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## **EDUCATION & PROFESSIONAL**

*Doctor of Philosophy:* Nuclear/Particle Physics, Queen's University, 1991

*Master of Science:* Nuclear Physics (Instrumentation), Queen's University, 1987

*Bachelor of Science:* Engineering Physics, Queen's University, 1984

*Member,* Professional Engineers of Ontario

## **ACADEMIC**

*Adjunct Assistant Professor,* Department of Pathology and Molecular Medicine,  
Queen's University, 2007-2010

*Adjunct Assistant Professor,* School of Computing, Queen's University, 2000-2005

*Adjunct Assistant Professor,* Department of Physics, Queen's University, 1995

## **CAREER HIGHLIGHTS**

### ***March 2003-present: President, Predictive Patterns Software Inc***

Predictive Patterns is a scientific and software consulting firm focused on algorithm design and implementation, simulation, data analysis and experiment design. These strengths, coupled with deep experience in rapid application development, have attracted a range of clients interested in taking new technology from idea to practical implementation as quickly as possible. Clients have included startup companies, research labs and established corporations. Successfully completed projects have included the development of fast 2D/3D multi-modality image registration algorithms for real-time (intra-operative) cardiac imaging and spinal imaging, image segmentation algorithms, and application development for waterborne pathogen detection.

Development work is done primarily in C++ and Python, and makes heavy use of the company's customizable XML-based code generation technology, which provides roughly the same services as a junior developer, writing human-readable, modifiable, code for serialization and UI. Variants of this technology have been used to generate database interface classes as well.

### ***March 2002 - March 2003: Director of Software Development, Molecular Mining Corporation***

*Executive:* Advised the Senior Management Team on issues of technology and development process. Prepared reports on technology trends and strategic directions.

*Management:* Managed a team of 15 development, QA, support and tech writing staff who produced MMC's award-winning GeneLinker(tm) numerical data mining software. The team produced four software releases in a single year, without heroics or death marches. Initiatives included a streamlined development process and the

invention of a low-overhead, quantitative progress tracking and estimation system that allowed accurate prediction of completion dates months prior to release. Dealt successfully with difficult management situations including downsizing and the eventual dissolution of the company due to poor market conditions.

Development: Designed and implemented embedded Perl scripting engine for pre-processing gene expression data prior to import into the application.

Data Analysis: Used GeneLinker(tm) to analyze proof-of-concept datasets, primarily in proteomics, where my physicist's knowledge of mass-spec data was particularly valuable.

**Sept. 1999- April 2002 : Senior Designer /Senior Scientist, iGO Technologies Inc.**

Invention: Developed the MIDScan osteoporosis diagnostic technology and worked with researchers at Queen's and Kingston General Hospital to perform pre-clinical trials. Wrote several patent applications and did extensive patent searches.

Regulatory: Participated in regulatory process meetings, including meetings with FDA officials and scientists.

Software Engineering: Designed and developed computer assisted surgery software as part of a startup company; design based on existing academic system. Created an extensible system architecture using Qt application framework, VTK visualization library, and Narrative Programming Framework design and code generation system. Acted as primary interface between the academics and the development team, developed and documented coding and process standards, and managed the development team through the early implementation process.

**Sept. 1998- Aug. 1999 : Head of Software Development, ESG Canada**

Managed development team, implemented coding and documentation standards, and trained junior personnel in design and software engineering practices. Used UML with Rose to re-engineer ESG's micro-seismic analysis software to increase robustness, maintainability and extensibility. Prototyped telephony interface.

**April 1996- Aug 1998 : Senior Developer and Senior Developer II, Hummingbird Communications Ltd., Business Intelligence Division (formerly Andyne Computing, now OpenText Inc.)**

Working closely with two other developers, converted Andyne's leading desktop application, GQL, to an interactive server component using XML and CORBA for Web delivery. Headed tiger team to eliminate integration problems from Andyne's Java-based Web rendering technology. Created and managed successful initiative to eliminate thousands of warnings from legacy code.

**Apr. 1996 – Aug. 1999: Freelance Scientist/Consultant/Developer**

Software Engineering Tools: Developed Narrative Programming Framework, a system for generating application framework code from an extended XML DTD. System includes SP-based DTD parser, ANTLR-based XML parser, code generator, and base class library for providing core framework services. This system is now

owned by iGO Technologies. Subsequently developed an entirely new code generation system, the eXtensible Programming Framework, that built on the lessons learned from the original implementation.

*Optical Mamography*: Developed deconvolution method for analysis of spatial-domain optical mamograms. Method is based on application of representational programming philosophy to implement a flexible constraint language on top of Levenberg-Marquardt fitter. Design done with Rational ROSE and uses Template Method Design Pattern extensively. This work, with Dr. Yong Park at the Ontario Cancer Foundation, has suggested a new treatment modality for breast cancer, as well as moved diagnostic optical imaging closer to clinical reality.

*Optical Transport Physics*: Comparison of Cherenkov light production from electrons following EGS4 generated paths (Moliere multiple scattering theory) and that from electrons following paths generated from single-scattering theory to ascertain the differences due to step length and scattering angle on coherence.

***Jan. 1993- April 1996: Research Associate with Sudbury Neutrino Observatory (SNO) at Queen's, and Adjunct Assistant Professor for 1995***

Developed simulation (Monte Carlo) and pattern recognition software for detector calibration and data analysis. Developed hardware control system for control of robotic manipulator to move sources around in detector. Developed portable high-energy gamma-ray generator. Taught intro physics and advanced numerical methods.

***1992: Research Fellow at Manitoba Cancer Treatment and Research Foundation, Adjunct Professor at University of Manitoba.***

Developed “pseudo-correlation” algorithm for fast alignment of images using Monte Carlo techniques, developed new theory of phosphor screen response and SNR,

***1991: Research Fellow with Felix Boehm, Bridge Lab, Caltech.***

Performed precision measurement of  $^{35}\text{S}$   $\beta$ -spectrum using a double-focusing magnetic spectrometer. Wrote simulation for transport in the spectrometer. Simulated and designed terrestrial neutrino oscillation detector.

***Sept. 1988-Dec. 1990: Ph.D. student, Queen's.*** Supervisors: Prof. J. R. Leslie (Queen's) and Dr. T. K. Alexander (Chalk River Nuclear Labs.) Search for resonances in the electron-positron annihilation-in-flight cross-section in the range of a few MeV.

## **PUBLICATIONS**

### ***Refereed***

Xiao Zhang, Jiamin Chen, Tom Radcliffe, Dave P. LeBrun, Victor A. Tron and Harriet Feilotter, An Array-Based Analysis of MicroRNA Expression Comparing Matched Frozen and Formalin-Fixed Paraffin-Embedded Human Tissue Samples, J Mol Diagn. 2008; 10: 513-519

Q.R. Ahmad et al (SNO Collaboration), Measurement of day and night neutrino

energy spectra at SNO and constraints on neutrino mixing parameters.  
Phys. Rev. Lett. 2002;89(1):011302.

Q.R. Ahmad et al (SNO Collaboration), Direct evidence for neutrino flavor transformation from neutral-current interactions in the Sudbury Neutrino Observatory. Phys. Rev. Lett. 2002;89(1):011301.

Q.R. Ahmad et al (SNO Collaboration), Measurement of the rate of  $\nu(e) + d \rightarrow p + p + e(-)$  interactions produced by  $(8)B$  solar neutrinos at the Sudbury Neutrino Observatory. Phys. Rev. Lett. 2001;87(7):071301

T. Radcliffe, S. Shalev and R. Rajapakshe, Pseudo-Correlation: a Fast, Robust, Absolute, Gray Level Image Alignment Algorithm, Medical Physics 21 (1994) 761

T. Radcliffe, G. Barnea, B. Wowk, R. Rajapakshe and S. Shalev, Monte Carlo Optimization of Metal/Phosphor Screens at Megavoltage Energies, Medical Physics, 20 (1993) 1161

B. Wowk, S. Shalev and T. Radcliffe, Grooved Screens for On-Line Portal Imaging, Medical Physics, 20 (1993) 1641

M. Chen, T. J. Radcliffe, D. A. Imel, H. Henrikson and F. Boehm, New Limits on the 17 keV Neutrino, Phys. Rev. Lett. 69 (1992) 3151

T. J. Radcliffe, T. K. Alexander, G. C. Ball, H. C. Evans, J. R. Leslie, H.-B. Mak, W. McLatchie, P. Skensved and A. T. Stewart, Search for Resonances in the Annihilation-in-Flight Cross-Section Between 1 and 4 MeV, Phys. Rev. C 42 (1990) R2275

### ***Posters***

N. J. MacIntyre, T. Radcliffe, R. Ellis, Validation of a New X-Ray Method of Detecting Osteoporosis, 49th Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, February, 2003 [Poster, presented by N. J. MacIntyre]

### ***Internal Reports***

C. J. Jillings and T. J. Radcliffe, Comparison of SNOMAN's Cherenkov Light Distribution to a Single-Scattering Model, SNO Report SNO-STR-96-032

T. J. Radcliffe, A Hardware Control Class Hierarchy, SNO Report SNO-STR-96-027

T. J. Radcliffe, SNO Source Manipulator Control Code, SNO Report SNO-STR-96-026

T. J. Radcliffe, Optics and Geometry in the SNO Detector, SNO Report SNO-STR-95-007

T. J. Radcliffe, Three Methods for Event-Type Identification in the SNO Detector, SNO Report SNO-STR-95-002

T. J. Radcliffe, Pattern Recognition for Event-Type Identification in the SNO Detector, SNO Report SNO-STR-94-019

T. J. Radcliffe, Fast Neutrons from Muon Spallation in the SNO Detector, SNO Report SNO-STR-93-023

T. J. Radcliffe and J. R. Leslie, Efficiency of Photomultiplier Tubes as a Function of Angle, SNO Report SNO-STR-89-76

***Non-academic***

Humor and commentary for the Kingston Whig-Standard, 1987 - 1991, 1996

***Patents***

U.S. Patent 6,990,220, Apparatuses and methods for surgical navigation, Ellis R. and Radcliffe, T., granted January 24, 2006

**OTHER SKILLS**

Expert in UNIX and Windows development. Expert C++, Python, C and FORTRAN programmer. Intermediate Perl, C# and Java programmer. Expert in image processing, neural network technology and fuzzy logic. Extensive knowledge of SGML, XML and HTML. Have written XML-based code generation tools for commercial application development. Expert with Qt and wxWidgets cross-platform toolkits. Expert with VTK, intermediate with ITK. Familiar with EBNF grammars and parsers. I also know which end of a soldering iron to hold.

**OTHER ACTIVITIES AND INTERESTS**

Sailing, canoing, hiking, poetry, freelance writing. Founding member of the the Kingston Software Design Study Group.

**REFERENCES**

**Available on request.**