

# Ken Duffy

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## Curriculum Vitae

### Research Interests

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Fields: Applied Mathematics & Statistics.

Applications: Biology - DNA Forensics, Immunology, Hematopoiesis & Cancer;

Engineering - Performance Evaluation, Network Algorithms, Inference & Security.

### Employment

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- 2017– present Director, Hamilton Institute, National University of Ireland Maynooth.  
2015 – 2016 Sabbatical, Massachusetts Institute of Technology.  
2014 – 2015, Acting Director, Hamilton Institute, NUI Maynooth.  
2013 – present Professor, Hamilton Institute, NUI Maynooth.  
2012 – 2013 Senior Lecturer, Hamilton Institute, NUI Maynooth.  
2007 – 2012 Lecturer, Hamilton Institute, NUI Maynooth.  
2005 – 2007 Senior Research Fellow, Hamilton Institute, NUI Maynooth.  
2001 – 2004 Research Fellow, CNRI, Dublin Institute of Technology (DIT).  
2000 – 2001 Research Scientist, Corvil Ltd. (startup from EU research grant).

### Education

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- 1996 – 2000 Ph.D. Probability Theory, University of Dublin, Trinity College (TCD).  
Title: “Logarithmic asymptotics in queueing theory and risk theory”.  
Advisor: Prof. John T. Lewis (dec.), Dublin Institute for Advanced Studies (DIAS).  
1992 – 1996 B.A. (Mod.) Mathematical Science (1<sup>st</sup> class), University of Dublin, Trinity College.

### Journal Papers (\* student co-author)

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57. S. Feizi, M. Médard, G. Quon, M. Kellis & K. R. Duffy.  
Network infusion to infer information sources in networks.  
*IEEE Transactions on Network Science and Engineering*, to appear.
56. O. Akinduro, T. S. Weber, H. Ang, M. L. R. Haltalli (\*), N. Ruvio, D. Duarte (\*), N. M. Rashidi, E. D. Hawkins, K. R. Duffy & C. Lo-Celso.  
Proliferation dynamics of acute myeloid leukaemia and haematopoietic progenitors competing for bone marrow space.  
*Nature Communications*, 9, 519, 2018.
55. D. Duarte (\*), E. D. Hawkins, O. Akinduro, H. Ang, K. De Filippo, I. Y. Kong, M. L. R. Haltalli (\*), N. Ruivo, L. Straszowski, S. J. Vervoort, C. McLean, T. S. Weber, R. Khorshed, C. Pirillo, A. Wei, S. K. Ramasamy, A. P. Kusumbe, K. R. Duffy, R. H. Adams, L. E. Purton, L. M. Carlin & C. Lo Celso.  
Inhibition of endosteal vascular niche remodeling rescues hematopoietic stem cell loss in AML.  
*Cell Stem Cell*, 22 (1), 64–77, 2018.
54. L. E. Alfonse (\*), A. D. Garrett (\*), D. S. Lun, K. R. Duffy & C. M. Grgicak.  
A large-scale dataset of single and mixed-source short tandem repeat profiles to inform human identification strategies: PROVEDIt.  
*Forensic Science International: Genetics*, 32, 62–70, 2018.
53. K. C. Peters (\*), H. Swaminathan, K. R. Duffy, D. S. Lun, J. Sheehan (\*) & C. M. Grgicak.  
Production of high-fidelity electropherograms results in improved and consistent DNA interpretation: standardizing the forensic validation process.  
*Forensic Science International: Genetics*, 31, 160–170, 2017.

52. Y. Cui, M. Médard, E. Yeh, D. Leith, F. Lai (\*) & K. R. Duffy.  
A linear network code construction for general integer connections based on the constraint satisfaction problem.  
*IEEE/ACM Transactions on Networking*, 25(6), 3441–3454, 2017.
51. S. Feizi (\*), A. Makhdoumi (\*), K. R. Duffy, M. Kellis & M. Médard.  
Network maximal correlation.  
*IEEE Transactions on Network Science and Engineering*, 4(4), 229-247, 2107.
50. F. P. Calmon (\*), A. Makhdoumi (\*), M. Médard, M. Varia, M. M. Christiansen (\*) & K. R. Duffy.  
Principal inertia components and applications.  
*IEEE Transactions on Information Theory*, 63(8), 5011-5038, 2017.
49. K. R. Duffy, N. Gurram (\*), K. Peters (\*), G. Wellner & C. Grgicak.  
Exploring forensic STR signal in the single- and multi-copy number regimes: deductions from an *in silico* model of the forensic DNA laboratory process.  
*Electrophoresis*, 38(6), 855–868, 2017.
48. J. M. Marchingo (\*), G. Prevedello (\*), A. Kan, S. Heinzel, P. D. Hodgkin (†) & K. R. Duffy (†).  
T cell stimuli independently sum to regulate an inherited clonal division fate.  
*Nature Communications*, 7, 13540, 12pp, 2016.
47. L. Perié & K. R. Duffy.  
Re-tracing the *in vivo* hematopoietic tree using single cell methods.  
*FEBS Letters*, 590 (22), 4068–4083, 2016.
46. T. S. Weber, M. Dukes, S. Glaser, S. H. Naik & K. R. Duffy.  
Site-specific recombinatorics: *in situ* cellular barcoding with the Cre Lox system.  
*BMC Systems Biology*, 10:42, 13pp, 2016.
45. T. S. Weber, L. Perié & K. R. Duffy.  
Inferring average generation via division-linked labeling.  
*Journal of Mathematical Biology*, 73, 2, 491–523, 2016.
44. L. Perié, K. R. Duffy, L. Kok, R. J. de Boer & T. N. Schumacher.  
The branching point in erythro-myeloid differentiation.  
*Cell*, 163, 7, 1655–1662, 2015.
43. M. M. Christiansen (\*), K. R. Duffy, F. du Pin Calmon (\*) & M. Médard.  
Multi-user guesswork and brute force security.  
*IEEE Transactions on Information Theory*, 61, 12, 6876–6886, 2015.
42. U. Mönich, K. R. Duffy, M. Médard, V. Cadambe, L. E. Alfonse (\*) & C. Grgicak.  
Probabilistic characterisation of baseline noise in STR profiles.  
*Forensic Science International: Genetics*, 19, 107–122, 2015.
41. J. M. Marchingo (\*), A. Kan, R. M. Sutherland, K. R. Duffy, C. J. Wellard, G. T. Belz, S. J. Turner, A. M. Lew, M. R. Dowling, S. Heinzel & P. D. Hodgkin.  
Antigen affinity, costimulation and cytokine inputs sum linearly to amplify T cell expansion.  
*Science*, 346:6213, 1123–1127, 2014.
40. L. Perié, P. D. Hodgkin, S. H. Naik, T. N. Schumacher, R. J. de Boer & K. R. Duffy.  
Determining lineage pathways from cellular barcoding experiments.  
*Cell Reports*, 6:4, 617–624, 2014.
39. K. R. Duffy & S. P. Meyn.  
Large deviation asymptotics for busy periods.  
*Stochastic Systems*, 4:1, 300-319, 2014.
38. K. R. Duffy, C. Bordenave & D. J. Leith.  
Decentralised constraint satisfaction.  
*IEEE/ACM Transactions on Networking*, 21:4, 1298–1308, 2013.
37. M. M. Christiansen (\*) & K. R. Duffy.  
Guesswork, large deviations and Shannon entropy.  
*IEEE Transactions on Information Theory* 58:2, 796–802, 2013.

36. K. D. Huang (\*), K. R. Duffy & D. Malone.  
H-RCA: 802.11 Collision-aware Rate Control.  
*IEEE/ACM Transactions on Networking* 21:4, 1021–1034, 2013.
35. M. Fang (\*), D. Malone, K. R. Duffy & D. J. Leith.  
Decentralised learning MACs for collision-free access in WLANs.  
*Wireless Networks* 19:1, 83–98, 2013.
34. K. R. Duffy & P. D. Hodgkin.  
Intracellular competition for fates in the immune system.  
*Trends in Cell Biology* 22:9, 457–464, 2012.  
Selected as the journal's **cover article**.
33. K. R. Duffy, C. J. Wellard, J. F. Markham, J. H. S. Zhou (\*), R. Holmberg, E. D. Hawkins, J. Hasbold, M. R. Dowling & P. D. Hodgkin.  
Activation-induced B cell fates are selected by intracellular stochastic competition.  
*Science* 335:6066, 338–341, 2012.
32. K. R. Duffy & G. L. Torrisi.  
Sample path large deviations of Poisson shot noise with heavy tail semi-exponential distributions.  
*Journal of Applied Probability* 48:3, 688–698, 2011.
31. K. D. Huang (\*), D. Malone & K. R. Duffy.  
The 802.11g 6 Mb/s rate is less robust than 11 Mb/s.  
*IEEE Transactions on Wireless Communications* 10:4, 1015–1020, 2011.
30. K. R. Duffy & S. P. Meyn.  
Estimating Loynes' exponent.  
*Queueing Systems: Theory and Applications* 68:3–4, 285–293, 2011.
29. K. R. Duffy, C. Macci & G. L. Torrisi.  
Sample path large deviations for order statistics.  
*Journal of Applied Probability* 48:1, 238–257, 2011.
28. K. R. Duffy, C. Macci & G. L. Torrisi.  
On the large deviations of a class of modulated additive processes.  
*ESAIM: Probability & Statistics* 2011:15, 83–109, 2011.
27. K. R. Duffy & S. P. Meyn.  
Most likely paths to error when estimating the mean of a reflected random walk.  
*Performance Evaluation* 67:12, 1290–1303, 2010.
26. K. D. Huang (\*), K. R. Duffy & D. Malone.  
On the validity of IEEE 802.11 MAC modeling hypotheses.  
*IEEE/ACM Transactions on Networking* 18:6, 1935–1948, 2010.
25. K. R. Duffy.  
Mean field Markov models of wireless local area networks.  
*Markov Processes and Related Fields* 16:2, 295–328, 2010.
24. J. F. Markham, C. J. Wellard, E. D. Hawkins, K. R. Duffy & P. D. Hodgkin.  
A minimum of two distinct heritable factors are required to explain correlation structures in proliferating lymphocytes.  
*Journal of the Royal Society Interface* 7:48, 1049–1059, 2010.
23. D. J. Leith, V. G. Subramanian & K. R. Duffy.  
Log-convexity of rate region in 802.11e WLANs.  
*IEEE Communications Letters* 14:1, 57–59, 2010.
22. V. G. Subramanian, K. R. Duffy & D. J. Leith.  
Existence and uniqueness of fair rate allocations in lossy wireless networks.  
*IEEE Transactions on Wireless Communications* 8:7, 3401–3406, 2009.
21. K. D. Huang (\*) & K. R. Duffy.  
On a buffering hypothesis in 802.11 analytic models.  
*IEEE Communications Letters* 13:5, 312–314, 2009.

20. K. R. Duffy & V. G. Subramanian.  
On the impact of correlation between collaterally consanguineous cells on lymphocyte population dynamics.  
*Journal of Mathematical Biology* 59:2, 255–285, 2009.
19. K. R. Duffy, N. O’Connell & A. Sapozhnikov.  
Complexity analysis of a decentralised graph colouring algorithm.  
*Information Processing Letters* 107:2, 60–63, 2008.
18. K. R. Duffy & A. Sapozhnikov.  
The large deviation principle for the on/off Weibull sojourn process.  
*Journal of Applied Probability* 45:1, 107–117, 2008.
17. K. R. Duffy & D. Malone.  
Logarithmic asymptotics for a single server processing distinguishable sources.  
*Mathematical Methods of Operations Research* 56:3, 509–537, 2008.
16. V. G. Subramanian, K. R. Duffy, M. L. Turner & P. D. Hodgkin.  
Determining the expected variability of immune responses using the Cyton Model.  
*Journal of Mathematical Biology* 56:6, 861–892, 2008.
15. K. Duffy & A. Ganesh.  
Modeling the impact of buffering on 802.11.  
*IEEE Communications Letters* 11:2, 219–221, 2007.
14. K. Duffy, O. Lobunets & Y. Suhov.  
Loss aversion, large deviation preferences, and optimal portfolio weights for some classes of return processes.  
*Physica A* 378:2, 408–422, 2007.
13. D. Malone, K. Duffy & C. King.  
Some remarks on LD plots for heavy tailed traffic.  
*ACM SIGCOMM Computer Communications Review* 37:1, 41–42, 2007.
12. K. Duffy, C. King & D. Malone.  
Ambiguities in estimates of critical exponents for long-range dependent processes.  
*Physica A* 337:1, 43–52, 2007.
11. K. Duffy, E. Pechersky, Y. Suhov & N. Vvedenskaya.  
Using estimated entropy in a queueing system with dynamic routing.  
*Markov Process and Related Fields* 13:1–2, 57–84, 2007.
10. D. Malone, K. Duffy & D. J. Leith.  
Modeling the 802.11 Distributed Coordination Function in non-saturated heterogeneous conditions.  
*IEEE/ACM Transactions on Networking* 15:1, 159–172, 2007.
9. K. Duffy, D. J. Leith, T. Li (\*) & D. Malone.  
Modeling 802.11 mesh networks.  
*IEEE Communications Letters* 10:8 635–637, 2006.
8. K. Duffy & A. P. Metcalfe (\*).  
How to estimate the rate function of a cumulative process.  
*Journal of Applied Probability* 41:4, 1044–1052, 2005.
7. K. Duffy, D. Malone & D. J. Leith.  
Modeling the 802.11 Distributed Coordination Function in non-saturated conditions.  
*IEEE Communications Letters* 9:8, 715–717, 2005.
6. K. Duffy & A. P. Metcalfe (\*).  
The large deviations of estimating rate-functions.  
*Journal of Applied Probability* 42:1, 267–274, 2005.
5. K. Duffy & M. Rodgers-Lee (\*).  
Some useful functions for functional large deviations.  
*Stochastics and Stochastics Reports* 76:3, 267–279, 2004.
4. K. Duffy & W. G. Sullivan.  
Logarithmic asymptotics for unserved messages at a FIFO.  
*Markov Processes and Related Fields* 10:1, 175–189, 2004.

3. K. Duffy & W. M. B. Dukes.  
On Knuth's generalization of Banach's matchbox problem.  
*Mathematical Proceedings of the Royal Irish Academy* 104A:1, 107–118, 2004.
2. K. Duffy, J. T. Lewis & W. G. Sullivan.  
Logarithmic asymptotics for the supremum of a stochastic process.  
*Annals of Applied Probability* 13:2, 430–445, 2003.
1. L. Györfi, A. Rácz, K. Duffy, J. T. Lewis & F. Toomey.  
Distribution-free confidence intervals for measurement of effective bandwidth.  
*Journal of Applied Probability* 37:1, 224–235, 2000.

## Refereed Conference Papers

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- C17. A. Rezaee (\*), A. Beirami, M. Médard & K. R. Duffy.  
Guesswork subject to a total entropy budget.  
*Proceedings of the 55th Allerton Conference, 2017.*
- C16. Y. Cui, D. Pandya (\*), M. Médard, E. Yeh, D. Leith & K. Duffy.  
A linear network code construction for general integer connections based on the constraint satisfaction problem.  
*Proceedings of IEEE Globecom, 2015.*
- C15. A. Beirami, R. Calderbank, M. Christiansen (\*), K. Duffy, A. Makhdoumi (\*) & M. Médard.  
A geometric perspective on guesswork.  
*Proceedings of the 53rd Allerton Conference, 2015.*
- C14. A. Beirami, R. Calderbank, K. Duffy & M. Médard.  
Computational security subject to source constraints, guesswork and inscrutability.  
*Proceedings of IEEE ISIT, 2015.*
- C13. Y. Cui, M. Médard, E. Yeh, D. Leith & K. Duffy.  
Optimization-based linear Network Coding for general connections of continuous flows.  
*Proceedings of IEEE ICC, 2015.*  
Winner of a **best paper** award.
- C12. U. J. Mönich, C. Grgicak, V. Cadambe, J. Y. Wu (\*), G. Wellner (\*), K. Duffy & M. Médard.  
A signal model for forensic DNA mixtures.  
*Proceedings of the Asilomar Conference on Signals, Systems & Computers, 2014.*
- C11. M. M. Christiansen (\*), K. R. Duffy, F. du Pin Calmon (\*) & M. Médard.  
Guessing a password over a wireless channel (on the effect of noise non-uniformity).  
*Proceedings of the Asilomar Conference on Signals, Systems & Computers, 2013.*
- C10. F. du Pin Calmon (\*), M. Varia, M. Médard, M. M. Christiansen (\*), K. R. Duffy & S. Tessaro.  
Bounds on inference.  
*Proceedings of the 51st Allerton Conference, 2013.*
- C9. M. M. Christiansen (\*), K. R. Duffy, F. du Pin Calmon (\*) & M. Médard.  
Brute force searching, the typical set and guesswork.  
*Proceedings of ISIT, 2013.*
- C8. F. du Pin Calmon (\*), M. Médard, L. Zegler, J. Barros, M. M. Christiansen (\*) & K. R. Duffy.  
Lists that are smaller than their parts: A coding approach to tunable secrecy.  
*Proceedings of the 50th Allerton Conference, 2012.*
- C7. G. Bianchi, K. R. Duffy, D. J. Leith & V. Shneer.  
Modeling conservative updates in multi-hash approximate count sketches.  
*Proceedings of ITC 24, 2012.*
- C6. K. D. Huang (\*), K. R. Duffy, D. Malone & D. J. Leith.  
Investigating the validity of IEEE 802.11 MAC modeling hypotheses.  
*Proceedings of IEEE PIMRC 2008.*
- C5. K. Duffy, D. J. Leith, T. Li (\*) & D. Malone.  
Improving fairness in multi-hop mesh networks using 802.11e.  
*Proceedings of RAWNET 2006.*

- C4. P. Clifford, K. Duffy, J. Foy, D. J. Leith & D. Malone.  
Modeling 802.11e for data traffic parameter design.  
*Proceedings of IEEE WiOPT 2006.*
- C3. K. Duffy, D. Malone & D. J. Leith.  
Modeling 802.11 wireless links.  
*Proceedings of the 44<sup>th</sup> IEEE CDC*, 2005, 6952–6957.
- C2. P. Clifford, K. Duffy, D. J. Leith & D. Malone.  
On improving voice capacity in 802.11 infrastructure networks.  
*Proceedings of IEEE WirelessCom 2005*, 214–219.
- C1. D. Malone, K. Duffy & D. J. Leith.  
Modeling the 802.11 distributed coordination function with heterogeneous finite load.  
*Proceedings of RAWNET 2005.*

## Patents

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- P1. F. du Pin Calmon, M. Médard, L. Zegler, M. M. Christiansen & K. R. Duffy.  
Method and apparatus for secure communication.  
PCT/US2014/026015. Status: Application/Licensed, 2014.

## Miscellaneous (Book Chapters and Correspondence)

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- M2. P. D. Hodgkin, M. R. Dowling & K. R. Duffy.  
Why the immune system takes its chances with randomness.  
*Nature Reviews Immunology*, 14:10, 711, 2014.
- M1. Q. Ni, D. Malone, P. Clifford, K. Duffy, D. Leith & T. Li (\*).  
Modelling and simulation analysis of the 802.11/802.11e MAC layers.  
*Advances in Wireless Networks: Performance Modelling, Analysis and Enhancement*,

## Research Funding

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- 10. 2018–2022, co-PI, European Union H2020-MSCA-ITN-2017, *Quantitative T cell immunology and immunotherapy*. Co-PIs: C. Molina-Paris (U. Leeds); B. Asquith (Imperial College London, ICL); P. Vicini (Medimmune); R. de Boer (Utrecht U.); J. Borghans (Utrecht U.); T. Höfer (U. Heidelberg); M. Lohning (Charité, Berlin); A. Freitas (Institut Pasteur); C. Seoighe (National University of Ireland Galway, NUIG); C. Niederalt (Bayer AG); T. Mora (CNRS).
- 9. 2015–2017, sub-contractor, National Institute of Justice (USA), *Establishing exclusion criteria and the significance of inclusion: developing tools for the interpretation of complex DNA mixtures*. PIs: C. Grgicak (Boston U.); D. Lun (Rutgers U.).
- 8. 2013–2017, PI, Science Foundation Ireland Investigator Grant, *Quantitative analysis of immune cell fate: stochastic competition and censorship*.
- 7. 2013–2017, co-PI, European Union FP7-PEOPLE-2012-ITN, *Quantitative T cell immunology*. Co-PIs: G. Lythe (U. Leeds); B. Asquith (Imperial College London, ICL); R. de Boer (Utrecht U.); J. Borghans (Utrecht U.); T. Schumacher (National Cancer Institute, NKI); T. Höfer (U. Heidelberg); M. Lohning (Charité, Berlin); A. Freitas (Institut Pasteur); B. Rocha (Institut Necker Enfants); C. Seoighe (National University of Ireland Galway, NUIG); J. Lippert (Bayer Healthcare Pharma).
- 6. 2013–2017, co-PI, European Union FP7-PEOPLE-2012-IRSES, *Indo-European research network in mathematics for health & disease*. Co-PIs: C. Molina-Paris (U. Leeds); R. Callard (UCL); R. de Boer (Utrecht U.); E. Delgado-Eckert (U. Basel); J. Faro (U. Vigo); M. Castro (U. Comillas).
- 5. 2012–2016, co-PI, Human Frontiers Science Programme, *Single cell lineage tracing to understand hematopoietic development & differentiation*. Co-PIs: T. Schumacher (NKI); P. Hodgkin (Walter & Elisa Hall Institute of Medical Research, WEHI); A. Cohen (Drexel U.).
- 4. 2010–2013, collaborator, European Union FP7-ICT-2009-05, *FLAVIA: FLEXible Architecture for Virtualizable future wireless Internet Access*.

3. 2008, PI, Science Foundation Ireland Travel Fellowship RFP-ENEF530-STTF08, *Mathematical modelling of lymphocyte proliferation & differentiation during an adaptive immune response.*
2. 2007–2010, PI, Science Foundation Ireland Research Frontiers Programme 07-RFP-ENEF530, *Using 802.11 medium access control layer measurements to understand & improve network performance.*
1. 2004–2008, collaborator, Science Foundation Ireland Investigator Award 03-IN3-1396, *Resource allocation in WLANs.*

### **Selected Invited Talks (since 2008)**

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Quantitative Analysis of Clonality in Hematopoiesis, Cambridge, UK, 12–14<sup>th</sup> Sept. 2018.  
 Stochastic Networks, 25–28<sup>th</sup> June, 2018.  
 Mathematical Modelling of Infection, Inflammation and Immunity, IISc Bangalore, 5–7<sup>th</sup> April, 2017.  
 U. Florida, 5<sup>th</sup> Workshop on Cognition and Control, 13–14<sup>th</sup> Jan. 2017.  
 BioQuant Seminar, University of Heidelberg, 6<sup>th</sup> December 2016.  
 British Society of Immunology Seminar, Cardiff University, 2<sup>nd</sup> November 2016.  
 Biophysics Seminar, Institut Curie, 28<sup>th</sup> September 2016.  
 Medimmune Workshop, Aztrazeneca, Cambridge, 21–22<sup>nd</sup> September 2016.  
 Coordinated Science Lab., University of Illinois Urbana-Champaign, 20<sup>th</sup> April 2016.  
 Communications and Signal Processing Seminar, University of Michigan, 7<sup>th</sup> April 2016.  
 Computer Engineering and Systems Group Seminar, Texas A & M, 11<sup>th</sup> March 2016.  
 Kavli Institute, U. California Santa Barbara, 12<sup>th</sup> February 2016.  
 U. Florida, 4<sup>th</sup> Workshop on Cognition and Control, 15–16<sup>th</sup> Jan. 2016.  
 Northeastern University, Applied and Interdisciplinary Mathematics Seminar, 30<sup>th</sup> October, 2015.  
 15th Human Frontiers Science Programme Awardees Meeting, 12–15<sup>th</sup> July, 2015.  
 Royal Netherlands Academy, Stochastic Single-Cell Dynamics in Immunology, 17–19<sup>th</sup> June, 2015.  
 U. Florida, 3<sup>rd</sup> Workshop on Cognition and Control, 16–17<sup>th</sup> Jan. 2015.  
 Northeastern University, Applied and Interdisciplinary Mathematics Seminar, 28<sup>th</sup> October, 2014.  
 Imperial College London, Biology Seminar, 10<sup>th</sup> July, 2014.  
 Control and Performance of Large Scale Networks, Eurandom, 30<sup>th</sup> June – 2<sup>nd</sup> July, 2014.  
 NUIG, QuanTI Course, 24<sup>th</sup> June, 2014.  
 ICL, Biomaths Seminar, 13<sup>th</sup> May, 2014.  
 MIT, Research Laboratory of Electronics, 23<sup>rd</sup> January, 2014.  
 U. Florida, 2<sup>nd</sup> Workshop on Cognition and Control, 15<sup>th</sup> –16<sup>th</sup> Jan. 2014.  
 ESF-EMBO B Cells from bedside to bench and back again, 2–7<sup>th</sup> September 2013.  
 Stochastic, statistical and computational approaches to Immunology, ICMS Edinburgh, 22–26<sup>th</sup> July, 2013.  
 EPF Lausanne, Summer Research Institute, School of Computer & Communication Sciences, 20–21<sup>st</sup> June, 2013.  
 Microsoft Research Cambridge, Mathematical Modelling in Immunology, 8–9<sup>th</sup> May, 2013.  
 MIT, Research Laboratory of Electronics, 4<sup>th</sup> May, 2013.  
 British Applied Mathematics Colloquium, Leeds, 9–12<sup>th</sup> Apr. 2013.  
 U. Florida, 1<sup>st</sup> Workshop on Cognition and Control, 21–23<sup>rd</sup> Feb. 2013.  
 Utrecht U., Biology Dept. Seminar, 6<sup>th</sup> Feb. 2013.  
 Dublin City University (DCU), Mathematics Seminar, 15<sup>th</sup> Nov., 2012.  
 MIT, Network Coding and Reliable Communications Group Seminar, 30<sup>th</sup> Oct., 2012.  
 Max-Planck-Institut Dresden, Multi-scale physics of lymphocyte development, 6–24<sup>th</sup> Aug., 2012.  
 Computational Immunology Conference, University of Melbourne, 11–13<sup>th</sup> Apr., 2012.  
 Institute of Molecular Immunology, St. James’s Hospital, Dublin, 26<sup>th</sup> March, 2012.  
 MIT, Network Coding and Reliable Communications Group Seminar, 9<sup>th</sup> March, 2012.  
 MIT, Laboratory for Information & Decision Systems Seminar, 7<sup>th</sup> March, 2012.  
 U. Florida, Cognition & Control in Complex Systems Seminar, 2<sup>nd</sup> March, 2012.  
 U. Florida, Biomedical Engineering Seminar, 27<sup>th</sup> February, 2012.  
 U. Limerick, Mathematics Seminar, 7<sup>th</sup> October, 2011.  
 INFORMS Applied Probability Society Conference, Stockholm, 6–8<sup>th</sup> July, 2011.  
 Max-Planck-Institut Dresden, Physics of Immunity Workshop, 4–8<sup>th</sup> April, 2011.  
 Royal Statistical Society Conference, 14<sup>th</sup> September, 2010.  
 NUIG, Mathematics Seminar, 6<sup>th</sup> May, 2010.

Eurandom Seminar, Technical U. Eindhoven (TUE), 16<sup>th</sup> Feb, 2010.  
U. California San Diego, 5th Information Theory and Applications Workshop, 31<sup>st</sup> Jan. – 5<sup>th</sup> Feb, 2010.  
U. of Leeds, I2M Summer School, 31<sup>st</sup> Aug.–4<sup>th</sup> Sept. 2009.  
WEHI, B-cell programme Seminar, Melbourne, 26<sup>th</sup> May 2009.  
U. New South Wales, Complex Systems in Biology Seminar, Sydney, 19<sup>th</sup> May 2009.  
CSIRO, NetCLab Seminar, Sydney, 18<sup>th</sup> May 2009.  
Swinburne U. of Technology, CAIA seminar, Melbourne, 14<sup>th</sup> May 2009.  
Eurandom, Stochastic Analysis of Modern Communication Networks, 1–3<sup>rd</sup> Dec. 2008.  
19th IEEE PIMRC, Cannes, France, 17<sup>th</sup> Sept. 2008.  
U. Bristol, Centre for Complexity Sciences Seminar, 19<sup>th</sup> Feb. 2008.  
U. of Rome II, Mathematics Seminar, 16<sup>th</sup> Jan. 2008.

### **Selected Research Visits (1 week+, since 2008)**

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Immunology Division, WEHI, February 2017.  
Kavli Institute, U. California Santa Barbara, February 2016.  
Research Laboratory of Electronics, MIT, June 2015.  
Immunology Division, WEHI, April 2015.  
Immunology Division, WEHI, December 2014.  
Research Laboratory of Electronics, MIT, January 2015.  
Immunology Division, WEHI, December 2014.  
Research Laboratory of Electronics, MIT, January 2014.  
Immunology Division, WEHI, March 2013.  
Dept. of ECE, U. Florida, February 2013.  
Biology Dept., Utrecht U., February 2013.  
Kavli Institute, U. California Santa Barbara, November & December 2012.  
Research Laboratory of Electronics, MIT, October 2012.  
Max-Planck-Institut for the Physics of Complex Systems, Dresden, August 2012.  
Research Laboratory of Electronics, MIT, March 2012.  
Dept. of ECE, U. of Florida, February 2012.  
Immunology Division, WEHI, April 2011.  
Max-Planck-Institut for the Physics of Complex Systems, Dresden, April 2011.  
Immunology Division, WEHI, December 2010 to February 2011.  
Immunology Division, WEHI, July 2010.  
Newton Institute for Mathematical Sciences, U. Cambridge, June 2010.  
Eurandom, TUE, February 2010.  
UC San Diego, January & February 2010.  
Immunology Division, WEHI, Melbourne, March – June 2009.  
Eurandom, TUE, December 2008.  
Mathematics Dept., U. Bristol, February 2008.  
Mathematics Dept., U. Rome II, January 2008.

### **University Service**

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2018            Rapporteur Academic Promotions Review.  
2017–           Academic Council Member (ex-officio).  
2015, 2017–   Academic Council Research Committee Member (ex-officio).  
2013 – 2015   Hamilton Institute Faculty Representative.  
2013           Member of Governing Authority (elected).  
2010 – 2013   Member of Academic Council (elected).  
2010 – 2012   Representative at Dublin Region Higher Education Alliance Graduate Education.  
2010           Chair of Hamilton Institute’s EU funding strategy panel.  
2008 – 2009   Chair of Hamilton Institute’s Quality Promotion review.  
2007 – 2010   Member of the executive board of the Hamilton Institute Network Maths Summer School.  
2006 – 2008   Member of the executive board of the Hamilton Grand Maths Challenge.

## Professional Associations

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- 2011 – Fellow of the Royal Statistical Society (RSS).  
2011 – 2015 Secretary RSS Applied Probability Section (APS).  
2011 Founding member of RSS APS.  
2006 – 2012 American Mathematical Society.  
2003 – 2011 Institute of Mathematical Statistics.

## Editorial Activities

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- 2011 – 2014 PLoS One, member of editorial board.  
2007 Markov Processes and Related Fields, guest editor with T. Dorlas (DIAS) and Y. Suhov (U. Cambridge).

## Conference Technical Programme Committees

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- 2016 28th International Teletraffic Congress, (ITC 28).  
2016 ACM SIGMETRICS / IFIP Performance.  
2015 GLOBECOM (Best Paper Selection Committee).  
2015 Int. Congress on Systems Immunology, Immunoinformatics & Immune-Computation, (ICSI<sup>3</sup>).  
2015 27th International Teletraffic Congress, (ITC 27).  
2013 25th International Teletraffic Congress, (ITC 25).  
2012 11th International Conference on Artificial Immune Systems, (ICARIS 2012).  
2012 ACM CoNext, 2012, (CoNext 2012).  
2012 24th International Teletraffic Congress, (ITC 24).  
2011 IEEE International Conference on Computer Communications and Networks, (ICCCN 2011).  
2011 23rd International Teletraffic Congress, (ITC 23).  
2010 22nd International Teletraffic Congress, (ITC 22).  
2008 3rd International Workshop on Performance Analysis and Enhancement of Wireless Networks, (PAEWN 08).  
2007 Valuetools workshop on interdisciplinary systems approach in performance evaluation and design of computer and communication systems, (Inter-Perf 2007).

## Workshop Organizing

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- Probability in Particle Filters (2014), Royal Statistical Society, London, 1 day, four international speakers, with D. Leslie (U. Lancaster).
- Stochastic, Statistical and Computational Approaches to Immunology (2013), ICMS, Edinburgh, 5 days, 15 international speakers, with A. Chakraborty (MIT), D. Coombs (U. British Columbia) and C. Molina-Paris (U. Leeds).
- Hamilton Institute Workshop on Network Science (2011), 2 days, 17 international speakers.
- 3rd Hamilton Institute Workshop on Systems Biology (2010), 3 days, 10 international speakers.
- 1st Hamilton Institute workshop on Applied Probability (2007), 2 days, 10 international speakers.
- J. T. Lewis Memorial Conference (2005), with T. Dorlas (DIAS) and B. Goldsmith (DIT), 4 days, 41 international speakers.

## Grant Reviewing

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- 2017, Horizon 2020, European Union (EU).  
2016, Horizon 2020, European Union (EU).  
2014, National Institutes of Health (US).

## Doctoral Examination

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- Ph.D., School of Biomedical Engineering, U. of New South Wales, supervisor Dr Robert Nordon, 2016.
- Ph.D., School of Electronic and Electrical Engineering, MIT, supervisor Prof. Muriel Médard, 2015.
- Ph.D., School of Electronic and Electrical Engineering, MIT, supervisor Prof. Muriel Médard, 2015.
- Ph.D., School of Electronic and Comms Engineering, DIT, supervisor Dr Mark Davis, 2014.

- Ph.D., School of Mathematical Sciences, Nottingham U., supervisor Prof. Sergey Utev, 2014.
- Ph.D., Faculty of ICT, Swinburne U., supervisor Prof. Hai Vu, 2012.
- Ph.D., School of Pathology, U. of New South Wales, supervisor Prof. Miles Davenport, 2010.
- Ph.D., School of Engineering, U. of Melbourne, supervisor Prof. Darryl Veitch, 2010.
- Ph.D., School of Mathematics, U. of Wales Swansea, supervisor Dr Mark Kelbert, 2007.

## Past Postdocs

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- 2013 – 2016 Dr Tom Weber (Walter & Eliza Hall Institute of Medical Research).
- 2011 Dr Kaidi Huang (SKSpruce).
- 2006 – 2010 Dr Vijay Subramanian (U. Michigan, Ann Arbor).
- 2004 – 2006 Dr Peter Clifford (Science Foundation Ireland).

## Current Graduate Students

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- 2015 – Gianfelice Meli.
- 2014 – Giulio Prevedello.
- 2014 – Harry Tideswell.

## Past Doctoral Students

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- 2011 – 2015 (Ph.D.), Mark Christiansen,  
“Guesswork”, NUIM.  
Examiners: Dr Ayalvadi Ganesh (Bristol University) and Dr David Malone (NUIM).
- 2008 – 2010 (Ph.D.), Kaidi Huang,  
“On wireless local area networks”, NUIM.  
Examiners: Prof. Sem Borst (Bell Labs & TUE) and Prof. Stephen Kirkland (NUIM).

## Past Masters Students

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- 2016 – 2017 (M.Sc.), Kelsey Peters,  
“Characterizing low copy DNA signal using simulated and experimental data”, BU, with Prof. C. Grgicak.
- 2015 – 2017 (M.Sc.) Alex Miles,  
“Mathematical modelling and statistical inference from immune response data”, NUIM.  
Examiners: Prof. Vitaly Ganusov (U. Tennessee) and Dr David Malone (NUIM).
- 2015 – 2016 (M.Eng.), Neil Gurram,  
“A mathematical model of polymerase chain reaction induced stutter”, MIT.
- 2009 – 2010 (M.Sc.), Minyu Fang,  
“Power evaluation and performance enhancement of CSMA/CA based WLANs”, NUIM.  
Examiner: Prof. Ilenia Tinnerello (U. Palermo).
- 2003 – 2004, (M.Sc.) Anthony Paul Metcalfe,  
“The large deviations of estimating rate-functions”, TCD.  
Examiners: Dr Wayne Sullivan (Uni. Col. Dublin) and Dr Brendan Murphy (TCD).
- 2002 – 2003, (M.Sc.) Mark Rodgers-Lee,  
“The large deviations of random time-changes in a metric topology”, TCD.  
Examiners: Prof. Charles Pfister (EPFL) and Prof. Richard Timoney (TCD).

## Teaching

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- 2016, Applied Probability (HM804), NUIM.
- 2015, Probabilistic Systems Analysis / Applied Probability (6.041 / 6.431), MIT.
- 2014, Applied Probability (HM804), NUIM.
- 2008, Applications of Probability (Hamilton Graduate Lecture Series), NUIM.
- 2007 – 2014, Netlab Conveynor (graduate student presentation forum), NUIM.
- 2006, Discrete Probability and Information (MAPH30180), UCD.
- 2003 – 2004, Probability Theory (MA412), TCD.

- 2000, Large Deviation Theory, DIAS.

## **Interns**

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- Sarah Halpin, stochastic modelling project, 4th year theoretical physics (TCD), June-Aug., 2017.
- Brendan Williamson, probability project, postgraduate (Duke U.), July-Aug., 2014.
- Conor Leonard, applied probability project, 3rd year mathematics (U. College Cork), June-Aug., 2013.
- Brendan Williamson, applied probability project, 3rd year actuarial science (DCU), Feb.-Sept., 2012.
- Tony Poole, stochastic modelling project, 1st year theoretical physics (NUIM), June-Sept. 2011.
- John Roche, stochastic modelling project, 1st year theoretical physics (TCD), June-Sept. 2011.
- Saumya George, stochastic modelling project, 1st year science (NUIM), June-July. 2011.
- Joshua Tobin, applied probability project, 3rd year math (TCD), June-Sept. 2010.