

# Brian A. Bryce

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CITIZENSHIP – United States

## EDUCATION

PhD/MS, Applied Physics, Cornell University (2012)  
BS, Electrical Engineering, University of Maryland, College Park (2005)  
BS, Physics with High Honors, University of Maryland, College Park (2005)

## EXPERIENCE

Embedded systems development, 10 years  
Semiconductor fabrication and characterization, 13 years  
Electronic scientific measurements/instrumentation development, 15 years

## EXAMPLE ENGINEERED ARTIFACTS

### **First piezoelectronic transistor**

Integration lead on a team core of 8 (extended team of 20) developing the first demonstration of a piezoelectronic transistor. Successfully won a 2 million dollar DARPA grant renewal from first demonstrated devices. Was awarded 4 patents related to this work.

### **Attogram mass sensing interferometer based on nanomechanics**

Successfully developed a system capable of measuring 0.1 attogram masses using nanomechanical silicon nanowires grown from the bottom up. Designed FPGA/ADC based sampling system to replace network analyzer to enable low cost sensing outcomes.

### **Picosecond impedance spectrometer**

Developed an X-band microwave based impedance spectrometer capable of measuring reflected power at picosecond time scales. This spectrometer was used to resolve fast recombination in semiconductor materials.

### **Projection lithography system**

Designed a sub 10,000 USD lithography system capable of 1  $\mu\text{m}$  resolution for my research lab at Harvey Mudd College. This system combines both optics and embedded systems for control.

### **Wafer scale high aspect ratio atomic force microscope probes**

Created an inexpensive means of mass producing atomic force microscopy probes using bottom up fabrication. Probe performance was comparable to high cost/low volume commercial probes. Was awarded a patent for method.

## WORK EXPERIENCE

### **Harvey Mudd College, Claremont, CA (2015 – present)**

*Assistant Professor of Engineering* Teaching of engineering curriculum with emphasis on electrical engineering topics and experimental/experiential learning. Developed new course materials for embedded systems and analog electronics labs. Created a suite of semiconductor tools to offer a semiconductor fabrication and characterization technical elective for the first time at the college. Supervised clinics for medical devices, satellite electronics, industrial controls, and low cost internet of things (IoT). Research on programmable lithography, on chip plasma based light sources, and scanned plasma thin film deposition.

### **National Institute of Standards and Technology, Gaithersburg, MD (2014 – 2015)**

*National Research Council Fellow* sponsored by Albert Davydov. Designed and constructed interferometer vacuum system for study of highly integrated mass sensors based on silicon vapor-liquid-solid (VLS) nanowires. Conducted experiments in selective electrodeposition of magnetic materials on (VLS) nanowires. Produced nanowire based scanned probes. Designed custom dynamic signal analyzer, photoreceiver, stroboscopic sampler based on pulsed laser diode, and other ancillary electronics.

### **IBM Research, Yorktown Heights, NY (2012 – 2013)**

*Post-doctoral researcher* on the piezoelectronic transistor project. Designed and directed the fabrication process of the first demonstration of this CMOS alternative concept. Successfully delivered first demonstration by DARPA deadline to receive next phase of funding. Developed measurements to rapidly characterize piezoelectric and piezoresistive material properties.

### **Cornell University, Ithaca, NY (2007-2012)**

*Graduate Researcher* in Sandip Tiwari's nanoscale electroscience group. Developed silicon vapor-liquid-solid (VLS) nanowire photovoltaics. Developed controlled VLS nanowire synthesis methods. Studied nanowire growth with transmission electron microscopy. Measured minority carrier lifetime of gold and aluminum catalyzed silicon VLS nanowires using a single shot microwave impedance spectroscopy. Developed and demonstrated effectiveness of VLS nanowire based atomic force microscopy probes. Mentored undergraduate researchers. Simulated and designed instrumentation.

### **teho Labs, Ithaca, NY (2011 – 2012)**

*Sole Proprietor*. Designed, marketed and sold ARM microcontroller development boards for the enthusiast and open hardware markets. Created a popular KiCAD tutorial for PCB design. Designed and created prototype instruments and end user products including photodetectors, arbitrary waveform generators, power supplies and audio products. Deployed and maintained webserver and related services. Created and maintained documentation, manuals and toolchain tutorials. Provided technical support for customers. Budgeted resources and estimated risk and development overheads.

### **Johns Hopkins University Applied Physics Laboratory, Laurel, MD (2005)**

*Summer Intern* for National Security Analysts Department/Space Department. Conducted research analysis of the near-earth object hazard, reviewing the scholarly literature and summarized findings in a white paper.

**Laboratory for Physical Sciences, University of Maryland, College Park, MD (2002-2005)**

*Research Assistant* in B.E. Kane silicon quantum computation group. Designed electronics in support of measurements. Measured field ionized delta doped layers in silicon via CV techniques at helium temperatures. Created tuning fork based probes for a custom scanned force microscope. Measured polymer mechanical properties at liquid nitrogen temperatures for vibration isolation scheme. Fabricated single electron transistors using electron beam lithography.

TEACHING EXPERIENCE

**Teaching experience at Harvey Mudd College**

*Experimental Engineering*

*Electronic and Magnetic Circuits and Devices*

*Digital Electronics and Computer Engineering*

*Semiconductor Devices*

*Autonomous Vehicles*

*Engineering Clinic*

**Teaching assistant experience**

*Introduction to Quantum Mechanics*, David A. Muller Professor, Cornell

*Intermediate Electromagnetism*, Chris Xu Professor, Cornell

*Basic Circuit Theory*, R.D. Gomez Professor, U. Maryland

SELECTED PAPERS

P.M. Solomon, **B.A. Bryce**, M.A. Kuroda, R. Keech, S. Shetty, T.M. Shaw, M. Copel, L-W. Hung, A.G. Schrott, C. Armstrong, M.S. Gordon, K.B. Reuter, T.N. Theis, W. Haensch, S.M. Rosnagel, H. Miyazoe, B.G. Elmegreen, X-H. Liu, S. Trolier-McKinstry, G.J. Martyna, and D.M. Newns; Pathway to the Piezoelectronic Transduction Logic Device, *Nano Letters*, **15**, 2391 (2015).

**B.A. Bryce**, B. R. Ilic, M. C. Reuter, S. Tiwari; Wafer scale tilt-compensated silicon nanowire atomic force microscopy probes for high aspect ratio geometries, *Journal of Micromechanics and Microengineering*, **24**, 095016 (2014).

**B.A. Bryce**, B. R. Ilic, M. C. Reuter, S. Tiwari; Silicon Nanowire Atomic Force Microscopy Probes for High Aspect Ratio Geometries, *Applied Physics Letters*, **100**, 213106 (2012).

**B.A. Bryce**, M. C. Reuter, B. A. Wacaser, S. Tiwari; Contactless Measurement of Surface Dominated Recombination in Gold-and Aluminum-Catalyzed Silicon Vapor-Liquid-Solid Wires, *Nano Letters*, **10**, 4282-7 (2011).

PATENTS

**B. A. Bryce**, J. B. Chang, M. A. Kuroda, M. Copel; Passivation and alignment of piezoelectronic transistor piezoresistor, *US Patent 9,419,203* (2016).

J. B. Chang, **B. A. Bryce**, H. Miyazoe; Self-limited etch to prevent device shorting *US Patent 9,318,692* (2016).

J. B. Chang, **B. A. Bryce**, M. A. Kuroda; Piezoelectronic transistor with co-planar common and gate electrodes, *US Patent 9,444,029* (2016).

**B. A. Bryce**, J. B. Chang, M. A. Kuroda; Integrating a piezoresistive element in a piezoelectronic transistor, *US Patent 9,419,201* (2016).

**B.A. Bryce**, B. R. Ilic, M. C. Reuter, S. Tiwari; Scanned Probe Microscopy (SPM) Probe Having Angled Tip, *US Patent 8,539,611* (2013).

#### SELECTED SKILLS

**Instrument design:** microwave, optical and vacuum systems, PCB and board level electronic design, electromechanical systems, system integration, automated test and measurement systems

**Programming:** scientific, low level embedded system firmware, mobile platforms, web, general purpose

**Semiconductor device:** design, process development, fabrication, and characterization

**IC design:** FPGA, mixed signal VLSI, RF VLSI

#### OTHER AWARDS AND ACCOMPLISHMENTS

National Research Council Fellowship (2013)

Cornell Center for Materials Research overall microscopy contest winner for transmission electron microscopy work (2010)

Best Physics Honors Thesis and Defense, University of Maryland (2005)

Created a product that has been distributed to over 500,000 people