

# Curriculum Vitae

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## Education

**Harvard University** **2006 – Present**  
Cambridge MA, USA

- PhD Candidate in Bioengineering, advised by Prof. Johan Paulsson

**The University of British Columbia** **2001 – 2006**  
Vancouver, Canada

- Bachelor of Applied Science in Engineering Physics with Distinction, Electrical Engineering Option, Co-operative Education Program

## Honours and Awards

Harvard Department of Physics White Prize for Excellence in Teaching (2)	2008, 2009
Harvard University Distinction in Teaching Award (2)	2008, 2009
NSERC Postgraduate Doctorate Fellowship	2008 – 2011
IEEE Electronic Devices Society Paul Rappaport Award	2007
UBC Roy Nodwell Prize (Top Graduating Project)	2006
UBC Undergraduate Scholars Program	2001 – 2006
UBC Dean's Honour List	2001 – 2006
UBC University Summer Scholarship	2002
UBC Louise Elliott McLuckie Bursary	2001
Shell Canada Scholarship	2001
Royal Canadian Army Cadets Scholarship	2001

## Research Experience

**Paulsson Lab, Harvard University** **Feb. 2007 – Present**  
Boston, USA  
*Graduate Student*

- Developing theory for copy number control for plasmids containing toxin-antitoxin addiction modules
- Developing advanced methods for tracking gene transcription by counting single mRNA molecules with qRT-PCR

**Stone Lab, Harvard University**  
Boston, USA  
*Graduate Student*

**Feb. 2007 –  
June 2009**

- In collaboration with the Kolter Lab at Harvard University – studying ecological behaviour and cell-cell communication of *E. coli* with microfluidic devices

**Hansen Lab, The University of British Columbia**  
Vancouver, Canada  
*Research Project*

**Sep. 2005 –  
Aug. 2006**

- Design and fabrication of MEMS biochips using multilayer soft lithography (MSL)
- Development of a microfluidic cell-sorter with indexing array capability for future perfusion and assay studies (2005), and microfluidic devices for high throughput protein crystallization optimization studies (2006)
- Substrate patterning with standard photolithography techniques in cleanroom conditions and mask design through AutoCAD
- Image recognition and actuator control development using LabVIEW; assembly of laboratory equipment involving plumbing and optics setup; basic biological protocols: buffer exchanges, protein concentration, titration calibrations, spectrophotometer absorbance measurements

**Nanoelectronics Group, The University of Würzburg**  
Würzburg, Germany  
*Research Project*

**May – Aug. 2005**

- Continued studies in transport physics with 1D GaAs/AlGaAs quantum wire transistors, with focus in capacitive feedback and stochastic resonance
- Design, modeling, development, and characterisation of quantum wire transistors with enhanced capacitive feedback leading to drain current bistability
- Data acquisition and instrument control programming with LabVIEW

**Nanoelectronics Group, The University of Würzburg**  
Würzburg, Germany  
*Research Project*

**May – Dec. 2004**

- Studies in transport physics with 1D GaAs/AlGaAs quantum wire transistors, with focus towards the realisation of a quantum-wire-based 1-bit full-adder
- Additional studies in quantum wire transistors with single side-gate design, memory effects in nanoelectronic Y-branches, and high frequency rectification of three-terminal ballistic junctions
- Design of devices using e-beam patterning with wet-etching

- Characterisation using low-temperature techniques and equipment, such as liquid helium cryostat operation and liquid nitrogen handling

## Publications

Billy T. C. Lau, Chris A. Baitz, Patrick Dong, Carl L. Hansen. "A Complete Microfluidic Screening Platform for Rational Protein Crystallization." *J. Am. Chem. Soc.*, 2007.

B. Lau, D. Hartmann, L. Worschech, A. Forchel, "Cascaded Quantum Wires and Integrated Designs for Complex Logic Functions: Nanoelectronic Full-Adder," *IEEE Trans. Elec. Devices*, 2006.

- *Received the Paul Rappaport Award from the IEEE Electron Devices Society (EDS) for best paper in an EDS publication in the 2006 calendar year.*

## Other Technical Experience

### **HUE-Mobile Enterprises**

**Jan. – Apr. 2005**

Vancouver, Canada

*Product Development*

- Design and production of a robotic mirror for large vehicles
- Manufacturing of device in machine shop
- Design and assembly of control and interface electronics
- Programming with Texas Instruments MSP430 microcontroller: servo and motor control, serial communication, and I/O operations

### **Meteorological Service of Canada, Environment Canada**

**Jan. – Apr. 2003**

Vancouver, Canada

*Applications Engineer (Student Co-operative Education Work Term)*

- Database programming with C#.NET and MS SQL Server to analyse weather forecast accuracy in the province of British Columbia
- Developed data visualisation software for a weather sonde in order to better monitor weather conditions and study temperature inversions in the Greater Vancouver region

## Technical Skills

**Laboratory techniques:** computerised instrument control and data acquisition with LabVIEW, circuit prototyping, automated data analysis and processing, molecular biology, genetic screens and selections, gel preparation, PCR, microscopy

**Computation and Simulation:** Mathematica, MATLAB, Origin

**Programming Languages/Environments:** C, C++, C#, Java, Perl, Python, Verilog, LabVIEW, Motorola HC11 and MIPS/NIOS Assembly

**Electrical Engineering:** Communications theory and signal processing, control systems, electromechanical energy production and transmission, circuit analysis, transistor physics, logic design and analysis, computer architecture, digital communications, electronic materials, robotics (coordinate transforms, direct and inverse kinematics, control methods), distributed computing

**Mechanical Engineering:** Material mechanics, fluid dynamics, machine shop certification, robotics

**Applied Physics:** Electromagnetism, quantum mechanics, semiconductor physics, laser optics and photonics, lagrangian kinematics, biomechanics, statistical mechanics, nuclear physics, mesoscopic electron transport physics, medical imaging physics, cleanroom operating procedures, soft matter physics, computational neuroscience

**Mathematics:** Fourier and Laplace transform, complex analysis, linear algebra, ordinary and partial differential equations, statistical analysis, probability theory, discrete mathematics, vector calculus, asymptotic methods, stochastic fluctuations, Markov processes

**Languages:** English (fluent), Cantonese (fluent), German (good), French (good)

## Activities and Affiliations

GSAS Housing Resident Advisor, Harvard University	2008 – Present
Harvard Graduate Student Canadian Club	2007 – Present
Harvard International Science and Health Network	2007 – Present
Head Teaching Fellow of Physical Sciences 3, Harvard University	Spring 2008
Teaching Fellow of Physical Sciences 2, Harvard University	Fall 2007
GDC Liaison to the Harvard Graduate Student Council	2007 – 2008
Harvard Ballroom	2007 – 2008
Social Coordinator, Harvard Dormitory Council	2007 – 2008
Member, Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) Student Society	2001 – 2006
Board of Studies Representative, UBC Engineering Physics	2005 – 2006
Member, UBC CiTR Radio Society	2005 – 2006
Member, UBC DiSCORDER Entertainment Magazine	2005 – 2006
Media Representative, UBC Engineering Physics Student Society	2004 – 2005
Member, Society of Automotive Engineers Student Society	2001 – 2002