Ernest (Rehmi) Post, Ph.D.

CONTACT INFORMATION

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RESEARCH INTERESTS

Inertial measurement, electronic textiles, particle traps, electric field sensing, MEMS, theory of programming languages, distributed sensing and computation, low-power wireless sensors, triboelectricity, energy harvesting.

EDUCATION

Massachusetts Institute of Technology, Cambridge, Massachusetts USA

Ph.D., MIT Media Lab, August 2003
Dissertation Topic: *Inertial Measurement via Dynamics of Trapped Particles*
Advisor: Prof. Neil A. Gershenfeld (MIT)
Committee: Prof. Scott Manalis (MIT), Prof. Joseph Paradiso (MIT)

M.Sc., MIT Media Lab, February 1999
Dissertation Topic: *E-broidery: An Infrastructure for Washable Computing*
Advisor: Prof. Neil A. Gershenfeld (MIT)
Readers: Prof. Alex (Sandy) Pentland (MIT), Prof. Joseph M. Jacobson (MIT)

University of Massachusetts, Amherst, Amherst, Massachusetts USA

B.Sc., University of Massachusetts, Amherst, June 1996
Major: Physics *cum laude*
Minor: Computer Science

HONORS AND AWARDS

Samsung Research America Outstanding Inventor Award for "Most A1-grade Commercial-Related Issued Patents as Lead Inventor", December 2018
Samsung Outstanding Researcher Award, January 2014
Samsung Spot Award for Excellence, October 2013
MIT Arts Council Grant to develop the ZeroN Levitated Interaction Device, March 2010
MIT homepage spotlight, *Microsensors without microfabrication: MIT researchers introduce a new class of microdevice*, April 20, 2010
Featured exhibit of interactive technological artwork, *Sp4rkl3 Power Harvesting Dress* installation, Boston Museum of Science (11/08-2/09)
Motorola Fellow, MIT Media Lab (2000-2002)
I.D. Magazine Silver Medal in Interactive Media Design (2000), Interactive multitouch table installation, New York Museum of Modern Art (7/99-10/99)
Interval Research Fellowship, MIT Media Lab (1996-1998)

PROFESSIONAL EXPERIENCE

Samsung Research America, Think Tank Team, Mountain View, CA USA
Lead Scientist **November 2012 - May 2022**

Science lead of an interdisciplinary and culturally diverse R&D team comprising researchers, scientists, designers, and engineers, functioning as a startup within Samsung Electronics to define and develop new products and technologies and take them to market. Development of real-time image deblurring algorithms for under-display cameras. Development of optimized grayscale update algorithms for bistable smectic liquid crystal displays. Development of novel triboelectric touch sensing technology from initial invention and prototyping to production ASIC/SoC. Managing and mentoring a team of ten in mixed-signal hardware engineering, computational imaging, and algorithm development. Presentation of ideas and functional demonstrations to executives to obtain support for commercialization of the team's work. Service as engineering and science hiring lead.

Massachusetts Institute of Technology, Cambridge, Massachusetts USA
Visiting Scientist, MIT Media Lab, Center for Bits and Atoms **Sep. 2009 - Nov. 2012**
Performing basic research and development of novel, low-cost technologies for inertial measurement based on levitation and actuation of microparticles. Teaching assistant and invited lecturer in Media Lab courses. Mentoring of and collaboration with students in several groups.

Invited lectures in MAS962: New Textiles **Spring 2011, Spring 2010**
Presented original work in hand-craftable, accessible technology for triboelectric power harvesting in textiles and planar media. Led workshops for students to prototype these ideas.

TA and Guest Lecturer for MAS863: How to make (almost) anything **2009 – 2011**
Responsibilities included teaching mixed-signal and RF electronic design, CAD/CAM, rapid prototyping. Guided students through construction and evaluation of term projects.

Teaching Assistant for MAS862: Physics of Information Technology **Spring 2010**
Led weekly recitation sections covering all aspects of applied physics. Guided students through construction and evaluation of term projects.

Intellectual Property Activities **Spring 2010 - Fall 2012**
Lead inventor on one US patent application in inertial measurement technology and one provisional patent application in 3D user interface technology.

Artistic collaboration: Sand Castles **Fall 2010 - Fall 2012**
Collaboration between artist Vik Muniz, designer and Media Lab PhD student Marcelo Coelho, and the MIT Center for Bits and Atoms to develop a series of prints originally conceived by Muniz to explore the interplay of artistic expression, fabrication, and material science at the microscale.

Ravel, Inc, Austin, TX USA
Chief Science Officer and Co-founder **June 2011 - November 2011**
Set strategic direction for and led an R&D team of scientists and engineers developing scalable, parallelized algorithms for massively distributed processing frameworks. Led development of overall system architecture. Designed methods and processes to validate and characterize performance of parallelized algorithms. Performed intellectual property analysis and assisted with the development of IP strategy. Led product definition and documentation efforts. Participated in community engagement and corporate messaging. Created management tools to aid in product roadmap planning, to facilitate information exchange and transparency amongst management, and to capture customer/investor needs identified in interviews and other contacts.

Rhode Island School of Design, Providence, Rhode Island USA
Critic and Lecturer, Digital Media Department **Spring 2011**
Invited lecturer in electronic textiles and material computing.

Asteism Inc, Cambridge, Massachusetts USA
President, Chief Scientist **2005 - 2011**
Co-founder of Asteism, providing custom engineering and consulting services to clients while pursuing research and development in electronic textiles and other areas.

Technical Activities
Lead architect and engineering supervisor of a growing team. Directed several projects in wireless sensing from concept through prototype and volume production. Developed manufacturing and test programs for production. Designed and built hardened, wireless high-resolution inertial measurement units. Prototyped and put into production very-low-power wireless distributed sensors. Developed firmware, protocols, graphical user interfaces and signal-processing algorithms to recontruct, analyze, and correlate multiple inertial sensor trajectories. Led the research and development of a novel power-harvesting technology for electronic textiles. Assisted clients in obtaining SBIR grant proposals.

Intellectual Property Activities
Performed intellectual property development, assisted IP counsel with the preparation of patent applications, legal opinions, and IP strategy. Lead inventor on one US patent application in renewable energy generation in electronic textiles.

ThingMagic, Inc, Cambridge, Massachusetts USA
Principal **2000 - 2005**
Co-founded ThingMagic, a leading provider of RFID reader systems and consulting services to Fortune 500 companies in the retail, industrial, and medical markets. Started the company in my Somerville garage without outside investment to pursue the vision of the Internet of Things. Developed software-defined RFID technology that brought ThingMagic to a market-leading position, and built on that success through four generations of RFID products to grow the company to 40 employees on revenue alone. In 2004, hired Kevin Ashton as VP of Marketing. In 2010, ThingMagic was acquired by Trimble, retaining its brand identity while complementing the latter's portfolio of navigation technologies.

Technical Activities
Lead software architect and engineering supervisor of a growing team. Directed several software-defined radio projects from concept through prototype and volume production. Developed manufacturing and test processes and programs. Lead software architect of RF baseband signal processing systems on the Intel XScale (ARM), TI DSP family, 68000, MSP430, PIC, and other microprocessors.

Intellectual Property Activities Performed intellectual property analysis and assisted with the development of IP strategy. Named inventor on three issued and one pending US patent applications in RFID systems.

Massachusetts Institute of Technology, Cambridge, Massachusetts USA
Visiting Scientist, MIT Media Lab **2003-2004**
Postdoctoral work on refinement and characterization of an inertial measurement unit based on electrodynamic particle traps.

Research Assistant, MIT Media Lab **1997 - 2003**
Development of a novel inertial measurement technique based on electrodynamic particle traps. Development of early techniques and applications of multi-layer textile circuit design and fabrication. Extensive analog and mixed-signal design focusing on electric field sensing techniques. Development of Pengachu, a low-cost handheld wireless Linux device that inspired the OLPC XO laptop. Experience includes RF design, digital signal processing, microcontroller design, MEMS and other sensor design and fabrication. Collaborations with several corporate research sponsors, including Interval Research, Levi Strauss, Motorola, Philips, Elesys, NEC. Numerous collaborations to bring technology to artists, including development of the Musical Levi's Jacket, the Fabric Ball musical controller, and networked multi-touch displays. Supervisor of four undergraduate student research assistants.

TA and Guest Lecturer, MIT MAS863: How to make (almost) anything **1998 - 2001**
Responsibilities included teaching classes in parametric CAD and simulation, rapid prototyping, and FPGA design over a period of four years. Was the lead TA 1998-1999. Assisted in curriculum design. Guided students through construction and evaluation of their term projects.

Intellectual Property Activities **1997 - 2010**
Performed intellectual property development, assisted IP counsel with the preparation of patent applications, legal opinions, and IP strategy. Lead inventor on several patents in the fields of electronic textiles, capacitive sensing, and inertial measurement.

Refereed Publications

ZeroN: mid-air tangible interaction enabled by computer controlled magnetic levitation UIST '11 Proceedings of the 24th annual ACM symposium on User interface software and technology, pp. 327-336, ACM New York, NY, USA, ISBN: 978-1-4503-0716-1 doi:10.1145/2047196.2047239 *Elec-*

trostatic Power Harvesting for Material Computing, E. R. Post, K. Waal, Personal and Ubiquitous Computing, v. 15 no. 2 pp. 115-121 (2011), doi:10.1007/s00779-010-0313-9 [**Invited Paper**]

Inertial Measurement with Trapped Particles: A Microdynamical System, E. R. Post, G. A. Popescu, N. Gershenfeld, Applied Physics Letters v. 96, no. 14, pp. 3501-3503 (2010), doi:10.1063/1.3360808

Scalable Interactive Surfaces Using Charge Source Tomography, E. R. Post, U. Pawar, A. Agarwal, N. Gershenfeld, 2nd Intl. Conference on Open Collaborative Design of Sustainable Innovation. December 1-2, 2002, Bangalore, India. (2002)

Origami Desk: integrating technological innovation and human-centric design., W. Ju, L. Bonanni, R. Fletcher, R. Hurwitz, T. Judd, R. Post, M. Reynolds, and J. Yoon. 2002. In Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques (DIS '02). ACM, New York, NY, USA, 399-405. doi:10.1145/778712.778770

An Installation of Interactive Furniture, O. Omojola, E. R. Post, M. D. Hancher, J. P. Strachan, P. Russo, N. Gershenfeld, IBM Systems Journal, v. 39 pp. 861-879 (2000), doi:10.1147/sj.393.0861

E-broidery: Design and Fabrication of Textile-based Computing, E. R. Post, M. Orth, P. Russo, N. Gershenfeld, IBM Systems Journal, v. 39 pp.840-860 (2000), doi:10.1147/sj.393.0840

High-resolution Micromachined Interferometric Accelerometer, E. B. Cooper, E. R. Post, S. Griffith, J. Levitan, C. F. Quate, S. R. Manalis, Applied Physics Letters v. 76 no. 22 pp. 3316-3318 (2000), doi:10.1063/1.126637

Fabric Computing Interfaces, M. Orth, E. R. Post, E. B. Cooper, Proceedings of Conference on Human Factors in Computing Systems, (CHI '98), Los Angeles, ACM Press, (1998), doi:10.1145/286498.286800

Musical jacket, M. Orth, J. R. Smith, E. R. Post, J. A. Strickon, and E. B. Cooper. 1998. In ACM SIGGRAPH 98 Electronic art and animation catalog (SIGGRAPH '98). ACM, New York, NY, USA. doi:10.1145/281388.281456

Intrabody Buses for Data and Power, E. R. Post, M. S. Reynolds, M. K. Gray, J. Paradiso, N. Gershenfeld; First Intl. Symp. on Wearable Computers, 13-14 Oct 1997 pp. 52-55

Smart Fabric, or Wearable Clothing, E. R. Post, M. Orth, First Intl. Symp. on Wearable Computers, 13-14 Oct 1997 pp. 167-168 (`http://web.media.mit.edu/~rehmi/fabric`)

Thinternet: Life at the End of a Tether, H. Shrikumar, E. R. Post, Computer Networks and ISDN Systems 27(3), 375-85 (1994)

Status and Performance of the Zmob Parallel Processing System, M. Weiser, S. Kogge, M. McElvany, R. Pierson, R. Post, A. Thareja, IEEE CompCon conference, San Francisco, CA, February 1985

Technical Reports and White Papers

Detection of Forelimb Lameness in Horses Using Inertial Sensor Data, K. Waal, E. R. Post, Asteism, Inc. Technical Report ATR-01, July 2009, pp. 1-10

Multi-band, Low Cost EPC Tag Reader, M. Reynolds, J. Richards, S. Pathare, H. Tsai, Y. Maguire, E. Post, R. Pappu, and B. Schoner, MIT Auto-ID Center Technical Report MIT-AUTOID-WH-012, 2002, pp. 1-24.

Theses

Inertial Measurement via Dynamics of Trapped Particles, PhD Thesis, MIT, August 2003

E-broidery: An Infrastructure for Washable Computing, MSc Thesis, MIT, February 1999

Patents Issued

US6210771 *Electrically active textiles and articles made therefrom*
US6211799 *Method and apparatus for transbody transmission of power and information*
US6493933 *Method of making flexible electronic circuitry*
US6891382 *Three-dimensional characterization using a one-dimensional electrode array*
US7075412 *Methods and apparatus for operating a radio device*
US7755765 *Method and apparatus for inertial sensing via measurement of trapped orbit dynamics*
US7961078 *Methods and apparatus for operating a radio device*
US7999658 *Methods and apparatus for operating a radio device*
US8330580 *Methods and apparatus for operating a radio device*
US8519677 *Electrostatic power harvesting*
US8590377 *Inertial measurement unit*
US9569055 *Interaction sensing*
US10042504 *Interaction sensing*
US10042446 *Interaction modes for object-device interactions*
US10108305 *Interaction sensing*
US10318090 *Interaction sensing*
US10375365 *Projection system with enhanced color and contrast*
US10378975 *Systems, methods, and devices for static and dynamic body measurements*
US10453371 *Multi-layer display with color and contrast enhancement*
US10458866 *Methods of manufacturing devices for static and dynamic body measurements*
US10515606 *Parallelizing display update*
US10554962 *Multi-layer high transparency display for light field generation*
US10565925 *Full color display with intrinsic transparency*
US10955983 *Interaction sensing*
US11237687 *Systems and methods for touch detection using electric field tomography through resistive sheet*
US11343440 *High dynamic range point spread function generation for image reconstruction*
US11443448 *Incoherent digital holography based depth camera*
US11575865 *Processing images captured by a camera behind a display*

Patents Pending

US20210359768 *Efficient physical layer for intrabody communication networks*
US20220261966 *Multiple point spread function based image reconstruction for a camera behind a display*
US20220277426 *Self-regularizing inverse filter for image deblurring*
US20220377856 *Systems and Methods for Temperature Profile Control of Microwave Oven Devices*
US20230042592 *Automating Search for Improved Display Structure for Under-Display Camera Systems*

Exhibits

The Museum of Science, Boston, MA, *j4k3t 2.0 Musical Jacket*, Seamless][Electronic Fashion Show, January 2006

The Museum of Science, Boston, MA, *Musical MIDI Jacket*, Spring 2001

SIGGRAPH Art Gallery, July, 1998, *Exhibition of Firefly Electronic Dress and Necklace, Musical MIDI Jacket and Drawings*

The Künstlerhaus Museum, Vienna, Austria, *Musical MIDI Jacket*, April through August, 2000

London Museum of Science, *Musical MIDI Jacket*, exhibited at the opening of the Wellcome Wing, 1999; now in the Museum's permanent collection

New York Museum of Modern Art, *The Unprivate House*, Collaborative gesture-sensing table, New York Museum of Modern Art, June through October 1999

MIT Media Lab Wearable Fashion Show, *Musical MIDI Jacket* and other works, October 1997

Other Invited Talks, Articles, Exhibits

Speaker and panelist, MIT *FAB11 Fab Lab Symposium*, MIT (Aug. 6, 2015)

Keynote speaker, Georgia Tech *Design and Wearable Technology Symposium*, (May 8-9, 2015)

Keynote speaker, National Technical University of Singapore, *History of Wearable Computing*, (March 2013)

The Museum of Science, Boston, MA, *Sp4rkl3 Power Harvesting Dress* (Nov. 2008 - Mar. 2009)

How Stuff Works: *How Smart Clothes Work*
(`http://computer.howstuffworks.com/computer-clothing.htm`)

University of Wisconsin, *Transmissions: Globalization, Technology, Media*, April 25-27, 2002.

Künstlerhaus Museum, Vienna, Austria, *Wearable computing and Fashion*, April 2000.

New York Fashion Institute of Technology, *Design in the Electronic Age*, NYC, May 1999

Publication Reviewer

ACM SIGCHI and UIST, 2011 – present
IEEE Transactions on Computers, 2010
Springer Journal of Personal and Ubiqitous Computing, 2009
IEEE International Symposium on Wearable Computing, 2007 – present