

William E. Byrd

School

School of Informatics and Computing
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EDUCATION

Indiana University, Bloomington, IN
Doctor of Philosophy in Computer Science, September 2009
Specialty Area: Programming languages, with an emphasis on functional and logic programming.
Committee: Daniel P. Friedman (Advisor), Amr Sabry, Christopher T. Haynes, Lawrence S. Moss.

University of Maryland, Baltimore County, Baltimore, MD
Bachelor of Science in Computer Science, *cum laude*, May 1999

College of Charleston, Charleston, SC
Bachelor of Science in Special Education, *magna cum laude*, December 1994

PUBLICATIONS

Books

Daniel P. Friedman, William E. Byrd and Oleg Kiselyov. *The Reasoned Schemer*. The MIT Press, Cambridge, MA, 2005.

Theses

William E. Byrd. *Relational Programming in miniKanren: Techniques, Applications, and Implementations*. Indiana University, Bloomington, IN, September 30, 2009.

Refereed Papers

Andrew W. Keep, Michael D. Adams, Lindsey Kuper, William E. Byrd, and Daniel P. Friedman. A Pattern-matcher for miniKanren -or- How to Get into Trouble with CPS Macros. In *Proceedings of the 2009 Workshop on Scheme and Functional Programming*, Cal Poly Technical Report CPSLO-CSC-09-03, pp. 37–45, 2009.

Joseph P. Near, William E. Byrd and Daniel P. Friedman. α leanTAP: A Declarative Theorem Prover for First-Order Classical Logic. In *ICLP 2008*, LNCS vol. 5366, Springer-Verlag, Heidelberg, pp. 238–252, 2008.

Oleg Kiselyov, William Byrd, Daniel Friedman, and Chung-chieh Shan. Pure, Declarative, and Constructive Arithmetic Relations (Declarative Pearl). In *FLOPS 2008*, LNCS vol. 4989, Springer-Verlag, Heidelberg, pp. 64–80, 2008.

William E. Byrd and Daniel P. Friedman. α Kanren: A Fresh Name in Nominal Logic Programming. In *Proceedings of the 2007 Workshop on Scheme and Functional Programming*, Université Laval Technical Report DIUL-RT-0701, pp. 79–90, 2007.

William E. Byrd and Daniel P. Friedman. From Variadic Functions to Variadic Relations: A miniKanren Perspective. In *Proceedings of the 2006 Scheme and Functional Programming Workshop*, University of Chicago Technical Report TR-2006-06, pp. 105–117, 2006.

Alan T. Sherman, Brian O. Roberts, William E. Byrd, Matthew R. Baker, and John Simmons. Developing and Delivering Hands-on Information Assurance Exercises: Experiences with the Cyber Defense Lab at UMBC. In *Proceedings from the Fifth IEEE Systems, Man and Cybernetics Information Assurance Workshop*, West Point, NY, pp. 242–249, 2004.

In Review

William E. Byrd, Daniel P. Friedman, Ramana Kumar, and Joseph P. Near. A Shallow Scheme Embedding of \perp -Avoiding Streams. Submitted to the special issue of *Higher-Order and Symbolic Computation* in honor of Mitchell Wand's 60th birthday.

In Revision

Ramana Kumar, Christian Urban, William E. Byrd, and Daniel P. Friedman. Nominal Unification with Triangular Substitutions.

David C. Bender, Lindsey Kuper, William E. Byrd, and Daniel P. Friedman. Efficient Representations of Triangular Substitutions: A Comparison in miniKanren.

Alan T. Sherman and William E. Byrd. Theoretical and Experimental Evaluation of the Rivest-Sherman Attacks on Enigma-like Machines: Determining the Rotors One at a Time from Ciphertext Only.

EMPLOYMENT

INDIANA UNIVERSITY, Bloomington, IN

Postdoctoral Research Scholar, Open Systems Lab, March 2010–present

<http://pti.iu.edu/osl>

Postdoctoral Researcher for the Declarative Parallel Programming (DPP) project. Duties include: refining and specifying the syntax, type system, and semantics for declarative extensions to the Message Passing Interface (MPI) library for high performance parallel programming; studying existing high-level approaches to declarative parallel programming; identifying which approaches may be applicable to the DPP project; evaluating the utility and efficiency of declarative extensions.

Visiting Researcher, August 2009–January 2010

Improved and refined a novel distributed architecture for data privacy in smart rooms. Implemented and benchmarked a prototype system in R⁶RS Scheme, using OpenSSL and a custom version of the *ThreshSig* Java threshold cryptography library.

Associate Instructor, C311 and B521, September 2003–May 2009

<http://www.cs.indiana.edu/classes/c311/> <http://www.cs.indiana.edu/classes/b521/>
Co-taught IU's graduate and undergraduate introductory programming languages courses. Co-wrote *The Reasoned Schemer* (MIT Press, 2005), one of two textbooks used in C311 and B521. Co-designed the miniKanren logic programming language used in both courses. Over the past eleven semesters wrote and delivered lectures on every topic in the course, including: environment-passing, continuation-passing, and store-passing interpreters; Continuation-Passing Style, trampolining, registerization, and other correctness-preserving transformations; hygienic macro expansion; types and type inference; functional and logic programming paradigms. Nominated for the department's *Associate Instructor of the Year* award.

LYVEGYDE.COM, Bloomington, IN/Garrett Park, MD

Co-founder and Lead Developer, August 2008–May 2009

Co-designed and developed *lyvegyde*, a guide to live online events. Responsible for site architecture (Ruby on Rails, AJAX, MySQL, nginx web server, Mongrel application server, Ubuntu Linux), middleware and backend development, page caching and other optimizations, and site deployment (using the Capistrano deployment tool).

BENEFITFOCUS.COM, Charleston, SC*Software Engineer*, February 2001–June 2002

Collaborated with other software engineers to port a multi-million dollar online benefits enrollment application from the Enhydra Java application server to BEA's WebLogic Java 2 Enterprise Edition (J2EE) application server. Implemented the supplemental insurance, password authentication/account lockout and W4 subsystems of the application. Set up, configured and tuned the production cluster of WebLogic J2EE application servers. Worked with other engineers to streamline and automate the application build process and integrate the JUnit Java unit testing framework into the application. Designed and implemented numerous utility programs, including several generations of log parsers and a suite of Perl scripts to repair defects in Java Server Pages (JSP) and HTML source files.

COMMERCE ONE/APPNET/CENTURY COMPUTING, Laurel, MD*Software Engineer*, August 1999–February 2001*Intern*, October 1998–June 1999

Responsible for the XML-based form subsystem of ProcureZone.com, a multi-million dollar online procurement application for the construction industry. Designed and implemented custom software to validate the logic, layout and content of several thousand Extensible Form Description Language (XFDL) forms and trained subcontractors in the use of this validation software. Designed and implemented custom software to perform sophisticated transformations on over a million lines of XFDL code. Created the Document Type Definition for ProcureZone structured XML documents. Wrote a non-trivial context-free grammar for Interleaf's BladeRunner software to allow users to convert ProcureZone documents between Microsoft Word and XML formats.

INTERACTIVE SOFTWARE ENGINEERING (now Eiffel Software), Goleta, CA*Intern*, Summer 1998

Worked with Dr. Bertrand Meyer, creator of the Eiffel programming language, on the implementation of Simple Concurrent Object-Oriented Programming (SCOOP), an experimental concurrency mechanism for Eiffel. Presented an overview of SCOOP to a group of ISE's most valued customers at the Techniques of Object-Oriented Languages and Systems (TOOLS USA) conference.

CAMP GREENTOP, Sabillasville, MD*Director*, Summer 2002

Responsible for the safety and well-being of 200 campers and 65 staff at the nation's oldest residential summer camp for children and adults with physical and multiple disabilities. Interviewed and hired staff members, evaluated staff performance, and directly supervised the business manager, unit leaders, activities coordinator and nurses. Coordinated staff training, wrote the staff manual and created the camp web site. Ultimately responsible for all programs, activities, policies and procedures at camp. Guided camp through successful State of Maryland and American Camping Association accreditation visits. Previous positions held at Camp Greentop include:

Activities Coordinator, Summer 2000**Assistant Director**, Summer 1999**Unit Leader**, Summer 1995, Summer 1996**Cabin Leader**, Summer 1992, Summer 1993, Summer 1994**Counselor**, Summer 1991**THURMONT MIDDLE SCHOOL**, Thurmont, MD*Special Education Teacher*, August 1995–June 1997

Taught math and English to 7th and 8th grade students with learning disabilities and behavioral disorders. Created extra-curricular clubs for computer programming, chess, and American Sign Language. Co-wrote the Frederick County, Maryland, continuing education curriculum on basic and intermediate computer use in the classroom. Co-wrote Thurmont Middle School's technology grant proposal, resulting in the award of \$50,000 for computer and networking hardware. Designed and taught seminars on Internet use for middle school teachers.

RECENT SOFTWARE

KANREN/miniKanren

A declarative applicative logic programming system.

<http://kanren.sourceforge.net/>

(in collaboration with Dan Friedman, Oleg Kiselyov, and Chung-chieh Shan)

α Kanren

A nominal logic programming language.

<http://www.cs.indiana.edu/~webyrd/>

(in collaboration with Dan Friedman; derived from miniKanren, and inspired by James Cheney and Christian Urban's α Prolog)

AWARDS

Benefitfocus.com “Medal of Honor”

Benefitfocus.com, 2001

Inaugural recipient of Benefitfocus.com's highest award, in recognition of exemplary work in porting the Benefitfocus application to the WebLogic J2EE application server. Award included a \$3,000 bonus.

AppNet Excellence Award

AppNet, 2000

Awarded for developing, within a strict deadline, a complex XML Document Type Definition and BladeRunner configuration file that formed the foundation of a major document management system.

Outstanding Senior in Computer Science and Electrical Engineering

University of Maryland, Baltimore County, 1999

One of a handful of seniors to receive this award for “highest academic achievement of graduating seniors majoring in computer science and electrical engineering”.

Director's Award for Outstanding Staff Person

Camp Greentop, 1993

Inaugural recipient of Camp Greentop's highest award, given to the staff member who most epitomizes Camp Greentop and performs above and beyond all reasonable expectations.

SUMMER SCHOOLS ATTENDED

3rd International Compulog/ALP Summer School on Logic Programming and Computational Logic
Las Cruces, NM, July 24–27, 2008

<http://www.cs.nmsu.edu/~ipivkina/compulog.htm>

Topics included: Foundations of Semantic Web and Computational Logic, Implementation and Execution Models for Logic Programming, Foundations of Constraint and Constraint Logic Programming, and Theoretical Foundations of Logic Programming.

AREAS OF INTEREST

Programming languages, declarative programming, functional programming, nominal/constraint logic programming, functional implementation of logic programming systems, web programming, program transformation.