

Allan F. Randall, PhD
Curriculum vitae
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SUMMARY

Research

Dissertation on philosophy of physics (quantum foundations)
Masters theses on philosophy of mathematics (MA) and artificial intelligence (MSc)
Research assistantships at Defence Canada in control theory and cognitive neuroscience

Teaching

University (T.A.), career college, high school, middle school (Vice-Principal) and elementary school teaching (including curriculum development), and private tutoring

EDUCATION

PhD, Philosophy, York University, Toronto, 2014

An Algorithmic Interpretation of Quantum Probability, Jagdish Hattiangadi (supervisor)
Jeffrey Bub, Aephraim Steinberg, Daniel McArthur, Stanley Jeffers, Judy Pelham (committee)

MA, Philosophy, York University, Toronto, 2006

Limit Recursion and Gödel's Incompleteness Theorem, Jagdish Hattiangadi (supervisor)

MSc, Computing Science, University of Alberta, Edmonton, 1990

Relaxation and Matching Relational Structures in Object Recognition, Terry Caelli (supervisor)

BSc (Hons), Mathematics and Computer Science, St.F.X. University, Antigonish, 1986

PRIMARY SPECIALTY

Philosophy of physics (especially quantum foundations)

SECONDARY SPECIALTIES AND INTERESTS

Philosophy of mathematics (especially Gödel)

Cognitive science (especially perceptual control theory, computational cognitive neuroscience)

Ancient philosophy (especially the Eleatics)

Mathematics curriculum reform

ADDITIONAL TEACHING COMPETENCIES

Logic, computability, rationalism, phenomenology, ethics of biotechnology, complexity theory, control theory, information theory, cognitive science, philosophy of mind, programming languages, linear algebra and discrete mathematics, computer vision, quantum mechanics

FULL-TIME RESEARCH POSITIONS

- 2010- Plenitude Consulting for MMT Consulting: research, programming and support for DRDC military scientist (retired) studying information theory and control systems.
- 2005-2007 NTT Systems Inc. for Dept. of National Defence: research, programming and support for DRDC military scientist studying computational cognitive neuroscience.
- 1990-1995, '96-1997 NTT Systems, Inc. for Dept. of National Defence: research, programming and support for DRDC military scientists studying neural networks, high-G collisions and sustained operations.

PUBLICATIONS AND THESES

- 2014 “Algorithmic synthetic unity”, accepted for: *Quantum [Un]Speakables II: 50 Years of Bell’s Theorem*, 19-22 June 2014 (Vienna).
- 2014 *An Algorithmic Interpretation of Quantum Probability*, PhD dissertation, York University, Philosophy Dept. (Toronto).
- 2006 *Limit Recursion and Gödel’s Incompleteness Theorem*, MA thesis, York University, Philosophy Dept. (Toronto).
- 2005 “Parmenides of Elea”, book chapter, in: *Meet the Philosophers of Ancient Greece*, P.F. O’Grady, editor, Ashgate (Aldershot).
- 2004 “Quantum miracles and immortality”, *Transvision 2004 Conf.*, 5-8 Aug. 2004, Trinity College, University of Toronto (Toronto).
- 1998 “Layered protocols and coalescent argumentation”, *Proc. 2nd Intl. Conf. Ontario Society for the Study of Argumentation*, 13-15 May 1999, Brock University (St. Catharines).
- 1990 *Relaxation and Matching in Object Recognition*, MSc thesis, U. of Alberta, Computing Science Dept. (Edmonton).

WORKS IN SUBMISSION

- 2014 *An ontic, many-worlds, a priori reconstruction of quantum mechanics*. A just-completed paper, currently in the submission process, adapted and expanded from Ch. 8 of the PhD dissertation.

WORKS IN PROGRESS

- 2014- *Algorithmic synthetic unity: a toy reconstruction of quantum mechanics*. A paper version of Ch. 7 of the PhD dissertation.
- 2014- *Sleeping Beauty and generative probability theory*. A paper taken from parts of Ch. 5 and 6 of the PhD dissertation.
- 2014- *In defence of the anthropic principle: a response to Smolin*. A paper version of the last section of Ch.5 of the PhD dissertation.
- 2011- *An information theoretic analysis of negative feedback loops in hierarchical perceptual control systems* (with M.M. Taylor), Plenitude Consulting.

TEACHING POSITIONS

- 2007-2011 Laurel Academy: Teacher, Vice-Principal of Middle School. Science and mathematics teaching, curriculum development and school administration. Taught grade 8 science and mathematics, plus science enrichment program, coached Lego robots team. Implemented advanced curriculum, including computer-aided learning and new mathematics curriculum (still in use). Administrative duties included teacher hiring, training and management, legal liaison, student discipline, parent relations, and financial planning.
- 2004-2005 Synergy Business College: Instructor in Software Engineering. Courses taught: Access, SQL Server, UNIX System Administration, HTML, Visual Basic.NET
- 1998-2004 The Abelard School: High school teacher, gifted/enriched programme. Courses taught: Physics 12, Physics OAC, Chemistry OAC, Chemistry 12, Chemistry 11, Computer Science, Finite Mathematics, Mathematics 12, Mathematics 9, Mathematics 7-8. Also helped develop the school's integrated curriculum.
- 1998 Canadian Information Technology College: Professor of Information Technology. Courses taught: Visual Basic, SQL Server, Access, Windows Architecture, MCSD exam preparation.

Part-time teaching experience: extensive private tutoring and T.A. experience (lecturing, conducting labs and marking) in computer science courses at the University of Alberta and St. Francis Xavier University.

INDUSTRY RESEARCH & TECHNICAL REPORTS

- 2006 *A parallel distributed model of the Stroop colour test* (with William Fraser), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2006 *Modelling synesthesia in parallel distributed networks* (with William Fraser), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2006 *Robots, Learning, and Autonomy: a cognitive approach based on Leabra networks*, NTT Systems Inc. (Toronto).
- 2005 *Parallel distributed processing for computational cognitive neuroscience: a survey*, NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2002 *Perceptual control analysis of SUSOPS tasks: preliminary evaluation and tool-building in LabVIEW* (with M.M. Taylor), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 1995 *Reorganizing Control Networks in the Recognition of Syntax* (with M.M. Taylor), NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine (Toronto).
- 1993 *Neural Control Networks: A Literature Survey*, NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine, Toronto.

1992 *Studies of Self-Organised Dynamic Behaviour in Neural Networks* (with M.M. Taylor), NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine.

OTHER WRITINGS

1997- various essays on physics, mathematics, computation & ethics at <http://allanrandall.ca>

PRESENTATIONS

Talks

2004 “Quantum miracles and immortality”, *Transvision 2004 Conference*, Trinity College, University of Toronto, 8 August 2004, 11:15 AM – 12:30 PM (Toronto).

Posters

2014 accepted: “Algorithmic synthetic unity”, *Quantum [Un]Speakables II: 50 Years of Bell’s Theorem*, 19-22 June 2014 (Vienna).

1988 “Stochastic relaxation and correspondence problems in object recognition” (with T. Caelli), *International Neural Network Society (INNS) First Annual Meeting*, Boston Park Plaza Hotel, 10 Sept. 1988 (Boston).

Seminars and Workshops

2007 “Leabra Advanced Workshop”, lead 3-day workshop for Canadian military scientists and engineers, on using computational cognitive neuroscience to solve military problems (e.g., tracking, autonomous vehicles); attended by military personnel from across the country, DRDC, CFB Suffield, Feb. 2007 (Suffield).

Guest Lectures

2008 “Cryonics: Present and Future”, public lecture, Centre for Inquiry Ontario, 8 March 2008, 5-7 PM (Toronto).

2006 “Introduction to the Ethics and Science of Cryonics”, public lecture, Bahen Centre for Information Technology, University of Toronto, 6 April 2006, 7-8 PM (Toronto).

2003 “Gödel’s Theorem”, invited guest lecture for third-year physics course for education students, “Current Questions in Math and Science”, University of Toronto, Dept. of Physics, 1 April 2003, 4-5 PM (Toronto).

Media Coverage and Interviews

2004- Media coverage and interviews include web, print, television and online chat, on topics such as quantum mechanics, science and spirituality, and life extension (e.g., Toronto Life, Yahoo.Ca, Discovery Channel, TVO, CBC, ImmInst.Org).

PEER REVIEW

2006 Provided peer review for *Journal of Evolution and Technology*.

MEMBERSHIPS

American Philosophical Association
Canadian Philosophical Association
Philosophy of Science Association
Leibniz Society of North America
Humanity+
Humanity Centre for Philosophy (Director, Co-founder)
Le Droit Humain International
Cryonics Society of Canada (Director, Secretary)

PROFESSIONAL EXPERIENCE

Major Software Projects

- 2013 *Allez-OOP for LiveCode*: object-oriented plugin for LiveCode development environment, Plenitude Consulting for MMT Consulting (Toronto).
- 1997 *EPlan CAD Automation*: automates the complex manual process of using the company's CAD software, NTT Systems Inc. for Husky Injection Molding Systems (Bolton).
- 1994 *Prograph Network Simulator*: general network simulator for Prograph CPX, NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine (Toronto).
- 1994 *Prograph MVC System*: model-view-controller add-on for Prograph, NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine (Toronto).
- 1993 *Perceptual Control Builder*: simulator for modeling perceptual control systems, NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine (Toronto).

Technical Writing

- 2013 *RSA ECAT User Guide*, ClicKnowledge for RSA Security (Bedford).
- 2005 *Symbology Workbench 2.0 User Guide* (with M. Grushcow), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2005 *Aha! User Manual* (with M. Grushcow), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2005 *Quest DB User Manual: a questionnaire database manager*, NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2004 *PI Assist User Manual: a software tool for doing science* (with M. Grushcow), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2003 *An Investigation into the Use of PDA Technology in Support of CEB Research* (with B. Leykekhman & M. Grushcow), NTT Systems Inc. for Defence Research and Development Canada (Toronto).
- 2000 *Distributed SUSOPS User Manual*, NTT Systems Inc. for Defence and Civil Institute of Environmental Medicine (Toronto).

Short-term and part-time contracts

- 2013 ClicKnowledge for RBC Wealth Management: RBC ClientView online guide and help system (in Robohelp).
- 2007 Archiprise Inc.: Head technical writer for large online knowledge management system.
- 2004 Elia and Associates Barristers and Solicitors: Online Mortgage Calculator (in JavaScript) and Land Transfer Tax Calculator (in Perl).
- 2004 NTT Systems Inc. for Husky Injection Molding Systems: Online help system for injection molding machines (in HTML Help Workshop).
- 2004 FlashQuarter Productions for RecipesPlus.Ca: Extended existing online contest forms with new features, including error-checking (in ASP).
- 2000 Support Services for Adult Survivors Committee, Antigonish Women's Resource Centre committee member report to the chair: *Recommendations on the Ethics of Group Counseling at the Antigonish Women's Resource Centre*.
- 1999 FlashQuarter Productions for Phases & Stages Maternity Wear: E-commerce credit card processing on company website (JavaScript, Perl).
- 1997-1998 York University, Philosophy Dept.: Research Assistant, student computer administration and LISTSERV maintenance, graduate liaison with computing services, VBA programming for Excel, CGI scripting in Perl.
- 1997, 2002 Ladnar Communications: complete online E-Commerce solution for multimedia content delivery, including security system, online transactions, administrative and marketing tools (in Perl, C and tcl).
- 1996-1997 NTT Systems Inc. for Husky Injection Molding Systems: Wrote an automation system for the EPlan CAD package (in WinBatch under Windows 95).
- 1986 St. Francis Xavier University, Biology Dept.: Research assistant and UNIX sys admin.

ABSTRACTS FOR MAJOR RESEARCH PROJECTS

2007-2014 *An Algorithmic Interpretation of Quantum Probability* (PhD dissertation)

The Everett relative state interpretation of quantum mechanics has been criticized for being unable to predict, *a priori*, the correct probability rule for predicting the outcomes of experiments. This dissertation delves into the foundational issues in logic, mathematics, computation and probability theory that are at the root of this controversy, and argues that adopting a purely computational view of probability (using Solomonoff's algorithmic probability theory) permits an *a priori* reconstruction of quantum mechanics from first principles that seriously mitigates the strength of the probability objection to Everett.

2011- *Information theoretic analysis of control networks.*

(in progress) We are studying multi-layered perceptual control networks and the information-theoretic analysis of these and related negative-feedback models of human behavior. To this end, we have created a tool for simulation of hierarchical perceptual control networks, and are working on a mobile-platform online game, which will collect data from players, for the purpose of information-theoretic analysis and comparison to the behavior of our models.

2007- *Returning to Euclid: traditional foundations and modern technology in curriculum reform*

(in progress) The mathematics curriculum for an Elementary and Middle School was revamped, with Principal, teachers and students very happy with results (it remains in use). The school's previous skills-based program, based on PRISM math, was integrated with Singapore Math to create a balance between conceptual learning, skills and problem solving. Continued communication with the school has led to preliminary research into a more comprehensive reform, based on a return to a Euclidean pedagogy, and with the early introduction of algebra and complex numbers. Issues addressed: computer-aided instruction, achieving a balance between computation, concepts and problem-solving, as well as individualization, exploration and direct instruction.

2006-2007 *Modelling Synesthesia in Leabra Networks*

NTT Systems Inc. under contract to Dept. of National Defence

Using parallel distributed models from computational neuroscience, a model was built of human synesthesia (the crossing of sensory modalities, where for instance, the visual system associates colours with numbers, or shapes with smells, and so on). Included the implementation of a computational model of the human colour visual system.

2005-2007 *Modelling the Stroop colour test in Leabra Networks*

NTT Systems Inc. under contract to Dept. of National Defence

Using parallel distributed models from computational neuroscience, a model was built of the Stroop test, one of the most studied psychological tests, in which reaction times for identifying colours of text vary according to the presence or absence of (either correct or incorrect) colour information in the text itself (e.g., it takes longer to recognize that a word is printed in red if the word itself is "blue"). Resulted in a much improved understanding of this class of models for Stroop, and

how they explain human reaction times.

2000-2006 *Limit Recursion and Gödel's Incompleteness Theorem* (MA thesis)

It is widely argued (for instance, by Roger Penrose and J.R. Lucas) that Gödel's Incompleteness Theorem implies that mathematical proofs have content beyond their formal structure, since the theorem shows that any consistent formal system (that can at least do arithmetical number theory) can express truths about itself that it cannot prove. It is even argued by Penrose and Lucas that this proves that true A.I. is impossible. I argue that these conclusions are unjustified, by using the little-known tools of limit recursion, a branch of computability theory that deals with computation in the limit of infinite time.

1996- Translation of Parmenides' *On Nature*

This is an ongoing project to produce a readable, sympathetic and authentic translation of Parmenides' *On Nature* (as I do not believe such a translation currently exists). I have on my website (<http://allanrandall.ca/Parmenides.html>) a preliminary attempt to stitch together the best of the existing translations, organizing the fragments into a coherent and logical sequence that is readable as a whole. The result is preliminary, but has been well received and used in several university courses. Encouraged by this reception, I am now working with a Greek translator to produce a more scholarly version, with an eye to eventually publishing it in book form, along with commentary and other resources.

1992-1995 *Reorganising Control Networks*

NTT Systems Inc. for Dept. of National Defence

Preliminary work on project to build hierarchical perceptual control networks for the predictive tracking of the output of a toy grammar. The grammar is meant to reflect some of the basic properties of human speech. The goal is for the system to reorganize and learn new strategies for predicting the grammar's output, mimicking the way humans predict as they track speech during passive listening.

1990-1992 *Chaos and Neural Networks*

NTT Systems Inc. for Dept. of National Defence

A neural network was developed using chaotic nonlinear dynamics to store memories. A system can be placed on a chaotic border simultaneously close to many different attractors, which are the memories or cognitive states for the system. The network can flip easily between different attractors. The goal was to develop genetic algorithms that would grow such networks from the ground up. This was part of an ongoing speech recognition project.

1988-1990 *Relaxation and Matching in Object Recognition*, (MSc thesis, University of Alberta)

In computer vision, once an image has been segmented into disjoint areas, and these areas have been analyzed and related to each other, the resulting relational structure must be matched with an internal model of the world. This is the correspondence problem and is known to be NP-complete. This thesis explores the use of stochastic relaxation (simulated annealing) methods (using a kind of noisy neural network) with chaotic dynamics to find reasonable estimates of the optimal correspondence in a massively parallel fashion, in very few time steps.