Peter S. Kim

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Education

2007 **Ph.D. in Applied Mathematics**, Stanford University, Stanford, USA
"Mathematical models of the activation and regulation of the immune system", Advisor: Prof. Doron Levy

2002 **Part III of the Mathematical Tripos**, University of Cambridge, UK
Martingales, stochastic calculus, financial mathematics, actuarial statistics, and operational research

2001 **B.Sc. in Mathematics** with a minors in physics and literature, Massachusetts Institute of Technology, Cambridge, USA

Research interests

Mathematical biology: immune, cancer, and virus dynamics; ordinary, delay, partial differential equations, and agent-based models

Professional experience

2017-present **Associate Professor**
School of Mathematics and Statistics, University of Sydney, Australia

2011-2016 **Lecturer** (2011-2013) **/ Senior Lecturer** (2014-2016)
School of Mathematics and Statistics, University of Sydney, Australia

2008-2011 **Research Assistant Professor**
Dept. of Mathematics, University of Utah, Salt Lake City, USA

2007-2008 **Chateaubriand Postdoctoral Fellow**
Ecole Supérieure d'Electricité and Paris VI, Paris, France

Fellowships and grants

2018-2021 Australian Research Council Discovery Project
$401,706 AU – lead CI with Dr. Federico Frascoli, A/Prof. Adelle Coster, and international partner Prof. Chae-Ok Yun. (According to the ARC report, the DP success rate for Mathematics, Physics, Chemistry and Earth Sciences was 18.9%.)

2017-2018 University of Sydney and Yonsei University Joint Research Funding.
$20,000 AU – co-CI with Prof. Jeehyun Lee (Yonsei University, Seoul, S. Korea).

2016-2019 Australian Research Council Discovery Project
$396,338 AU – sole CI with international partner Prof. Kristen Hawkes. (According to the ARC report, the DP success rate for Mathematics, Physics, Chemistry and Earth Sciences was 17.7%.)

2015 University of Sydney Bridging Support Grant, $30,000 AU.

2012-2015 Australian Research Discovery Early Career Research Award
$375,000 AU – sole CI. (According to the ARC report, the DECRA success rate for Engineering, Mathematics, and Informatics was 11.3% in 2012.)

2007-2008 Chateaubriand Postdoctoral Fellowship

2001-2004 National Science Foundation Graduate Research Fellowship

2001-2002 Cambridge Overseas Trust for postgraduate studies

Other funding

Jan 2013 Sydney International Workshop on Tumour-Immune System Dynamics (with A. Eladdadi and D. Mallet).

- National Science Foundation (Co-PI with A. Eladdadi): $30,000 US,
- Australian Mathematical Sciences Institute (PI with A. Eladdadi and D. Mallet): $7,000 AU,
- Society for Mathematical Biology (PI with A. Eladdadi): $2,000 US.

Supervision

Postdoc

Jun 2016-present	Danya Rose (University of Sydney)
Jul 2017-Mar 2018 & Mar-Sep 2016	Matthew Chan (University of Sydney)

PhD

Jan 2017-present	Collin Zheng (University of Sydney)
Jan 2017-present	Adarsh Kumbhari (University of Sydney)
Jan 2017-present	Pantea Pooladvand (University of Sydney)
Aug 2015-present	Adrianne Jenner (University of Sydney)
Mar 2015-present	Sara Loo (University of Sydney)
Jul 2016-May 2017	Anthony Cheung (University of Sydney)
Jul 2012-Feb 2016	Matthew Chan (University of Sydney, completed in Feb 2016)
Jul 2015-Aug 2016	James Reoch (University of Adelaide, external supervisor)
Feb 2012-Feb 2016	David Khoury (PhD, UNSW, associate supervisor)

Masters

2016	Collin Zheng (University of Sydney, transferred to PhD program at University of Sydney)
2015	Jared Field (University of Sydney, transferred to PhD program at Oxford University)

Honours

2017	Yuhuang Wu (University of Sydney)
2017	Ruben Robertson (University of Sydney)
2016	Hak Joon Kim (University of Sydney)
2016	Adarsh Kumbhari (University of Sydney)
2015-2016	Pantea Pooladvand (University of Sydney)
Aug 2014-Jul 2015	Adrianne Jenner (University of Sydney)
2014	Jared Field (University of Sydney)
2014	Sara Loo (University of Wollongong, co-supervisor, A/Prof Annette Worthy was the primary supervisor)
2013	Andrea Cooper (University of Sydney)
2012	James Reoch (University of Sydney)

Undergraduate (before honours)

Jul 2017-present	Viney Kumar and Katrina Milliner (Talented Student Program independent project)
2017 sem 1	Kelsey Ann McKinnon (3rd-yr mentor), Vaishnavi Calisa (3rd-yr domain expert), Jason Chami, Shirley Chen, Viney Kumar, Jung A (Monica) Lee, Katrina Milliner, Andreas Orsmond, and Alexis Zimbulis (Talented Student Program 1st-year project)
2016 sem 2	Vaishnavi Calisa (Talented Student Program 2nd-year project)
2015 sem 2	Vaishnavi Calisa and Benjamin Xie (Talented Student Program 1st-year project)
2015 sem 1	Edward Burrowes (3rd-yr mentor), Noah Johnston, Mona Khosh, Kelsey McKinnon, Justin Phu, and Stephanie Sun (Talented Student Program 1st-year project)
2013 sem 1	Jian Cao (Winton Charitable Foundation Internship in Mathematical Biology for 3rd-year exchange student)
Nov 2011-Feb 2012	Edward Kim (3rd-year Vacation Scholar on stochastic modelling of biological systems)

Selected conferences and presentations

Editor

Guest editor (with A. Eladdadi and D. Mallet)) of Springer Book on "Mathematical Models of Tumor-Immune System Dynamics", Nov 2014.

Organiser

July 8-12, 2018	Society for Mathematical Biology (SMB) Annual Meeting, University of Sydney, Sydney, Australia. Treasurer and member of local organising committee (with M. Myerscough (conference director), A. Coster, J. Murray, and A. Francis).
Dec 7-11, 2015	Australian Mathematical Sciences Institute (AMSI) Bioinfo Summer, Mathematical Biology Day (with J. Yang, M. Myerscough, and N. Armstrong), University of Sydney, Sydney, Australia.
Jan 5-9, 2015	American Institute of Mathematics (AIM) workshop on "Mathematical Modeling of Tumor-Immune Dynamics: Linking Agent-Based Models and Partial Differential Equation Approaches" (with A. Eladdadi, D. Mallet, and C.-O. Yun), San Jose, USA.
Jan 7-10, 2013	Sydney International Workshop on "Mathematical Models of Tumour-Immune System Dynamics" (with A. Eladdadi & D. Mallet),University of Sydney, Sydney, Australia.
May 2009	Mathematical Biology Workshop on Building an Interdisciplinary Career (with D. Toth & M. Zajac), Univ. of Utah, Salt Lake City, USA.

Publications

1. A. JENNER, C.-O. YUN, P.S. KIM, AND A.C.F. COSTER (2018), "Mathematical modelling of the interaction between cancer cells and an oncolytic virus: insights into the effects of treatment protocols", accepted by *Bulletin of Mathematical Biology*.

2. A. JENNER, C.-O. YUN, A.C.F. COSTER, AND P.S. KIM (2018), "Modelling combined virotherapy and immunotherapy: strengthening the antitumour immune response mediated by IL-12 and GM-CSF expression", accepted by *Letters in Biomathematics*.

3. A. JENNER, A.C.F. COSTER, P.S. KIM, AND F. FRASCOLI (2018), "Treating cancerous cells with viruses: insights from a minimal model for oncolytic virotherapy", accepted by *Letters in Biomathematics*.

4. M.H. CHAN, P.S. KIM, R. MARANGELL (2018), "Stability of travelling waves in a Wolbachia invasion", *Discrete and Continuous Dynamical Systems – B*, 23(2): 609-628.

5. J. LEE, F.R. ADLER, AND P.S. KIM (2017), "A mathematical model for the macrophage response to respiratory viral infection in normal and asthmatic conditions", *Bulletin of Mathematical Biology*, 79(9):1979-1998.

6. S.L. LOO, K. HAWKES, AND P.S. KIM (2017), "Evolution of male strategies with sex-ratio dependent payoffs: connecting pair bonds with grandmothering", *Philosophical Transactions of the Royal Society B: Biological Sciences*, 372: 20170041.

7. S.L. LOO, M.H. CHAN, K. HAWKES, AND P.S. KIM (2017), "Further mathematical modelling of mating sex ratios and male strategies with special relevance to human life history", *Bulletin of Mathematical Biology*, 79(8):1907-1922.

8. A. PEACOCK, A. CHEUNG, P. KIM, AND S.K. POON (2017), "Socialising health burden through different network topologies: A simulation study", *Studies in Health Technology and Informatics*, 239: 112–118.

9. M.H. CHAN, K. HAWKES, AND P.S. KIM (2017), "Modelling the evolution of traits in a two-sex population, with an application to grandmothering", *Bulletin of Mathematical Biology*, 79(9): 2132–2148.

10. F. FRASCOLI, E. FLOOD, AND P.S. KIM (2017) "A model of the effects of cancer cell motility and cellular adhesion properties on tumour-immune dynamics", *Mathematical Medicine and Biology*, 34(2): 215–240.

11. J.L. GEVERTZ, P.S. KIM, AND J.R. WARES (2017), "Mentoring undergraduate interdisciplinary mathematics research students: Junior faculty experiences", *PRIMUS Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 27(3): 352–369. (Authors in alphabetical order.)

12. W.L. SWEATMAN, G. MERCER, J. BOLAND, N. CUSIMANO, A. GREENWOOD, K. HARLEY, P. VAN HEIJSTER, P. KIM, J. MAISANO, M. NELSON, AND G. PETTET (2016), "Seaweed cultivation and the remediation of by-products from ethanol production: a glorious green growth" in T. Farrell and A.J. Roberts (eds.) "Proceedings of the 2014 Mathematics and Statistics in Industry Study Group, MISG-2014", *ANZIAM Journal*, 56: pp. M1-M29. (Authors in alphabetical order.)

13. A. ORTIZ, D. CARNATHAN, J. YU, K. SHEEHAN, P. KIM, A. REYNALDI, T. VANDERFORD, N. KLATT, J. BRENCHLEY, M. DAVENPORT, AND G. SILVESTRI (2016),

"Analysis of the in vivo Turnover of CD4+ T-cell Subsets in Chronically SIV-Infected Sooty Mangabeys", *PLoS One*, 11(5): e0156352.

14. J.A.H. KOOP*, P.S. KIM*, S.A. KNUTIE, F. ADLER, AND D.H. CLAYTON (2016), "An introduced parasitic fly may lead to local extinction of Darwin's finch populations", *Journal of Applied Ecology*, 53(2): pp. 511–518. (* Both authors contributed comparably.)

    (Press coverage: *BBC News, Smithsonian, The Telegraph, London, Discovery News, Christian Science Monitor, Huffington Post, Newsy (video), Mental Floss, Phys.Org, International Business Times, Dispatch Tribunal, Laboratory Equipment, I4U News, States Chronicle, Council Chronicle, FTC Publications*)

15. M.H. CHAN, K. HAWKES, P.S. KIM (2016), "Evolution of longevity, age at last birth and sexual conflict with grandmothering", *Journal of Theoretical Biology*, 393: pp. 145–157

16. J.E. COXWORTH, P.S. KIM, J.S. MCQUEEN, AND K. HAWKES (2015), "Grandmothering life histories and human pair bonding", *Proceedings of the National Academy of Sciences, USA*, 112(38): pp. 11806–11811.

17. M.H. CHAN, R. SHINE, G.P. BROWN, P.S. KIM (2015), "Mathematical modelling of spatial sorting and evolution in a host-parasite system", *Journal of Theoretical Biology*, 380: pp. 530–41.

18. J.R. WARES, J. J. CRIVELLI, C.-O. YUN, I.-K. CHOI, J.L. GEVERTZ, AND P.S. KIM (2015), "Treatment strategies for combining immunostimulatory oncolytic virus therapeutics with dendritic cell injections", *Mathematical Biosciences and Engineering*, 12(6): pp. 1237–1256.

19. P.S. KIM, J. J. CRIVELLI, I.-K. CHOI, C.-O. YUN, AND J.R. WARES (2015), "Quantitative impact of immunomodulation versus oncolysis with cytokine-expressing virus therapeutics", *Mathematical Biosciences and Engineering*, 12(4): pp. 841–858.

20. A. K. COOPER AND P.S. KIM (2014), "A cellular automata and a partial differential equation model of tumour-immune dynamics and chemotaxis", in A. Eladdadi, P. Kim, and D. Mallet, (eds.), *Mathematical Models of Tumor-Immune System Dynamics*, Springer Proceedings in Mathematics & Statistics, vol. 107, Springer, New York, NY: pp. 21-46.

21. J.R. WARES, J. J. CRIVELLI, AND P. S. KIM (2014), "Differential equation techniques for modeling a cycle-specific oncolytic virotherapeutic", in A. Eladdadi, P. Kim, and D. Mallet, (eds.), *Mathematical Models of Tumor-Immune System Dynamics*, Springer Proceedings in Mathematics & Statistics, vol. 107, Springer, New York, NY: pp. 253-275.

22. M.H.T. CHAN AND P.S. KIM (2014), "Modelling the impact of marine reserves on a population with depensatory dynamics", *Bulletin of Mathematical Biology*, 76(9): pp. 2122–2143.

23. F. FRASCOLI, P.S. KIM, B.D. HUGHES, AND K.A. LANDMAN (2014), "A dynamical model of tumour immunotherapy", *Mathematical Biosciences*, 253: pp. 50–62.

24. P.S. KIM, J.S. MCQUEEN, J.E. COXWORTH, K. HAWKES (2014), "Grandmothering drives the evolution of longevity in a probabilistic model", *Journal of Theoretical Biology*, 353: pp. 84–94.

25. M.H.T. CHAN AND P.S. KIM (2014), “An age-structured approach to modelling behavioural variation maintained by life-history trade-offs”, *PLoS One*, 9(1): e84774.

26. D. KHOURY, D. CROMER, S. BEST, K. JAMES, P. KIM, C. ENGWERDA, A. HAQUE, AND M. DAVENPORT (2014), “Effect of mature, blood-stage Plasmodium parasite sequestration on pathogen biomass in mathematical and in vivo models of malaria”, *Infection and Immunity*, 82(1): pp. 212-220.

27. M.H.T. CHAN AND P.S. KIM (2013), “Modelling a *Wolbachia* invasion using a slow-fast dispersal reaction-diffusion approach”, *Bulletin of Mathematical Biology*, 75(9): pp. 1501-1523.

28. F.R. ADLER AND P.S. KIM (2013), “Models of contrasting strategies of rhinovirus immune manipulation”, *Journal of Theoretical Biology*, 327(1): pp. 1-10.

29. P.S. KIM, P.P. LEE, AND D. LEVY (2013), “Basic principles in modeling adaptive regulation and immunodominance”, in A. Friedman, E. Kashdan, U. Ledzewicz, and H. Schättler, (eds.), *Mathematical Models and Methods in Biomedicine*, *Lecture Notes on Mathematical Modelling in the Life Sciences*, Springer, New York, NY: pp. 33-57.

30. P.S. KIM, J.E. COXWORTH, AND K. HAWKES (2012), “Increased longevity evolves from grandmothering”, *Proceedings of the Royal Society B: Biological Sciences*, 279 (1749): pp. 4880-4884

31. P.S. KIM AND P.P. LEE (2012), “Modeling protective immunity via preventative cancer vaccines using a hybrid agent-based and delay differential equation approach”, *PLoS Computational Biology*, 8(10): e1002742.

32. J.J. CRIVELLI, J. FOLDES, P.S. KIM, AND J. WARES (2012), “A mathematical model for cell cycle specific cancer virotherapy”, *Journal of Biological Dynamics*, 6(S1): pp. 104–120.

33. P.S. KIM (2011). “Modeling leukemia stem cell differentiation: Bridging agent-based and partial differential equation models”, *Proc. Russia-Korea Workshop on advanced computer and information technologies*, Yekaterinburg, Russia, 29 May – 1 June 2011: pp. 28-51.

34. M.M. PEET, P.S. KIM, AND P.P. LEE (2011), “Biological circuit models of the immune regulatory response: a decentralized control system”, *Proc. 50th IEEE Conference on Decision and Control and European Control Conference*, Orlando, Florida, USA, December 12-15, 2011: pp. 3020-3025.

35. F. MAZENC, P.S. KIM, AND S.-I. NICULESCU (2011), “Stability of an imatinib and immune model with delays”, *Institute of Mathematics and its Applications Journal of Mathematical Control and Information*, 28: pp. 447−462.

36. K. HAWKES, P.S. KIM, B. KENNEDY, R. BOHLENDER, AND J. HAWKS (2011), “A reappraisal of grandmothering and natural selection”, *Proceedings of the Royal Society B: Biological Sciences*, 278(1714): pp. 1936-1938.

37. P.S. KIM, P.P. LEE, AND D. LEVY (2011), “A theory of immunodominance and adaptive regulation”, *Bulletin of Mathematical Biology*, 73(7): pp. 1645-1665.

38. D. PAQUIN, P.S. KIM, P.P. LEE, AND D. LEVY (2011), “Strategic treatment interruptions during imatinib treatment of chronic myelogenous leukemia”, *Bulletin of Mathematical Biology*, 73(5): pp. 1082-1100.

39. P.S. KIM AND P.P. LEE (2011), “T cell state transitions produce an emergent change detector”, *Journal of Theoretical Biology*, 275(1): pp. 59-69.

40. P.S. KIM, P.P. LEE, AND D. LEVY (2010), “Emergent group dynamics governed by regulatory cells produce a robust primary T cell response”, *Bulletin of Mathematical Biology*, 72(3): pp. 611-644.

41. M. DOUMIC-JAUFFRET*, P.S. KIM*, AND B. PERTHAME (2010), “Stability analysis of simplified yet complete model for chronic myelogenous leukemia”, *Bulletin of Mathematical Biology*, 72(7): pp. 1732-1759. (* Both authors contributed comparably.)

42. S.-I. NICULESCU, P.S. KIM, K. GU, P.P. LEE, AND D. LEVY (2010), “Stability crossing boundaries of delay systems modeling immune dynamics in leukemia”, *Discrete and Continuous Dynamical Systems – Series B*, 13(1): pp. 129-156.

43. P.S. KIM, D. LEVY, AND P.P. LEE (2009), “Modeling and simulation of the immune system as a self-regulating network”, in Michael L. Johnson and Ludwig Brand, (eds), *Methods in Enzymology,* vol. 467, Academic Press, Burlington, MA: pp. 79-109.

44. M.M. PEET*, P.S. KIM*, S.-I. NICULESCU, AND D. LEVY (2009), “New computational tools for modeling chronic myelogenous leukemia”, *Mathematical Modelling of Natural Phenomena*, 4(2): pp. 119-139. (* Both authors contributed comparably.)

45. F. MAZENC, P.S. KIM, AND S.-I. NICULESCU (2008), “Stability of a Gleevec and immune model with delays”, *Proc 47th IEEE Conference on Decision and Control*, Cancun, Mexico.

46. P.S. KIM, P.P. LEE, AND D. LEVY (2008), “A PDE model for imatinib-treated chronic myelogenous leukemia”, *Bulletin of Mathematical Biology*, 70(7): pp.1994-2016.

47. P.S. KIM, P.P. LEE, AND D. LEVY (2008), “Dynamics and potential impact of the immune response to chronic myelogenous leukemia”, *PLoS Computational Biology*, 4(6): e1000095.

48. P.S. KIM, P.P. LEE, AND D. LEVY (2008), “Modeling imatinib-treated chronic myelogenous leukemia: reducing the complexity of agent-based models”, *Bulletin of Mathematical Biology*, 70(3): pp. 728-744.

49. S.-I. NICULESCU, P.S. KIM, P.P. LEE, AND D. LEVY (2007), “On stability of a combined Gleevec and immune model in chronic leukemia: Exploiting delay system structure”, *Proc. 7th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2007)*, Pretoria, South Africa.

50. P.S. KIM, P.P. LEE, AND D. LEVY (2007), Mini-transplants for chronic myelogenous leukemia: a modeling perspective, in Queinnec et al. (eds.) "Biology and Control Theory: Current Challenges", *Lecture Notes in Control and Information Sciences*, 357, Springer, Berlin: pp. 3-20.

51. P.S. KIM, P.P. LEE, AND D. LEVY (2007), “Modeling regulation mechanisms in the immune system”, *Journal of Theoretical Biology*, 246(1): pp. 33-69.

52. S.-I. NICULESCU, P.S. KIM, K. GU, AND D. LEVY (2006), “On the stability crossing boundaries of some delay systems modeling immune dynamics in leukemia”, *Proc 17th International Symposium on Mathematical Theory of Networks and Systems*, Kyoto, Japan.

53. R. DeConde*, P.S. Kim*, D. Levy, and P.P. Lee (2005), “Post-transplantation dynamics of the immune response to chronic myelogenous leukemia”, *Journal of Theoretical Biology*, 236(1): pp. 39-59. (* Both authors contributed comparably.)

54. P.S. Kim, L. Stemkoski, and C. Yuen (2001), "Polynomial knots of degree five," *MIT Undergraduate Journal of Mathematics* 3: pp. 125-135.

55. L. Pachter and P.S. Kim (1998), “Forcing matchings on square grids”, *Discrete Mathematics*, 190(1-3): pp. 287-294.