

## CURRICULUM VITAE

### PERSONAL DETAILS

Name: Shane Cooper  
Address: 8 Bamburgh Road, Newton Hall,  
Durham, DH1 5NW, UK.  
Email: salcoops@gmail.com  
Webpage: <http://salcooper.co.uk>  
Date of Birth: 28<sup>th</sup> December 1983  
Nationality: British

### CURRENT POSITION

EPSRC POSTDOCTORAL RESEARCH FELLOW and WILLMORE FELLOW at the Department of Mathematical Sciences, Durham University since *July 2017*.

### PREVIOUS POSTS

04/15-06/17 EPSRC Postdoctoral Research Fellow at University of Bath, UK.  
04/14-03/15 Postdoc at Université de Montpellier 2, LMGC, France.  
04/13-03/14 Postdoc at Institut Fresnel, Marseille, France.  
04/12-03/13 Wales Institute of Mathematical and Computational Sciences -  
Leverhulme Fellow at Cardiff University, UK.

### EDUCATION

2008-2012 PhD in Mathematics (2012), University of Bath.  
THESIS: Two-scale homogenisation of partially degenerating PDEs with applications to photonic crystals and elasticity.  
SUPERVISORS: Dr I.V. Kamotski and Prof. V.P. Smyshlyaev.  
2007-2008 MSc in Modern Applications of Mathematics with **distinction**  
(**Average 86%**). Graded top of cohort of 21 students from two Applied Maths MScs.  
THESIS: Non-classical homogenisation, related analytic tools and applications to dynamic problems with partially high contrasts.  
SUPERVISOR: Prof. V.P. Smyshlyaev.  
2004-2007 BSc in Natural Sciences with **Honours Class 1 (Graduated top of my year)**  
- Major subjects: Mathematics and Physics.

### RESEARCH INTERESTS

Asymptotic analysis, Elliptic PDE theory, Functional analysis, Measure theory, Operator theory and Spectral theory with applications in the contexts of Acoustics, Elasticity and Electromagnetism such as: Linear wave theory, Homogenisation theory for multi-scale composites (such as metamaterials), and analysis of thin structures.

### GRANTS

04/15-03/18 Principal Investigator of EPSRC Postdoctoral Fellowship grant EP/M017281/1: "Operator asymptotics, a new approach to length-scale interactions in metamaterials". **Value £221,738**.  
09/06-02/17 EPSRC Impact Acceleration Account Funding (IAA): "New wave-dampening composites" (as CI). **Value £7,822**.

## PATENT

- TITLE Composite Elastic Wave Waveguide. (Application number GB1507537.7)  
SUBMITTED 1<sup>st</sup> May 2015.

## AWARDS

- La Bourse de la ville Marseille
- Bath University Excellent Research Student Award
- Natural Sciences Finalists Prize - Awarded to the student who has shown the best performance in the final year

## INVITED REVIEWER

- AMS Mathematical Reviews

## CONFERENCES ORGANISED

June 2018      Recent advances in Homogenisation theory

## STUDENT SUPERVISION

2016 - 2017	Postdoctoral research assistant supervision (joint supervision with Dr Kirill Cherednichenko) PROJECT: Analysis of Piezoelectric waveguides STUDENT: James Roberts
2016 - 2017	PhD supervision (joint supervision with Dr Kirill Cherednichenko) TITLE: Operator-theoretic methods in homogenisation of singular periodic structures STUDENT: Serena D'Onofrio
Summer 2016	SUMMER PROJECT: Analysis of surface waves in stratified electromagnetic Media with Leontovich boundary conditions (joint supervision with Dr Kirill Cherednichenko) STUDENT: Will Graham
Summer 2016	MMATH PROJECT: Analysis of Rayleigh-type surface waves in stratified elastic media for a general class of boundary conditions (joint supervision with Dr Kirill Cherednichenko) STUDENT: Dan Gardham
Summer 2016	MSC PROJECT: Analysis of Love-type surface waves in acoustic and elastic layered media (joint supervision with Dr Kirill Cherednichenko) STUDENT: Felix Maxey-Hawkins

## TEACHING EXPERIENCE

May 2017	COURSE prepared and delivered at <i>Spring school on Analysis and Applications to Mathematical Physics</i> , in UNAM Mexico City, on “Analysis of wave propagation in highly heterogeneous periodic media via two-scale homogenisation techniques”
2016	READING COURSE prepared and delivered on “Analysis of elasticity equations for singular structures with applications”
2015-2016	GRADUATE LECTURES on “Homogenisation of elliptic partial differential equations with partially degeneracies and spectral convergence”
2014-2015	LECTURES on “Weak and Weak star topologies”
2008-2012	TUTORIALS AND PROBLEM CLASSES in Applied Mathematics for undergraduates at the University of Bath
2008	PRIVATE TUTOR in Mathematical Methods for PDEs

### **RECENT CONFERENCE & WORKSHOP TALK INVITATIONS**

- 05-07/04/17 “Workshop on Applied Analysis of Operators, PDE, and Functionals”. Méridia, Yucatán
- 06-09/06/16 “Computational and Analytic problems in Spectral Theory”. Cardiff University, UK
- 26-27/05/16 “Young Applied Analysts in the UK” conference. University of Bath, UK
- 16-19/05/16 “Operators, Operator families and Asymptotics” conference. University of Bath, UK
- 26-30/10/15 “Mathematics, Mechanics and Physics for materials of tomorrow”. ICMS Edinburgh
- 01-05/06/15 “Periodic and Ergodic Spectral Problems” workshop, Isaac Newton Institute, Cambridge, UK

### **RECENT SEMINAR TALK INVITATIONS**

- 13/11/17 “Cardiff Analysis Seminar”, Cardiff University, UK
- 27/03/17 “Applied Mathematics Seminars”, University of Durham, UK
- 16/06/16 POEMS Homogenisation Seminar, ENSTA, Palaiseau, France
- 05/05/16 “Dynamical Systems and PDE Seminar Series”. University of Surrey, UK
- 24/02/16 Warwick University, UK
- 15/10/15 “Analysis and Differential Equations Seminar”. University of Bath, UK

### **INTERNATIONAL CONFERENCE TALK INVITATIONS**

- 23-29/09/13 Crimean International Mathematical Conference CIMC, Sudak, Crimea
- 02-07/09/12 The 9<sup>th</sup> International ETOPIM, Marseille, France
- 06-07/04/11 International Conference on the occasion of Vasily Zhikov’s birthday, Naples, Italy

### **ADDITIONAL RECENT CONFERENCE & WORKSHOP INVITATIONS**

- 12-20/07/16 “Computational and Mathematical Aspects of Maxwell’s equations”. Durham University, UK
- 20-24/06/16 “Metamaterials Beyond Photonics”. ICMS, Edinburgh, UK
- 18-22/04/16 “Spectral Theory for Novel Materials”. CIRM, Luminy, France
- 13-15/03/16 “Spectral theory and applications”. Stockholm, Sweden
- 05-07/10/15 “Asymptotic analysis and Spectral theory”. Orsay, Paris, France
- 25-30/08/15 “Partial Differential Equations, Optimal Design and Numerics”. Benasque, Spain

## PUBLICATIONS LIST

- [A:1] Quasi-periodic two-scale homogenisation and effective spatial dispersion in high-contrast media. *To appear in Calculus of Variations and PDEs*.
- [A:2] (with Cherdantsev, M. Cherednichenko, K.) Extreme localisation of eigenfunctions in one-dimensional high-contrast problems with a defect. *To appear in SIAM Journal on Mathematical Analysis*
- [A:3] (with Cherednichenko, K.) Asymptotic behaviour of the spectra of systems of Maxwell equations in periodic composite media with high contrast. *To appear in Mathematika*.
- [A:4] (with Bellieud, M.) 2017. Asymptotic analysis of stratified elastic media in the space of functions with bounded deformation. *SIAM Journal on Mathematical Analysis (SIMA)* Vol. 49, No. 5: 4275-4317.
- [A:5] (with Bellieud, M.) 2016. Analyse asymptotique de milieux élastiques stratifiés dans les espaces de fonctions à déformation bornée. (**trans.** Asymptotic analysis of elastic stratified media in the space of functions with bounded deformation) *Comptes Rendus Mathématique*, **354**(4), pp.437-442.
- [A:6] (with Cherednichenko, K.) 2016. Resolvent estimates for high-contrast elliptic problems with periodic coefficients. *Archive for Rational Mechanics and Analysis*, **219**(3), pp.1061-1086.
- [A:7] (with Cherednichenko, K.) 2015. On the existence of high-frequency boundary resonances in layered elastic media. *Proceedings of the Royal Society A*, **471**(2178).
- [A:8] (with Cherednichenko, K.) 2015. Homogenisation of the system of high-contrast Maxwell equations. *Mathematika*, **61**(02), pp.475-500.
- [A:9] (with Cherednichenko, K., Guenneau, S.,) 2015. Spectral analysis of one-dimensional high-contrast elliptic problems with periodic coefficients. *Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal*, **13**(1), pp.72-98.
- [A:10] 2013. Homogenisation and spectral convergence of a periodic elastic composite with weakly compressible inclusions. *Applicable Analysis*, **93**(7), pp.1401-1430.

## SUBMISSIONS AND PREPRINTS

- [A:11] Cooper, S., Savostianov, A. (2018). Homogenisation with error estimates of attractors for the damped anisotropic semi-linear wave equation. *In preparation*
- [A:12] Cooper, S., Kamotski, I., Smyshlyaev, V. (2018). A general framework for the homogenisation of high-contrast problems; asymptotics and operator-type error estimates. *In preparation*
- [A:13] Cooper, S., Waurick, M. (2017). Fibre Homogenisation. *Preprint available at <https://salcooper.co.uk>*
- [A:14] (with Kamotski, I., Smyshlyaev, V.) (2016) On band gaps in Photonic Crystal Fibres. *Preprint available at <https://arxiv.org/abs/1411.0238>*.

## PHD THESIS

- [A:15] *Two-scale homogenisation of partially degenerating PDEs with applications to photonic crystals and elasticity*. 2012, University of Bath.

## MSc THESIS

- [A:16] *Non-classical homogenisation, related analytical tools and applications to dynamic problems with partially high contrasts*. 2007, University of Bath.

These publications, submissions and pre-prints are available at <http://salcooper.ac.uk>.

**BOOK CHAPTER**

- [A:17] (with Antonakakis, T., Cherednichenko, K., Guenneau, S. and Craster. R.,) 2012. “Homogenisation techniques for periodic structures” in: *Gratings: Theory and Numeric Application* (ISBN: 978-2-85399860-4), Fresnel Institute.