# Curriculum Vitae

Henrik Bäärnhielm

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## Personal data

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| Name | Henrik Bäärnhielm |
| Date of birth | 1979-09-13 (YYYY-MM-DD) |
| E-mail | `redstar [at] kth [dot] se` |
| Website | `http://henrik.baarnhielm.net` |
| Marital status | Single |
| Nationality | Swedish |
| Current position | Post-doctoral research fellow in mathematics at the University of Auckland, New Zealand. |

## Education

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| 2004 - 2007 | Queen Mary, University of London, School of Mathematical Sciences. PhD student in Mathematics and Computer Science. |
| 2003 - 2004 | Imperial College, London, Department of Mathematics. Postgraduate studies (MSc) in Pure Mathematics. |
| 2002 - 2003 | Stockholm University. Studies in Physics and Mathematics. |
| 1998 - 2002 | Royal Institute of Technology, Stockholm, School of Computer Science and Engineering. Undergraduate studies at the Computer Science program. |
| 1995 - 1998 | High school at "Åso Gymnasium", Stockholm, specialising in science. Graduated with top grades and scholarships. |
| 1986 - 1995 | Primary school at "Eriksdalsskolan", Stockholm |

## Employment

- 2008. Post-doctoral research fellow at the Department of Mathematics, University of Auckland, `http://www.math.auckland.ac.nz`. Main work is software development for the Magma system `http://magma.maths.usyd.edu.au`, but also theoretical work and teaching.
- 2006 - 2007. Employed by the School of Mathematical Sciences at Queen Mary, University of London, for teaching exercise classes to undergraduates.
- 2001 - present. Involved to varying degrees in mostly non-profit voluntary software projects with "Elevorganisationen i Sverige" (the organisation for Swedish primary and secondary school students, `http://www.elevorg.se/`),

the Urbanninja company, `http://www.urbanninja.se`, the Swedish Institute of Computer Science, `http://www.sics.se`, as well as independently. Also acts as system administrator for Elevorganisation and Urbanninja.

- 1999 - 2003. Employed by the computer consultant company "Racasse AB", `http://www.racasse.se`, mainly as senior software engineer but also partly as system administrator for a mixed UNIX and Windows network.
- 1994 - 1998. Employed by the Royal Library in Stockholm, National library of Sweden, `http://www.kb.se`, as a computer consultant for developing a picture database system. This was primarily done using Borland Paradox for Windows, in its built-in language ObjectPAL, but a web version was also developed using MS SQL Server and IIS.

Some software projects:

- As part of PhD and post-doc, developed and wrote Magma implementations of several algorithms for the *matrix group recognition project*, the international research project aimed at computing efficiently with matrix groups. Most prominently, I implemented a new version of the main algorithm, "composition tree", within this research project. Most of my implementations are now part of the standard Magma system, `http://magma.maths.usyd.edu.au`.
- A content management system written in Perl, used by `http://www.elevorg.se`, among others.
- A Java GUI client for the Prosopopeia pervasive game, `http://www.prosopopeia.se/`, a project at the Swedish Institute of Computer Science.

Some projects at Racasse:

- A Windows application written in Borland C++ Builder and MS Visual Studio for administering and playing songs in various formats. Used worldwide by a major music publishing company. I alone was responsible for the first versions of this.
- A database engine for fast indexing and searching in very large amounts of data. Mainly written in C, but also x86 and Sparc assembler, and tools like Flex and Bison. I wrote major parts of the matching, indexing and searching, as well as the parser of the search language. The engine has subsequently been used in most of the projects at Racasse.
- A system for handling searching and matching of huge address databases, involving MySQL, server-side matching code in Perl and C, as well as a Java search client. I wrote or maintained most of the server-side code. The system is used by a major Swedish publisher.
- A database system using J2EE, for making company catalogues. The system used the JBoss J2EE engine and Java client. I mainly wrote various import and export parts from/to various forms of XML.

# Academic experience

## Qualifications

- PhD in Mathematics and Computer Science, Queen Mary, University of London, United Kingdom, November 2007.

  *Thesis title*: Algorithmic problems in twisted groups of Lie type

  `http://henrik.baarnhielm.net/alg_twisted.pdf`

  *Thesis advisor*: Prof. Charles Leedham-Green

- MSc in Pure Mathematics, with distinction, Imperial College of Science, Technology and Medicine, London, United Kingdom, September 2004.

  *Thesis title*: The Schreier-Sims algorithm for matrix groups

  `http://arxiv.org/abs/math.GR/0410593`

  *Thesis advisors*: Prof. Alexander A. Ivanov and Prof. Leonard Soicher

- MSc in Computer Science and Engineering, Royal Institute of Technology, Stockholm Sweden, August 2002. Graduated with top grades and chosen as best graduate of the year from the School of Computer Science.

  *Thesis title*: Trace formulae for Jacobi Matrices

  `http://henrik.baarnhielm.net/trace.pdf`

  *Thesis advisor*: Dr. Oleg Safronov

## Publications and preprints

All publications are available on the web at

`http://www.math.auckland.ac.nz/~henrik/publications.html`

- *Recognising the Suzuki groups in their natural representations*, J. Algebra 300 (1), 171-198, 2006
- *Tensor decomposition of the Suzuki groups*, submitted
- *Recognising the Ree groups in their natural representations*, preprint
- *Tensor decomposition of the Ree groups*, preprint
- *Recognising the Big Ree groups in their natural representations*, preprint
- (with Charles Leedham-Green) *Extending the product replacement algorithm*, preprint
- (with John Bray) *Standard generators for the Suzuki groups*, preprint

## Invited visits

- Invited visit for 6 weeks to the Magma computational algebra group, School of Mathematics and Statistics, University of Sydney, 04/2007.
- Invited visit for one month to Department of Mathematics, University of Auckland, 11/2005.
- Invited visit for one week to the Department of Mathematics, Technical University Carolo-Wilhelmina at Braunschweig, 04/2005.

## Conference presentations

- Invited speaker at the conference "Groups and Computation V", Ohio State University, Columbus, Ohio, USA, 4/2008.
- Invited speaker at the conference "Computational Group Theory", Mathematisches Forschungsinstitut Oberwolfach, 07/2006.
- Invited speaker at "Conference on Finite Groups and Representations", University of Canterbury, New Zealand, 17/1/2008.
- Invited speaker at "Groups and their applications", University of Birmingham, 14/11/2007.
- Invited speaker at "Workshop on Group Theory", University of Auckland, 11/2005.
- Groups St Andrews 2005, University of St Andrews, 08/2005.
- British Mathematical Colloquium 2006, Newcastle upon Tyne, 04/2006.
- MAGMA Workshop on Group Theory and Algebraic Geometry, University of Warwick, 08/2005.
- Nikolaus Conference, RWTH Aachen, 12/2005.
- 8th Postgraduate Group Theory Conference, Southampton, 04/2006.

## Other conferences

- "The International Congress of Mathematicians 2006", Madrid, 08/2006.
- "Groups and Computation 2006" at Queen Mary, University of London, 10/07/2006.
- "7th Postgraduate Group Theory Conference" at the University of Newcastle upon Tyne, 04/2005.

### Seminars

- Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, 07/2006.
- Computational algebra seminar, University of Sydney, 12/04/2007.
- Technical University Carolo-Wilhelmina at Braunschweig, Braunschweig, 04/2006.
- Queen Mary Pure Mathematics Seminar, QMUL, 03/2005.
- Queen Mary Mathematics Postgraduate Seminar, QMUL, 12/2005.

### Research interests

Interactions between mathematics and computer science. In particular, algorithms for groups, computer algebra, efficient implementations.

### Teaching

- Was completely responsible for the teaching of half of the discrete mathematics course for computer science undergraduates at University of Auckland, first half of 2008. This included lectures, assignments, exam.
- Tutor at exercise classes in the Maple programming course at Queen Mary, University of London, second halves of 2006 and 2007.

### Other merits

- Organiser for the Algebra and Combinatorics seminar series at the Department of Mathematics, University of Auckland.
- Reviewer for Mathematical Reviews, `http://www.ams.org/mr-database`.

## Computer experience

Have experience with computers since 1988, mostly PC:s, and until 1995 mostly with Microsoft DOS and/or Windows, but since 1995 mostly UNIX. Have experience with programming since 1990. Enjoys computer games since 1988, and have developed some.

Computer knowledge and experience in different categories:

### Mathematical systems

- Magma. Experience since 2004. Very good knowledge.
- GAP. Experience since 2003. Good knowledge.
- Maple. Experience since 1999. Good knowledge.
- Mathcad. Experience since 1997. Some knowledge.
- Matlab. Experience since 1999. Good knowledge.
- Mathematica. Experience since 2003. Some knowledge.

### Programming

- C/C++ programming. Experience since 1995. Very good knowledge.
- Assembly programming (Intel & Sparc). Experience since 1995. Very good knowledge.
- Java programming. Experience since 1997. Very good knowledge.
- Object oriented programming. Experience since 1995. Very good knowledge.
- Compiler technology. Very good knowledge (made my own compiler).
- Database technology. Experience since 1994. Very good knowledge.
- Windows programming. Experience since 1994. Good knowledge.
- Internet programming. Very good knowledge.
- UNIX programming. Very good knowledge.
- Audio programming. Good knowledge.
- Graphics programming. Good knowledge.
- Logic programming. Some experience.
- Functional programming. Some experience.
- DirectX. Some experience.

### Operating systems

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| Debian GNU/Linux | Very good knowledge (SysAdmin). |
| Windows XP/2000/NT/9x | Very good knowledge (SysAdmin). |
| DOS | Very good knowledge. |
| Solaris | Good knowledge. |
| FreeBSD | Good knowledge. |
| Slackware Linux | Good knowledge. |
| RedHat Linux | Good knowledge. |
| MacOS | Some experience. |

## Awards and scholarships

- 2004 - 2007. Awarded a "Queen Mary, University of London Research Studentship" for funding of PhD studies.
- 2003. Scholarship while studying at the Royal Institute of Technology in Stockholm, for exceptionally good studies, "Henrik Göransson Sandvikens Stipendiefond".
- 2003. Honorary scholarship upon graduation from the Royal Institute of Technology in Stockholm, as being the best graduate of the year from the School of Computer Science.

- 2003. Scholarship from "Tekn. dr Marcus Wallenbergs Stiftelse för utbildning i internationellt industriellt företagande", for higher studies abroad.
- 2003. Scholarship from "Erik och Göran Ennerfelts stipendiefond", for higher studies abroad.
- 2001. Member of group which won the award "One of three best projects" in the KTH course "Program development project". The project can be found at `http://www.nada.kth.se/theory/gecco/`.
- 1998 High school scholarship winner, for being among the top 10 science graduates of the year.
- 1996-2007. Eleven times winner of scholarships from the Swedish House of Nobility, for exceptionally good studies.

## Language skills

Artificial languages (the most important ones):

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| C | Very fluent |
| Perl | Very fluent |
| SQL | Very fluent |
| Java | Very fluent |
| C++ | Fluent |
| Intel assembler | Fluent |
| Motorola assembler | Fluent |
| Sparc assembler | Some experience |
| Pascal | Very much experience, but no recent |
| BASIC-variants | Very much experience, but no recent |
| LISP-variants (functional languages) | Some experience |
| Prolog | Some experience |

Natural languages:

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| Swedish | Native language |
| English | Very fluent |
| German | Some knowledge |

## References


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