

Curriculum Vitae

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Positions

2018 - 2020: Head of the Department of Mathematics (CY Cergy Paris University).

From 2015: Professor at the AGM Research Center in Mathematics (CY Cergy Paris University).

2010 - 2015: Professor “Hadamard” at the Laurent Schwartz Center for Mathematics (École polytechnique).

2008 - 2010: Half-time assistant professor at the Department of Mathematics and their Applications (École normale supérieure).

2005 - 2010: Assistant professor at the Research Center in Mathematics for Decision (University Paris Dauphine).

Education

2011: Habilitation thesis about “A Few Contributions to the Mathematical Analysis of the Gross-Pitaevskii Equation and the Bogoliubov-Dirac-Fock Model” under the supervision of Éric Séré (University Paris Dauphine).

2004: PhD thesis about “Travelling Waves in the Gross-Pitaevskii Equation” under the direction of Fabrice Bethuel (University Pierre and Marie Curie).

Research interests

- Construction and qualitative analysis (behaviour at infinity, transonic limit, long-time stability) of travelling waves for the Gross-Pitaevskii, Kadomtsev-Petviashvili, Landau-Lifshitz and surface quasi-geostrophic equations.
- Derivation of long-wave regimes for the Gross-Pitaevskii and Landau-Lifshitz equations.
- Analysis of mean field models in relativistic quantum mechanics.

Papers

All the papers are available here :

<http://philippe.gravejat.perso.math.cnrs.fr/Research.html>

Preprints

1. [with *Amandine Aftalion* and *Étienne Sandier*] **Bifurcating solitonic vortices in a strip**, 48 p., 2024.

Articles

1. [with *André de Laire* and *Didier Smets*] **Minimizing travelling waves for the Gross-Pitaevskii equation on $\mathbb{R} \times \mathbb{T}$** , Ann. Fac. Sci. Toulouse Math., in press, 2024.
2. [with *André de Laire* and *Didier Smets*] **Construction of minimizing travelling waves for the Gross-Pitaevskii equation on $\mathbb{R} \times \mathbb{T}$** , Tunisian J. Math., 6, 1, 2024, 157-188.
3. [with *Ludovic Godard-Cadillac* and *Didier Smets*] **Co-rotating vortices with N fold symmetry for the inviscid surface quasi-geostrophic equation**, Indiana Math. Univ. J., 72, 2, 2023, 603-650.
4. [with *Eliot Pacherie* and *Didier Smets*] **On the stability of the Ginzburg-Landau vortex**, Proc. London Math. Soc., 125, 5, 2022, 1015-1065.
5. [with *André de Laire*] **The cubic Schrödinger regime of the Landau-Lifshitz equation with a strong easy-axis anisotropy**, Rev. Mat. Iberoam., 37, 1, 2021, 95-128.
6. [with *Didier Smets*] **Smooth travelling-wave solutions to the inviscid surface quasi-geostrophic equation**, Int. Math. Res. Not., 2019, 6, 2019, 1744-1757.
7. [with *André de Laire*] **The Sine-Gordon regime of the Landau-Lifshitz equation with a strong easy-plane anisotropy**, Ann. Inst. Henri Poincaré, Analyse non linéaire, 35, 7, 2018, 1885-1945.

8. [with *Mathieu Lewin* et *Éric Séré*] **Derivation of the magnetic Euler-Heisenberg energy**, *J. Math. Pures Appl.*, 117, 2018, 59-93.
9. [with *Didier Smets*] **Asymptotic stability of the black soliton for the Gross-Pitaevskii equation**, *Proc. London Math. Soc.*, 111, 2, 2015, 305-353.
10. [with *Fabrice Bethuel* and *Didier Smets*] **Asymptotic stability in the energy space for dark solitons of the Gross-Pitaevskii equation**, *Ann. Sci. Éc. Norm. Supér.*, 48, 6, 2015, 1327-1381.
11. [with *André de Laire*] **Stability in the energy space for chains of solitons of the Landau-Lifshitz equation**, *J. Differential Equations*, 258, 1, 2015, 1-80.
12. [with *Fabrice Bethuel* and *Didier Smets*] **Stability in the energy space for chains of solitons of the one-dimensional Gross-Pitaevskii equation**, *Ann. Inst. Fourier*, 64, 1, 2014, 19-70.
13. [with *Christian Hainzl*, *Mathieu Lewin* and *Éric Séré*] **Construction of the Pauli-Villars-regulated Dirac vacuum in electromagnetic fields**, *Arch. Ration. Mech. Anal.*, 208, 2, 2013, 603-665.
14. [with *Mathieu Lewin* and *Éric Séré*] **Renormalization and asymptotic expansion of Dirac's polarized vacuum**, *Comm. Math. Phys.*, 306, 1, 2011, 1-33.
15. [with *Fabrice Bethuel*, *Jean-Claude Saut* and *Didier Smets*] **On the Korteweg-de Vries long-wave approximation of the Gross-Pitaevskii equation II**, *Comm. Partial Differential Equations*, 35, 1, 2010, 113-164.
16. [with *Fabrice Bethuel*, *Jean-Claude Saut* and *Didier Smets*] **On the Korteweg-de Vries long-wave approximation of the Gross-Pitaevskii equation I**, *Int. Math. Res. Not.*, 2009, 2009, 2700-2748.
17. [with *Mathieu Lewin* and *Éric Séré*] **Ground state and charge renormalization in a nonlinear model of relativistic atoms**, *Comm. Math. Phys.*, 286, 1, 2009, 179-215.
18. [with *Fabrice Bethuel* and *Jean-Claude Saut*] **Travelling waves for the Gross-Pitaevskii equation II**, *Comm. Math. Phys.*, 285, 2, 2009, 567-651.
19. [with *Fabrice Bethuel*, *Jean-Claude Saut* and *Didier Smets*] **Orbital stability of the black soliton to the Gross-Pitaevskii equation**, *Indiana Math. Univ. J.*, 57, 6, 2008, 2611-2642.
20. [with *Fabrice Bethuel* and *Jean-Claude Saut*] **On the KP I transonic limit of two-dimensional Gross-Pitaevskii travelling waves**, *Dynamics of PDE*, 5, 3, 2008, 241-280.
21. **Asymptotics of the solitary waves of the generalised Kadomtsev-Petviashvili equations**, *Disc. Cont. Dyn. Syst., Ser. A*, 21, 3, 2008, 835-882.
22. **First order asymptotics for the travelling waves in the Gross-Pitaevskii equation**, *Adv. Differential Equations*, 11, 3, 2006, 259-280.
23. **Asymptotics for the travelling waves in the Gross-Pitaevskii equation**, *Asymptot. Anal.*, 45, 3-4, 2005, 227-299.

24. **Limit at infinity and non-existence results for sonic travelling waves in the Gross-Pitaevskii equation**, Differential and Integral Equations, 17, 11-12, 2004, 1213-1232.
25. **Decay for travelling waves in the Gross-Pitaevskii equation**, Ann. Inst. Henri Poincaré, Analyse non linéaire, 21, 5, 2004, 591-637.
26. **A non-existence result for the travelling waves in the Gross-Pitaevskii equation**, Comm. Math. Phys., 243, 1, 2003, 93-103.
27. **Limit at infinity for travelling waves in the Gross-Pitaevskii equation**, C. R. Acad. Sci. Paris, Sér. I, 336, 2003, 147-152.

Proceedings and reviews

1. [with *Christian Hainzl*, *Mathieu Lewin* and *Éric Séré*] **Deux modèles effectifs pour les champs électromagnétiques dans le vide de Dirac**, Séminaire Laurent Schwartz 2015-2016, École polytechnique, Palaiseau, 2016.
2. [with *André de Laire*] **Stabilité des solitons de l'équation de Landau-Lifshitz à anisotropie planaire**, Séminaire Laurent Schwartz 2014-2015, École polytechnique, Palaiseau, 2015.
3. [with *Christian Hainzl*, *Mathieu Lewin* and *Éric Séré*] **Two Hartree-Fock models for the vacuum polarization**, Journées Équations aux Dérivées Partielles, 2012.
4. [with *Fabrice Bethuel*, *Raphaël Danchin*, *Jean-Claude Saut* and *Didier Smets*] **Les équations d'Euler, des ondes et de Korteweg-de Vries comme limites asymptotiques de l'équation de Gross-Pitaevskii**, Séminaire X-EDP 2008-2009, École polytechnique, Palaiseau, 2010.
5. [with *Fabrice Bethuel* and *Jean-Claude Saut*] **Ondes progressives pour l'équation de Gross-Pitaevskii**, Séminaire X-EDP 2007-2008, École polytechnique, Palaiseau, 2008.
6. [with *Fabrice Bethuel* and *Jean-Claude Saut*] **Existence and properties of travelling waves for the Gross-Pitaevskii equation**, in *Stationary and Time Dependent Gross-Pitaevskii Equations*, A. Farina and J.-C. Saut editors, Contemporary Mathematics, 473, 55-104, American Mathematical Society, Providence, R.I., 2008.

Talks

- 2023:** Conference “Topological and geometrical aspects in complex materials” at the Hausdorff Research Institute for Mathematics (Bonn).
- 2019:** Workshop “Nonlinear Days in Alghero” at the University of Sassari (Alghero).
- 2017:** Workshop “Eighth Itinerant Meeting” at the Basque Center for Applied Mathematics (Bilbao).

- 2016:** “Nonlinear Analysis Seminar” at the Mathematics and Physics Research Institute of the Catholic University of Louvain ;
Seminar “Partial Differential Equations and Mathematical Physics” at the Institute of Mathematics of the University of Zürich ;
Workshop “Recent progress on the qualitative properties of nonlinear dispersive waves and systems” at the Wolfgang Pauli Institute (Vienna) ;
Conference “Topological patterns and dynamics in magnetic elements and in condensed matter” at the Max Planck Institute for the Physics of Complex Systems (Dresden).
- 2013:** Workshop “Domain Micro-Structure and Dynamics in Magnetic Elements” at the Archimedes Center for Modelling, Analysis and Computation (Heraklion).
- 2012:** Conference “Blow-up, Dispersion and Solitons” at the Department of Mathematics Guido Castelnuovo of Sapienza University (Roma) ;
Conference “Dynamics of Nonlinear Dispersive and Fluid Mechanics Equations” at the Beijing International Center for Mathematical Research (Beijing).
- 2010:** Workshop “Recent Progress and Perspectives on the Gross-Pitaevskii Equation with Non-Zero Boundary Conditions” at the Wolfgang Pauli Institute (Vienna).
- 2007:** Mini-symposium “Quantum Kinetic Theory for Bose-Einstein Condensation” at the Sixth International Congress on Industrial and Applied Mathematics (Zürich).
- 2006:** Workshop “The Gross-Pitaevskii and Related Equations with Non-Zero Boundary Conditions at Infinity” at the Wolfgang Pauli Institute (Vienna).

Advisory

- From 2021:** PhD thesis of Jordan Berthoumieu (CY Cergy Paris University).
- 2020:** [with *Didier Smets*] PhD thesis of Ludovic Godard-Cadillac (Sorbonne University). Ludovic Godard-Cadillac is now assistant professor at the University of Bordeaux.
- 2016:** [with *Raphaël Côte*] PhD thesis of Yakine Bahri (École polytechnique). Yakine Bahri is now senior analyst in the risk modelling team of British Columbia Investment.

Editorial activity

- 2020 - 2024:** Associate editor at the Bulletin des Sciences Mathématiques.