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Education

- Oct. 10 - June 14** | **Ph.D. diploma of École Polytechnique (Palaiseau, France)**, specialty *Applied Mathematics* graduated with highest honors and defended on 12 June 2014 in front of the committee composed of Bruno Després (Pres.), Josselin Garnier (ref.), Boris Galak (exam.), Christophe Hazard (adv.), Patrick Joly (coadv.), Jeffrey Rauch (ref.), Chrysoula Tsogka (exam.) and Ricardo Weder (ref.).
Title: Analysis of two wave propagation phenomena: 1) Space–time focusing in acoustics; 2) Transmission between a dielectric and a metamaterial.
- 2009 - 2010** | **M.Sc. in Numerical Analysis and Partial Differential Equations** of University of Versailles Saint-Quentin-en-Yvelines graduated with highest honors.
- 2007 - 2010** | **M.Sc. in Engineering of ENSTA ParisTech** (Superior National School of Advanced Techniques), specialty *Applied Mathematics*.
- 2004 - 2007** | Undergraduate intensive studies in a national preparatory program for entrance into French engineering Schools in Lycée du Parc, Lyon, France.
- Jun. 2004** | Scientific Baccalaureate, specialty *Mathematics* graduated with highest honors in Lycée du Parc, Lyon, France.

Research experience

- Jan. 18- Pres.** | **CNRS researcher at the Fresnel Institute**, Marseille, France in the team Epsilon with Boris Galak (team leader) and Sebastien Guenneau.
- Aug. 17- Dec. 17** | **Associate research scientist and adjunct assistant professor** in the Department of Applied Physics and Applied Mathematics at **Columbia University**, United States.
- Aug. 14 - June 17** | **Assistant professor (lecturer)** in the Department of Mathematics at the **University of Utah**, United States.
- Oct. 10 - June 14** | **Ph.D. student** in the **POEMS** team, under the supervision of Christophe Hazard and Patrick Joly.
- 2010 (5 months)** | **Research internship** in the **POEMS** team, granted by the **Airbus group**, under the supervision of Christophe Hazard and Patrick Joly: Detection and focusing on unknown obstacles by using the time reversal principle.
- 2009 (3 months)** | **Research internship** at **RWTH University**, Aachen, Germany under the supervision of Lothar Nannen and Joachim Schöberl: Pole condition method for scattering and resonance problems for the Helmholtz equation on unbounded domains.

Current research topics

- Mathematical study of dispersive Maxwell's equations (metamaterials, spectral theory, limiting absorption and limiting amplitude principles, resonance phenomena, cloaking, passive linear systems and theory of Herglotz functions),
- Electromagnetic composite materials,
- Inverse and imaging problems in acoustics and electromagnetism,
- Mathematical justification of asymptotic models for point-scatterers.
- Spectral theory in electromagnetic periodic media (honeycomb structures, Dirac points), recent topic.

Other research activities

Sep.17 - Dec.	Member of a weekly working group meeting organized by Michael Weinstein on the mathematical analysis of wave propagation phenomena at Columbia University.
Sep. 16- Jun. 17	Mentor of Caleb Webb for a REU (Research Experience for Undergraduates) project financed by the University of Utah entitled: Spectral analysis of periodic, nonreciprocal systems consisting of high-loss and lossless components.
Sep. 15 - May 16	Organizer of two minisymposia in the SIAM conference on the Mathematical Aspects of Materials Science (Philadelphia, United States, May 8-12 2016): <ul style="list-style-type: none">• Inverse Problems in Materials Science co-organized with Fernando Guevara Vasquez and Andrew Thaler• Complex analysis, optimization, and Herglotz functions in passive electromagnetics and composite media co-organized with Graeme W. Milton, Mihai Putinar and Aaron Welters.
Sep. 14 - May 15	Member of a weekly working group meeting on the mathematical and numerical analysis of wave propagation phenomena at the University of Utah.
2014 - Pres.	Referee for the following international scientific review: "Archive for Rational Mechanics and Analysis", "Multiscale Modeling and Simulation", "SIAM Journal on Imaging Sciences" and "SIAM Journal on Mathematical Analysis.
Aug. 12 - Dec 15	Member of the ANR project MetaMath (mathematical and numerical modeling for waves propagation in the presence of metamaterials).

Teaching

Fall 2017	Instructor for the graduate course Function of a Complex Variable in the applied physics and applied mathematics department of Columbia University , United States. (35h of lessons and 15h of office hours)
Spring 2017	Instructor for the courses Partial Differential Equations for Engineers for two classes (35h of lessons and 15h of office hours for each class) and Introduction to Partial Differential Equations (advanced course, lessons 35h, office hours 30h) at University of Utah .
Spring 2016	Instructor for the courses Applied Complex Analysis (lessons 35h, office hours 30h) and Partial Differential Equations for Engineers (lessons 35h, office hours 30h) at University of Utah .

2015	Instructor for the courses Partial Differential Equations for Engineers (lessons 35h, office hours 30h) and Introduction to Partial Differential Equations (advanced course, lessons 35h, office hours 30h) at University of Utah .
Fall 2014	Instructor for the courses Applied Complex Analysis (lessons 30h, office hours 30h) at University of Utah .
2010 - 2013	Teaching assistant at ENSTA ParisTech (Superior National School of Advanced Techniques), Palaiseau, in the courses: Dynamical Systems (15h/year, 4 years), Functions of a Complex Variable (15h/year, 3 years), Introduction to MATLAB (23h/year, 3 years), Remedial Classes in Mathematics (3h/year, 2 years), Mathematical Tutoring (10h/year, 3 years).

Main co-workers

- Fernando Guevara Vasquez (University of Utah, Salt Lake City, United States),
- Christophe Hazard (POEMS team, UMR 7231 CNRS-INRIA-ENSTA, Palaiseau, France),
- Maryna Kachanovska (POEMS team, UMR 7231 CNRS-INRIA-ENSTA, Palaiseau, France),
- Patrick Joly (POEMS team, UMR 7231 CNRS-INRIA-ENSTA, Palaiseau, France),
- Graeme Milton (University of Utah, Salt Lake City, United States),
- Michael Weinstein (Columbia University, New-York, United States), recent collaboration,
- Aaron Welters (Florida Institute of Technology, Melbourne, United States).

Invitations and rewards

- **Invited to participate to the Workshop Mathematical and Physical Aspects of Topological Protect States at Columbia University**, New-York, United States (Mai 2017).
- **Outstanding Postdoc award for research and teaching delivered by the Mathematics department of the University of Utah**, (April 2017).
- **Invited one week (April 2017) by Aaron Welters at the Florida Institute of Technology**, Melbourne, United States.
- **Invited to participate to the workshop Mathematical and Numerical Modeling in Optics at the IMA** (Institute for Mathematics and its Applications) at Minneapolis (December 2016).
- **Invited as a three months long term visitor (September to November 2016) at the IMA** at Minneapolis for the annual thematic Mathematics and Optics.
- **Invited eight days (October 2015) by Aaron Welters at the Florida Institute of Technology**, Melbourne, United States.
- **Invited two days by Kirill Cherednichenko at the University of Bath**, United Kingdom.
- Invited one day (November 2013) by Josselin Garnier and Georges Papanicolaou at IHES, Bures-sur-Yvette, France.
- Invited one day (March 2012) by Rémi Carminati and Sylvain Gigan, and one day (December 2012) by Claire Prada at the Institute Langevin, ESPCI, Paris, France.
- Invited one day (October 2011) by Josselin Garnier at École Normale Supérieure Paris, Paris, France.
- Invited one day (June 2011) by Karim Ramdani at the Institute Élie Cartan de Lorraine, Nancy, France.
- Invited one day (october 2010) by Stephene Alestra, Eric Duceau, Vassili Srithammavanh and Isabelle Terasse at EADS , Suresnes, France.

Publications

PhD thesis

- [1] **Analysis of two wave propagation phenomena: 1) Space–time focusing in acoustics; 2) Transmission between a dielectric and a metamaterial**, Maxence Cassier, *École Polytechnique*, 2014, available online at <https://pastel.archives-ouvertes.fr/pastel-01023289>.

Papers published or accepted in refereed journals

- [1] **Spectral theory for Maxwell’s equations at the interface of a metamaterial. Part I: Generalized Fourier transform.**, Maxence Cassier, Christophe Hazard and Patrick Joly, available online at <https://arxiv.org/abs/1610.03021> and accepted for publication in **Communication in Partial Differential Equations**.
- [2] **Imaging polarizable dipoles**, Maxence Cassier and Fernando Guevara Vasquez, 35 pages, available online at <https://arxiv.org/abs/1703.03544> and accepted in 2017 for publication to **SIAM Journal on Imaging Sciences**.
- [3] **Mathematical models for dispersive electromagnetic waves: an overview**, Maxence Cassier, Patrick Joly and Maryna Kachanovska, 45 pages, submitted in 2017, available online at <https://arxiv.org/abs/1703.05178> and accepted in 2017 for publication to a special issue in honor of Peter Monk in **Computers and Mathematics with Applications**.
- [4] **Bounds on Herglotz functions and fundamental limits of broadband passive quasi-static cloaking**, Maxence Cassier and Graeme W. Milton, *Journal of Mathematical Physics* 58 (7), 071504, 2017.
- [5] **Space-time focusing on unknown scatterers**, Maxence Cassier and Christophe Hazard, *Wave Motion*, vol. 51(8) pp. 1254-1272, 2014.
- [6] **Multiple scattering of acoustic waves by small sound-soft obstacles in two dimensions: mathematical justification of the Foldy–Lax model**, Maxence Cassier and Christophe Hazard, *Wave Motion*, vol. 50 (1), pp. 18-28, 2013.

Papers in preparation

- [7] **Spectral theory for Maxwell’s equations at the interface of a metamaterial. Part II: Limiting absorption and limiting amplitude principles**, Maxence Cassier, Christophe Hazard and Patrick Joly.
- [8] **Electromagnetic Imaging using Stokes parameters**, Patrick Bardsley, Maxence Cassier and Fernando Guevara Vasquez.
- [9] **Bounds on the DtN map and fundamental limits of broadband passive near-cloaking for the conductivity problem**, Maxence Cassier, Graeme W. Milton and Aaron Welters.

Book chapters

- [1] **Analyticity of the Dirichlet-to-Neumann map for the time-harmonic Maxwell’s equations**, Maxence Cassier, Aaron Welters and Graeme W. Milton, chapter in *Extending the theory of composites to other areas of science* edited by Graeme W. Milton (2016) and reviewed by the *Journal of Applied Mechanics*, pp 95-122, available online at <http://arxiv.org/abs/1512.05838>.
- [2] **A rigorous approach to the field recursion method for a two-component composites with isotropic phases** Maxence Cassier, Aaron Welters and Graeme W. Milton, chapter in *Extending the theory of composites to other areas of science* edited by Graeme W. Milton and reviewed by the *Journal of Applied Mechanics*, pp. 287-307, 2016, available online at <https://arxiv.org/abs/1601.01378>.

Reports

- [1] **Imaging small scatterers with electromagnetic waves**, Maxence Cassier and Fernando Guevara Vasquez, *to appear in Oberwolfach reports 2017*, 3 pages, available online at <https://www.math.utah.edu/cassier/papers/oberwolfach2.pdf>.
- [2] **Selective focusing for time-dependent waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Oberwolfach report No. 03, 2013*, pp. 150-153, available online at http://www.mfo.de/occasion/1304/www_view.

Conference proceedings

- [1] **Imaging polarizable dipoles**, Maxence Cassier and Fernando Guevara Vasquez, *Waves 2017 conference proceedings*, 2 pages, available online at <https://www.math.utah.edu/cassier/papers/waves2017.pdf>.
- [2] **Limiting amplitude principle for a two-layered medium composed of a dielectric material and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Waves 2015 conference proceedings*, 2 pages, available online at <https://www.math.utah.edu/cassier/papers/waves2015.pdf>.
- [3] **Selective focusing on unknown scatterers**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Waves 2013 conference proceedings*, pp. 129-130, available online at <https://www.math.utah.edu/cassier/papers/waves2013.pdf>.
- [4] **Multiple acoustic scattering by small obstacles in two dimensions**, Maxence Cassier and Christophe Hazard, *Waves 2011 conference proceedings*, pp. 631-634, available online at <https://www.math.utah.edu/cassier/papers/waves2011.pdf>.
- [5] **Using time reversal for space-time focusing of acoustic waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *5ème Colloque sur les Tendances des Applications Mathématiques en Tunisie, Algérie, Maroc (TAMTAM), Sousse, Tunisia, Avril 2011*, 6 pages, available online at <https://www.math.utah.edu/cassier/papers/tamtam.pdf>

Talks, seminars and poster sessions

International conferences as invited speaker

- [1] **Limiting Amplitude Principle for Maxwell's Equations at the Interface of a Metamaterial.**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Waves diffracted by Patrick Joly, conference in honor of the 60th birthday of Patrick Joly, France, August 2017*.
- [2] **Bounds on Herglotz functions and physical limits to broad-band passive cloaking in quasistatics**, Maxence Cassier and Graeme W. Milton, *Workshop on Herglotz-Nevanlinna functions and their applications, Institut Mittag-Leffler, Sweden, May 2017*.
- [3] **On the limiting amplitude principle for Maxwell's equations at the interface of a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop, Waves in periodic media and metamaterials, Cargese, France, November 2016*.
- [4] **Limitations to broadband cloaking in quasistatics**, Maxence Cassier and Graeme W. Milton, *The mathematics of metamaterials and materials, Snowbird Workshop, United States, August 2016*.
- [5] **Bounds on Stieltjes functions and their applications to fundamental limits of broadband passive cloaking in quasistatics**, Maxence Cassier and Graeme W. Milton, *Mathematical and computational aspects of Maxwell's equations, EPSRC Durham Symposium, United Kingdom, July 2016*.
- [6] **On the spectral theory and limiting amplitude principle for a transmission problem between a dielectric and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Conference on operators, operators families and asymptotic, University of Bath, United Kingdom, May 2016*.

- [7] **Spectral theory and limiting amplitude principle for a two-layered medium composed of a dielectric and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop on Interdisciplinary Mathematics, Penn State University, Pennsylvania, United States, May 2015*.
- [8] **On the limiting amplitude principle for a transmission problem between a dielectric and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *AMS spring western sectional meeting, University of Nevada, Las Vegas, United States, April 2015*.
- [9] **Space-time focusing on unknown obstacles**, Maxence Cassier, Christophe Hazard and Patrick Joly, *International conference in applied mathematics, Heraklion, Greece, September 2013*.
- [10] **Selective focusing for time-dependent waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop: Inverse problems and imaging, Institut Henri Poincaré, Paris, France, February 2013*.
- [11] **Selective focusing for time-dependent waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop: Computational electromagnetism and acoustics, Oberwolfach, Germany, January 2013*.
- [12] **Using time reversal for space-time focusing of acoustic waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop: Journées de Metz 2012: recent advances in modeling, analysis and simulation of wave propagation, Metz, France, March 2012*.

International conferences with review committee

- [1] **Imaging polarizable dipoles**, Maxence Cassier and Fernando Guevara Vasquez, *Waves conference, Minneapolis, United States, May 2017*.
- [2] **Bounds on Stieltjes functions and their applications to passive cloaking**, Maxence Cassier and Graeme W. Milton, *SIAM Conference on mathematical aspects of materials Science, Philadelphia, United States, May 2016*.
- [3] **Imaging polarizable dipoles**, Maxence Cassier and Fernando Guevara Vasquez, *SIAM Conference on mathematical aspects of materials Science, Philadelphia, United States, May 2016*.
- [4] **Limiting amplitude principle for a two-layered medium composed of a dielectric material and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly *Waves conference, Karlsruhe institut of technology, Germany, July 2015*.
- [5] **Selective focusing on unknown scatterers**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Waves conference, Tunis, Tunisia, June 2013*.
- [6] **Multiple acoustic scattering by small obstacles in two dimensions**, Maxence Cassier, Christophe Hazard, *Waves conference, Vancouver, Canada, July 2011*.

Colloquium and Seminars

- [1] **On the limiting amplitude principle for Maxwell's equations at the interface of a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Applied Mathematics Colloquium, New Jersey Institute of Technology, United States, September 2016*.
- [2] **Spectral theory and limiting amplitude principle for Maxwell's equations at the interface of a metamaterial.**, Maxence Cassier, Christophe Hazard and Patrick Joly, *IMA seminar, University of Minnesota, United States, October 2016*.
- [3] **Bounds on Herglotz functions and fundamental limits on broadband passive quasi-static cloaking**, Maxence Cassier and Graeme W. Milton, *IMA Postdoc seminar, University of Minnesota, United States, October 2016*.
- [4] **Space-time focusing on acoustic scatterers**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Geomechanics Seminar, Civil Engineering Department, University of Minnesota, United States, October 2016. Invited by the Civil Engineering Department*
- [5] **Spectral theory and limiting amplitude principle for a transmission problem between a dielectric and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Mathematical Physics Seminar, Florida Insitute of Technology, United States, October 2015 (invited talk)*.

- [6] **Space–time focusing for time-dependent acoustic waves**, Maxence Cassier, Christophe Hazard, *Inverse problems seminar of University College of London, United Kingdom, June 2015 (invited talk)*.
- [7] **Analysis of two time-dependent wave propagation phenomena: 1) Space-time focusing on unknown scatterers; 2) Limiting amplitude principle in a medium composed of a dielectric and a metamaterial**, Maxence Cassier, Christophe Hazard and Patrick Joly, *University of Utah applied math seminar, Salt Lake City, United States, October 2014*.
- [8] **Selective focusing for time-dependent waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *Poems seminar, Palaiseau, France, January 2013*.

Posters

- [1] **Space-time focusing for acoustic waves**, Maxence Cassier, Christophe Hazard and Patrick Joly, *International conference on novel directions in inverse scattering, honoring David Colton, Newark, United states, July 2013 (invited)*.
- [2] **Space-time focusing on unknown scatterers** (poster session), Maxence Cassier, Christophe Hazard and Patrick Joly, *Workshop: Wave propagation in complex media and applications, Heraklion, Greece, May 2012*.

Other information

Languages

French **Native speaker**
 English **Fluent**
 German **Fluent**

Computer skills

Programming C, CSS, XHTML
 Scientific C++, Julia, Matlab, Maple, Prolog
 Office L^AT_EX, Microsoft Office

Extracurricular activities

- Sports: fencing, scuba diving, hiking, running, skiing, rugby.
- Culture: cinema, music, antique history: ancient Greek (4 years of study), Latin (3 years).