

# Jaan Altosaar

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Born: March 8, 1992

Languages: *English* (native), *Estonian* (native), *French* (professional proficiency)

## Areas of Specialization

Machine Learning • Theoretical Physics • Biophysics • Functional Analysis • Algebra

## Education

- 2013- **Ph.D., Physics**  
*Princeton University*, Princeton, New Jersey
- 2009-2013 **B.Sc. First Class Honours in Mathematics and Physics**  
*McGill University*, Montreal, Quebec  
*Distinction, Dean's Honour List, Dean's Multidisciplinary Undergraduate Research List*
- 2007-2009 **Ontario Secondary School Diploma**  
*Hillcrest High School*, Ottawa, Ontario. Honours, Co-President of 1200-student body
- 2006-2007 **Higher School Certificate Years 9 & 10**  
*Randwick Boys High School*, Sydney, Australia

## Honours & Awards

- 2014-2017 **NSERC Doctoral Postgraduate Scholarship**: ranked 3rd of 204 (Princeton, \$21,000)
- 2013 **Julie Payette NSERC Research Scholarship**: awarded to the top 24 applicants in the Canada-wide Postgraduate Scholarships M competition (Ottawa, \$25,000)
- 2013-2016 **Commonwealth Scholarship**, DPhil studies at University of Oxford (*Declined*, £31,875/year)
- 2013 **The Faculty of Science Moyse Travelling Scholarship**, McGill University (Montreal, \$8,800)
- 2013 **Delta Upsilon Graduate Scholarship**, McGill University (Montreal, \$5,000)
- 2013 Full funding to attend the **King Abdullah University of Science and Technology WEP Conference**: international competition, 15 recipients (Jeddah, \$2000)
- 2012 First Prize for best poster, **Canadian Undergraduate Physics Conference** (Vancouver)
- 2012 Elected to **Sigma Xi Society** (Montreal)
- 2012 Second Prize, **McGill Faculty-wide Undergraduate Research Conference** (Montreal, \$150)
- 2012 Third Prize, McGill Department of Physics Poster Conference (Montreal)
- 2012 **NSERC Undergraduate Student Research Award** (Waterloo, \$8,400)
- 2011 McGill Award for Canadian Undergraduate Physics Conference (Saskatoon, \$1,000)
- 2011 NSERC Undergraduate Student Research Award (Montreal, \$7,600)
- 2010 **Estonian Foundation of Canada Scholarship** (Toronto, \$2,000)
- 2010 NSERC Undergraduate Student Research Award (Montreal, \$5,500)
- 2009 Annette S. Hill McGill Scholarship and Bursary (Montreal, \$5,000)
- 2008 Harry Elton Memorial Award (Shanghai, China, \$2,000)

## Work Experience

- 11/2013- **Founding Director – Useful Science** (<http://usefulscience.org>)  
Led team of 26 through concept, launch, and funding of a non-profit science outreach website (75k hits). Featured on mainstream tech websites: Lifehacker and Boing Boing.
- 10/2013- **Science Media Consultant – Thwacke Consulting** (<http://thwacke.com>)  
Consulting for game developers: how to make realistic game elements based on science. Literature reviews, communicating science to developers and screenwriters.
- 5/2013-8/2013 **iOS and Android User Interface Designer – Ottawa Hospital Research Institute**  
Led user experience and user interface design and testing; completed the design of Canada's national vaccinations tracking mobile app and backend released in 2014 ([demo](#)).

## Research Experience

- 9/2013-4/2014 **Advisor: Professor Iain Couzin**  
*Princeton University, Departments of Physics, Ecology and Evolutionary Biology*  
*Julie Payette NSERC Research Scholarship*  
Machine learning: applying topological data analysis and theoretical neuroscience techniques to rainforest audio. Realtime computer vision techniques to analyze collective behavior. Completed 3-week field study in Costa Rica to collect rainforest audio.
- 9/2012-7/2013 **Advisors: Professor Jürgen Sygusch & Professor Anmar Khadra**  
*Université de Montréal, Department of Biochemistry*  
*McGill University, Department of Mathematics and Statistics, Honours Research Project*  
Theoretical biophysics: developed a physical foundation for the Resonant Recognition Model as a viable theory of biomolecular recognition via transition dipole coupling. This project received full funding for the KAUST 2013 Undergraduate Poster Competition.
- 5/2012-8/2012 **Advisor: Professor Michel Gingras**  
*University of Waterloo, Department of Physics and Astronomy*  
*NSERC Undergraduate Student Research Award*  
Condensed matter theory: studies of the generalized dipolar spin ice model of dysprosium titanate via [cumulant expansion methods](#) implemented within Monte Carlo simulations, and crystal field calculations with Stevens operator methods. This project won awards at departmental, faculty-wide, and national conferences.
- 5/2011-4/2012 **Advisors: Professor Moshe Szyf & Professor Walter Reisner**  
*McGill University, Department of Physics*  
*McGill University, Department of Pharmacology & Therapeutics*  
*NSERC Undergraduate Student Research Award, McGill Honours Research Thesis*  
Biophysics: single molecule DNA methylation mapping in nanochannels. Experienced with MATLAB, protein purification and binding assays, and Total Internal Reflection Fluorescence (TIRF) microscopy.

- 5/2010-8/2010 **Advisor: Professor Jürgen Sygusch**  
**Université de Montréal**, Department of Biochemistry  
 NSERC Undergraduate Student Research Award  
 Bioinformatics: virtual high throughput screening of potential *Magnaporthe grisea* aldolase II pesticides, 3D conformational modeling of various aldolases. Experienced with AutoDock, Schrodinger Glide, PyMOL, Shell scripting, and Python.
- 9/2009-3/2010 **Advisor: Professor Moshe Szyf**  
**McGill University**, Department of Pharmacology & Therapeutics  
 Epigenetics: quantifying changes in microRNAs triggered during cancer metastasis.

## Teaching Experience

- Winter 2013 Teaching Assistant: MATH 270, Applied Linear Algebra (Professor Adam Oberman)  
 Winter 2012 Teaching Assistant: MATH 249, Honours Complex Variables (Professor Robert Seiringer)  
 Fall 2011 Supervised a graduate student in the Szyf Lab at McGill

## Oral Presentations

- 2014 Acoustical Society of America Spring 2014 Meeting, *Providence, Rhode Island*  
 2013 Montreal Startup Club presentation on the Immunize Canada app, *Rho Canada Ventures*  
 2013 Faculty of Science presentation on research opportunities, *McGill University*  
 2012 Department of Mathematics Honours Project Oral Component, *McGill University*  
 2012 Department of Physics Undergraduate Student Symposium, *McGill University*  
 2012 Canadian Undergraduate Physics Conference, *University of British Columbia*  
 2012 Department of Physics Honours Research Thesis Defense, *McGill University*

## IT & Programming Skills

Version control systems: Git  
 Systems administration: LEMP/LAMP stacks on Ubuntu & Debian  
 Systems languages: C  
 Scripting languages: Python, Shell Script  
 Web development: HTML5, CSS, Flask, MySQL  
 Data analysis: Mathematica, MATLAB

## Publications

- 2013 J. Sygusch and J. Altosaar. The Resonant Recognition Model: long-range protein interaction via transition dipole couplings. *McGill Honours Research Project, manuscript in preparation for submission.*
- 2013 T. Lin, J. Altosaar, P. Henelius, and M. J. P. Gingras. Numerical study of perturbations in dipolar spin ice. *The American Physical Society March Meeting 2013.*
- 2012 J. Altosaar, T. Lin, and M. J. P. Gingras. Cumulants to crystal fields: a case for stuffing of the B-site in dysprosium titanate. *Technical Report, Department of Physics and Astronomy, University of Waterloo.*
- 2012 J. Altosaar. Detecting methylation of single molecules of DNA using a methyl binding domain GFP fusion protein. *McGill Honours Research Thesis.*

## Conferences & Workshops

- 2014 <sup>4</sup>Acoustical Society of America Spring 2014 Meeting, *Providence, Rhode Island*
- 2014 Collective Intelligence, *Massachusetts Institute of Technology*
- 2014 ComSciCon: Communicating Science, *Harvard University*
- 2013 Reinforcement Learning and Decision Making, *Princeton University*
- 2013 John von Neumann Symposium: Towards Quantitative Biology, *Rockefeller University*
- 2013 HackMIT; developed [Android app](#) to track sitting, *Massachusetts Institute of Technology*
- 2013 <sup>3</sup>WEP Poster Competition, *King Abdullah University of Science and Technology*
- 2013 Biological Small Angle X-Ray Scattering Workshop, *University of Montreal*
- 2012 <sup>2</sup>Canadian Undergraduate Physics Conference, *University of British Columbia*  
*First Prize for best poster*
- 2012 <sup>2</sup>Faculty of Science Undergraduate Research Conference, *McGill University*  
*Second Prize: induction to Sigma Xi Society*
- 2012 <sup>2</sup>Department of Physics Poster Conference, *McGill University*  
*Third Prize: nomination and award for Canadian Undergraduate Physics Conference*
- 2012 Friday Condensed Matter Seminars, *Perimeter Institute for Theoretical Physics*
- 2012 Southwest Ontario Condensed Matter Symposium, *Perimeter Institute*
- 2012 <sup>1</sup>Groupe de Recherche Axé sur la Structure des Protéines Symposium, *McGill University*
- 2011 <sup>1</sup>Canadian Undergraduate Physics Conference, *University of Saskatchewan*
- 2011 <sup>1</sup>Department of Physics Poster Conference, *McGill University*  
*Hon. Mention: nomination and award for Canadian Undergraduate Physics Conference*
- 2011 <sup>1</sup>Department of Engineering Poster Conference, *McGill University*
- 2010 Gordon Research Conference: Enzymes & Metabolic Pathways, *New Hampshire*  
<sup>4</sup>*Talk & Poster: Machine learning an audio taxonomy: quantifying biodiversity and habitat recovery through rainforest audio recordings*  
<sup>3</sup>*Poster: Protein interaction through transition dipole couplings: Resonant Recognition*  
<sup>2</sup>*Poster: How stuffing leads to novel behaviour in spin ice*  
<sup>1</sup>*Poster: DNA methylation mapping in nanochannels*

## Science Outreach

- 2014 [San Diego Comic-Con International](#) panelist
- 2014 Hopewell Elementary School science fair judge

## Professional Associations

*Member:* Canadian Association of Physicists, Institute of Physics, Sigma Xi Scientific Society (nominated), American Association for the Advancement of Science (nominated)

## Activities & Interests

- 2014-2015 Resident Graduate Student, Wilson College, Princeton University
- 2009-present Meditation (Enpuku-ji Zen Center, Abbess: Zengetsū Myōkyō)
- 1996-present Classical and jazz piano
  - 2012 University of Waterloo Choir (Director: Professor Gerard Yun)
  - 2012 University of Waterloo Intramural Beach Volleyball (placed second out of 54 teams)
  - 2010 Mentor with McGill University Mentorship Program for First-Year Students
  - 2010 Montreal Estonian Society Kindergarten Teacher
  - 2009 McGill Choral Society (Director: Mary-Jane Pui)