,” “project” or “coursework only”)	Thesis/Paper Title (if applicable)	Completed (Year)
Alanson Sample	Project	Postdoc supervision	7/11 – 8/12
Lillian Chang CRA/CCC CIF Postdoc Fellowship	Project, with Dieter Fox	Postdoc supervision	11/10 – 2/12
Ravi Balasubramanian UW CSE postdoc	Project, with Yoky Matsuoka	Postdoc supervision	9/09 – 9/10

Student Name	Level of Supervision (“thesis,” “project” or “coursework only”)	Thesis/Paper Title (if applicable)	Completed (Year)
Eric Garcia UW EE	Project	Numerical & Analytical Modeling of Electric Field Sensing	6/06 – 9/06
Bing Jiang UW EE	Project, with A. Mamishev	WISP hardware; modeling inductive power	7/04 – 9/05
Ganesh Krishnamoorthy U.T. Austin	Project	E-Field Pretouch (joint pub)	6/05 – 9/05
Kishore Sundara-rajan UW EE	Project, with Alex Mamishev	Low power MEMS sensing	7/04 – 9/05
Post-Bac or Undergrad			
Ben Waters Columbia EE post-bac	Project	WREL	7/10 – 12/10 Now UW EE
Scott Southwood UW CSE undergrad	Project	WARP weather station	9/09 – 6/10 9/10 – 12/10
Brian Mayton UW CSE post-bac	Project	E-Field Pretouch	6/08 - 9/10 Now at MIT, advisor Joe Paradiso, also admitted to CMU, GA Tech, and UW
David Meyer UW EE & Physics undergrad	Project	WREL	6/08 – 9/08 Now at MIT, EE Ph.D. program
Ryan Wistort UW EE	Project	Robotic manipulators, E-Field Pretouch	6/07 – 9/08 Attended MIT, advisor Cynthia Breazeal
Seong-Ho Kim	Project	Gen 2 WISP firmware	4/07 – 9/07
Dimitri Negroponte NYU ITP	Project	Physical User Interface; Industrial Design	9/05 – 9/06 now @ Applied Minds

Jim Youngquist UW CSE undergrad	Project	E-Field plugging in	6/10 – 9/10 Accepted UW CSE PhD
Barrett Comiskey MIT undergrad	Project	MIT UROP: Modulation and Information Hiding in Images (joint publication)	1995 (later co-founded E-Ink Corp)
Edward S. Boyden MIT undergrad	Project	MIT UROP: E-Field Sensing	1996 now Asst. Prof. Neuro-Engineering, MIT
Chris Salthouse MIT undergrad	Project	MIT UROP: Code Division Multiplexing of a Sensor Channel (joint publication)	1997 Now Asst. Prof. EE, U. Mass Amherst

RESEARCH ACTIVITIES

Current and Pending Grants

Funded Research

Funding Agency	Title	Total Amount (Subcontracts)	University Matching, if any	Your Amount	Your Role, Other Pi's co-Pi's	Dates (start-finish)
CRA / CCC Visioning	Perpetual Computing: Proposal for a CCC Visioning Exercise	\$40K		\$40K	PI, David Wetherall, Dina Kitabi, Kevin Fu, Matt Reynolds, Prabal Dutta	10/14/11
UW C4C	Wireless Power for Left Ventricular Assist Devices (LVADs)	\$50,000		\$50,000	PI	7/1/12 – 6/30/13
Google Faculty Research Award	Powering the Internet of Things with Wireless Ambient Radio Power (WARP)	\$61,728 (Gift)		\$61,728	PI	7/18/11 – 8/17/12
NSF	Adaptive	\$3.7M / year		\$155,000	Co-PI (Thrust	9/16/11

ERC for SNE EEC-1028725 Personnel grant	wireless power for chronic electrocortigraphy			(1 RA + 1 mo. summer salary) for 2 years	leader for Communications and Interface)	– 9/15/13
NSF ERC for SNE EEC-1028725 Seed grant	Development of the NFC-WISP as a standardized framework for wireless power delivery and bidirectional communication with neural implants	\$3.7M / year		\$11,753	Co-PI	9/16/11 – 9/15/12
Intel Science and Technology Center	ISTC for Pervasive Computing (2 grad students + 1.5 month summer sal)	\$2.5M / yr		\$740K (2 RAs+ 1.5 mo. summer salary) for 5 years	Co-PI (Lead of low power sensing and communication theme)	10/1/11 – 9/30/16
DARPA (via UW APL sub-contract)	ICL for undersea data communication	Partial support EE grad student, summer		\$10,000	PI	7/1/11 – 9/30/11
NSF ECCS 0824265	Realizing the Internet of Things via RFID Sensor Nets	\$499,999	0	0	Co-PI	9/15/08 – 8/31/12
NSF CRI, CNS-0454394	Creating an <i>RFID Ecosystem</i> to Bridge the Physical-Information Divide	\$200,401	0	0	Sr. Research Staff	2005 – 2007

In-kind Contributions, Direct student funding, Student Fellowships

Funding Agency	Title	Total Amount (Subcontracts)	University Matching, if any	Your Amount	Your Role, Other Pi's co-Pi's	Dates (start-finish)
Korean government "BK21" program	Wireless power research at UW	Gunbok Lee ~\$60K		~\$60K	Research advisor	4/1/12 – 1/31/13
NSF / CRA grant to Intel	Synthesis and Analysis of Manipulation Actions to	CI Fellows Postdoctoral grant for Lillian Chang \$90K		\$90K	Research advisor	10/4/10 – 10/3/11

	Improve Dexterity in Robot and Human Systems					
Intel	BTAG Commercialization	Grad student Justin Reina ~\$20K		~\$20K	Research advisor	2/1/11 – 6/1/11
Intel	BTAG Commercialization	Grad student & Postdoc Alanson Sample ~\$40K		~\$40K	Research advisor	2/1/11 – 10/1/11
NSF Fellowship	Wirelessly powered BCI	Artem Dementyev ~\$180K		0	Research advisor	7/1/12 – 6/30/17

Equipment Donations

Funding Agency	Title	Total Amount (Subcontracts)	University Matching, if any	Your Amount	Your Role, Other Pi's co-Pi's	Dates (start-finish)
Tektronix	Test equipment for wireless power research	Equipment donation \$28.4K		\$28.4K	PI	4/13/12
Intel	Test equipment from Intel Seattle	Equipment donation 3D printer, RF amp, scopes, materials ~\$100K		~\$100K	PI	6/1/2011
National Instruments	WISP Camera sensing	Equipment donation, \$10K		\$10K	PI	4/25/2011
Intel	Surplus equipment	2 Vector Network Analyzers ~\$60K		~\$60K	PI	2/1/2011, 5/1/2011
Willow Garage	Open Source Discount Award	\$120K		\$120K	PI	7/8/10 - 12/29/11

Pending grant applications

Funding Agency	Title	Total Amount (Subcontracts)	University Matching, if any	Your Amount	Your Role, Other Pi's co-Pi's	Date grant submitted
DOD (SBIR)	Efficient Self Adaptive Wireless Power Transfer	\$150K (including phase I option)		\$50K (including phase I option)	Co-PI	6/25/12
NIH	Characterization and safety profiling for wireless LVADs	\$250K		\$179K	Co-PI	6/15/12
UW CPAC	Battery-Free RF Energy Harvesting Gas Sensing Platform	\$80K		\$80K	PI	4/9/2012
DoD (Navy)	A Novel Wireless Identification and Sensing Platform (WISP) for Corrosion Monitoring in Sealed Compartments	\$100K		\$45K	Co-PI	3/20/12
NSF CNS	CPS: Synergy: Collaborative Research: Enabling RFID-based Cyberphysical Systems via Physical Layer Enhancement	\$400K		\$120K	Co-PI	3/14/12
NSF Expedition	Collaborative Research: RF-Powered Computing and Communications Systems	\$5.7M		\$1.4M	Co-PI	3/12/12

DOCUMENTATION OF TEACHING EFFECTIVENESS

Courses Taught & Student Evaluations

Ratings are reported as raw / adjusted. Item 1: "Course as a whole" Item 2: "Course content"
Item 3: "Instructor's contribution" Item 4: "Instructor's effectiveness in teaching the subject
matter" 5.0: Excellent 4.0 Very Good 3.0 Good

Course	Title	Quarter	Credit Hrs	Enrollment	Evaluations / Responses	Item 1	Item 3	Item 4	Avg Items 1-4
CSE 599 J	Personal Robotics	Spr 2012	3	11	5/11	4.7 / 4.4	4.9 / 4.7	4.0 / 3.8	4.5 / 4.3
EE 205	Intro. To Signal Conditioning	Win 2012	4	18	18/23	4.0 / 4.0	3.8 / 3.8	3.5 / 3.5	3.8 / 3.9
CSE 466	Software for Embedded Systems	Aut 2011	4	24	21/24	4.2 / 4.0	4.0 / 3.9	3.8 / 3.7	4.0 / 3.9
EE 205	Intro. To Signal Conditioning	Spr 2011	4	18	11/18	4.6 / 4.4	4.8 / 4.6	4.4 / 4.1	4.6 / 4.4
CSE 466	Software for Embedded Systems	Win 2008 w/ Gaetano Borriello	4	20	13/20	4.5	4.6	4.5	4.5

Supervision of independent study (design projects and research).

Independent Study

Course	Title or Student Name	Quarter	# of Students (Total Credit Hrs)
CSE499A	Baba-Weiss, Kogon, Maeda, Singh	Sp 12	4(6)
EE499A	Chao, Mosseau, Shi, Thomas, Vadrevu, Xie	Sp 12	6(15)
EE599A	Dementyev, Zhao	Sp 12	2(8)
EE700A	Parks, Talla, Waters	Sp 12	3(14)
CSE499A	Baba-Weiss, Kogon, Maeda, Singh, Thomas	Wi 12	5(7)
EE499A	Chao, Mousseau, Noll, Shi, Shi Zhang	Wi 12	6(19)
EE599A	Dementyev, Talla, Zhao	Wi 12	3(6)
EE700A	Talla, Waters	Wi 12	2(6)
CSE498A	Macomber	Au 11	1(2)
CSE499A	Mullen, Singh	Au 11	2(6)
EE499A	Chen, Le, McLaughlin, Mosseau, Pang, Wang	Au 11	6(14)
EE599A	Jiang, Parks, Zhao	Au 11	3(12)
EE700A	Reina	Su 11	1(10)
EE599B	Wisdom	Su 11	1(4)
EE599A	Jiang, Talla, Waters	Su 11	3(6)
CSE499A	Mailhot, Mullen, Singh, Thomas	Spr 11	4(11)

EE800A	Sample	Spr 11	1(15)
EE600A	Jiang	Spr 11	1(4)
EE599A	Waters, Arnes, Kagi, Le, Parks, Parris, Reed, Marquardt	Spr 11	8(29)
EE800A	Sample	Wi 10	1(15)
EE600A	Jiang	Wi 10	1(3)
EE599A	Waters	Wi 10	1(5)
EE499A	Govier, Kagi, Marquardt, Parks, Yi	Wi 10	5(20)
CSE499A	Arnes, Kogon, Mailhot, Reed, Singh, Thomas, Mullen, Wu	Wi 10	8(26)
CSE499	Southwood	Au 10	1(3)
CSE498A	Youngquist	Sp 10	1(1)
CSE498B	Southwood	Sp 10	1(3)
CSE498B	Southwood	Wi 10	1(3)
CSE498A	Southwood	Au 09	1(3)

Teaching – Teaching Assistant positions

Institution	Course Title or Student Name	Quarter	Instructor
MIT	Physics of Information Technology Program in Media Arts & Sciences	Spr 1996	Neil Gershenfeld
MIT	Nature of Mathematical Modeling	Aut 1995	Neil Gershenfeld
MIT	Physics of Information Technology	Spr 1995	Neil Gershenfeld
MIT	Nature of Mathematical Modeling	Aut 1994	Neil Gershenfeld
Williams College	Artificial Intelligence Dept. of Computer Science	Spr 1990	Donald House
Williams College	Knowledge, Belief, and Understanding, Dept. of Philosophy	Aut 1989	Peter Lipton
Williams College	Knowledge, Belief, and Understanding, Dept. of Philosophy	Spr 1989	Peter Lipton

SERVICE

Departmental service

- Member EE Faculty Recruiting Committee, 2012-2013
- Member CSE 5th year Masters Admissions Committee, 2012-2013
- Leader, Communications and Interface thrust, Center for Sensorimotor Neural Engineering, 2012 - present.
- Member of EE Professional Masters Committee, 2011-Present.
- Member of search committee for EE Department 2010-2011 Molecular Engineering faculty search.
- EE Direct Freshman Admits Committee, 2011-2012
- Engineering Discovery Days: 2011, 2012 (April). Demonstrations of robotics and wireless power.

Professional society and other service

Selection panel for NSF CISE Computer Systems Research grant panel, Arlington, VA
4/11/12—4/12/12.

Selection panel for NIH NHLBI SBIR grants on Novel Technologies for Powering Ventricular Assist Devices, Bethesda, MD, 3/8/2012.

Member of [CCC/CRA Study on Robotics](#) (Professional and Service Robotics panel, 7-8 Aug. 2008, San Francisco, CA), creating [15 year U.S. National roadmap for robotics research](#), which has been presented to the U.S. Congress in a series of briefings; a photo of my EF Pretouch research appears on the cover of the report. Aug 2012: Member of panel updating Robotics Roadmap.

Program Committee member for IEEE RFID 2012, 2011, 2010, 2009, MedCOMM 2012 (workshop on Medical Communication in conjunction with SigCOMM), Internet of Things (IoT) 2012, RFIDSec 2011, Ubiquitous Computing Systems (UCS) 2010, 2009, RFID Data Management 2008 (RFDM 08), UCS 2007, Pervasive Computing 2006.

Reviewer for ICRA, IROS, RSS, Ubicomp, IEEE Pervasive Computing Magazine, UIST Conference, CHI conference, IEEE Transactions on Image Processing, Eurasip Journal on Applied Signal Processing, Cambridge University Press (Physics section and Engineering section). Chaired Tactile Sensing Session at IROS in 2008 and in 2007.

International, national or governmental service

- Federal Trade Commission, "[Protecting consumers in the next Techade](#)". Testified on the future of RFID and sensing. Other speakers included Vint Cerf (Google), Eric Horvitz (Microsoft) 2006.
- United States Postal Service, Mail Technology Strategy Council, Member 2003-2008
- [U.S. President's Commission on the Postal Service](#). My testimony led to new U.S. "Personalized Postage" with custom photographs. Examples of my prototypes are found on pps 24 and 179 of the report, 2003
- United States Postal Service, Intelligent Document Task Force, Member, 1999-2003
- United States Postal Service, Intelligence on Mail for Security Task Force, Industry co-chair for Technology and Infrastructure Sub-Committee, 10/01 – 5/02
- Smithsonian Institution, National Postal Museum. Appointed Member of the Council of Advisors (Board of directors), National Postal Museum, 2002-2004

Industrial service/Intel Service

Wireless Strategic Patent Team
2007 – 2010

Sets patent filing targets for the two Intel Corporation IP committees covering wireless technologies. Membership normally restricted to grade P.E. and above.

Wireless Platform Technologies IP Committee
2006 – 2010

Votes to reject or file patent applications on invention disclosures for Intel Corporation in wireless technology.

Physicality Theme, Intel Research
2006 – 2010

Leader of one of Intel Research's 5 content themes.

