

Dr. DMITRY PONOMAREV

Technical University of Vienna (TU Wien) / Institute of Analysis and Scientific Computing, Wiedner Hauptstrasse 8, 1040 Vienna, Austria	St. Petersburg Department of Steklov Institute of Mathematics of the Russian Academy of Sciences / Laboratory of Applied, Probabilistic and Algorithmic Methods, Fontanka 27, 191023 Saint Petersburg, Russia <i>(on unpaid leave)</i>
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Date of birth: 22.03.1985 **Place of birth:** Electrostal, USSR

Nationality: Russian **Family status:** Married

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Reference contacts:

- Anton Arnold (anton.arnold@asc.tuwien.ac.at), postdoc advisor and collaborator;
- Iliaria Perugia (ilaria.perugia@univie.ac.at), collaborator;
- Laurent Bourgeois (laurent.bourgeois@ensta-paristech.fr), postdoc advisor and collaborator;
- Eduardo Andrade Lima (limaea@mit.edu), collaborator;
- Stanislas Kupin (stanislas.kupin@math.u-bordeaux.fr), collaborator;
- Juliette Leblond (juliette.leblond@inria.fr), PhD thesis advisor and collaborator;
- Laurent Baratchart (laurent.baratchart@inria.fr), PhD thesis advisor and collaborator;
- Dmitry Pelinovsky (dmpeli@math.mcmaster.ca), MSc thesis advisor and collaborator;
- Sergey Leble (leble@mif.pg.gda.pl), MSc thesis advisor and collaborator;
- Victorita Dolean (victorita.dolean@strath.ac.uk), internship project advisor;
- Stéphane Lanteri (stephane.lanteri@inria.fr), internship project advisor;
- Oleg Nagornov (nagornov@yandex.ru), diploma project advisor and collaborator.

Research keywords:

Applied mathematics, asymptotic analysis, model justification, inverse problems (obstacle identification, inverse magnetization problem), integral and integro-differential equations (e.g. of Wiener-Hopf type) and their discrete analogs (Toeplitz/Hankel matrices), partial data problems (e.g. Cauchy problem for elliptic PDEs), nonlinear wave propagation, approximation theory (approximation by traces of analytic functions), optimal bases construction (spectral theory for convolution operators), complex-analytic methods (Riemann-Hilbert problems, Fourier analysis, etc), hybrid asymptotic-numerical methods for wave propagation (high frequency Helmholtz equation), long-time behavior analysis (time-domain approach to Helmholtz equation / limiting amplitude principle, decay estimates for initial-value problems).

Academic work experience:

1. Jan. 2019 – present (on unpaid leave): St. Petersburg Department of Steklov Mathematical Institute of the Russian Academy of Sciences – researcher.
2. Dec. 2018 – Feb. 2022: Institute of Analysis and Scientific Computing, TU Vienna – post-doctoral fellow (project assistant).
3. Oct. 2016 – Dec. 2018: POEMS laboratory, ENSTA ParisTech – post-doctoral fellow.
4. Oct. 2012 – Jun. 2016: INRIA Méditerranée, APICS research team – Ph.D.

5. *Sep. 2010 – May 2012*: McMaster University, Mathematics and Statistics department – research and teaching assistant, additionally, private tutor in mathematics / physics / electrical and mechanical engineering.
6. *Mar. 2006 – Feb. 2007*: Lyceum 8 (Electrostal) - physics tutor (“Solution Methods for Advanced Physics Problems” course).

Education:

1. *Oct. 2012 – Jun. 2016*: Ph.D. [under supervision of Juliette Leblond and Laurent Baratchart], University of Nice – Sophia Antipolis, INRIA Méditerranée, France.
2. *Sep. 2010 – May 2012*: M.Sc. in mathematics, Department of Mathematics and Statistics, McMaster University [M.Sc. thesis under supervision of Dmitry Pelinovsky].
3. *Sep. 2008 – Jul. 2010*: MathMods - Mathematical Modeling in Engineering: Theory, Numerics, Applications [*graduated with honors*] - international M.Sc. program organized and funded by the European Commission:
 - *Sep. 2008 – Feb. 2009*: Theoretical module - University of L'Aquila, Italy.
 - *Feb. 2009 – Aug. 2009*: Numerics - University of Nice - Sophia Antipolis, France.
 - *Aug. 2009 – Aug. 2010*: Applications (“Advanced computational methods in material science” track) and M.Sc. Thesis [under supervision of Sergey Leble] – Gdansk University of Technology, Poland.
4. *Sep. 2002 – Feb. 2008*: National Research Nuclear University MEPhI (formerly Moscow Engineering Physics Institute, State University), the Faculty of Theoretical and Experimental Physics, the Department of Modeling of Physical Processes in Environment [diploma work under supervision of Oleg Nagornov].
5. *Sep. 2001 – Jun. 2002*: MIPT (Moscow Institute of Physics and Technology, State University) Distance-Learning School of Physics and Mathematics.

Industrial projects / internships:

- ◆ *June 2012 – Aug. 2012*: INRIA (APICS team), Sophia Antipolis, France – pre-doctoral summer project [under supervision of Juliette Leblond and Laurent Baratchart].
- ◆ *May 2009 – Aug. 2009*: INRIA (NACHOS team), Sophia Antipolis, France – industrial training / internship [under supervision of Stéphane Lanteri, Victorita Dolean and Stéphane Descombes].

Awards, fellowships and grants (excluding travel funding provided by an employer):

1. **2021 – Kovalevskaya Grant & Travel Grant from Deutsche Mathematiker-Vereinigung for participation in ICM 2022 (St. Petersburg, Russia).**
2. *2021* – Invited research visit to INRIA Méditerranée (Sophia Antipolis, France).
3. *2021* – Travel bursary from organizers of DK Summer School at Weissensee, Austria.
4. *2021* – Travel bursary from organizers of the 11th Zurich Summer School.
5. *2019* – Travel bursary from organizers for participation in “Classical & Quantum Integrability” conference (Dijon, France).
6. *2019* – Financial support of Gennady Mishuris (Aberystwyth University, UK) for participation in the one-month research program “Bringing pure and applied analysis together via the Wiener-Hopf technique, its generalisations and applications” in Newton Institute of Mathematical Sciences (Cambridge, UK).
7. *2019* – Travel bursary from organisers for participation in UKBIM12 conference (Oxford, UK) through support of London Mathematical Society.
8. *2018* – Bursary from organizers for participation in “Spring school & workshop on inverse problems and approximation techniques in planetary sciences” (Sophia Antipolis, France).
9. *2018* – IMB funding for an invited talk and a further research visit of Stanislas Kupin, Institute of Mathematics (Bordeaux, France).

10. 2017 – GDR AFHP (CNRS) funding for a research visit of Laurent Baratchart and Juliette Leblond (Sophia-Antipolis, France).
11. 2017 – Travel bursary for participation in ASPECT17 conference (Trier, Germany).
12. 2016 – DGA (Direction Générale de l'Armement) 2-year funding for a thematic postdoctoral research with Laurent Bourgeois (ENSTA ParisTech, France).
13. 2015 – Bursary for participation in IHP School on Inverse Problems at CIRM (Marseille, France).
14. 2015 – Invited talk at Jean Kuntzmann lab, Grenoble University (Grenoble, France).
15. 2015 – Invited talk at CMAP, École Polytechnique (Palaiseau, France).
16. 2014 – Invited talk at Analysis seminar, Aix-Marseille University (Marseille, France).
17. 2014-17 – IMPINGE MIT-France project funding for 4 research visits to Boston for collaboration with Eduardo Andrade Lima (MIT, USA) and participation in Shanks Workshop (Nashville, USA).
18. 2012 – Travel bursary for participation in a FUSENET PhD event (Pont-à-Mousson, France).
19. 2012 – École Doctorale STIC (Sciences & Technologies de l'Information et de la Communication) grant for 3-year Ph.D. studies (Nice / Sophia Antipolis, France) complemented by INRIA team (project) funding.
20. 2010-2012 – McMaster University, Department of Mathematics & Statistics graduate school scholarship.
21. 2008-2010 – Erasmus Mundus study grant and scholarship (42 000 EUR) by the European Commission for participating in the two-year international MathMods program awarded on a highly competitive basis.
22. 2008 – Russian national grant for a developer of MEPHI nano-modeling portal.
23. 2007 – Special MEPHI award for research work in modeling of dynamic inflation of a volcanic chamber.
24. 2003-2008 – set of 7 regular and 3 special (for only “excellent” grades in a semester) MEPHI scholarships.
25. 2001-2003 – number of diplomas in physics, mathematics and computer science for successful high-school competitions on a regional level.

Publications / preprints (available for download on my [homepage](#)):

1. A. Arnold, S. Geever, I. Perugia, D. Ponomarev, "On the exponential time-decay for the one-dimensional wave equation with variable coefficients", *Communications on Pure & Applied Analysis* [submitted], 2022.
2. A. Arnold, S. Geever, I. Perugia, D. Ponomarev, "An adaptive finite element method for high-frequency scattering problems with smoothly varying coefficients", *Computers and Mathematics with Applications* [accepted], 2021.
3. D. Ponomarev, "Asymptotic solution to convolution integral equations on large and small intervals", *Proc. R. Soc. A*, 477:20210025, 2021.
4. D. Ponomarev, "Asymptotic solutions of convolution integral equations with even positive definite kernels on a small or large interval", *Proceedings of UKBIM12*, 2019.
5. J. Leblond, L. Baratchart, D. Ponomarev, "Solution of a homogeneous version of Love type integral equation in different asymptotic regimes", *Integral Methods in Science and Engineering*, Springer, 2019.
6. L. Bourgeois, J. Dardé, D. Ponomarev, "An inverse obstacle problem for the wave equation in a finite time domain", *Inverse Problems and Imaging*, 13 (2), 377-400, 2018.
7. L. Baratchart, J. Leblond, E. Lima, D. Ponomarev, "Magnetization moment recovery using Kelvin transformation and Fourier analysis", *Journal of Physics: Conf. Ser.*, 904, 2017.
8. J. Leblond, D. Ponomarev, "On some extremal problems for analytic functions with constraints on real or imaginary parts", *Advances in Complex Analysis and Operator Theory*, 219-236, 2017.
9. J. Leblond, D. Ponomarev, "Recovery of analytic functions with prescribed pointwise values on the disk from partial boundary data", *J. Inverse Ill-Posed Probl.*, 25 (2), 2017.

10. L. Baratchart, J. Leblond, D. Ponomarev "Constrained optimization in classes of analytic functions with prescribed pointwise values", arXiv preprint [<http://arxiv.org/abs/1401.7633>], July 2014.
11. D. Pelinovsky, D. Ponomarev, "Justification of a nonlinear Schrödinger model for laser beams in photopolymers", Z. Angew. Math. Phys. (ZAMP), 65, 405-433, 2014.
12. D. Ponomarev, S. Leble, "Molecular zero-range potential method and its application to cyclic structures", arXiv preprint [<http://arxiv.org/abs/1101.0439>], January 2011.
13. S. Leble, D. Ponomarev, "Dressing of zero-range potentials into realistic molecular potentials of finite range", Task Quarterly, 14, 29-34, 2010.
14. D. Ponomarev, O. Nagornov, "On effective wave propagation characteristics in porous fluid-saturated medium containing fluid inclusions", Geophys. J. Int., 182 (2), 1043-1057, 2010.
15. D. Ponomarev, "High-order time integration leap-frog schemes combined with a Discontinuous Galerkin method for the solution of the Maxwell equations", INRIA preprint [<http://hal.inria.fr/inria-00424560/fr/>], October 2009.
16. O. Nagornov, D. Ponomarev, "Plane wave scattering on spherical inclusions of different types in fluid-saturated porous media" [*accepted with minor revisions in Mechanics of Solids; in Russian*], September 2009.

Works in preparation:

1. "Revisiting the limiting amplitude principle for the wave equation with variable coefficients" (with A. Arnold, S. Geevers, I. Perugia).
2. "On a transformation of Schrödinger equation to a simple first order equation with complex conjugation: theoretical and practical applications".
3. "On some space-time integral equations pertinent to the punch problem with wear".
4. "On the asymptotic extension of convolution theorem for Fourier cosine transform for certain integral equations on half-line".
5. "New method for construction of asymptotic solution for Prandtl lifting line equation".
6. "Recovery of magnetization features from partial field measurements: Fourier and Kelvin transforms approaches" (with J. Leblond, L. Baratchart and E. Lima).

Short conference papers / talks / poster presentations:

1. "Revisiting the limiting amplitude principle", DK Summer School 2021, Weissensee, September 2021.
2. "The limiting amplitude principle for the wave equation with variable coefficients", 11th Zurich Summer School, August 2021.
3. "Convolution integral equations on an interval and asymptotic solution of the related spectral problem", PDE Afternoon (TU Wien & UniVienna joint seminar), Vienna, December 2020.
4. "Kelvin transform and Fourier analysis for explicit reconstruction formulae in paleomagnetic context", The complex analysis toolbox: new techniques and perspectives / Newton Institute workshop, Cambridge, September 2019.
5. "A complex-analysis friendly form of Schrödinger equation with a non-vanishing potential", Classical and Quantum Integrability, Dijon, September 2019.
6. "Spectral theory of convolution operators on finite intervals: small and large interval asymptotics", Factorisation of matrix functions: New techniques and applications / Newton Institute workshop, Cambridge, August 2019.
7. "Constructive asymptotic techniques for integral equations on a finite interval", IWOTA 2019, Lisbon, July 2019.
8. "Asymptotic solutions of convolution integral equations with even positive definite kernels on a small or large interval", UKBIM12, Oxford, July 2019.
9. "Asymptotic solutions of convolution integral equations on large or small intervals under weak kernel assumptions", INRIA Factas team seminar, Sophia Antipolis, June 2019.
10. "Inverse magnetisation problem for ancient rocks: a fruitful encounter of harmonic analysis and paleomagnetism", VSS 2019, Vienna, June 2019.

11. "Spectrum of an operator associated with the Love integral equation", IMSE 2018, Brighton, July 2018.
12. "On obstacle reconstruction for wave equation with partial space-time boundary data" [*extended version*], Waves @ Palaiseau, Palaiseau, July 2018.
13. "On obstacle reconstruction for wave equation with partial space-time boundary data" [*abridged version*], Journée de la Faculté DSIT de NewUni, Palaiseau, June 2018.
14. "Reconstruction of obstacles from partial boundary data for wave equation with finite measurement time", Spring School & Workshop: Inverse Problems and Approximation Techniques in Planetary Sciences , Sophia Antipolis, May 2018.
15. "Spectral decomposition of truncated Poisson operator", ASPECT 2017, Trier, September 2017.
16. "Magnetization moment recovery using Kelvin transformation and Fourier analysis", IMA Conference for Inverse Problems, Cambridge, September 2017.
17. "Magnetization features recovery based on Kelvin transformation and Fourier analysis", NCMIP 2017 [poster presentation], April 2017.
18. "On inverse magnetization problem: magnetic moment recovery from partial measurements", Asymptotic analysis seminar, Faculty of Mathematics and Mechanics, Moscow State University, April 2017.
19. "Spectral decomposition of truncated Poisson operator", Séminaire d'analyse, Institut de Mathématiques de Bordeaux, March 2017.
20. "Magnetization features recovery based on Kelvin transformation and Fourier analysis", PICOF 2016 [poster presentation], June 2016.
21. "On recovery of magnetization moments using Kelvin transformation and Fourier analysis", Shanks workshop, Vanderbilt University, March 2016.
22. "Partially overdetermined problem for Laplace equation: taking the most from measured data while smoothing the boundary", IFIP Conference on System Modeling and Optimization, July 2015.
23. "New methods for inverse problems of paleomagnetism", Jean Kuntzmann laboratory, University of Grenoble, May 2015.
24. "Some inverse problems of paleomagnetism", DEFI team seminar, École Polytechnique, November 2014.
25. "Recovery of harmonic functions from partial boundary data respecting internal pointwise values", AIMS Conference on Dynamical Systems and Differential Equations, Madrid, July 2014.
26. "Bounded extremal problems for analytic functions with pointwise constraints", Séminaire d'analyse et géométrie, Aix-Marseille Université, May 2014.
27. "Justification analysis for a nonlinear Schrödinger model for laser beams in photopolymers", Waves 2013, June 2013.
28. "Equilibrium plasma shape recovery from magnetic measurements in tokamaks", PhD event in Fusion Science and Engineering [poster presentation], October 2012.
29. "Rigorous justification analysis of an NLS approximation for the wave-Maxwell system", APICS team seminar, INRIA, July 2012.
30. "On justification techniques for an NLS model", AIMS lab seminar, McMaster University, October 2011.
31. "On Darboux transformations and zero-range potentials models in quantum mechanics", AIMS lab seminar, McMaster University, March 2011.
32. "Plane wave scattering on solid, fluid and porous inclusions in fluid-saturated porous media" (with O. Nagornov), Proceedings of Moscow Engineering Physics Institute Scientific Session - 2008, January 2008.
33. "Dynamic inflation of a volcanic chamber in elastic half-space" (with O. Nagornov and S. Dunin), Proceedings of Moscow Engineering Physics Institute Scientific Session - 2007, January 2007.

External projects / collaboration:

1. *June 2013 – present:* with Eduardo Lima [Earth, Atmospheric and Planetary Sciences Department, Massachusetts Institute of Technology] – developing mathematical methods

for magnetization recovery from partial measurements of weak fields produced by ancient rocks.

2. *June 2016 – present*: UniConcilium non-profitable start-up project [<http://www.uniconcilium.com>] – medical expert opinion aggregation platform for the Russian healthcare system.

Professional membership:

Institute of Mathematics and its Applications (IMA), UK – Associate Member (since 2017).

Academic community service:

- ◆ Reviews in journals: *Scientific Reports*, *Applied Mathematical Modelling*, *Geophysical Journal International*, *Theoretical Biological & Medical Modelling*, (MDPI) *Mathematics*, *Symmetry*.
- ◆ Reviewer of AMS MathSciNet Mathematical Reviews.
- ◆ Occasional participation in PhD committees and doctoral & postdoctoral selections.
- ◆ Minor contribution to a successful grant proposal (SFB Austria).
- ◆ Informal occasional student mentoring / advising.
- ◆ Participation in the student selection for international M.Sc. program & Erasmus Mundus scholarship InterMaths.

Computer skills:

- ◆ Linux, Inkscape, Gnuplot, LyX, LaTeX, HTML/CSS.
- ◆ Mathematical and computational software: MATLAB, Maple, COMSOL Multiphysics.
- ◆ Programming experience: Fortran, C++, Assembler, Pascal, Perl, PHP, JavaScript.

Languages: English (fluent), French (upper-intermediate), Russian (native).

Teaching experience at McMaster University (*my course notes are available [online](#)*):

1. *Spring 2012*: MATH 3D03 (“Mathematical Physics II”) – tutorials, marking.
2. *Fall 2011*: MATH 3C03 (“Mathematical Physics I”) – tutorials, marking.
3. *Fall 2011*: Participant of the informal weekly “Teaching Math” seminar.
4. *Spring 2011*: MATH 3FF3 (“Partial Differential Equations”) – tutorials, marking.
5. *Fall 2010*: MATH 3DC3 (“Discrete Dynamical Systems and Chaos”) – marking.

Teaching evaluations from students are available upon request.

Non-academic work experience:

1. *Jul. 2006 – Aug. 2008*: SAS Institute (Moscow), Russian office webmaster.
2. *Oct. 1998 – May. 1999*: IntSys – Intellectual Systems (Electrostat), webmaster of local Internet service provider.

Non-academic interests/hobbies:

- running (incl. competitive), biking, hiking, alpine and Nordic skiing
- graphic- and web-design
- music of 1960s-80s, vinyl record collecting