

CURRICULUM VITAE
SHANE COOPER

PERSONAL DETAILS

Email: s.cooper@ucl.ac.uk;

Personal webpage: <http://salc24.azurewebsites.net/>

CURRENT POSITION

Lecturer in Applied Mathematics at University College London since *1st September 2019*.

PREVIOUS POSTS

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| 03/18-09/19 | EPSRC Postdoctoral Research Fellow and Independent Willmore Research Fellow at Durham University, UK. |
| 04/15-03/18 | EPSRC Postdoctoral Research Fellow (at University of Bath, UK until 06/17 then transferred to Durham University, UK until completion). |
| 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 | Leverhulme Fellow at Cardiff University, WIMCS, UK. |

GRANTS

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| 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 GB1507537.7). SUBMITTED 1st May 2015.

AWARDS

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

CONFERENCES ORGANISED AND CONDUCTED

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| 10-14/07/2024 | Asymptotics 2024 — A conference on <i>Mathematical homogenisation and stability of differential equations</i> , at Tu Frieberg, Germany. Joint organised with Professor Marcus Waurick. |
| 18-19/07/18 | <i>Recent advances in Homogenisation theory</i> , Durham University, UK. |

RESEARCH HIGHLIGHTS TO DATE

- RECENTLY COMPLETED A CRUCIAL COMPONENT OF A LONG TERM PROJECT (AT UCL) TO DEVELOP A GENERAL THEORY FOR QUANTITATIVE ASYMPTOTIC ANALYSIS OF MULTI-SCALE PROBLEMS that arise in the physics of metamaterials. This work has forms a substantial article submitted to the world leading mathematics journal *Inventiones Mathematicae*. [A:1].
- INDEPENDENTLY INTRODUCED AND DEVELOPED THE NOTION OF ‘QUASI-PERIODIC TWO-SCALE CONVERGENCE’ to study wave phenomena due to scale-interactions in highly heterogeneous complex media, see my single-author publication in a top journal in the field [A:5].
- INTRODUCED AND DEVELOPED A NOTION OF ‘OPERATOR ASYMPTOTICS’ to study degenerate PDEs realisable in the study of multi-scale wave phenomena in heterogeneous media, see my work in another top journal [A:7]. This work provided the first of such results in the field.
- DISCOVERED A NOVEL WAVE IN PERIODIC MEDIA which finds applications in areas such as acoustic dampening, and invented a ‘Composite Elastic Wave Waveguide’; patent GB1507537.7.

RESEARCH STUDENT SUPERVISION AT UCL

Summer 23	Successfully applied for funding, interviewed, and supervised, a MAPS Summer Research Intern.
Summer 22	Successfully applied for funding, interviewed, and supervised, two MAPS Summer Research Interns.

TEACHING AND ADMINISTRATIVE DUTIES AT UCL

2024 - to date	Introduced and started teaching the module MATH0115: Solid Mechanics.
2023 -2024	Lecturing Advanced Mathematical Modelling Techniques (MATH0065)
03/2023	Acted as a panel member for the newly launched bursary scheme for undergraduates and PGT students.
09/2022	Successfully achieved FHEA.
2022 - To date	Chair of the Board of Examiners for the Mathematical Modelling MSc.
2021 - To date	Programme coordinator for the Maths & Stats degree programme.
2019- 2024	Lecturing Mathematical Methods 5 (MATH0027)
2019	Lectured Mathematical Methods 1 (MATH0010) (as emergency cover for Professor R. Halburd.)

RECENT SEMINAR TALK INVITATIONS

24-25/11/22	Oberseminar Analysis at TU Dresden, invited by Professor Ralph Chill.
21-23/11/22	Analysis seminar at TU Freiberg, invited by Professor Marcus Waurick.

RECENT INTERNATIONAL CONFERENCE TALK INVITATIONS

19-23/05/24	’Analysis, homogenization, and spectral problems in materials science’ at the forthcoming SIAM Conference on Mathematical Aspects of Materials Science in Pittsburgh, USA.
18-22/05/20	SIAM Conference on Mathematical Aspects of Materials Science (MS2020), (originally planned for Bilbao, Spain).
March - June 2020	Summer school on “Evolutionary Equations”, the 23rd Internet Seminar Series.

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PUBLICATIONS LIST

SHANE COOPER

These publications, submissions and pre-prints are available at <http://salc24.azurewebsites.net/>.

1. (with Kamotski, I.) (2024) On photonic band gaps in two-dimensional photonic crystal fibres. Analysis in the vicinity of the low-dielectric light line. *Submitted*.
Available at <http://arxiv.org/abs/2501.10536>.
2. (with Essadeq, I., Waurick, M.) (2024). Fibre homogenisation for time dependent problems. *Submitted*.
Available at <https://arxiv.org/abs/2407.09148>.
3. (with Kamotski, I., Smyshlyaev, V.) (2023). Quantitative multiscale operator-type approximations for asymptotically degenerating spectral problems. *Submitted*.
Available at <http://arxiv.org/abs/2307.13151>.
4. (with Davies, B., et. al.) (2023) Roadmap to metamaterial theory, modelling and design. *Submitted to J. Phys. D: Appl. Phys.: JPhysD-137024*.
5. (with Waurick, M.) 2019. Fibre Homogenisation. Journal of Functional Analysis, (2019) Volume 276, Issue 11 Pages 3363-3405.
6. (with Savostianov, A.) 2019. Homogenisation with error estimates of attractors for damped semi-linear anisotropic wave equations. Advances in Nonlinear Analysis, (2019) Volume 9, Issue 1.
7. 2018. Quasi-periodic two-scale homogenisation and effective spatial dispersion in high-contrast media. *Calculus of Variations and PDE's*, 57:76. <https://doi.org/10.1007/s00526-018-1365-3>
8. (with Cherdantsev, M. Cherednichenko, K.) 2018. Extreme localisation of eigenfunctions in one-dimensional high-contrast problems with a defect. *SIAM Journal on Mathematical Analysis* Vol. 50, No. 6: 5825-5856.
9. (with Cherednichenko, K.) 2018. Asymptotic behaviour of the spectra of systems of Maxwell equations in periodic composite media with high contrast. *Mathematika*, **64** (2), pp. 583-605.
10. (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.
11. (with Bellieud, M.) 2016. Analyse asymptotique de milieux élastiques stratifiés dans les espaces de fonctions á 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.
12. (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.
13. (with Cherednichenko, K.) 2015. On the existence of high-frequency boundary resonances in layered elastic media. *Proceedings of the Royal Society A*, **471**(2178).
14. (with Cherednichenko, K.) 2015. Homogenisation of the system of high-contrast Maxwell equations. *Mathematika*, **61**(02), pp.475 - 500.
15. (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.
16. 2013. Homogenisation and spectral convergence of a periodic elastic composite with weakly compressible inclusions. *Applicable Analysis*, **93**(7), pp.1401 - 1430.

PHD THESIS

Two-scale homogenisation of partially degenerating PDEs with applications to photonic crystals and elasticity.
2012, University of Bath.

MSC THESIS

Non-classical homogenisation, related analytical tools and applications to dynamic problems with partially high contrasts. 2007, University of Bath.

BOOK CHAPTER

(with Antonakakis, T., Cherednichenko, K., Guenneau, S. and Craster. R.,) 2012.

“Homogenisation techniques for periodic structures” chapter in the book

Gratings: Theory and Numeric Application (ISBN: 978-2-85399860-4), Fresnel Institute.