

## Paul Biggar

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### CONTACT INFORMATION

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### At a glance

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#### OVERVIEW

PhD candidate with significant real-world experience, seeking interesting and challenging work in compilers, interpreters, JITs, optimization, static analysis, garbage collection or language design and tools, especially related to scripting languages.

#### PROFESSIONAL ACHIEVEMENTS

- **Google tech talk:** [Compiling and Optimizing Scripting Languages](#)
- Maintainer of [phc](#), an open source PHP compiler.
- **Ph.D. Thesis:** Design and Implementation of an Ahead-of-time PHP Compiler.
- Accepted for Google Summer of Code 2006 (16% acceptance rate)
- PhD sponsorship provided by IRCSET (17% acceptance rate)
- **Undergraduate Thesis:** [Fast Sorting on Modern Computers](#)

#### MAJOR SKILLS

##### Specialist knowledge:

- *Programming language implementation:* Compilers, interpreters, JITs, garbage collection.
- *Scripting language research:* semantics, type systems, programming idioms, implementation techniques, static analysis.
- *Program Analysis:* Optimization, alias- and type-analysis, whole-program analysis, automated bug finding.
- *Other:* Sorting, caches, branch prediction

##### Programming languages:

- *Significant experience:* C, C++, Java, Perl, PHP, Python
- *Other:* Ruby, Javascript, Lua, Bash, Calypso (Prolog dialect), OCaml/F#, Haskell

**Platforms:** Linux, GNU toolchain (gcc, gdb, autotools).

### Detailed Information

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#### EDUCATION

##### Ph.D. Computer Science (candidate)

[Dr. David Gregg](#)

**October 2005 - October 2009**

Trinity College Dublin, Ireland

- **Title:** Design and Implementation of an ahead-of-time Compiler for PHP.
- **Area of Study:** Compilers, Static Analysis, Optimization, Scripting Languages.
- Made novel contributions related to compilation and static analysis of scripting languages, particularly PHP. Created new algorithm for combined alias analysis, type inference and constant propagation. Investigated use of SSA with PHP.
- Wrote most of [phc](#), a PHP compiler, including an advanced optimizer.
- Also worked on escape analysis for [gcc](#)
- Sponsorship and stipend provided by IRCSET (17% acceptance rate).

##### B. A. (Mod.) Computer Science

[School of Computer Science and Statistics](#)

**October 1999 - June 2004**

Trinity College Dublin, Ireland

- 1st Class Honours Degree
- **Final Year Electives:** Advanced Compiler Design, Hardware Compilation
- **Undergraduate dissertation:** [Fast Sorting on Modern Computers](#): Investigated the properties of sorting with respect to branch prediction and caches, including cache-optimized sorts. Work accepted for [publication in ACM journal](#). Made numerous novel discoveries:
  - More efficient means of updating heaps,
  - Method for doubling the speed of radixsort by halving cache misses,
  - Insertion sort has just one branch misprediction per key,
  - Relationship between the performance of quicksort and entropy of keys.

INDUSTRY  
EXPERIENCE

**Software Engineer (Telecoms), NCL**

**June to October 2005**

- Ported HTML application to run on mobile phones (WML, Servlets, BEA WebLogic). Important early collaboration with a now-important client.
- Consulted in creating testing procedures and policies for high-profile iMode roll-out at O2 (Ireland).

**Software Engineer, Demonware**

**December 2004 to February 2005**

- Created module to use UPnP through NAT on a firewalled router, by resiliently parsing SOAP with minimal external dependencies, in C++.
- Essential for Demonware's networking middleware, as most home networks have NAT and UPnP enabled by default.

**Co-founder, Edgespace**

**June to November 2004**

- Established company vision, found funding and offices, maintained internal infrastructure.
- Awarded consulting contract with large US company
- Automated web application testing in Perl.

**PS2Linux Intern, Sony Computer Entertainment Europe**

**July to December 2003**

- Wrote **Eyetoy driver for PS2linux**, as part of Sony's successful open source hobbyist strategy.
- Linux kernel development, C, USB, video4linux, PS2 development.

**Other positions:**

- Summer Technology Intern, Barclays Capital, 2003
- Internet Support Technician, Eircom.net, 2000-2002
- Java Programmer, Credo, 2000-2001

PUBLICATIONS  
(IN SUBMISSION)  
(CACHED)

P. BIGGAR and D. GREGG, One Representation to Rule Them All, (Combining analyses on SSA with On-Demand SSA Construction), *PLDI '09 FIT Session* (June 2009).  
[people.csail.mit.edu/rabbah/conferences/09/pldi/fit/papers/fit09-01-biggarpdf](http://people.csail.mit.edu/rabbah/conferences/09/pldi/fit/papers/fit09-01-biggarpdf)

P. BIGGAR, E. DE VRIES and D. GREGG, A Practical Solution for Scripting Language Compilers, *SAC '09: ACM Symposium on Applied Computing (2009)* (March 2009).  
[portal.acm.org/citation.cfm?id=1529282.1529709](http://portal.acm.org/citation.cfm?id=1529282.1529709)

P. BIGGAR and D. GREGG, Sorting in the Presence of Branch Prediction and Caches, *Technical Report TR-CS-2005-57, Department of Computer Science, Trinity College Dublin* (2005).  
[cs.tcd.ie/~pbiggart/TCD-CS-2005-57-rev1.pdf](http://cs.tcd.ie/~pbiggart/TCD-CS-2005-57-rev1.pdf)

P. BIGGAR, Patently Counter-productive, *Business and Finance, Issue 46* (November 2007).  
[www.businessandfinance.ie/publications/GoldenSpidersSupp07/index.htm](http://www.businessandfinance.ie/publications/GoldenSpidersSupp07/index.htm)

P. BIGGAR, N. NASH, K. WILLIAMS, and D. GREGG, An Experimental Study of Sorting and Branch Prediction, *ACM Journal of Experimental Algorithmics* (June 2008).  
[portal.acm.org/citation.cfm?id=1370599](http://portal.acm.org/citation.cfm?id=1370599)

TALKS

P. BIGGAR, *Untitled, StackOverflow DevDays London* (Scheduled: October 2009).  
[stackoverflow.carsonified.com/events/london/](http://stackoverflow.carsonified.com/events/london/)

P. BIGGAR and D. GREGG, On the use of SSA with scripting languages, *Static Single-Assignment Form Seminar* (April 2009).  
[www.prog.uni-saarland.de/ssasem/](http://www.prog.uni-saarland.de/ssasem/)

P. BIGGAR and D. GREGG, Compiling and Optimizing Scripting Languages, *Google, Facebook, LLNL and OssBarCamp* (March 2009).  
[youtube.com/watch?v=kKySEUrP7LA](http://youtube.com/watch?v=kKySEUrP7LA)

INTERESTS AND  
ACHIEVEMENTS

I very frequently have programming projects on the side, and program as a hobby. Prior to my Ph.D. research on `phc`, I worked on it in my spare time. Amongst other things, I wrote the complete testing framework, and improved the speed of generated code by a factor of ten. I am currently `phc`'s maintainer.

In the past, I have written quite a number of other projects, including a top-down role playing game in Java, and a bot to play networked tetris, in C++. A current side-project is to automatically pass entire C and C++ projects through multiple program optimizers.

I was chosen for Google Summer of Code 2006 (632 chosen from approximately 3800 applicants), working on escape analysis for `gcc`. I mentored a student during Google Summer of Code 2009 (for the `php` project), and at the same time supervised an intern in our research group.

I have a number of hobbies, including skiing, poker, squash and martial arts. I have represented my university in squash leagues and inter-varsities, and in regional, national and international martial arts competitions. I have a black belt in Kenpo/Ju-jitsu, and have trained for a number of years at Kenpo, TaeKwon-do, classical and Brazilian Ju-jitsu, and thai boxing. I was elected captain of my university Kenpo club, and worked as treasurer for my university cards society. I have also debated for my university, as well as reaching the semi-finals of a large national second-level debating contest.

REFERENCES

**David Gregg**

*Title:* Senior Lecturer, Trinity College Dublin; Fellow, Trinity College Dublin

*Relationship:* Ph.D. supervisor; undergraduate dissertation supervisor

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**James Noctor**

*Title:* CEO, NCL

*Relationship:* Previous employer

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