

CURRICULUM VITAE

Greg Gamble

SUMMARY

Gregory Alexander GAMBLE has degrees in Electrical Engineering, Computer Science and Mathematics, and has particular skills in the use of the computer algebra systems MAGMA and GAP 4, software documentation and the provision of interfaces to facilitate the accessibility of documentation. Most recently he has been involved in the development of a MAGMA program to search for defining sets of designs, and in the development of the GAP 4 Share Package: ACE, and Linux system administration which utilised his skills in writing perl programs. (Each of these is discussed in more depth in the Skills section.) His mathematical interests are primarily in permutation groups.

CONTENTS

Personal	2
For Correspondence	2
Most Recent Position	2
Education	2
Employment Record/University Studies/Teaching Experience	3
Research	4
Software Expertise	4
Skills	5
Publications	6
Sporting Achievements/Awards	6
Sporting Affiliations	7
Referees	7

PERSONAL

Name: Gregory Alexander GAMBLE, BSc BE MMath *NSW* PhD *W. Aust.*

Nationality: Australian

Date & place of birth: May 22, 1958 (Canberra, Australia).

Spouse: Lyndall ANDREWS

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MOST RECENT POSITION

Research Fellow

Centre for Discrete Mathematics & Computing

Department of Computer Science & Electrical Engineering

The University of Queensland

Queensland 4072 AUSTRALIA

Project Title: Algorithms for Combinatorial Computation

EDUCATION

Secondary:

St. Edmund's College, Griffith ACT

Chevalier College, Bowral NSW

Tertiary:

University of New South Wales

University of Western Australia

Degrees:

1998: PhD (Mathematics) *W. Aust*

1985: MMath *NSW*

1983: BE (Electrical) *NSW*

1981: BSc (Computing) *NSW*

Academic Awards:

1983: Commonwealth Postgraduate Research Award (1 year) – for MMath.

1990–1993: UWA Studentship (3½ years) – for PhD.

Other Awards:

1975: Outstanding Service to Fellow Students (Chevalier College)

1984: Sports Recognition Award (UNSW)

EMPLOYMENT RECORD/UNIVERSITY STUDIES/TEACHING EXPERIENCE

- 1998–2000: June 1, 1998 – June 30, 2000: Research Fellow, University of Queensland – researching *Algorithms for Combinatorial Computation* (supported by an ARC (Australian Research Council) grant held jointly by the Mathematics and Computer Science & Electrical Engineering departments). In 1999, gave lectures for *CS363: Algorithm Analysis and Design* and supervised and marked the honours project course, *CS494: Advanced Algorithms and Data Structures*. Provided Linux system administration support. Maintained computer algebra software (MAGMA, GAP and quotpic), and made their documentation easily accessible via the web (see <http://www.csee.uq.edu.au/~magma>). Research conducted on defining sets of designs (software written as packages using MAGMA intrinsics, which are self-documenting), and upgrading a GAP 4 share package ACE (Advanced Coset Enumerator) which is currently in pre-release.
- 1998: February 23 – May 29: Research Associate, University of Western Australia – providing support for a web-based Masters in Mathematics for Information Technology Course. See <http://ciips.ee.uwa.edu.au/~gregg/M255>
- 1998: January 27 – February 20: Calculus Bridging Course tutor and marker, at University of Western Australia.
- 1997: Correcting PhD thesis (passed on September 5) that was passed subject to minor corrections on May 8; mathematics tutor, computing demonstrator (UWA Mathematics Department); one-to-one mathematics tutor (ATAS – Aboriginal Tutorial Assistance Scheme); computing tutor (UWA Mechanical and Materials Engineering Department); part-time lecturer (UWA Academy for Young Mathematicians); examination scribe at UWA;
- 1996: Writing up and submission (on November 26) of PhD; casual programmer – to install \TeX software; part-time lecturer – UWA Academy for Young Mathematicians; one-to-one tutor – ATAS (Aboriginal Tutorial Assistance Scheme) at UWA; examination scribe at UWA; one-to-one tutor – 1st year Functional Programming.
- 1995: Writing up of PhD; part-time mathematics teacher – Year 9, Perth Waldorf School; part-time lecturer – enrichment course at UWA, for high-school students wishing to enter the Pacific Mathematics Olympiad; part-time lecturer – UWA Academy for Young Mathematicians; one-to-one tutor – ATAS (Aboriginal Tutorial Assistance Scheme) at UWA; examination scribe at UWA.
- 1994: Part-time mathematics tutor – University of Western Australia.
- 1990–1993: Full-time research toward mathematics PhD – supported for the first $3\frac{1}{2}$ years by a UWA Studentship.
- 1990: Part-time mathematics tutor – University of Western Australia.
- 1986–1989: Full-time mathematics tutor (now: Lecturer Level A) – Melbourne University (subjects included logic, first-year advanced and ordinary-level and engineering mathematics and some second-year mathematics; during 1987–1989, prepared problem sheets and wrote (in 1989, using \TeX) assignment solutions for the first-year advanced and ordinary level mathematics courses).

- 1985: Full-time mathematics tutor – Macquarie University (tutoring first- and second-year subjects).
- 1983–1984: Full-time study for MMath – supported for one year by a Commonwealth Government Research Award; part-time tutor – Mathematics School, UNSW (tutoring first- and second-year algebra and demonstrating computing).
- 1981–1982: Full-time study for BE (Electrical) – completion of degree; part-time tutor – Electrical Engineering School, UNSW.
- 1980: Full-time study for BSc (Computing) – a one-year break from BE studies to get an additional qualification.
- 1979: Full-time study for BE (Electrical) – an upgrade of BSc (Engineering).
- 1976–1978: Part-time study for BSc (Engineering); Engineering Assistant (full-time) – NSW Public Works Department.

RESEARCH

Research Interests:

Permutation Groups, Combinatorics, Computer Algebra, Designs, Number Theory, Galois Theory.

Most Recent Research:

1998–2000 *Algorithms for Combinatorial Computation*: Apart from a paper with Cheryl Praeger on vertex-primitive groups and graphs, which applied some results of my PhD thesis, work has principally been in the development of algorithms (implemented in MAGMA) for determining minimal defining sets of designs with Anne Street, and with the development of the GAP 4 Share Package ACE with George Havas. My recent work on design defining sets and ACE are further discussed in the Skills section.

Past Research:

1997* *Elements of Prime Order in Primitive Permutation Groups*: Thesis for Doctor of Philosophy Degree (UWA). The determination of primitive permutation groups containing an element of degree mp and order p , where p is a prime and $p \leq m \leq p^2$.

* Thesis was submitted on November 26, 1996, passed subject to minor corrections on May 8, 1997, corrections were completed on August 29, 1997, and thesis was passed on September 5, 1997.

1984 *Computation of Galois Groups*: Thesis for Master of Mathematics degree (UNSW). Work entailed extensive Fortran programming, some Macsyma programming and researching of resolvent polynomial and Van der Waerden methods of generating Galois groups associated with polynomials over the rationals.

1982 *Discrete Hankel Transform*: Thesis for Electrical Engineering degree (UNSW). Results analogous to those of the Discrete Fourier Transform were derived.

SOFTWARE EXPERTISE

Very experienced with main-frames operating under UNIX in an X-windows environment, e.g. SUN Sparc Station or SGI. Have also worked on personal computers, including Macintosh, but currently I usually work from a dual-boot Windows98/Linux PC.

Programming languages: C, Fortran, Pascal, Basic, Prolog, Snobol, Various assembler languages.

Applications packages:

Algebra: GAP, MAGMA*, Maple, Mathematica, Macsyma, Cayley, Reduce.

* I beta-tested the Permutation Groups module of MAGMA. My contribution is acknowledged in *Handbook of Magma Functions* by Wieb Bosma and John Cannon. One of my "for fun" MAGMA solutions appears on page 1 of *Solving Problems with Magma* by Wieb Bosma et al.

General mathematics: Matlab.

Statistics: Minitab, Splus.

Typesetting: T_EX, L^AT_EX, A_MS-T_EX, A_MS-L^AT_EX.

I was employed during 1996 to install T_EX and related software on the new server of the UWA Mathematics Department. I also created a number of L^AT_EX packages for general departmental use. For more details, see the WWW interface: <http://maths.uwa.edu.au/computing/software/tex/> I created.

World Wide Web: HTML.

Other: Perl, Awk, Sed, Gopher.

Operating Systems:

UNIX, Linux: I have a thorough knowledge of UNIX. I have performed some system administration particularly on Linux, preferring to use `perl`, for tasks that traditionally require the use of `awk`, `sed`, `sh` and `cs`, particularly for more complex tasks; (`perl` has the advantage of being self-documenting).

DOS, Windows95, Windows98: Some Experience.

SKILLS

My particular forte is the mastery of computer languages, programming tools and algebra systems, by determining what they do best, by a combination of reading documentation and experimentation, and by then providing the appropriate filter programs to pipe output from one appropriate tool into the next. In a recent example, I modified an existing C program for completion of partial designs, to provide a *compact* option and thereby facilitate its use from within a MAGMA program (the MAGMA program needed to provide input to the C program and then also make sense of the output). The program itself was a *tree* search that also drew on my permutation groups knowledge, and was efficient enough to discover some previously unknown lists of minimal defining sets of designs. More recently, I have been developing the GAP 4 Share Package: ACE (Advanced Coset Enumerator). ACE was developed as a C-program by George Havas and Colin Ramsay. A primitive interface from within the computer algebra system GAP 4 was programmed by Alexander Hulpke. My task was to remove various deficiencies of the original interface and provide an interactive interface, using the 'IOstream' functionality introduced in GAP 4.2, in March 2000. I have now completed this task. It still needs to be refereed to become a fully-fledged GAP Share Package, but is available at <http://www-gap.dcs.st-and.ac.uk/~gap/Info4/deposit.html>, or <http://www.csee.uq.edu.au/~gregg/ACE/>. (At the latter of these links one can find the ACE Share Package manual, `manual.dvi` which was mainly written by myself.)

I also have a talent for providing documentation in a way that's accessible. The development of the web browser has given me an excellent tool for providing documentation of software tools, in particular. I began with a World Wide Web interface to the voluminous amount of information available for using T_EX and its related software. More recently I have provided similar interfaces for the documentation of the MAGMA and GAP computer algebra systems at the University of Queensland. Needless to say, the ACE Share Package

documentation is available via this interface (see: <http://www.csee.uq.edu.au/~gap>). A fairly recent advance in web browsers is their ability to automatically uncompress a compressed file that it is served. Since disk space is often at a premium on computer systems and documentation can consume quite a lot of this resource, I developed a `perl` tool, called `docpack`, that, using a concept from permutation groups theory, determines the '*HTML*' orbit of an initial page, modifies any links in those pages that are in the '*HTML*' orbit and then compresses each file of the '*HTML*' orbit. A happy by-product of the program is that it will determine and report any *bad links* (to files that don't exist).

Finally, I am skilled as a teacher of mathematics, with a particular talent for diagnosing gaps in students' knowledge. I have taught Year 9 high school mathematics (in 1995), and have lectured to the UWA Academy for Young Mathematicians since 1995. However, most of my teaching skills derive from my many years' tutoring experience in a diverse range of mathematics and some computing and engineering. In particular, I have tutored Logic, Calculus, Linear Algebra, Statistics and Complex Analysis to third year university level. I have also lectured computing at third year level.

PUBLICATIONS

Theses:

- [1] 'Discrete Hankel Transform', *UNSW BE Thesis* (1982), supervised by Prof. Karbowiak.
- [2] 'Computation of Galois Groups', *UNSW MMath Thesis* (1984), supervised by David C. Hunt.
- [3] 'Elements of Prime Order in Primitive Permutation Groups', *UWA PhD thesis* (passed 1997), supervised by Cheryl E. Praeger.

Refereed papers:

- [1] 'Block-transitive 3-designs with affine automorphism group', *J. Geom.* **51** (1994), 36–49.
- [2] 'A first year differential equation', *Aust. Math. Soc. Gazette* **24** No. 4 (1995), 168–172.
- [3] with Cheryl E. Praeger, 'Vertex-primitive groups and graphs of order twice the product of two distinct odd primes', *J. Group Theory* **3** (2000), 247–269.

Research reports:

- [4] 'Block-transitive 3-designs with affine automorphism group', *UWA Research Report* **6** (1992).

Papers in preparation:

- [5] 'Algorithms for computing defining sets and trades of simple t -designs'.
- [6] with Barbara M. Maenhaut, Jennifer Seberry, and Anne Penfold Street, 'Further results on secret sharing schemes'.
- [7] 'Primitive permutation groups containing an element of large prime order, I'.
- [8] 'Primitive permutation groups containing an element of large prime order, II'.

SPORTING ACHIEVEMENTS/AWARDS

1984: Sports Recognition Award (for services as Captain of UNSW Squash Club).

1978–1987: Represented UNSW three times and Melbourne University once at Squash intervarsities.

SPORTING AFFILIATIONS

1976–1984: Member of UNSW Squash Club.

1980–1984: Captain of UNSW Squash Club.

1986–1989: Member of Melbourne University Squash Club. Highest standard reached was State 5.

1987–1989: Record Keeper of Melbourne University Squash Club. Rewrote the existing Record-keeping Computer Program and wrote many other programs for their management.

1990–1991: Member of UWA Squash Club.

REFEREES

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