

# Robert Osburn

## Personal

Place of birth Eunice, Louisiana, USA  
Citizenship American, Irish

## Research Interests

Number theory, special functions, modular forms, combinatorics, algebraic  $K$ -theory, low-dimensional topology

## Education

Ph.D. **Mathematics**, *Louisiana State University*, 2001,  
Thesis: *Densities of 4-ranks of  $K_2$  of rings of integers*,  
Advisor: Professor Jürgen Hurrelbrink.  
B.S. **Mathematics**, *Louisiana State University*, 1996.

## Employment

5/2017 - **Associate Professor**, *University College Dublin*, Dublin, Ireland.  
9/2005 - 5/2017 **Lecturer**, *University College Dublin*, Dublin, Ireland.  
8/2004 - 6/2005 **Invited Guest**, *Max-Planck Institut für Mathematik*, Bonn, Germany.  
7/2003 - 6/2004 **Postdoctoral Fellow**, *Queen's University*, Kingston, Canada.  
7/2001 - 6/2003 **Postdoctoral Fellow**, *McMaster University*, Hamilton, Canada.

## Research Visits

8/2023 **Visiting Professor**, *Okinawa Institute of Science and Technology*, Okinawa, Japan, 3 weeks.  
5/2023 **Invited Guest**, *Max-Planck Institut für Mathematik*, Bonn, Germany, 1 month.  
5/2022 **Visiting Professor**, *Okinawa Institute of Science and Technology*, Okinawa, Japan, 4 months.  
3/2022 **Invited Guest**, *Max-Planck Institut für Mathematik*, Bonn, Germany, 1 month.  
1/2022 **Research in Pairs**, *Mathematisches Forschungsinstitut Oberwolfach*, Germany, 2 weeks.  
5/2019 - 8/2019 **James M. Flaherty Visiting Professor**, *McMaster University*, Hamilton, Canada, 12 weeks.

- 2/2019 - 4/2019 **Invited Guest**, *Max-Planck Institut für Mathematik*, Bonn, Germany, 3 months.
- 1/2018 **Invited Participant**, *Hausdorff Research Institute for Mathematics*, Bonn, Germany, 2 weeks.
- 3/2016 **Research in Pairs**, *Mathematisches Forschungsinstitut Oberwolfach*, Germany, 2 weeks.
- 3/2015 - 5/2015 **Invited Guest**, *Max-Planck Institut für Mathematik*, Bonn, Germany, 3 months.
- 1/2015 - 3/2015 **Invited Guest**, *Institut des Hautes Études Scientifiques*, Bures-sur-Yvette, France, 3 months.
- 6/2012 - 7/2012 **Invited Guest**, *Institut des Hautes Études Scientifiques*, Bures-sur-Yvette, France, 2 months.
- 6/2011 - 7/2011 **Invited Guest**, *Université Paris Diderot - Paris 7*, Paris, France, 1 month.
- 1/2007 - 7/2007 **Invited Guest**, *Institut des Hautes Études Scientifiques*, Bures-sur-Yvette, France, 7 months.

## Awards/Qualifications

- 2023 - 2027 **Advanced Laureate Award**, *Irish Research Council*.
- 2022 **Theoretical Sciences Visiting Professor**, *Okinawa Institute of Science and Technology*.
- 2018 **James M. Flaherty Visiting Professorship**, *Ireland Canada University Foundation*.
- 2015 - 2019 **Professor, Section 25 - Mathematics**, *French Conseil National des Universités*.

## Editorial Boards

- 2021 - **Journal of Combinatorial Theory, Series A**.
- 2023 - **Canadian Journal of Mathematics**.
- 2023 - **Canadian Mathematical Bulletin**.
- 2025 - **Canadian Mathematical Communications**.

## Publications

54. *Arborescent links and modular tails (with Matthias Storzer)*, 25 pages, preprint.
53. *Resurgence, Habiro elements and strange identities (with Samuel Crew, Veronica Fantini, Ankush Goswami and Campbell Wheeler)*, 20 pages, accepted for publication in *Communications in Number Theory and Physics* on February 25, 2025.
52. *Knot theory and Rogers-Ramanujan type identities*, 3 pages, accepted for publication in *Srinivasa Ramanujan: His Life, Legacy and Mathematical Influence (Springer)* on April 19, 2019.
51. *Unimodal sequences and mixed false theta functions (with Kevin Allen)*, *Advances in Mathematics* **473** (2025), Paper No. 110293.
50. *On sporadic sequences (with Brendan Alinquant)*, *Monatshefte für Mathematik* **205** (2024), no. 2, 217–234.
49. *Rank deviations for overpartitions (with Jeremy Lovejoy)*, *Research in Number Theory* **10** (2024), no. 3, Paper No. 67.
48. *Asymptotics and sign patterns for coefficients in expansions of Habiro elements (with Ankush Goswami, Abhash Kumar Jha and Byungchan Kim)*, *Mathematische Zeitschrift* **304** (2023), no. 4, 57.

47. *A  $q$ -multisum identity arising from finite chain ring probabilities (with Jehanne Dousse)*, *Electronic Journal of Combinatorics* **29** (2022), no. 2, Paper No. 2.4.
46. *The colored Jones polynomial and Kontsevich-Zagier series for double twist knots (with Jeremy Lovejoy)*, *Journal of Knot Theory and its Ramifications*, **30** (2021), no. 5, 2150031, 28 pages.
45. *Quantum modularity of partial theta series with periodic coefficients (with Ankush Goswami)*, *Forum Mathematicum*, **33** (2021), no. 2, 451–463.
44. *Variations of Andrews-Beck type congruences (with Song Heng Chan and Renrong Mao)*, *Journal of Mathematical Analysis and Applications*, **495** (2021), no. 2, 124771.
43. *Generalized Fishburn numbers and torus knots (with Colin Bijaoui, Hans Boden, Beckham Myers, Will Rushworth, Aaron Tronsgard and Shaoyang Zhou)*, *Journal of Combinatorial Theory, Series A* **178** (2021), 105355.
42. *Sequences, modular forms and cellular integrals (with Dermot McCarthy and Armin Straub)*, *Mathematical Proceedings of the Cambridge Philosophical Society* **168** (2020), no. 2, 379–404.
41. *The colored Jones polynomial and Kontsevich-Zagier series for double twist knots, II (with Jeremy Lovejoy)*, *New York Journal of Mathematics* **25** (2019), 1312–1349.
40. *Interpolated sequences and critical  $L$ -values of modular forms (with Armin Straub)*, *Elliptic Integrals, Elliptic Functions and Modular Forms in Quantum Field Theory*, 327–349, *Texts & Monographs in Symbolic Computation*, Springer, Vienna, 2019.
39. *Constrained ternary integers (with Florian Luca, Pieter Moree, Sumaia Saad Eddin and Alisa Sedunova)*, *International Journal of Number Theory* **15** (2019), no. 2, 407–431.
38. *A modular supercongruence for  ${}_6F_5$ : an Apéry-like story (with Armin Straub and Wadim Zudilin)*, *Annales de l'Institut Fourier (Grenoble)* **68**, no. 5, (2018), 1987–2004.
37. *Mock theta double sums (with Jeremy Lovejoy)*, *Glasgow Mathematical Journal* **59**, no. 2, (2017), 323–348.
36.  *$q$ -series and tails of colored Jones polynomials (with Paul Beirne)*, *Indagationes Mathematicae* **28**, no. 1, (2017), 247–260.
35. *On a conjecture of Kimoto and Wakayama (with Ling Long and Holly Swisher)*, *Proceedings of the American Mathematical Society* **144**, no. 10, (2016), 4319–4327.
34. *The first positive rank and crank moments for overpartitions (with George Andrews, Song Heng Chan and Byungchan Kim)*, *Annals of Combinatorics* **20** (2016), no. 2, 193–217.
33. *Supercongruences for sporadic sequences (with Brundaban Sahu and Armin Straub)*, *Proceedings of the Edinburgh Mathematical Society (2)* **59** (2016), no. 2, 503–518.
32. *Rogers-Ramanujan type identities for alternating knots (with Adam Keilthy)*, *Journal of Number Theory* **161** (2016), 255–280.
31. *On the  $(K.2)$  supercongruence of Van Hamme (with Wadim Zudilin)*, *Journal of Mathematical Analysis and Applications* **433**, no. 1, (2016), 706–711.
30. *On recursions for coefficients of mock theta functions (with Song Heng Chan and Renrong Mao)*, *Research in Number Theory*, 1:29 (2015).
29. *Real quadratic double sums (with Jeremy Lovejoy)*, *Indagationes Mathematicae* **26**, no. 4, (2015), 697–712.
28. *On two 10th order mock theta identities (with Jeremy Lovejoy)*, *The Ramanujan Journal* **36**, no. 1-2, (2015), 117–121.

27. *q-hypergeometric series, alternating knots and identities*, Oberwolfach Reports **11**, no. 3, (2014), 2164–2167.
26. *Mixed mock modular q-series* (with Jeremy Lovejoy), Journal of the Indian Mathematical Society, New Series. Special Ramanujan Issue, (2013), 45–61
25. *q-hypergeometric double sums as mock theta functions* (with Jeremy Lovejoy), Pacific Journal of Mathematics **264**, no. 1, (2013), 151–162.
24. *A supercongruence for generalized Domb numbers* (with Brundaban Sahu), Functiones et Approximatio Commentarii Mathematici **48**, no. 1, (2013), 29–36.
23. *The Bailey chain and mock theta functions* (with Jeremy Lovejoy), Advances in Mathematics **238** (2013), 442–458.
22. *Principal forms  $X^2 + nY^2$  representing many integers* (with David Brink and Pieter Moree), Abhandlungen aus dem Mathematischen Seminar der Universität Hamburg **81**, no. 2, (2011), 129–139.
21. *Supercongruences for Apéry-like numbers* (with Brundaban Sahu), Advances in Applied Mathematics **47**, no. 3, (2011), 631–638.
20. *Congruences via modular forms* (with Brundaban Sahu), Proceedings of the American Mathematical Society **139**, no. 7, (2011), 2375–2381.
19. *Quadratic forms and four partition functions modulo 3* (with Jeremy Lovejoy), Integers **11** (2011), A4, 47–53.
18. *Supercongruences satisfied by coefficients of  ${}_2F_1$  hypergeometric series* (with Heng Huat Chan, Aristides Kontogeorgis and Christian Krattenthaler), Annales des sciences mathématiques de Québec **34**, no. 1, (2010), 25–36.
17.  *$M_2$ -rank differences for overpartitions* (with Jeremy Lovejoy), Acta Arithmetica **144**, no. 2, (2010), 193–212.
16. *Automorphic properties of generating functions for generalized rank moments and Durfee symbols* (with Kathrin Bringmann and Jeremy Lovejoy), International Mathematics Research Notices, no. 2, (2010), 238–260.
15. *Rank and crank moments for overpartitions* (with Kathrin Bringmann and Jeremy Lovejoy), Journal of Number Theory **129**, no. 7, (2009), 1758–1772.
14.  *$M_2$ -rank differences for partitions without repeated odd parts* (with Jeremy Lovejoy), Journal de Théorie des Nombres de Bordeaux **21**, no. 2, (2009), 313–334.
13. *Gaussian hypergeometric series and supercongruences* (with Carsten Schneider), Mathematics of Computation **78**, no. 265, (2009), 275–292.
12. *A p-adic analogue of a formula of Ramanujan* (with Dermot McCarthy), Archiv der Mathematik **91**, no. 6, (2008), 492–504.
11. *Rank differences for overpartitions* (with Jeremy Lovejoy), The Quarterly Journal of Mathematics (Oxford) **59**, no. 2, (2008), 257–273.
10. *Congruences for traces of singular moduli*, The Ramanujan Journal **14**, no. 3, (2007), 411–419.
9. *Representations of integers by certain positive definite binary quadratic forms* (with Ram Murty), The Ramanujan Journal **14**, no. 3, (2007), 351–359.
8. *On a conjecture of Wilf* (with Stefan de Wannemacker and Thomas Laffey), Journal of Combinatorial Theory, Series A **114**, no. 7, (2007), 1332–1349.
7. *Two-dimensional lattices with few distances* (with Pieter Moree), L'Enseignement Mathématique **52**, no. 3-4, (2006), 361–380.
6. *On sums of three squares* (with Stephen Choi and Angel Kumchev), International Journal of Number Theory **1**, no. 2, (2005), 161–173.

5. *A remark on a conjecture of Borwein and Choi*, Proceedings of the American Mathematical Society **133**, no. 10, (2005), 2903–2909.
4. *Vanishing of eigenspaces and cyclotomic fields*, International Mathematics Research Notices, no. 20, (2005), 1195–1202.
3. *A note on 4-rank densities*, Canadian Mathematical Bulletin **47**, no. 3, (2004), 431–438.
2. *Tame kernels and further 4-rank densities* (with Brian Murray), Journal of Number Theory **98**, no. 2, (2003), 390–406.
1. *Densities of 4-ranks of  $K_2(\mathcal{O})$* , Acta Arithmetica **102**, no. 1, (2002), 45–54.

## Invited Talks

- 2/2024 **Unimodal sequences and mixed modularity**, *The Web of Modularity*, New Orleans, USA.
- 1/2024 **Strange identities, the Habiro ring and resurgence**, NISER Colloquium talk, Bhubaneswar, India.
- 9/2023 **Strange identities, the Habiro ring and resurgence**, OIST Frontiers in Nonlinear Differential Equations and Stokes Phenomena, Okinawa, Japan.
- 10/2022 **Asymptotics, strange identities and the Habiro ring**, Representation Theory XVII, Dubrovnik, Croatia.
- 7/2022 **Knots and modularity**, OIST TSVP Talk, Okinawa, Japan.
- 4/2021 **From knots to modularity**, University of Denver Graduate Colloquium, Denver, USA (online).
- 9/2019 **Knots, modularity and beyond**, Colloquium and Flaherty Public Lecture, Hamilton, Canada.
- 8/2019 **Generalized Kontsevich-Zagier series via knots**, KIAS 2nd q-day: q-series and related topics, Seoul, Korea.
- 7/2019 **Generalized Kontsevich-Zagier series via knots**, REU Colloquium, Corvallis, USA.
- 5/2018 **Knots and modular forms**, Antalya Algebra Days XX, Şirince, Turkey.
- 4/2018 **Knots and modular forms**, AMS Special Session on Mock modular and quantum modular forms, Portland, USA.
- 12/2017 **Sequences, modular forms and period integrals**, Trends in Modular forms, Daejeon, Korea.
- 1/2017 **An example of motivic supercongruences**, Hypergeometric motives and Calabi-Yau differential equations, Melbourne, Australia.
- 1/2017 **Sequences, modular forms and cellular integrals**, Hypergeometric motives and Calabi-Yau differential equations, Melbourne, Australia.
- 5/2016 **q-series, modularity and knots**, Pacific Northwest Number Theory Conference, Corvallis, USA.
- 10/2015 **q-series and quantum knot invariants**, Automatic sequences, Number Theory and Aperiodic Order, Delft, Netherlands.
- 10/2015 **q-series and quantum knot invariants**, KIAS, Seoul, Korea.
- 3/2015 **Rogers-Ramanujan type identities for alternating knots**, AKLS Seminar, Cologne, Germany.
- 11/2014 **Rogers-Ramanujan type identities for alternating knots**, Séminaire tournant de théorie des nombres, ICJ, Lyon, France.

- 9/2014 **Variations of hypergeometric functions and applications**, *Advanced School and Workshop on L-functions and modular forms*, Trieste, Italy.
- 8/2014 **Rogers-Ramanujan type identities for alternating knots**, *Workshop on Low-dimensional topology and number theory*, Oberwolfach, Germany.
- 4/2014 **Supercongruences**, *Applications of Automorphic Forms in Number Theory and Combinatorics*, Baton Rouge, USA.
- 12/2013 **Supercongruences**, *Analytic theory of automorphic forms*, Chennai, India.
- 12/2012 **The modularity of  $q$ -hypergeometric series**, *Ramanujan 125*, New Delhi, India.
- 10/2012 **The mixed mock modularity of  $q$ -hypergeometric series**, *AMS Special Session on Harmonic Maass Forms and  $q$ -Series*, Tucson, USA.
- 6/2012 **The mock modularity of  $q$ -hypergeometric series**, *CNTA XII*, Lethbridge, Canada.
- 5/2012 **The mock modularity of  $q$ -hypergeometric series**, *Hypergeometric series and their generalizations in algebra, geometry, number theory and physics*, Paris, France.
- 3/2012 **Multisum mock theta functions**, *AMS Special Session on Automorphic and Modular forms*, Honolulu, USA.
- 3/2011 **Automorphic properties of combinatorial generating functions**, *25th Automorphic Forms Workshop*, Corvallis, USA.
- 10/2010 **Supercongruences**, *Zeta and Limit Laws in Okinawa 2010*, Okinawa, Japan.
- 5/2009 **Automorphic properties of generating functions for generalized rank moments and Durfee symbols**, *International Conference at MPIM: Mock theta functions and applications in combinatorics, algebraic geometry and mathematical physics*, Bonn, Germany.
- 1/2009 **Gaussian hypergeometric series**, *AMS Special Session on Automorphic and Modular forms*, Washington, D.C., USA.
- 11/2008 **Gaussian hypergeometric series**, *UCD-Nottingham Number Theory Day*, Dublin, Ireland.
- 12/2007 **Ramanujan, partitions and overpartitions**, *Colloquium Talk at University College Cork*, Cork, Ireland.
- 9/2007 **Ramanujan, partitions and overpartitions**, *Irish Mathematical Society Meeting*, Dublin, Ireland.
- 6/2007 **Rank differences for overpartitions**, *Rencontres de théorie analytique et élémentaire des nombres*, Paris, France.
- 2/2007 **Gaussian hypergeometric functions and supercongruences**, *Palmetto Number Theory Series II*, Clemson, USA.
- 2/2007 **Two-dimensional lattices with few distances**, *Colloquium Talk at Clemson University*, Clemson, USA.
- 10/2004 **Vanishing of eigenspaces and cyclotomic fields**, *Workshop on Explicit Algebraic Number Theory*, Paris, France.
- 4/2004 **Congruences for traces of singular moduli**, *Québec-Vermont Number Theory Seminar*, Montréal, Canada.
- 3/2004 **Congruences for traces of singular moduli**, *Workshop on Arithmetic and Geometry of Algebraic Varieties*, Toronto, Canada.
- 12/2003 **Traces of singular moduli**, *CMS Winter Meeting: Number Theory Session*, Vancouver, Canada.
- 12/2003 **Representations of integers by certain binary quadratic forms**, *PIMS Number Theory Day*, Vancouver, Canada.

- 10/2002 **Rédei matrices and  $K$ -groups**, Québec-Maine Number Theory Conference, Laval, Canada.
- 6/2002 **Tame kernels and 4-rank densities**,  $K$ -theory of Number Fields: from theory to algorithms, Metz, France.

## Seminar Talks

- 5/2024 **Unimodal sequences and mixed false theta functions**, Arbeitsgemeinschaft Diskrete Mathematik, Vienna, Austria.
- 1/2024 **Strange identities, the Habiro ring and resurgence**, School of Mathematics and Statistical Sciences Seminar, Galway, Ireland.
- 11/2023 **From knots to quantum modularity**, Mathematical Sciences Seminar Series, Cork, Ireland.
- 7/2022 **Asymptotics, strange identities and the Habiro ring**, Kyushu Mathematical Physics Seminar, Fukuoka, Japan.
- 6/2022 **Combinatorics and knot invariants**, OIST Seminar, Okinawa, Japan.
- 3/2022 **Generalized Fishburn numbers via torus knots**, MPIM Number Theory Seminar, Bonn, Germany.
- 12/2021 **Generalized Fishburn numbers, torus knots and quantum modularity**, McMaster Algebra and Algebraic Geometry Seminar, Canada.
- 12/2020 **Generalized Fishburn numbers, torus knots and quantum modularity**, SFB F50 Statusseminar, Austria (online).
- 12/2020 **Generalized Fishburn numbers, torus knots and quantum modularity**, EIMI Number Theory Seminar, Russia (online).
- 11/2020 **Generalized Fishburn numbers, torus knots and quantum modularity**, Warsaw Number Theory Seminar, Poland (online).
- 11/2020 **Generalized Fishburn numbers and torus knots**, Vanderbilt Number Theory Seminar, USA (online).
- 3/2020 **Generalized Fishburn numbers and torus knots**, Algebra and Number Theory Seminar, Dublin, Ireland.
- 6/2019 **Generalized Kontsevich-Zagier series via knots**, Number Theory Seminar, Queen's University, Canada.
- 5/2019 **Generalized Kontsevich-Zagier series via knots**, McMaster University, Canada.
- 5/2019  **$q$ -series, knots and modular forms**, McMaster University, Canada.
- 4/2019 **Generalized Kontsevich-Zagier series via knots**, Algebra Seminar, TU Darmstadt, Germany.
- 3/2019 **The colored Jones polynomial for double-twist knots**, MPIM Number Theory Seminar, Bonn, Germany.
- 10/2018 **The colored Jones polynomial for double-twist knots**, Number Theory and Algebra Seminar, Zagreb, Croatia.
- 9/2018 **The colored Jones polynomial for double-twist knots**, Algebra and Number Theory Seminar, Dublin, Ireland.
- 6/2018  **$q$ -series and knots**, UCD Reading Seminar, Dublin, Ireland.
- 5/2017 **Sequences, modular forms and period integrals**, University of Alberta, Edmonton, Canada.
- 9/2016 **Sequences, modular forms and cellular integrals**, Algebra and Number Theory Seminar, Dublin, Ireland.

- 6/2014 **The mock modularity of  $q$ -hypergeometric series**, Warwick Number Theory Seminar, Coventry, UK.
- 5/2014 **The mock modularity of  $q$ -hypergeometric series**, NUI Galway MSAM Seminar, Galway, Ireland.
- 4/2014 **The mock modularity of  $q$ -hypergeometric series**, Séminaire de théorie des nombres de l'IMJ-PRG, Paris, France.
- 10/2012 **On computations of Shanks and Schmid**, Emory Algebra and Number Theory Seminar, Atlanta, USA.
- 9/2012 **The mock and mixed mock modularity of  $q$ -hypergeometric series**, Penn State Combinatorics/Partitions Seminar, University Park, USA.
- 9/2012 **The mock and mixed mock modularity of  $q$ -hypergeometric series**, Collaborative Number Theory Seminar, CUNY Graduate Center, New York, USA.
- 6/2012 **Ramanujan: his life, the last letter and beyond**, Oregon State University Special Seminar, Corvallis, USA.
- 10/2011 **Supercongruences for Apéry-like numbers**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 6/2011 **Automorphic properties of combinatorial generating functions**, LIAFA Séminaire "Combinatoire énumérative et analytique", Paris, France.
- 4/2011 **Automorphic properties of combinatorial generating functions**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 2/2011 **Automorphic properties of combinatorial generating functions**, Cambridge Number Theory Seminar, Cambridge, UK.
- 3/2010 **On computations of Shanks and Schmid**, University of South Carolina Number Theory Seminar, Columbia, USA.
- 10/2007 **Congruences for combinatorial functions**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 9/2006 **Gaussian hypergeometric functions and supercongruences**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 2/2006 **Two-dimensional lattices with few distances**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 11/2005 **4-core partitions and class numbers**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 9/2005 **Vanishing of eigenspaces and cyclotomic fields**,  $K$ -theory, Quadratic Forms and Number Theory Seminar, Dublin, Ireland.
- 10/2004 **Vanishing of eigenspaces and cyclotomic fields**, Max-Planck Institut für Mathematik Number Theory Seminar, Bonn, Germany.
- 6/2004 **On the norm of the fundamental unit**, Number Theory Seminar at Queen's University, Kingston, Canada.
- 5/2004 **Sums of three squares**, Number Theory Seminar at Queen's University, Kingston, Canada.
- 2/2004 **4-core partitions and class numbers**, Number Theory Seminar at Queen's University, Kingston, Canada.
- 1/2004 **Representations of integers by certain quadratic forms**, Ottawa/Carleton Number Theory Seminar, Ottawa, Canada.
- 10/2003 **Erdos' 105 problem**, Number Theory Seminar at Queen's University, Kingston, Canada.



- 10/2003 **Supercongruences**, *Calabi-Yau Mirror Symmetry Seminar at Queen's University*, Kingston, Canada.
- 9/2003 **Traces of singular moduli**, *Number Theory Seminar at Queen's University*, Kingston, Canada.
- 8/2003 **Representations of integers by certain quadratic forms**, *Number Theory Seminar at Queen's University*, Kingston, Canada.
- 7/2003 **Rédei matrices**, *Number Theory Seminar at Queen's University*, Kingston, Canada.
- 3/2003 **Gauss sums and sign ambiguities**, *Algebra/Number Theory Seminar at LSU*, Baton Rouge, USA.
- 3/2003 **Gauss sums and sign ambiguities**, *Algebra/Number Theory Seminar at McMaster University*, Hamilton, Canada.
- 9/2002 **Middle binomial coefficients**, *Algebra/Number Theory Seminar at McMaster University*, Hamilton, Canada.
- 3/2002 **The partition function**, *Algebra/Number Theory Seminar at McMaster University*, Hamilton, Canada.
- 9/2001 **4-rank formulas and possible densities**, *Algebra/Number Theory Seminar at McMaster University*, Hamilton, Canada.
- 9/2001 **Densities of 4-ranks of tame kernels**, *Algebra/Number Theory Seminar at McMaster University*, Hamilton, Canada.

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## Contributed Talks

- 7/2009 **Automorphic properties of generating functions for generalized rank moments and Durfee symbols**, *26th Journées Arithmétiques*, Saint-Étienne, France.
- 5/2008 **Rank and crank moments for overpartitions**, *The Hawaii workshop on the arithmetic of modular forms*, Manoa, USA.
- 3/2008  **$M_2$ -rank differences for partitions without repeated odd parts**, *Conference on Partitions,  $q$ -series and Modular Forms*, Gainesville, USA.
- 7/2006 **Two-dimensional lattices with few distances**, *CNTA IX*, Vancouver, Canada.
- 5/2002 **Tame kernels and 4-rank densities**, *CNTA VII*, Montréal, Canada.
- 5/2002 **Tame kernels and 4-rank densities**, *Illinois Number Theory Conference*, Urbana-Champaign, USA.
- 1/2001 **Densities of 4-ranks of  $K_2$  of rings of integers**, *AMS Joint Mathematical Meeting*, New Orleans, USA.
- 5/2000 **Densities of 4-ranks of  $K_2$  of rings of integers**, *Millennial Conference on Number Theory*, Urbana-Champaign, USA.
- 3/2000 **Densities of 4-ranks of  $K_2$  of rings of integers**, *Illinois Graduate Number Theory Conference*, Urbana-Champaign, USA.

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## Conferences Attended

- 11/2024 **New developments in representation theory of algebras**, Okinawa, Japan.
- 2/2024 **The Web of Modularity**, New Orleans, USA.
- 8/2023 **Exact Asymptotics: From Fluid Dynamics to Quantum Geometry**, Okinawa, Japan.
- 10/2022 **Representation Theory XVII**, Dubrovnik, Croatia.
- 6/2021 **Number Theory, Strings and Quantum Physics**, Tokyo, Japan (online).

- 5/2021 ***New connections in number theory and physics***, Cambridge, UK (online).
- 11/2020 ***KITP program on Modularity in Quantum Systems***, Santa Barbara, USA (online).
- 3/2019 ***ICERM workshop on Modularity and 3-manifolds***, Providence, USA.
- 5/2018 ***Antalya Algebra Days XX***, Şirince, Turkey.
- 4/2018 ***AMS Special session on Mock modular and quantum modular forms***, Portland, USA.
- 3/2018 ***Modular forms and quantum knot invariants***, Banff, Canada.
- 1/2018 ***Periods in Number Theory, Algebraic Geometry and Physics***, Bonn, Germany.
- 12/2017 ***Trends in modular forms***, Daejeon, Korea.
- 8/2017 ***Low-dimensional topology and number theory***, Oberwolfach, Germany.
- 1/2017 ***Hypergeometric motives and Calabi-Yau differential equations***, MATRIX, Melbourne, Australia.
- 9/2016 ***Modular forms in String Theory***, Banff, Alberta, Canada.
- 5/2015 ***Automorphic forms: advances and applications***, CIRM, Marseille, France.
- 5/2015 ***Workshop on vertex operator algebras and mock modular forms***, NUIG, Galway, Ireland.
- 3/2015 ***Characters of Representations and Modular Forms***, MPIM, Bonn, Germany.
- 2/2015 ***ANR Q-DIFF***, Grenoble, France.
- 8/2014 ***Low-dimensional topology and number theory***, Oberwolfach, Germany.
- 7/2014 ***Building Bridges: 2nd EU/US Workshop on Automorphic Forms and Related Topics***, Bristol, UK.
- 5/2014 ***Groups in Galway***, Galway, Ireland.
- 7/2013 ***Special functions and special numbers, 60th birthday of Frits Beukers***, Utrecht, Netherlands.
- 3/2011 ***Conference on Modular forms and Mock modular forms and their applications in Arithmetic, Geometry and Physics***, ICTP, Trieste, Italy.
- 6/2010 ***Summer School on quasimodular forms and applications***, Besse, France.
- 7/2009 ***9th International Conference on Finite Fields and Applications***, Dublin, Ireland.
- 5/2009 ***UCD-Nottingham Number Theory Day***, Nottingham, UK.
- 7/2007 ***25th Journées Arithmétiques***, Edinburgh, Scotland.
- 9/2006 ***Conference in Celebration of Bryan Birch's 75th Birthday***, Bristol, UK.
- 6/2005 ***Gauss-Dirichlet Conference***, Göttingen, Germany.
- 2/2005 ***Yuri Manin's Emeritierung Conference***, MPIM, Bonn, Germany.
- 1/2005 ***Workshop on Automorphic Forms***, Siegen, Germany.
- 8/2004 ***Modular forms and their applications***, Sophus Lie Conference Center, Nordfjordeid, Norway.
- 6/2004 ***CNTA VIII***, Toronto, Canada.
- 9/2003 ***Workshop on The Equivariant Tamagawa Number Conjecture***, McMaster University, Hamilton, Canada.
- 6/2003 ***The Web of Modularity***, NSF-CBMS Conference, Urbana-Champaign, USA.
- 4/2003 ***The many aspects of Mahler's measure***, BIRS, Banff, Canada.
- 7/2002 ***A school on Algebraic K-theory and its applications***, ICTP, Trieste, Italy.
- 4/2002 ***Great Lakes K-theory conference VIII***, Urbana-Champaign, USA.
- 3/2001 ***Quadratic Forms Conference at LSU***, Baton Rouge, USA.

- 3/2001 **Arizona Winter School**, Southwestern Center for Arithmetical Algebraic Geometry, Tucson, USA.
- 8/2000 **Lehmer Conference**, Berkeley, USA.
- 1/2000 **Unusual applications of Number Theory**, DIMACS Workshop, New Brunswick, USA.

## Organization of Conferences, Seminars and Workshops

- 9/2005 - Co-organizer of **Algebra and Number Theory Seminar at UCD**.
- 10/2026 Co-organizer of **Modularity and Quantum Topology** (with Amanda Folsom, Jeremy Lovejoy and Holly Swisher), AIM, California, USA.
- 5/2022 Co-organizer of **AMS Special Session on  $q$ -series, number theory and quantum topology** (with Shashank Kanade and Chris Jennings-Shaffer), Denver, USA.
- 3/2021 Co-organizer of **Workshop on Enumerative Combinatorics** (with Mark Dukes and Neil O'Connell), Dublin, Ireland (online).
- 3/2018 Co-organizer of **Modular forms and quantum knot invariants** (with Kazuhiro Hikami and Jeremy Lovejoy), BIRS, Banff, Canada.
- 5/2015 Co-organizer of **Workshop on vertex operator algebras and mock modular forms** (with Michael Tuite), Galway, Ireland.
- 3/2013 Co-organizer of **27th Automorphic Forms Workshop** (with Scott Ahlgren and Jeremy Lovejoy), Dublin, Ireland.
- 7/2012 Co-organizer of **Algebraic  $K$ -theory and Arithmetic: a conference in honor of Jürgen Hurrelbrink** (with Grzegorz Banaszak, Jerzy Browkin, Manfred Kolster, Piotr Krasoń, Wiesława Nizioł, Robert Perlis, Kazimierz Szymiczek and Jerzy Urbanowicz), Będlewo, Poland.
- 7/2010 Co-organizer of **Prospects in  $q$ -series and modular forms conference** (with Jeremy Lovejoy and Sander Zwegers), Dublin, Ireland.
- 11/2008 Co-organizer of **UCD/Nottingham Number Theory Day** (with Nigel Boston), Dublin, Ireland.
- 3/2008 Co-organizer of **AMS Special Session on Number Theory and applications in other fields** (with Jorge Morales, Robert Perlis and Helena Verrill), Baton Rouge, USA.
- 3/2003 Co-organizer of **AMS Special Session on Algebraic Number Theory and  $K$ -theory** (with Jürgen Hurrelbrink and Jorge Morales), Baton Rouge, USA.
- 1/2002 - 4/2003 Co-organizer of **Algebra/Number Theory Seminar at McMaster University** (with Manfred Kolster and Hui June Zhu), Hamilton, Ontario, Canada.

## Grants (Total: €1,362,552.73)

- 12/2023 - 11/2027  **$q$ KIM:  $q$ -series, quantum knot invariants and modularity**, IRC Advanced Laureate Award, €993,160.
- 6/2021 - 6/2022 **The modularity of quantum invariants for classical and virtual knots**, Enterprise Ireland, €16,000.
- 4/2020 - 9/2021 **Modular properties of quantum knot invariants**, UCD Seed Funding Scheme, €1,800.
- 5/2019 - 8/2019  **$q$ KI+TQC**, James M. Flaherty Visiting Professorship, €21,800.
- 10/2018 - 9/2020 **Quantum knot invariants and modular forms**, IRC Postgraduate Scholarship for Paul Beirne, €48,000.

- 4/2018 - 4/2019 **Quantum knot invariants and modularity**, UCD Seed Funding Scheme, €1,500.
- 2/2016 - 9/2017 ***q-series and quantum knot invariants***, UCD Seed Funding Scheme, €1,100.
- 5/2015 **Workshop on vertex operator algebras and mock modular forms**, €6,000 from the Irish Research Council New Foundations Scheme.
- 3/2013 **The 27th Automorphic Forms Workshop**, €2000 from the SFI Conference and Workshop Programme, \$5,000 from the Number Theory Foundation, €2,500 from the UCD School of Mathematical Sciences, €460 from Failte Ireland and €200 from the Irish Mathematical Society to host this conference.
- 5/2012 - 5/2013 **The Bailey chain and mock theta functions**, UCD Seed Funding Scheme, €1,500.
- 1/2010 - 4/2010 **Prospects in *q-series and modular forms***, €10000 from the UCD School of Mathematical Sciences, \$1,000 from the Number Theory Foundation and €300 from the Irish Mathematical Society to host this conference.
- 4/2008 - 10/2011 **Arithmetic properties of coefficients of modular forms**, Science Foundation Ireland Research Frontiers Programme, €116,300.
- 12/2007 - 11/2008 **Ramanujan type congruences for overpartitions and overpartition pairs**, IRCSET France-Ireland Ulysses programme, €2,500.
- 12/2007 - 11/2008 **Dyson's rank and overpartitions**, UCD Seed Funding Scheme, €2,380.
- 6/2007 - 6/2009 **Variations of Kummer's conjecture**, IRCSET Postdoctoral Fellowship Scheme for Marilyn Myers, €93,000.
- 9/2006 - 8/2010 **Number theory, modular forms and combinatorics**, UCD Ad Astra Scholarship Programme for Dermot McCarthy, €48,000.
- 8/2006 - 7/2007 **Two-dimensional lattices with few distances**, UCD Seed Funding, €2,093.73.

## Advising

Undergraduate  
Students

**Brendan Alinquant**,

UCD Summer Research Project, 6/2023 to 8/2023.

**Colin Bijaoui (McMaster), Beckham Myers (Harvard), Shaoyang Zhou (Vanderbilt), Aaron Tronsgard (Alberta)**,

Fields Institute Undergraduate Summer Research Program, Toronto, Canada, 7/2019 to 8/2019.

**Paul Beirne**,

UCD Summer Research Project, 6/2015 to 8/2015.

**Adam Keilthy**,

UCD Summer Research Project, 5/2014 to 7/2014.

Current position: Postdoc, Chalmers University of Technology, Sweden.

Masters  
Students

**Hao Dai**, MSc. UCD, Summer 2022,

Thesis: *Somos sequences and cluster algebras*.

Ph.D. Students

**Björn Johannesson**,

Ph.D. student UCD, starting 9/2024.

**Kevin Allen**, Ph.D. student UCD, 9/2021 to 8/2025,

Thesis: *q-series and modularity*.

**Paul Beirne**, Ph.D. UCD 2020,

Thesis: *Stability properties for the coefficients of the colored Jones polynomial*,

First position: Senior Operations Executive, IMVO, Ireland.

**Dermot McCarthy**, *Ph.D. UCD 2010*,  
Thesis: *p-adic hypergeometric series and supercongruences*,  
First position: 3 year Visiting Assistant Professor, Texas A&M, USA.  
Current position: Associate professor, Texas Tech University, USA.

**Stefan de Wannemacker**, *Ph.D. UCD 2006*,  
Thesis: *Annihilating polynomials and Stirling numbers of the second kind*,  
Current position: Senior Researcher, iTec, K.U. Leuven, Kortrijk, Belgium.

Postdocs **Matthias Storzer**, *IRC Advanced Laureate Award Postdoctoral Fellow, 10/2024 - 9/2027*.

**Yuma Mizuno**, *IRC Advanced Laureate Award Postdoctoral Fellow, 4/2024 - 3/2027*.

**Brundaban Sahu**, *SFI Postdoctoral Fellowship, 11/2008 - 10/2010*,  
Current position: Professor, National Institute of Science Education and Research, Bhubaneswar, India.

**David Brink**, *Danish Research Fellowship, 8/2009 - 8/2010*,  
Current position: Researcher, Akamai Technologies, Denmark.

**Marilyn Myers**, *IRCSET Postdoctoral Fellowship, 12/2007 - 11/2009*,  
Current position: Tenure-track assistant professor, Calvin College, Michigan, USA.

Internal Committees **Andrew Fuller**,  
Internal Examiner of UCD Doctoral Defense, 6/2025.

**Ruhah Kabulantok**,  
Chair of UCD Research Studies Panel, 2/2024.

**Rodrigo Coronado**,  
Chair of UCD Doctoral Defense, 1/2023.

**Andrew Mullins**,  
Chair of UCD Research Studies Panel, 1/2023.

**Erman Isik**,  
Member of UCD STA Panel, 5/2021.

**Firtina Kucuk**,  
Member of UCD Research Studies Panel, 12/2019.

**Giuseppe Cotardo**,  
Member of UCD Doctoral Studies Panel, 10/2019.

**Emrah Sercan Yilmaz**,  
Internal Examiner of UCD Doctoral Defense, 7/2018.

**Daniela Müller**,  
Head of UCD Doctoral Studies Panel, 7/2015.

**Stiofain Fordham**,  
Member of UCD Doctoral Studies Panel, 6/2015.

**Richard Ellard**,  
Head of UCD Doctoral Studies Panel, 9/2013.

**Anthony Brown**,  
Head of UCD Doctoral Defense, 12/2011.

**Richard Moloney**,  
Internal Examiner of UCD Doctoral Defense, 5/2011.

**Caitriona Kellehan**,  
Member of UCD Master's Defense, 9/2010.

**Vijay Singh**,  
Member of UCD Master's Defense, 1/2010.

**Tao Liquin,**  
Internal Examiner of UCD Doctoral Defense, 5/2009.

**Ursula Finnegan,**  
Member of UCD Master's Defense, 8/2007.

External  
Committees **Shivansh Pandey,**  
External Examiner of NISER, Bhubaneswar Doctoral Defense, 4/2024.

**Nankun Hong,**  
External Examiner of NTU Singapore Doctoral Defense, 10/2019.

**Sudhir Pujahari,**  
External Examiner of IISER Pune Doctoral Defense, 8/2016.

**Abhash Jha,**  
External Examiner of NISER, Bhubaneswar Doctoral Defense, 8/2016.

**Jehanne Dousse,**  
External Examiner of Paris 7 (LIAFA) Doctoral Defense, 9/2015.

**Renrong Mao,**  
External Examiner of NTU Singapore Doctoral Defense, 10/2013.

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## Teaching

9/2005 - **UCD:** 26 courses including 4 graduate courses and courses with large enrollments  
SCI 10010 (Principles of Scientific Enquiry)  
MST 10020 (Calculus II)  
MST 10030 (Linear Algebra I)  
MST 10040 (Combinatorics and Number Theory)  
Math 10040 (Numbers and Functions)  
Math 10070 (Calculus), 400 students  
Math 10110 (Math for Business II)  
MST 20010 (Algebraic Structures)  
MST 20040 (Analysis)  
Math 20310 (Groups, Rings and Fields)  
Math 20320 (Quantitative Methods in Business)  
Math 2105 (Number Theory and Group Theory)  
Math 20070 (Optimization in Finance)  
MST 30010 (Algebra and Applications)  
Math 30010 (Field Theory)  
MST 30020 (History of Mathematics)  
Math 30030 (Advanced Linear Algebra)  
MST 30040 (Differential Equations)  
Math 30070 (Vector Calculus via Differential Forms)  
Math 30130 (Number Theory)  
Math 40090 (Algebraic Number Theory)  
Math 40240 (Combinatorics)  
Math 40280 (Algebra for Graduates)  
Math 40450 (Undergraduate Research Project)  
Math 40600 ( $q$ -series and applications)  
Math 40800 (Representation Theory of Finite Groups)

- 1/2004 - 6/2004 **Queen's University**: 2 courses with large enrollments  
 Math 111 (Linear Algebra)  
 Math 121 (Calculus), 300 students
- 9/2001 - 6/2003 **McMaster University**: 6 courses including 3 graduate courses  
 Math 1B3/1H3 (Linear Algebra)  
 Stat 1L3 (Probability and Linear Algebra)  
 Math 3EE3 (Ring Theory, Field Theory)  
 Math 4E3/701 (Group Theory, Field Theory, Galois Theory)  
 Math 799 (Reading Course in Algebraic Number Theory)  
 Math 799 (Reading Course in Analytic Number Theory)
- 9/1996 - 5/2001 **LSU**: 13 courses with full lecturer responsibilities  
 Math 0092 (Intermediate Algebra)  
 Math 1021 (College Algebra)  
 Math 1022 (Trigonometry)  
 Math 1029 (Contemporary Mathematics)  
 Math 1550 (Calculus I)

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## Service

**Member** of the AMS, CMS, EMS and IMS.

3/2014 - **Reviewer** for NSA Mathematical Sciences Grant Program, Book proposals (CRC Press, Cambridge University Press), Austrian Science Fund (FWF), The Royal Society.

1/2002 - **Written** over 200 letters of recommendation for students and colleagues.

3/2002 - **Referee** for 64 journals:

Acta Arithmetica

Acta Mathematica Scientia

Advances in Applied Mathematics

Advances in Difference Equations

Advances in Mathematics

AMS Contemporary Mathematics Series

Annales des Sciences Mathématiques du Québec

Annali della Scuola Normale Superiore di Pisa

Annali dell'Università di Ferrara

Annals of Combinatorics

Arabian Journal of Mathematics

Archiv der Mathematik

Boletim da Sociedade Paranaense de Matemática

Bulletin of the Brazilian Mathematical Society, New Series

Bulletin of the Iranian Mathematical Society

Bulletin of the Korean Mathematical Society

Bulletin of the London Mathematical Society

Colloquium Mathematicum

Combinatorica

Communications in Number Theory and Physics

Compositio Mathematica  
Comptes Rendus de l'Académie des Sciences: Mathématique  
Contemporary Mathematics  
Discrete Mathematics  
Electronic Journal of Combinatorics  
European Journal of Combinatorics  
Finite Fields and their Applications  
Functiones et Approximatio, Commentarii Mathematici  
Forum Mathematicum  
Integers  
Integral Transforms and Special Functions  
International Journal of Mathematics and Mathematical Sciences  
International Journal of Number Theory  
Journal of Algebra and its Applications  
Journal of Combinatorial Theory, Series A  
Journal of Combinatorics and Number Theory  
Journal of Integer Sequences  
Journal of the London Mathematical Society  
Journal of Mathematical Analysis and Applications  
Journal of Number Theory  
Journal of Symbolic Computation  
Journal of Topology & Analysis  
Kyungpook Mathematical Journal  
La Matematica  
LMS Journal of Computation and Mathematics  
Mathematica Slovaca  
Mathematische Nachrichten  
Monatshefte für Mathematik  
Pacific Journal of Mathematics  
Proceedings of the American Mathematical Society  
Proceedings of the Edinburgh Mathematical Society  
Proceedings of the Royal Society of Edinburgh: Section A Mathematics  
Publicationes Mathematicae Debrecen  
Quarterly Journal of Mathematics  
Ramanujan Journal  
Research in Number Theory  
Research in the Mathematical Sciences  
Results in Mathematics  
Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas  
Rocky Mountain Journal of Mathematics  
Seminaire Lotharingien de Combinatoire  
SIGMA (Symmetry, Integrability and Geometry: Methods and Applications)  
Taiwanese Journal of Mathematics



- Transactions of the American Mathematical Society
- 4/2003 - **Reviewer** for Mathematical Reviews (18 reviews).
- 8/2006 - **Liaison** with UCD Librarian Josh Clark in acquiring over 230 books in Number theory, algebraic geometry and algebraic  $K$ -theory.
- 11/2008 - **Member** of the Science Ambassador Programme, Discover Science and Engineering Programme, Ireland.
- 9/2015 - 1/2019 **Coordinator** of International Student Relations for UCD School of Mathematics and Statistics.
- 7/2013 - 8/2014 **Member** of Engineering Program Board.
- 10/2012 - 7/2013 **Head** of Public Relations committee for UCD School of Mathematical Sciences.
- 3/2013 **Member** of UCD Seed Funding Committee.
- 1/2008 - 1/2012 **Coordinator** of Exams for UCD School of Mathematical Sciences: consists of ensuring that all end of semester exams are both fair and submitted in a timely manner to the exams office and meeting with the extern.
- 1/2006 - 12/2009 **Coordinator** of Junior Year Abroad for UCD School of Mathematical Sciences.
- 10/2000 **David Oxley Memorial Graduate Student Teaching Award**, LSU, awarded annually to a senior graduate student to recognize excellence in teaching.
- 10/1999 **Certificate of Teaching Excellence**, LSU.
- 4/1999 **Certificate of Teaching Excellence**, LSU.

## Outreach

- 1/2017 - **Coordinator** of Summer Undergraduate Research Projects Programme for UCD School of Mathematics and Statistics.
- 8/2019 **Speaker** at McMaster Summer Undergraduate Research Program  
"Ramanujan, partitions and knots"
- 4/2017 **Speaker** at UCD Mathematical Society  
"From  $q$ -series to knots"
- 2/2017 **Speaker** at UCD Math Sparks program  
"Symmetry and a nixer"
- 3/2016 **Speaker** at UCD Math Sparks program  
"Groups and counting"
- 2/2016 **Speaker** at UCD Mathematical Society  
"On irrational numbers"
- 12/2015 **Speaker** at UCD School of Mathematics and Statistics one-day workshop  
" $q$ -series, modularity and knots"
- 12/2014 **Speaker** at LMS Prospects in Mathematics, Mathematical Institute, Oxford  
"Rogers-Ramanujan identities, knots and UCD"
- 7/2013 **Speaker** at UCD Summer School for High School Students  
"(Very) recent developments in number theory"
- 1/2013 **Speaker** at UCD Mathematical Society  
"The ABC conjecture"
- 11/2012 **Speaker** at Career afternoon, St. Joseph's College, Summerhill, Athlone

- “Mathematical Sciences at UCD”
- 11/2011 **Speaker** at UCD School of Mathematical Sciences Open Evening  
“Research in mathematics at UCD”
- 10/2011 **Speaker** at Public Lecture during Maths Week at UCD  
“Ramanujan: his life, the last letter and beyond”
- 5/2011 **Speaker** at the UCD/TCD Mathematics Summer School  
“Topics in number theory”
- 4/2011 **Speaker** at UCD Undergraduate Ambassadors Scheme Outreach Afternoon  
“Paul Erdős”
- 6/2010 **Speaker** at the UCD/TCD Mathematics Summer School  
“Number theory”
- 4/2009 **Speaker** at UCD Mathematical Society  
“Erdős’ 105 problem”