Curriculum Vitae

Name: **Kirill Cherednichenko**
Work Address: Department of Mathematical Sciences, University of Bath, Claverton Down, Bath, UK
E-mail: K.Cherednichenko@bath.ac.uk
Telephone: +44 (0)1225 386891
Born: 18 June 1975, Sevastopol, USSR
Nationality: United Kingdom
URL: `http://people.bath.ac.uk/kc525`

Academic Employment

Currently: Professor of Applied Analysis, University of Bath; **Jul 2014 – Jan 2021:** Reader in Mathematics, University of Bath; **Oct 2006 – Jun 2014:** Lecturer, then Senior Lecturer in Mathematics, Cardiff University; **Oct 2005 – Sep 2006:** Postdoctoral Research Associate, Department of Applied Mathematics and Theoretical Physics, University of Cambridge; **Oct 2001 – Sep 2005:** Junior Research Fellow in Mathematics, St. John's College, University of Oxford.

Education and Qualifications

May 2009: Postgraduate Certificate in University Teaching and Learning, Cardiff University; **Nov 1998 – Nov 2001:** PhD Course in Mathematics under the supervision of V. P. Smyshlyaev, University of Bath. PhD awarded in December 2001. Viva date: August 2001. Thesis title: "Higher-order and non-local effects in homogenisation of periodic media"; **July 1998:** First-class diploma degree (equivalent of MSc) with distinction in Mathematics from St. Petersburg State University, Russia. Research project (MSc Dissertation) under the supervision of V. M. Babich. Dissertation title: "Asymptotic expansion of Fock's type for solutions of linear ordinary differential equations of second order with a singular point and a large parameter"; **Sep 1993 – Jul 1998:** Undergraduate studies at the Department of Mathematics and Mechanics, St. Petersburg State University, Russia. Division of Mathematics, specialisation in Partial Differential Equations and Applications.

Research Funding

Current grants:

LMS Conference Grant: Feb 2022 – Apr 2023 (Conference "British Mathematics Colloquium 2023". Value: £15K)

EPSRC, Responsive Mode Grant: Oct 2021 – Sep 2024 (Project title: "Quantitative tools for upscaling the micro-geometry of resonant media". Value: £394K);

University of Bath, International Funding Scheme: Jan – Dec 2020 (Project title: "From functional models of operator theory to materials science: new vistas through Bath-UNAM partnership". Value: £9.9K)

CONACyT, Mexico (Co-I) "The evolution of active zones in tectonic plates: a mathematical approach based on low-frequency flexural vibrations" (Value: £100K)

Previous grants:

Engineering and Physical Sciences Research Council (EPSRC), Fellowship: July 2014 – June 2019 (Project title: "Mathematical foundations of metamaterials: homogenisation, dissipation and operator theory". Value: £899K)

London Mathematical Society (LMS), Research in Pairs: Feb – Sep 2019 (Collaboration with I. Velčić, University of Zagreb. Value: £1K); Mar – Jun 2021 (Collaboration with Josip Žubrinic, University of Zagreb. Value: £1K)

LMS Conference Grant: Jun 2018 – Jan 2019 (Conference "Operators, Operator Families and Asymptotics II". Value: £5.8K)

Royal Society – Newton Mobility Grant: February 2017 – January 2019 (Project title: "Homogenisation of degenerate equations and scattering for new materials". Value: £12K)

EPSRC Impact Acceleration Account: September 2016 – March 2017 (Project title: "New wave-damping composites". Value: £6.3K)

LMS Conference Grant: Nov 2015 (Conference "Operators, Operator Families and Asymptotics". Value: £6.8K)

University of Bath, Global Mobility Scheme: Mar 2015 – June 2016 (Project title: "Functional models for applied analysis: from Jacobi matrices to invisibility". Value: £4.9K)

LMS, Joint Research Groups in the UK: Jan – Sep 2015 (Workshop Series "LMS-WIMCS Analysis Day". Value: £1.5K)

Leverhulme Trust Grant RPG-167 (Co-Investigator): Apr 2012 – Mar 2013 (Project title: "Dissipative and non-self-adjoint problems". Value: £161K)

EPSRC, Responsive Mode Grants: Nov 2011 – Oct 2012 (Project title: "The mathematical analysis and applications of a new class of high-contrast photonic band-gap composite media". Value: £23.4K); Nov 2008 – Oct 2010 (Project title: "Variational convergence for nonlinear high-contrast homogenisation problems". Value: £183.6K)

Cardiff University, International Collaboration Fund Award — Early Stage Researcher: May 2008 (For a visit by Prof. V. V. Zhikov. Value: £3.2K)

LMS, Conference Grants: Jul 2008 (Conference organised: "South-West UK Analysis Meeting". Value: £2.5K); Feb 2008 (Conference organised: "Non-classical, boundary and localisation phenomena in mathematical homogenisation" Value: £3.1K); Feb 2007 (Conference organised: "Perturbed periodic PDE, problems with singular boundaries and their numerical aspects". Value: £2.5K)

Wales Institute of Computational and Mathematical Sciences (WIMCS), Conference Grant, Apr 2008 (Conference organised: "Non-classical, boundary and localisation phenomena in mathematical homogenisation" Value: £0.9K)

LMS, Collaborative Grants: Oct 2007 (Collaborator: P. Padilla. Value: £0.6K); Mar 2006 (Collaborators: V. M. Babich, V. V. Zhikov. Value: £0.5K)

Research Supervision

Postdocs:

J. Žubrinić (Mar – Jun 2021), R. Castaneira (Oct 2018 – Mar 2019), Y. Ershova (Feb 2016 – Jul 2018), J. Roberts (Nov 2016 – Mar 2017), M. Waurick (Oct 2015 – Sep 2017), M. Cherdantsev (Oct 2008 – Sep 2010), S. Cooper (Apr 2012 – Mar 2013), K. Kuliev (Sep 2012 – Aug 2013)

PhD students:

Y. S. Lim (Oct 2019 – Sep 2023), Project title: "Localisation of waves in resonant random media";

W. Graham (Oct 2018 – Jun 2022, PhD awarded), Project title: "Asymptotic and numerical analysis of wave propagation in photonic fibres with a thin-structure cladding";

A. Pim (Sep 2017 – Dec 2021, PhD awarded), Project title: "Asymptotic and variational methods for the study of defects in liquid crystals";

S. D'Onofrio (Sep 2016 – Mar 2020, PhD awarded), Thesis title: "Operator-theoretic methods in homogenisation of singular periodic structures";

M. Lewis (Sep 2014 – Mar 2018, PhD awarded), Thesis title: "Stability of solutions of a one-dimensional p-Laplace equation with periodic potential";

J. Evans (Sep 2012 – Mar 2016, PhD awarded), Thesis title: "Some analytical techniques for partial differential equations on periodic structures and their applications to the study of metamaterials".

MPhil students:

R. Hicks (Sep 2010 – Jun 2013; Project title: "Boundary effects in high-contrast composite media"), A. Burgmann (Sep 2008 – Nov 2009; Project title: "Averaging for spectral problems in high-contrast materials").

MMath students:

F. Maxey-Hawkins, D. Gardham (Jun 2016 – May 2017, Project title: "The derivation and numerical analysis of dispersion relations for surface waves in stratifies elastic media"); L. Steyer (Jan – June 2014, Project title: "Scattering theory"); M. Corkhill (Sep 2011 – May 2012; Project title: "Ray theory and its applications in mechanics"); J. Evans (Sep 2011 – May 2012; Project title: "Calculus of variations and its applications in the mechanics. of solids")

MSc student:

G. Grishchenko (Feb – Sep 2020, Project title: "Experimental analysis of 3D-printed acoustic stealth structures")

Undergraduate project students:

R. Braymuk (Nov 2018 – June 2019), M. Tasic (Jan 2018 – May 2020), J. Larsson (Sep 2010 – Jun 2011); D. Hughes, N. Prowse (Sep 2008 – Jun 2009),

Mentoring and Network Activities

— David Parkin Visiting Professorship: U. Smilansky, Wezmann Institute (Sep 2021 – Mar 2022)

— EPSRC Postdoctoral Fellowships: M. Cherdantsev (2010–2013, Cardiff), S. Cooper (2015–2017, Bath)

— Consortium "Universidades por la Ciencia" ("Universities for Science") (May – Nov 2021): `https://twitter.com/UniversidadesX`

— Weekly research seminar "Operators, Asymptotics and Functionals" (Jan 2016 – present): `http://people.bath.ac.uk/kc525/Seminar/programme.html`

— Bath-UNAM-CIMAT ("BUC") Research Series (Apr 2015 – present): `http://buc.cimat.mx/`

— Examination of PhD theses:

J. Žubrinić, University of Zagreb, 2022: *"Spectral analysis of thin heterogeneous elastic structures"*

M. Evans, University of Bath, 2019: *"The extrudate swell singularity of viscoelastic fluids"*

J. Harris, University of Bath, 2018: *"Singularities in nematic liquid crystals: statics and dynamics for new applications"*

X. Pellet, University of Bath, 2017: *"Variational models of particle tystems and Their macroscopic limits"*

A. Rahimabadi, Cardiff University, 2014: *"Error-controlled adaptive multiscale method for fracture in polycrystalline materials"*

Y. Ershova, Ukraine National Academy of Sciences (Institute of Mathematics), 2014: *"Inverse spectral problems for classical and quantum graphs"*

Y. Liu, École Centrale Marseille, 2013: *"Homogénéisation à toute fréquence et optique transformationelle dans des milieux bianisotropes"*

— Examination of habilitation thesis:

M. Waurick, Technische Universität Dresden, 2016: *"On the continuous dependence on the coefficients of evolutionary equations"*

Visiting Research Appointments

Jul – Sep 2012: Visiting CNRS Researcher, Fresnel Institute, Aix-Marseille Université, France

Apr – May 2022: Research Fellowship, ITMO University, St. Petersburg, Russia (curtailed due to war in Ukraine)

Invited Research Visits

Jun 2019: Hausdorff Center for Mathematics, Bonn; Apr 2019: IIT Bombay, India; Apr 2018: University of Santiago, Chile; Mar 2018: University of Helsinki, Finland; Jan 2018, Feb 2017: University of Freiburg, Germany; May 2017: University of Zagreb; Oct 2015: TU Dresden, Germany; May 2015: University of Utah; Apr 2012, Nov 1998: Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany; Aug 2018, Jun 2015, Dec 2013, Aug 2007, Dec 2003: Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas (IIMAS), UNAM, Mexico; Aug 2018, Aug 2016, Sep 2012, Jan 2003, Nov 2001: Departement de Mecanique et Genie Civil, Université Montpellier II, France; Feb-Mar 2019, Mar-Apr 2015, Sep-Dec 1999: Isaac Newton Institute for Mathematical Sciences, Cambridge, UK; Oct 2010, Feb 2015, Apr 2020: Basque Center for Applied Mathematics, Bilbao, Spain.

Conferences Organised

Jul-Aug 2023: LMS-Bath Symposium "Operators, Asymptotics, Waves" (University of Bath)

Apr 2023: British Mathematics Colloquium (University of Bath)

BUC (Bath-UNAM-CIMAT) & CUWB (CIMAT-UNAM-Warwick-Bath) workshop series:

— May 2023 (CUWB-I): Recent progress in quantitative analysis of multiscale media (University of Split);

— January 2023 (BUC-XX): Explicitly solvable models and their applications to current challenges in mechanics and wave propagation (CIMAT, Mérida);

— July 2022 (BUC-XIX): Threshold Phenomena in Spectral Analysis and Their Applications to Waves and Tectonics (UMAR, Huatulco, Mexico; IIMAS-UNAM, Mexico City);

— January 2019 (BUC-XVI): Recent Developments in Wave Propagation and Their Application to New Materials (CIMAT, Mérida);

— Sep 2019 (BUC-XVI): "Resonant" Media: Wave Scattering Phenomena under Strong Length-Scale Interactions, (UNAM, México City);

—- Sep 2018 (BUC-XV): Function Spaces Meet Materials Science: Recent Developments in Spectral Theory and Scattering (CIMAT Guanajuato, México);

— Mar 2018 (BUC-XII): Asymptotic and Operator-Theoretic Techniques for the Analysis of Time-Dispersive Media (University of Bath);

— Nov-Dec 2017 (BUC-XI): Advances in the Mathematics of Multiple Scales (CIMAT Mérida);

— Mar-Apr 2017 (BUC-VII): Spring School on Analysis and Applications to Mathematical Physics and Materials Science (UNAM, Mexico City) and Applied Analysis of Operators, PDE, and Functionals (CIMAT Mérida);

Jan 2019: Operators, Operator Families, and Asymptotics II (University of Bath);

May 2016: Operators, Operator Families, and Asymptotics I (University of Bath);

Dec 2015 (University of Bath), Jan 2014 (Cardiff University): LMS-WIMCS Analysis Day;

Dec 2012, May 2012: Dissipative Spectral Theory: Operator Theory, PDEs and Numerics (Cardiff University);

Jun 2011: Metamaterials and high-contrast homogenisation: analysis, numerics and applications (Cardiff University);

Jan 2009: South-West UK Analysis Meeting (University of Bath);

Aug 2008: Non-classical, boundary and localisation phenomena in mathematical homogenisation (Cardiff University);

Sep 2007: Perturbed periodic PDE, problems with singular boundaries and their numerical aspects (Cardiff University).

Total number of speakers: 280

Prizes and Awards

Junior Research Fellowship, St. John's College, University of Oxford: Sep 2001 – Sep 2005.

Overseas Research Studentship (ORS), CVCP: Nov 1998 – Nov 2001.

Soros Studentship in Mathematics: Mar 1997 – Oct 1998.

Research Highlights (in reverse chronological order)

11. Establishing the link between time/frequency dispersion in equations of continuum mechanics and the averaging (coarse-graining) of heterogeneous media: Publications [39, 38, 36].

10. Stochastic formulation of the homogenisation problem for degenerate PDE and new results for the overall behaviour of high-contrast composites and their spectral properties: [33].

9. Phenomenon of super-exponential decay of localised eigenfunctions in composite media with high contrast: [32].

8. Connecting abstract results of operator theory (Krein formula, functional model for non-selfadjoint operators) and the asymptotic analysis of differential operators in materials science: [29, 25].

7. Bending of periodic nonlinearly elastic plates: settling the case when plates are described by isometric surfaces on the microscale; the derivation of a new set of nonlinear constraints" [22]

6. Discovery and quantitative description of a new type of surface waves in stratified elastic media, for which the boundary displacement vanishes: [20].

5. A new transform-asymptotic approach for the analysis of periodic problems with degeneracies, proof of sharp operator-norm resolvent estimates, a new rationale for mathematical homogenisation via "operator asymptotics": [30, 23].

4. The new method of two-scale Γ-convergence for the analysis of a class of nonlinear multiscale problems with degeneracies: [26, 18].

3. Existence and the analysis of properties of guided, surface and interface elastic and electromagnetic waves: [15, 13, 12, 11, 8, 6].

2. Mathematical framework for phenomenological theories of size effects in the elasticity and plasticity of continuous media with microstructure: [4, 2].

1. Uniform asymptotic expansions for solutions of second-order ordinary differential equations with degeneracies: [3, 1].

Invited Talks at International Conferences

Euromech Colloquium on Mechanics of High-Contrast Composites, Keele University (September 2021) – Title: "Sharp operator-norm asymptotics for thin elastic plates with rapidly oscillating periodic properties"

Quantum Mechanics of Artificial Material Structures, Sochi Mathematics Centre, Russia (February 2020) — Title: "Functional model for extensions of symmetric operators and applications to scattering theory"

OTAMP 2020: Operator Theory, Analysis and Mathematical Physics, UNAM, México (January 2020) — Title: "Periodic PDEs with critical contrast: unified approach to homogenisation and links to time-dispersive media"

Small Scales and Homogenisation, Cardiff University (June 2019) – Title: "Effective behaviour of critical-contrast PDEs: micro-resonances, frequency conversion, and time dispersive properties"

Dynamic Phenomena in Media with Microstructure, Tel-Aviv University (October 2018) — Title: "Time-dispersive behaviour as a feature of critical-contrast media"

Calculus of Variations and Applications, University of Zagreb (September 2018) — Title: "Unified approach to critical-contrast homogenisation of PDEs, and their link to time-dispersive media"

Applied Analysis Day, TU Dresden (June 2018) – Title: "Dispersive effective behaviour of high-contrast periodic media"

SIAM Conference of Mathematical and Computational Issues in the Geosciences 2017 (September 2017) — Title: "Homogenisation of thin periodic frameworks with high-contrast inclusions"

Partial Differential Equations, Optimal Control and Numerics, Benasque, Spain (August 2017) — Title: "Boundary triples, Krein formula, and resolvent estimates for one-dimensional high-contrast periodic problems"

9th St. Petersburg Conference in Spectral Theory, dedicated to the memory of M. Sh. Birman (July 2017) — Title: "Functional model for extensions of symmetric operators and applications to scattering theory"

International Conference on Elliptic and Parabolic Problems, Gaeta, Italy (May 2017) — Title: "Resolvent estimates for high-contrast elliptic problems with periodic coefficients"

InterPore: 9th International Conference on Porous Media, TU Delft, The Netherlands (May 2017) — Title: "Extreme localisation property for eigenfunctions of one-dimensional high-contrast periodic problems with a defect"

Mathematical and Computational Aspects of Maxwell's Equations, EPSRC Durham Symposium (July 2016) — Title: "Homogenisation of the system of high-contrast Maxwell equations"

New Trends in Nonlinear PDEs: from Theory to Applications, Cardiff University (June 2016) — Title: "Homogenisation in finite elasticity for composites with a high contrast in the vicinity of rigid-body motions"

Computational and Analytic Problems in Spectral Theory, Cardiff University (June 2016) — Title: "Boundary triples, Krein formula and resolvent estimates for one-dimensional high-contrast periodic problems"

Spectral Theory of Novel Materials, CIRM, Marseille (April 2016) — Title: "Asymptotic behaviour of the spectra of systems of Maxwell equations in periodic composite media with high contrast";

Spectral Theory and Applications, Stockholm University (March 2016) – Title: "Resolvent estimates for one-dimensional high-contrast problems via boundary triples"

Mathematics of Novel Materials, Mittag-Leffler Institute, Sweden (June 2015); Partial Differential Equations, Optimal Control and Numerics, Benasque, Spain (August 2015) – Title: "Resolvent estimates for high-contrast elliptic problems with periodic coefficients"

Periodic and Other Ergodic Problems, Isaac Newton Institute, Cambridge, UK (April 2015) – Title: "Bending of thin periodic plates"

Crimean International Mathematics Conference, Sudak, Ukraine (Sep 2013) – Title: "On resolvent estimates for homogenisation problems with high contrast"

ETOPIM9, Marseille, France (Sep 2012) — Title: "Band-gap effects in one-dimensional high-contrast periodic media"

Analytic and Computational Techniques in Spectral Theory and Related Topics, Gregynog, UK (June 2011) – Title: "High-frequency spectral analysis of thin periodic acoustic strips"

"Multiscale Methods and Qualitative Properties of Differential Operators (V. V. Zhikov's 70th Anniversary)", Naples, Italy (May 2011); "Equadiff", Loughborough University, UK (Sep 2011) — Title: "Homogenization in finite elasticity for composites with a high contrast in the vicinity of rigid-body motions"

"Differential Equations and Dynamical Systems", Suzdal, Russia (Jul 2010) — Title: "Homogenisation of nonlinear composites via two-scale Γ-convergence"

"Microscopic Models of Plastic Evolution", University of Warwick, UK (Sep 2007) — Title: "Plastic shear of a thin film via homogenisation of the dislocation transport"

"Multi-scale problems: modelling, analysis and applications", University of Bath, UK (Sep 2005) — Title: "Variational and asymptotic approaches to higher-order effects in periodic composites via homogenisation"

"Multiscale Methods in Nonlinear PDE", Isaac Newton Institute, Cambridge, UK (Apr 2001) — Title: "On full asymptotic expansion of the solutions of nonlinear periodic rapidly oscillating problems"

Invited Seminars at Mathematics Departments

Aberystwyth (2009), Bath (2008, 2010), BCAM Bilbao (2010, 2015), Birmingham (2010, 2023), Bristol (2009), University of Buenos Aires (2017), Cambridge (2007), Cardiff (2003, 2015, 2018), CMM, University of Chile (2018), TU Dresden (2015), ETH Zürich (2021), Freiburg (2017, 2018), Helsinki (2018), Imperial College London (2006, 2012), Keele (2019), King's College London (2011), Liverpool (2006), TU Munich (2009), Pontificia Universidad Católica, Santiago de Chile (2018), Saint-Étienne (2018), St. Petersburg (2018), Steklov Institute (2020), Surrey (2014), Sussex (2017), University College London (2010, 2012), Kings College London (Paris-London Analysis Seminar, 2014), University of Utah (2015), Zagreb (2018)

Invited lectures at Research Schools

QJMAM/IMASummer School on Asymptotics of PDEs and Modelling of Waves (University of Liverpool, July 2021)

Mini-courses in Mathematical Analysis (University of Padova, June 2021)

Academic Community Service

— Fellow of the Institute for Mathematical Innovation, University of Bath (Mar 2021 – present)

— Editorial Board Member for Differential Equations and Applications (2019 – present)

— Member of the London Mathematical Society (2008 – present)

— EPSRC College Full Member (2012 – present)

— Editorial reviewer for international mathematics and mechanics journals:

American Mathematical Society Translations, Annales de l'Institut Henri Poincaré (C) Analyse Non Linéaire, Applicable Analysis, Archive for Rational Mechanics and Analysis, European Journal of Applied Mathematics, European Journal of Mechanics A, Journal de Mathématiques Pures et Appliquées, IMA Journal of Applied Mathematics, Journal of the Mechanics and Physics of Solids, Multiscale Modelling and Simulation (SIAM), Networks and Heterogeneous Media (AIMS), Proceedings of the Royal Society A, Proceedings of the Royal Society of Edinburgh A, Quarterly Journal of Mechanics and Applied Mathematics, SIAM Journal on Applied Mathematics, SIAM Journal on Mathematical Analysis, St. Petersburg Mathematical Journal, Wave Motion

University Service

— Chair of the MSc Working Group, Department of Mathematical Sciences, University of Bath (2019 – present)

— Member of the Board of Studies (Faculty of Science Representative), Faculty of Engineering & Design, University of Bath (2016 – present)

— Chair of Mathematics Subject Board, School of Mathematics, Cardiff University (2007 – 2009)

List of Publications

Journal Papers: Refereed

46. (with I. Velčić, J. Žubrinić) Operator-norm resolvent estimates for thin elastic periodically heterogeneous rods in moderate contrast *To appear in Calculus of Variations and Partial Differential Equations,* 55 pp. *arXiv: 2112.06265*.

45. (with M. Bužančić, I. Velčić, J. Žubrinić) Spectral and evolution analysis of composite elastic plates with high contrast. *Journal of Elasticity* **152**, 79–177 (2022)

44. (with Yu. Yu. Ershova, A. V. Kiselev, V. A. Ryzhov, L. O. Silva) Asymptotic analysis of operator families and applications to resonant media. *To appear in Operator Theory: Advances and Applications,* 62 pp., arXiv: 2204.01199.

43. (with S. D'Onofrio) Operator-norm homogenisation estimates for the system of Maxwell equations on periodic singular structures. *Calculus of Variations and Partial Differential Equations* **61**(67), doi: 10.1007/s00526-021-02139-7, 41 pp. (2022)

42. (with A. Kiselev and L. Silva) Operator-norm resolvent asymptotic analysis of continuous media with low-index inclusions. *Mathematical Notes* **111**(3–4), 373–387 (2022)

41. (with I. Velčić) Sharp operator-norm asymptotics for thin elastic plates with rapidly oscillating periodic properties. *Journal of the London Mathematical Society* **105**(3), 1634–1680 (2022)

40. (with A. Kiselev and L. Silva) Functional model for boundary-value problems. *Mathematika* **67**(3), 596–626 (2021)

39. (with A. V. Kiselev and L. O. Silva) Scattering theory for a class of non-selfadjoint extensions of symmetric operators. Analysis as a Tool in Mathematical Physics. *Operator Theory: Advances and Applications* **276**, 194–230 (2020)

38. (with Yu. Yu. Ershova and A. V. Kiselev) Effective behaviour of critical-contrast PDEs: micro-resonances, frequency conversion, and time dispersive properties. I. *Communications in Mathematical Physics* **375**, 1833–1884 (2020)

37. (with Y. Ershova, A. Kiselev and S. Naboko) Unified approach to critical-contrast homogenisation with explicit links to time-dispersive media. *Transactions of the Moscow Mathematical Society* **80**(2), 295–342 (2019)

36. (with W. Graham) Frequency-dependent impedance and surface waves on the boundary of a stratified dielectric medium. *Philosophical Transactions of the Royal Society A* **377**(2156), 20190218, 13 pp. (2019)

35. (with Y. Ershova and A. Kiselev) Time-dispersive behaviour as a feature of critical contrast media. *SIAM Journal on Applied Mathematics* **79**(2), 690–715 (2019)

34. (with J. Evans) Homogenisation of thin periodic frameworks with high-contrast inclusions, *Journal of Mathematical Analysis and Applications* **473**(2), 658–679 (2019)

33. (with M. Cherdantsev and I. Velčić) Stochastic homogenisation of high-contrast media. *Applicable Analysis* **98**(1–2), 91–117 (2019).

32. (with M. Cherdantsev and S. Cooper) Extreme localisation of eigenfunctions to one-dimensional high-contrast periodic problems with a defect, *SIAM Journal on Mathematical Analysis* **50**(6), 5825–5856 (2018).

31. (with P. Dondl and F. Rösler) Norm-resolvent convergence in perforated domains. *Asymptotic Analysis* **110**(3–4), 163–184 (2018).

30. (with S. D'Onofrio) Operator-norm convergence estimates for elliptic homogenisation problems on periodic singular structures. *Journal of Mathematical Sciences* **232**(4), 558–572 (2018).

29. (with A. V. Kiselev and L. O. Silva) Functional model for extensions of symmetric operators and applications to scattering theory. *Networks and Heterogeneous Media* **13**(2), 191–215 (2018).

28. (with M. Waurick) Resolvent estimates in homogenisation of periodic problems of fractional elasticity. *Journal of Differential Equations* **264**(6), 3811–3835 (2018).

27. (with S. Cooper) Asymptotic behaviour of the spectra of systems of Maxwell equations in periodic composite media with high contrast. *Mathematika* **64**(2), 583–605 (2018).

26. (with M. Cherdantsev and S. Neukamm) Homogenisation in finite elasticity for composites with a high contrast in the vicinity of rigid-body motions. *Asymptotic Analysis*, **104**(1–2), 67–102 (2017).

25. (with A. Kiselev) Norm-resolvent convergence of one-dimensional high-contrast periodic problems to a Kronig-Penney dipole-type model, *Communications in Mathematical Physics* **349**, 441–480 (2017).

24. (with J. Evans) Full two-scale asymptotic expansion and higher-order constitutive laws in the homogenisation of the system of Maxwell equations, *Multiscale Modeling and Simulation (SIAM)* **14**(4), 1513–1539 (2016).

23. (with S. Cooper) Resolvent estimates for high-contrast homogenisation problems. *Archive for Rational Mechanics and Analysis* **219**(3), 1061–1086 (2016).

22. (with M. Cherdantsev) Bending of thin periodic plates. *Calculus of Variations and Partial Differential Equations* **54**(4), 4079–4117 (2015).

21. (with S. Cooper) Homogenisation of the system of high-contrast Maxwell equations. *Mathematika* **61**(2), 475–500 (2015).

20. (with S. Cooper) On the existence of high-frequency boundary resonances in layered elastic media. *Proceedings of the Royal Society A* **471**, 20140878 (2015).

19. (with S. Cooper and S. Guenneau) Spectral analysis of one-dimensional high-contrast elliptic problems with periodic coefficients. *Multiscale Modeling and Simulation (SIAM)* **13**(1), 72–98 (2015).

18. (with M. Cherdantsev) Two-scale Γ-convergence and its application to homogenisation of high-contrast variational integrals. *Archive for Rational Mechanics and Analysis* **204**(2) 445–478 (2012).

17. Some analogues of the double-porosity models and the associated effect of micro-resonance. *Journal of Mathematical Sciences* **176**(6), 818–827 (2011).

16. An approach to constitutive modelling of elasto-plasticity via averaging of the dislocation transport. *Journal of the Mechanics and Physics of Solids* **58**(5), 798–809 (2010).

15. (with S. D. M. Adams, R. V. Craster and S. Guenneau) High-frequency spectral analysis of thin periodic acoustic strips: theory and numerics. *European Journal of Applied Mathematics* **21**(6), 557–590 (2010).

14. (with N. F. Britton, C. Carrillo and M. Mogie) Dynamic coexistence of sexual and asexual invasion fronts in a system of integro-difference equations. *Bulletin of Mathematical Biology* **71**(7), 1612–1625 (2009).

13. (with F. J. Sabina) On the existence of waves guided by a cavity in an elastic film. *Quarterly Journal of Mechanics and Applied Mathematics* **62**(3), 221–233 (2009).

12. (with G. W. Milton, N.-A. Nicorovici, R. C. McPhedran and Z. Jacob) Solutions in folded geometries and associated cloaking due to anomalous resonance. *New Journal of Physics* **10**(11), 115021 (2008).

11. Asymptotic expansion of the boundary-layer type for flexural waves along the curved edge of a Kirchhoff-Love plate. *J. Math.Sci. (N. Y.)* **142**(6), 2682–2688 (2007).

10. (with S. Guenneau) Bloch-wave homogenisation for spectral asymptotic analysis of the periodic Maxwell operator. *Waves in Random and Complex Media* **17**(4), 627–651 (2007).

9. Two-scale asymptotics for non-local effects in composites with highly anisotropic fibres. *Asymptotic Analysis* **49**(1–2), 39–59 (2006).

8. On propagation of Scholte-Gogoladze waves along a fluid-solid interface of arbitrary shape. *Journal of Mathematical Sciences (New York)* **138**(2), 5613–5622 (2006).

7. (with V. P. Smyshlyaev and V. V. Zhikov) Non-local homogenised limits for composite media with highly anisotropic periodic fibres. *Proceedings of the Royal Society of Edinburgh: Section A* **136**(1), 87–114 (2006).

6. On propagation of attenuated Rayleigh waves along a fluid-solid interface of arbitrary shape. *Quarterly Journal of Mechanics and Applied Mathematics* **59**(1), 75–94 (2006).

5. (with P. Padilla) On derivation of the density of states for periodic operators by the method of asymptotic expansion. *Proceedings of the Edinburgh Mathematical Society* **48**(1), 51–60 (2005).

4. (with V. P. Smyshlyaev) On full two-scale expansion of the solutions of nonlinear periodic rapidly oscillating problems and higher-order homogenised variational problems. *Archive for Rational Mechanics and Analysis* **174**(3), 385–442 (2004).

3. (with V. M. Babich) On a differential equation with a singular point of regular type and a large parameter. *Integral Transforms and Special Functions* **11**(2), 101–112 (2001).

2. (with V. P. Smyshlyaev) On rigorous derivation of strain gradient effects in the overall behaviour of periodic heterogeneous media. *Journal of the Mechanics and Physics of Solids* **48**(6–7), 1325–1357 (2000).

1. (with V. M. Babich) On Fock's type asymptotics of Legendre functions. *Integral Transforms and Special Functions* **5** (1–2), 1–18 (1997).

Book and Proceedings Chapters

"Homogenisation techniques for periodic structures' '(with T. Antonakakis, S. Cooper, S. Guenneau and R. Craster) in: *Gratings: Theory and Numeric Application* (ISBN: 978-2-85399860-4), Fresnel Institute, 2012.

"Global long wave approximations for elastic wave guides" (with J. Kaplunov, D. Prikazchikov, L. Sultanova) in: *EURODYN 2020, XI International Conference of Structural Dynamics,* 2020.

Papers: in Review

R1. Two-scale series expansions for travelling wave packets in one-dimensional periodic media, 16 pp. *arXiv: 1802.05809*.

R2. (with Yu. Yu. Ershova, S. N. Naboko, L. O. Silva) Functional model for generalised resolvents and its application to time-dispersive media, 24 pp. *arXiv: 2111.05387.*

R3. (with M. Cherdantsev, I. Velčić) High-contrast random composites: homogenisation framework and new spectral phenomena, 84 pp. *arXiv: 2110.00395.*

Patent

PCT International Application No. PCT/GB2016/051124 "Subterranean Design Process" (April 2016)

6 April 2022