David Andrew Smith Curriculum vitæ

Yale-NUS College,
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Employment

Yale-NUS College Assistant Professor of Science (Mathematics)	2016–Present
National University of Singapore Assistant Professor	2022–Present
Yale-NUS College Common Curriculum Course Facilitator: QR	2021–Present
University of Michigan Assistant Professor (Postdoctoral)	2015–2016
University of Cincinnati Visiting Assistant Professor	2013–2015
University of Crete Postdoctoral Research Fellow	2012–2013
University of Reading Teaching Fellow	2011–2012

Education

PhD Mathematics University of Reading, UK, 2011. Advisor: Beatrice Pelloni. Supported by EPSRC studentship.
Spectral theory of ordinary and partial linear differential operators on finite intervals.

MMath Mathematics University of York, UK, 2007. 1st class honors.

Teaching & Learning Support Programme University of Reading, UK, 2012. Distinction. Elected Associate Fellow of the UK Higher Education Academy.

Research

- Spectral theory of nonselfadjoint two point differential operators.
- Well-posedness of initial boundary value problems for high order linear partial differential equations.
- Exotic boundary conditions: multipoint, interface, nonlocal.
- Solution representations for initial boundary value problems
- Revival phenomena in dispersive evolution equations
- Asymptotics of initial-boundary value problems for linear and nonlinear evolution equations.

Funding

QJMAM Fund for Applied Mathematics *Dispersive revivals* 2021–2022
GB£1300

Sydney Mathematics Research Inst. International Visitor Program 2020–2022
Spectral theory of non-self-adjoint two-point differential operators
AU$5500

Yale-NUS College Project Grant 2019–2022
Numerical and spectral unified transform method: complicated boundary conditions
SG$20 000

Newton Institute Visitor Support 2019
Complex analysis: techniques, applications and computation
GB£7560

Yale-NUS College Workshop Grant 2018–2020
Dispersive quantisation via the unified transform method
SG$20 000

Yale-NUS College Teaching Innovation Grant *Technology in Proof* 2017–2018
SG$5000

SIAM Postdoctoral Travel Award 2015
International Congress on Industrial & Applied Mathematics
US$2000

Journal articles

13. S Aitzhan, S Bhandari, D A Smith, *Fokas diagonalization of piecewise constant coefficient linear differential operators on finite intervals and networks* Acta. Appl. Math. **177** 2 (2022) 1–69 arXiv:2012.05638 [math.SP].

12. D A Smith, W Y Toh, *Linear evolution equations on the half line with dynamic boundary conditions* Eur. J. Appl. Math. (to appear 2022) 1–33 arXiv:1910.08764 [math.AP].

11. L Boulton, P J Olver, B Pelloni, D A Smith, *New revival phenomena for linear integro-differential equations* Stud. Appl. Math. **147** 4 (2021) 1209–1239 arXiv:2010.01320 [math.AP].

10. P J Olver, N E Sheils, D A Smith, *Revivals and fractalisation in the linear free space Schrödinger equation* Quart. Appl. Math. **78** 2 (2020) 161–192 arXiv:1812.08637 [math.PH].

9. P D Miller, D A Smith, *The diffusion equation with nonlocal data* J. Math. Anal. Appl. **466** 2 (2018) 1119–1143 arXiv:1708.00972 [math.AP].

8. B Pelloni, D A Smith, *Nonlocal and multipoint boundary value problems for linear evolution equations* Stud. Appl. Math. **141** 1 (2018) 46–88 arXiv:1511.07244 [math.AP].

7. E Kesici, B Pelloni, T Pryer, D A Smith, *A numerical implementation of the unified Fokas transform for evolution problems on a finite interval* European J. Appl. Math. **29** 3 (2018) 543–567 arXiv:1610.04509 [math.NA].

6. B Deconinck, N E Sheils, D A Smith, *The Linear KdV Equation with an Interface* Comm. Math. Phys. **347** 2 (2016) 489–509 arXiv:1508.03596 [math.AP].

5. A S Fokas, D A Smith, *Evolution PDEs and augmented eigenfunctions. Finite interval*, Adv. Diff. Eq. **21** 7/8 (2016) 735–766 arXiv:1303.2205 [math.SP].

4. B Pelloni, D A Smith, *Evolution PDEs and augmented eigenfunctions. Half-line*, J. Spectr. Theory **6** 1 (2016) 185–213 arXiv:1408.3657 [math.AP].

3. N E Sheils, D A Smith, *The heat equation on a network using the Fokas method*, J. Phys. A **48** 33 (2015) 335001 (21pp) arXiv:1503.05228 [math.AP].

2. B Pelloni, D A Smith, *Spectral theory of some non-selfadjoint linear differential operators*, Proc. Roy. Soc. Lond. Ser. A **469** 2154 (2013) 20130019 (21pp) arXiv:1205.4567v2 [math.SP].

1. D A Smith, *Well-posed two-point initial-boundary value problems with arbitrary boundary conditions*, Math. Proc. Cambridge Philos. Soc. **152** 3 (2012) 473–496 arXiv:1104.5571v2 [math.AP].

Peer reviewed book chapter

1. D A Smith, *The unified transform method for linear initial-boundary value problems: a spectral interpretation*, Unified transform method for boundary value problems: applications and advances, (B Pelloni and A S Fokas (Eds.)), SIAM (2015) 34–47 arXiv:1408.3659 [math.SP].

Preprints

2. A S Fokas, B Pelloni, D A Smith, *Time-periodic linear boundary value problems on a finite interval* 2021 (23pp) arXiv:2109.00834 [math.AP] (submitted).

1. D A Smith, T Trogdon, V Vasan, *Linear dispersive shocks* 2019 (12pp) arXiv:1908.08716 [math.AP] (submitted).

Magazine article

1. D A Smith, *Revivals and fractalization* Dyn. Sys. Web **2020** 2 (2020) 1–8 DSWeb.

Peer reviewed conference proceedings (mathematics education)

1. D A Smith, *Collaborative peer feedback*, Proceedings of ICEduTech 2017, IADIS (2017) 183–186.

Summer school

1. The Fokas transform method, International Centre for Theoretical Sciences, Bengaluru, India 16–19 July 2018.

Conferences, workshops & seminars

45. 2021 SIAM Annual Meeting, Online. 22 July 2021.

44. 8th LMS OPSFOTA meeting and 4th Operator theory workshop, Reading, UK. 21 November 2019.

43. Isaac Newton Institute workshop: Complex analysis in mathematical physics and applications, Cambridge, UK. 28 October 2019.

42. University of California Santa Cruz geometry & analysis seminar, CA, USA. 22 May 2019.

41. University of California Davis PDE and applied math seminar, CA, USA. 17 May 2019.

40. University of California Irvine applied mathematics seminar, CA, USA. 29 April 2019.

39. Claremont center for mathematical sciences applied math seminar, CA, USA. 22 April 2019.

38. IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, GA, USA. 18 April 2019.

37. AustMS 2018, Adelaide, Australia. 6 December 2018.

36. AIMS conference on dynamical systems, differential equations and applications, Taipei, Taiwan. 7 July 2018.

35. SIAM Conference on nonlinear waves and coherent structures, CA, USA. 12 June 2018.

34. University of East Anglia Applied mathematics seminar, Norwich, UK. 05 February 2018.

33. University of East Anglia Applied mathematics seminar, Norwich, UK. 29 January 2018.

32. University of Sydney Applied Mathematics Seminar, Sydney, Australia. 11 October 2017.

31. IMA / University of Minnesota Mathematical Physics Seminar, Minneapolis, MN, USA. 20 July 2017.

30. University of York Integrable Systems Seminar, York. 15 May 2017.

29. ICMS workshop: applied and computational complex analysis, Edinburgh. 11 May 2017.

28. IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, GA. 30 March 2017.

27. Yale-NUS College Mathematics, Computer Science & Statistics Seminar, Singapore. 22 August 2016.
26. Nonlinear Waves: Theory and Computation, Beijing. 25 June 2016.
25. 77$^{\text{th}}$ Midwest PDE Seminar, Cincinnati, Ohio. 7 May 2016.
24. University of Michigan Applied & Interdiscipliniary Mathematics Seminar, Ann Arbor, Michigan. 8 April 2016.
23. ICIAM 2015, Beijing. 13 August 2015.
22. AIM Workshop: Mathematical aspects of physics with non-self-adjoint operators, San Jose, California. 8–12 June 2015.
21. IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia. 2 April 2015.
20. Ohio River Analysis Meeting 5, Cincinnati, Ohio. 28 February 2015.
19. University of South Florida Mathematics Colloquium, Tampa, Florida. 17 February 2015.
18. Analysis & PDE Seminar, University of Kentucky, Lexington, Kentucky. 11 November 2014.
17. University of Washington Mathematical Methods Seminar Series, e-Seminar. 28 October 2014.
16. SIAM conference on Nonlinear Waves and Coherent Structures, Cambridge, UK. 13 August 2014.
15. Scattering and Inverse Scattering in Multidimensions, Lexington, Kentucky. 15–23 May 2014.
14. University of Cincinnati Analysis & PDE Seminar. 3 April 2014.
13. Ohio River Analysis Meeting 4, Lexington, Kentucky. 8 March 2014.
12. University of Maryland PDE & Applied Math Seminar, College Park, Maryland. 6 March 2014.
11. Conference for Ercolani's 60$^{\text{th}}$: Integrable Systems, Random Matrix Theory, and Combinatorics, Tucson, Arizona. 26 October 2013.
10. University of Cincinnati Analysis & PDE Seminar. 26 September 2013.
9. Crete Applied and Numerical Analysis Seminar, Heraklion, Greece. 27 September 2012.
8. Marchenko 2012: Spectral Theory and Differential Equations, Kharkov, Ukraine. 22 August 2012.
7. ICMS workshop: Boundary value problems for linear elliptic and integrable PDEs: theory and computation, Edinburgh. 31 May 2012.
6. Reading Analysis Seminar, Reading. 27 February 2012.
5. Young Functional Analysts' Workshop 2011, York. 8 April 2011.
4. York Pure Mathematics Seminar. 23 February 2011.
3. MAGIC Postgraduate student conference 2011. 14 January 2011.
2. Reading Friday afternoon seminar series. 21 May 2010.
1. Reading PhD seminar series. 21 October 2009.

Conferences, workshops & seminars: mathematics education

5. Department of Mathematics & Statistics, Reading, UK. 22 November 2019.
4. Yale-NUS College Centre for Teaching & Learning workshop: Integrating Peer Review Into Your Teaching, Singapore. 6 November 2019.
3. ICEduTech 2017, Sydney. 13 December 2017.
2. University of Michigan Teaching Mathematics Seminar, Ann Arbor, Michigan. 18 April 2016.
1. Math Teaching Colloquium, University of Cincinnati, Cincinnati, Ohio. 20 November 2014.

Courses taught

Yale-NUS College

Proof `YSC2209` Introduction to higher mathematics, rigourous construction of $\mathbb{R}$.
AY2021-2022 S1 27 students (two sections, one e-learning)
AY2020-2021 S1 15 students e-learning
AY2018-2019 S2 25 students
AY2018-2019 S1 21 students
AY2017-2018 S2 28 students (two sections)
AY2017-2018 S1 15 students
AY2016-2017 S2 16 students
AY2016-2017 S1 15 students

Ordinary & partial diff eq `YSC4220` ODE: Exact & series soln. PDE: Fourier series & transforms, Bessel fn.
AY2020-2021 S2 11 students
AY2017-2018 S1 12 students
AY2016-2017 S2 9 students

Quantitative reasoning `YCC1122` Introduction to data visualisation, statistics, and programming in R.
AY2021-2022 S1 33 students e-learning (two sections)
AY2020-2021 S1 20 students e-learning

Coordinator Quantitative reasoning `YCC1122`
AY2021-2022 S1 239 students (fourteen sections)

Applied calculus `YSC1211` Multivariate differential calculus, elementary multivariate integral calculus.
AY2017-2018 S1 15 students

MCS capstone seminar `YSC4103` Research seminar & final year undergraduate project presentations.
AY2017-2018 S2 13 students

Scientific inquiry 2 `YCC2137` Compulsory module on philosophy of science & climate change.
AY2018-2019 S1 17 students

University of Michigan

Boundary value problems `MATH454` Sturm-Liouville problems, Fourier series & transforms, Bessel fn.
AY2015-2016 S2 29 students (two sections)

Calculus 1 `MATH115` Differential & integral calculus of a single variable.
AY2015-2016 S1 35 students (two sections)

University of Cincinnati

Calculus 1 `MATH1061` Differential & integral calculus of a single variable.
AY2014-2015 S1 125 students (three sections)
AY2013-2014 S3 (first half) 38 students

Coordinator Precalculus review for Calculus 1 `MATH1060SRS` Supplementary classes on functions.
AY2014-2015 S1 133 students (fifteen sections)

Calculus 1 with precalculus review `MATH1060` Functions, differential & integral calculus of a single variable.
AY2013-2014 S1 103 students (three sections)

Introduction to discrete mathematics `MATH1071` Truth tables, logic gates, elementary predicate calculus.
AY2013-2014 S3 (first half) 18 students

University of Crete

Unified transform method for linear evolution equations Advanced graduate course on Fokas UTM.
AY2012-2013 S1 4 students

University of Reading

Analysis 2 (part 2) `MA2AN2` Rigourous differential and integral calculus for functions of a single variable.
AY2011-2012 S2 98 students

Analysis 1 (part 1) `MA1AN1` Introduction to higher mathematics.
AY2011-2012 S1 110 students

Undergraduate research advising

See `www.unifiedtransformlab.com` for full details of my supervision of undergraduate research including available projects and reports on completed projects.

- Supervised 3 undergraduate capstone projects and examined 9 others.
- Supervised 1 graduate research assistant.
- Supervised 19 undergraduate summer research projects.
- Supervised 8 undergraduate semester reading projects.
- Supervised 2 undergraduate semester research projects in mathematics.
- Supervised 1 undergraduate semester research project in mathematics education.

Professional societies

- SIAM. Member.
- Australian Mathematical Society. Member.
- Higher Education Academy (UK). Associate Fellow.

Service to the mathematics community

- Reviews for journals.
  1. Applied Numerical Mathematics
  2. European Journal of Applied Mathematics
  3. Funkcialaj Ekvacioj
  4. Institute of Mathematics and its Applications Journal of Applied Mathematics
  5. Journal of Mathematical Physics
  6. Physica D: Nonlinear Phenomena
  7. Proceedings of the Royal Society of Edinburgh Section A: Mathematics
  8. Proceedings of the Royal Society of London Series A. Mathematical, Physical and Engineering Sciences
  9. Studies in Applied Mathematics
- Conference organization.
  - Minisymposium *Riemann-Hilbert, inverse scattering & associated methods* at SIAM NWCS, Bremen, Germany, 2020 (cancelled due to COVID-19 pandemic)
  - Workshop *Dispersive quantisation via the unified transform method*, Singapore, 2020
  - Minisymposium *Advances using the Unified Transform Method* at IMACS, Atlanta GA, USA, 2015

Service to Yale-NUS College

Committee & taskforce membership

Council of Common Curriculum Facilitators 2021–present
Advise on the content and management of the Yale-NUS College Common Curriculum.

Committee on Faculty Affairs 2020–present
Set agenda for full faculty meetings, gather & discuss faculty opinion on proposals for the Faculty Handbook and other procedures of the College.

Sciences Common Curriculum Development Team 2021
Identify the main priorities of the Sciences division for a Common Curriculum Science sequence, present a new Science sequence that engages and inspires students from across the divisions.

Teaching, Learning and Advising Committee 2018–2019
Consider policies and procedures in matters concerned with pedagogy, evaluation and recognition of faculty members' teaching, assessment of learning goals, and student advising.