DR. ROBERT HEFFERNAN

Department of Mathematics, Munster Technological University, Bishopstown, Cork, Ireland.   *robert.heffernan@mtu.ie*

Education

- **University College Cork**—Ireland
  Ph.D. in Finite Group Theory

  – September 2006 – September 2009.
  – Title of thesis: *Topics in Computer Assisted Finite Group Theory*.
  – Supervisor: Prof. Des MacHale, UCC.
  – Second reader: Dr. Colva Roney-Dougal, St. Andrews.

- **University College Cork**—Ireland
  M.Sc. by research in Finite Group Theory.

  – September 2005 – August 2006.
  – Title of thesis: *Computational and Numerical Aspects of Finite Group Theory*.
  – Supervisor: Prof. Des MacHale, UCC.

- **University College Cork**—Ireland
  B.Sc. in Computer Science and in Mathematics

  – October 2001 – June 2005.
  – Joint-honours degree including both Computer Science and Mathematics.
  – Graduation Date: September 2005 with second class honours grade 1.
  – Included as part of the assessment was an undergraduate thesis in mathematics supervised by Prof. Patrick Fitzpatrick concerning quasi-cyclic error correcting codes, awarded a grade of first-class honours.
  – Received a grade of first-class honours in my first-year exams earning the title of *College Scholar*.

Employment

- **Department of Mathematics**—MTU, Cork, Ireland
  Assistant lecturer / Lecturer

  – January 2016 – Present
  – Formerly Cork Institute of Technology (CIT), Cork, Ireland

- **Department of Mathematics**—University of Connecticut, USA
  Assistant Professor in Residence / Visiting Assistant Professor

  – August 2012 – January 2016

- **Department of Mathematics and Statistics**—KFUPM, Saudi Arabia
  Assistant Professor

  – October 2009 – June 2012

- **Department of Mathematics and Statistics**—UCC, Cork, Ireland
  Part-time temporary lecturer

  – September 2006 – August 2009

- **Cork Constraint Computation Centre**—UCC, Cork, Ireland
  Research Assistant

  – July 2001 – December 2005

- **TMC**—Cork, Ireland
  Programmer

  – September 2000 – May 2001

Teaching Experience

- **Dept. of Mathematics**—MTU, Cork, Ireland
  Lecturer

  - Modules including:
    MATH6000 (Essential Mathematical Skills), MATH6004 (Discrete Mathematics), MATH6031 (Engineering Computer 1), MATH6055 (Mathematics for Computer Science), MATH7015 (Numerical Methods 1), MATH8005 (Maths for Control and Quality), STAT6000 (Statistics and Probability) and *STAT6011 (Statistics and Financial Mathematics for Business)*
  - Duties including: preparation and delivery of lectures, setting and marking of quizzes and exams. I have also been involved in supervising projects and theses for the Higher Diploma and M.Sc. in Data Analytics.

- **Dept. of Mathematics**—University of Connecticut, USA
  Assistant Professor in Residence

  - Modules including:
    MATH1070Q (Mathematics for Business and Economics), MATH1071Q (Calculus for Business and Economics), MATH1131Q (Calculus I), MATH1132Q (Calculus II), MATH1152Q (Honors Calculus II), MATH2210Q (Applied Linear Algebra), MATH2360Q (Geometry), MATH2410Q (Elementary Differential Equations), MATH3160 (Probability) and *MATH3230Q (Abstract Algebra I).*
  - Duties including: preparation and delivery of lectures, setting and marking of quizzes and exams and coordination of various multi-section courses including Math1070, Math1071 and Math1131.

- **Dept. of Mathematics and Statistics**—KFUPM, Saudi Arabia
  Assistant Professor

  - Academic years of 2009/2010, 2010/2011 and 2011/2012.
  - Undergraduate courses: *MATH132 (Applications of Calculus), MATH201 (Multivariable Calculus), MATH202 (Elements of Differential Equations), MATH232 (Introduction to Sets and Structures), MATH260 (Introduction to Differential Equations & Linear Algebra), MATH345 (Modern Algebra I)* and *MATH490 (Seminar in Mathematics)* .
  - Graduate courses: *MATH595 (Reading & Research I)* [Topic: "Probabilistic group theory"].
  - Duties including: preparation and delivery of lectures, setting and marking of quizzes and exams.
  - Course coordinator of multi-section course MATH260 during Semester I of 2010.
  - Supervised an undergraduate project for the course *MATH490 (Seminar in Mathematics).* This included helping a student prepare a short report and a 30 minute seminar.
  - Workshops attended: 'Student Motivation' and 'Participatory Classrooms'.

- **Dept. of Mathematics, UCC**—Cork, Ireland
  Part-time Assistant Lecturer

  - Academic years of 2007/2008 and 2008/2009: *MA1003 (Mathematical Methods and Calculus).*
  - Academic year of 2006/2007: *MA3052 (Ring and Field Theory).*
  - Duties including: preparation and delivery of lectures, preparation of tutorials, setting and marking of exams.

- **Dept. of Mathematics, UCC**—Cork, Ireland
  Tutor

  - Academic years of 2005/2006 and 2006/2007.
  - Tutorials in the area of Discrete Mathematics to undergraduate Computer Science students.

- **Dept. of Computer Science, UCC**—Cork, Ireland
  Lab Demonstrator

  - October 2002 – March 2003.
  - Assistant / tutor in Java programming labs.

Committees

- Chair of the *Scheduling* committee, KFUPM (academic year 2011/2012).
- Member of the *Math201 exam* committee, KFUPM (academic year 2011/2012).
- Member of the *Undergraduate* committee, KFUPM (academic year 2010/2011).
- Member of the *Information Technology* committee, KFUPM (academic year 2009/2010).

Research Grants / Funding

- KFUPM *Junior Faculty Research Grant* (project #JF100011) for a project entitled *Commutativity in compact topological groups*. Ended April 2012.

Research Interests

- Finite group theory. In particular, questions relating to the theory of p-groups, the theory of group automorphisms and the commutativity of finite groups. Character theory of finite groups.
- More recently, I have developed an interest in geometric group theory and, in particular, group actions on λ-trees and pretrees.

Presentations

- *Embeddings of small finite groups*, IMS September Meeting 2020, January 2021.
- *Groups, words, graphs and geometry*, WIT Seminar Series in Mathermatics and Physics, May 8th, 2019.
- *Lines: the only things we really understand*, Mathematics Spring Seminar Series, May 17th, CIT.
- *The automorphism tower problem*, SIGMA Seminar Oct. 10, 2014, University of Connecticut.
- *The random graph*, Mathematics Club Apr. 10, 2013, University of Connecticut.
- *An introduction to random groups*, SIGMA Seminar Feb. 22, 2013, University of Connecticut.
- *What is the probability that two elements of a (finite) group commute?*, Mathematics Seminar Feb. 2010, KFUPM, KSA.
- *On the sum of character degrees of a finite group* at the Postgraduate Group Theory Conference 2007, Cambridge University, UK.
- *How big must $|G|$ be to ensure that G has an abelian subgroup of order at least n?* (Poster), Groups in Galway 2006, NUI Galway, Ireland.
- Several presentations to the Postgraduate Mathematics Seminar, UCC, Ireland.
- Also: Presentations to the Dept. of Engineering and the Constraint Programming group in the Computer Science Dept. as an undergraduate student in UCC, Ireland.

Publications

- R. Heffernan, D. MacHale: *Comparing large values of commutativity ratios in finite groups* (in preparation).
- R. Heffernan, B. McCann: *Minimal embeddings of finite cyclic groups* (in preparation).
- R. Heffernan, N. Lord, D. MacHale: *Euler's prime-producing polynomial revisited* in The Mathematical Gazette, Volume 108, Issue 571, 69–77 (2024).
- R. Heffernan, D. MacHale: *The genesis of a conjecture in number theory* in Bulletin of the Irish Mathematical Society, 93, 39–41 (2024).
- R. Heffernan, D. MacHale: *Finite groups with at most nine non-central conjugacy classes* in Mathematical Proceedings of the Royal Irish Academy 124 (1), 33–46 (2024).
- R. Heffernan, D. MacHale: *Some shorter proofs for p-groups* in Bulletin of the Irish Mathematical Society, 86, 107 (2020).

- R. Heffernan, D. MacHale: *Values of f(G) for groups G of odd order with* $\Pr(G) \geq \frac{11}{75}$ in Bulletin of the Irish Mathematical Society, 85, 17–20 (2020).

- R. Heffernan, D. MacHale: *On the order of a smallest group with a given representation degree* in Bulletin of the Irish Mathematical Society, 84, 21–24 (2020).

- R. Heffernan, D. MacHale, B. McCann: *Cayley's theorem revisited: Embeddings of small finite groups* in Mathematics Magazine, 91 (2), 103–111 (2018).

- R. Heffernan, D. MacHale, Á. Ní Shé: *Central factor groups and commutativity* in Mathematical Proceedings of the Royal Irish Academy, Vol. 117A (2), 63–75 (2017).

- R. Heffernan, D. MacHale: *Some shorter proofs for p-groups (Classroom note)* in Bulletin of the Irish Mathematical Society, 86, 107–108 (2020).

- R. Heffernan, B. McCann: *Minimal embeddings of small finite groups* in International Journal of Group Theory, 9 (3), 157–183 (2020).

- R. Heffernan, D. MacHale, Á. Ní Shé: *Restrictions on commutativity ratios in finite groups* in the International Journal of Group Theory, 3 (4), 1–12 (2014).

- J. Curran, R. Heffernan and D. MacHale: *On the Order of the Automorphism Group of a Finite Group* in Communications in Algebra, 39 (10), 3616–3624, (2011).

- E. C. Freuder, R. Heffernan, R. J. Wallace and N. Wilson: *Lexicographically-ordered Constraint Satisfaction Problems* in Constraints, 15 (1), 1–28 (2010).

- R. Heffernan and D. MacHale: *On the sum of the character degrees of a finite group* in Mathematical Proceedings of the Royal Irish Academy, 108A (1), 57–63 (2008).

- E. C. Freuder, R. Heffernan and R. J. Wallace: *Ordinal constraint satisfaction* in The Proceedings of 5th International Workshop on Soft Constraints, 2003.