Joackim Bernier

Curriculum Vitae

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Education and position

2020–now **Chargé de recherche au CNRS**, *Université de Nantes*

Sept 2020 **Postdoc**, *Université de Nantes*, Advisor: Benoît Grébert

2019–2020 **Postdoc**, *Université Paul Sabatier, Toulouse 3*, Advisor: Jean-François Coulombel

2016–2019 **PhD in Mathematics**, *Université de Rennes 1* , Advisors: Erwan Faou, Nicolas Crouseilles

2013–2016 **Master in Mathematics**, *Université de Rennes 1*

2015 **Agrégation de Mathématiques**, *rank 10*

2012–2013 **Bachelor's degree in Mathematics**, *Université de Rennes 1*

2012–2014 **Bachelor's degree in Physics**, *Université de Rennes 1*

2012–2016 **Student at the ENS Rennes**, *normalien*

Papers

Gains of integrability and local smoothing effects for quadratic evolution equations, Journal of Functional Analysis, Volume 285, Issue 10, 15 November 2023, 110119, *with P. Alphonse*.

Polar decomposition of semigroups generated by non-selfadjoint quadratic differential operators and regularizing effects, Annales Scientifiques de l'ENS, 4 e série, t. 56, 2023, p. 323 à 382 *with P. Alphonse*.

Dynamics of nonlinear Klein-Gordon equations in low regularity on $\mathbb{S}^2$, Annales de l'Institut Henri Poincaré C, Analyse Non Linéaire, *with B. Grébert and G. Rivière*.

Birkhoff normal forms for Hamiltonian PDEs in their energy space, Journal de l'Ecole polytechnique — Mathématiques, Tome 9 (2022), pp. 681-745, *with B. Grébert*.

Long-time existence for semi-linear beam equations on irrational tori, *Journal of Dynamics and Differential Equations*, 2021 *with R. Feola, B. Grébert and F. Iandoli*.

Long time dynamics for generalized Korteweg-de Vries and Benjamin-Ono equations, *Archive for Rational Mechanics and Analysis*, 2021 *with B. Grébert*.

Exact splitting methods for semigroups generated by inhomogeneous quadratic differential operators, *Foundations of Computational Mathematics*, 2021.

Exact splitting methods for kinetic and Schrödinger equations, *Journal of Scientific Computing*, **86** (10) (2021) *with N. Crouseilles and Y. Li*.

Rational normal forms and stability of small solutions to nonlinear Schrödinger equations, *Annals of PDE* **6**, 14 (2020), *with E. Faou and B. Grébert*.

Smoothing Properties of fractional Ornstein-Uhlenbeck semigroups and null-controllability, *Bulletin des Sciences Mathématiques*, Volume 165, 2020, 102914 , *with P. Alphonse*.

Splitting methods for rotations: application to Vlasov equations, *SIAM Journal on Scientific Computing* 2020 42:2, A666-A697, with *F. Casas and N. Crouseilles*. Bonus: a note to detail the microlocal estimates.

Long time behavior of the solutions of NLW on the d-dimensional torus, *Forum of Mathematics, Sigma* (2020), Vol. 8, e12, 26 pages *with E. Faou and B. Grébert*.

Long-time behavior of second order linearized Vlasov-Poisson equations near a homogeneous equilibrium, *Kinetic and Related Models*, February 2020, 13 (1), 129-168, with *M. Mehrenberger*.

Existence and stability of traveling waves for discrete nonlinear Schroedinger equations over long times, *SIAM Journal on Mathematical Analysis* 2019 51:3, 1607-1656, *with E. Faou*.

Bounds on the growth of high discrete Sobolev norms for the cubic discrete nonlinear Schrödinger equations on $h\mathbb{Z}$, *Discrete and Continuous Dynamical Systems - Series A*, 2019, 39 (6), pp. 3179-3195.

Optimality and resonances in a class of compact finite difference schemes of high order, *Calcolo* (2019) 56: 12.

Preprints

Dynamics of quintic nonlinear Schrödinger equations in $H^{2/5+}(\mathbb{T})$, arXiv:2305.05236, *with B. Grébert and Tristan Robert*.

Symmetric-conjugate splitting methods for linear unitary problems, arXiv:2303.10950, *with S. Blanes, F. Casas and A. Escorihuela-Tomàs*.

Almost global existence for some nonlinear Schrödinger equations on $\mathbb{T}^d$ in low regularity, arXiv:2203.05799, *with B. Grébert*.

Proceedings and notes

Verification of 2D$\times$ 2D and Two-Species Vlasov-Poisson Solvers, *ESAIM: ProcS*, 63(2018), pp. 78-108, *with Y. Barsamian, S. Hirstoaga and M. Mehrenberger*.

A note on some microlocal estimates used to prove the convergence of splitting methods relying on pseudo-spectral discretizations , hal-02929869v1, *with F. Casas and N. Crouseilles*.

Responsibilities

June 2022 Organization of the conference *Normal forms and splitting methods* in Pornichet

2022-Now Organization of the colloquium of the LMJL

2021-Now Organization of the seminar of the team Anayse-EDP in Nantes

2022-Now Organization of the Journées Rennes-Nantes d'analyse

2021 Membre du jury du concours MPI 2021 X-ENS

2017-2019 Organization of the seminar for Ph.D. students in analysis in Rennes

April 2017 Organization of the TFJM (mathematic tournament for high-school students) in ENS Rennes

Grants

2021-2024 Etoile Montante *MasCan* (regional grant of the region Pays de la Loire) as PI

2023-2027 ANR *KEN* as member

2023 PEPs of Nicolas Camps as member

PhD student

2021-now Charbella Abou Khalil, Dynamics of Hamiltonian PDEs in low regularity, co-advisor Benoît Grébert

Post-doc

2022-now Nicolas Camps

Master students advising

2021 Charbella Abou Khalil, Long time behavior of the small non-smooth solutions of the beam equation, M2 internship, co-advisor : Benoît Grébert

2021 Henry Dumant, Théorie spectral des opérateurs de Sturm–Liouville en dimension 1, M1 internship.

Teaching

2023-now **L3 TD**, *Nantes université*, Licence Mathématiques
Intégration 2

2022-now **M2 course**, *Nantes université*, Master Mathématiques Fondamentales et Appliquées
Formes normales de Birkhoff pour les EDPs Hamiltoniennes

2016–2019 **Teaching assistant**, *ENS Rennes*
- Numerical analysis practicals in Scilab (L3 and Agrégation)
- TD General topology (L3)

Given Talks

- Workshop, Deterministic and Probabilistic Dynamics of Nonlinear Dispersive PDEs, Edinburgh, UK, June 2023
- Seminar, Universitat Jaume I, Castellón de la Plana, Spain, May 2023
- Seminar, Laboratoire J.A. Dieudonné, Nice, April 2023
- Journées EDPs de l'IECL, Metz, March 2023

- Workshop Nonlinear Waves and Hamiltonian PDE's, La Thuile, Italy, February-March 2023
- Colloque Tuniso-Français d'EDP, Hammamet, Tunisia, October 2022
- Workshop, Computational Mathematics for Quantum Technologies, Bath, UK, August 2022
- Conference, Ypatia 2022, Roma, Italia, June 2022
- Seminar, CY Cergy Paris Université, May 2022
- Seminar, Laboratoire de Mathématiques d'Orsay, February 2022
- Conférence, Équations de Schrödinger, Le Croisic, May 2021
- Workshop, Geometric Numerical Integration (hybrid meeting) Oberwolfach, Germany, March–April 2021
- Journée annuelle de la Fédération de recherche Mathématiques des Pays de Loire, Nantes, January 2021
- Web-Seminar, ENS Rennes, December 2020
- Web-Seminar, Open PDE & Analysis Seminar, June 2020
- Web-Seminar, Enriques-Lebesgue seminar, April 2020
- Journées Jeunes EDPistes 2020, Tours, March 2020 (cancelled)
- Seminar, Institut de Mathématiques de Marseille, February 2020
- Seminar, Laboratoire de Physique de l'ENS Lyon, December 2019
- Seminar, SISSA, Trieste, Italy, December 2019
- Seminar, Institut de Mathématiques de Toulouse, November 2019
- Seminar, laboratoire Jean Leray, Nantes, November 2019
- Seminar, laboratoire Paul-Painlevé, Lille, October 2019
- Workshop "Some news on dispersive PDEs : modeling, theory and numerics", WPI, Vienna, Austria, September/October 2019
- Conference "DEA 2019", talk in parallel session "Numerical methods", Kraków, Poland, September 2019
- Workshop "Hamiltonian PDEs: KAM, Reducibility, Normal Forms and Applications", Oaxaca, Mexico, June 2019
- Journées EDP 2019, Obernai, June 2019
- Workshop "LEANING TORI An Hamiltonian Event under the Tower", SNS Pisa, Italia, May 2019
- Workshop "Asymptotic methods and numerical approximations of multi-scale evolutions problems, and uncertainty quantification", ENS Rennes, May 2019
- Seminar, Courant Institute, New York, April 2019
- Seminar, LAMA, Bourget-du-Lac, March 2019
- Meeting Moonrise-Mingus, Saint-Malo, December 2018
- Seminar, ENS Rennes, October 2018
- Journée des doctorantes et doctorants en analyse, IRMAR Rennes, May 2018
- Workshop "Dynamics of hamiltonian PDEs", La Thuile (Italy), February 2018
- NABUCO workshop, Université Paul Sabatier Toulouse, January/February 2018

- Meeting Moonrise-Ipso, Saint-Malo, December 2017
- IPL FRATRES Annual Meeting 2017, INRIA, Rennes, November 2017
- Journées Louis Antoine, IRMAR, Rennes, October 2017 (about diophantine approximation)
- Scicade conference, talk in mini-symposium: Methods for the Nonlinear Schrödinger equation, solitary waves and discrete patterns, Bath (U.K.), September 2017
- Meeting Moonrise-Ipso-Geopardi, Saint-Malo, December 2016

Others

July/August 2017 — CEMRACS 2017: Participation in the project "Uncertainty quantification for the Vlasov equation" proposed by M. Campos Pinto, K. Kormann and O. Mula

July/August 2016 — CEMRACS 2016: Participation in the project "Particle in Cell and Semi-Lagrangian schemes for two species plasma simulations" proposed by S. Hirstoaga and M. Mehrenberger

Research Internships

April/June 2016 — **M2 Internships**, *IRMAR, Université de Rennes 1*, Advisors: Erwan Faou, Nicolas Crouseilles
Méthodes de différences finies d'ordre élevé pour le problème de Dirichlet

May/June 2014 — **M1 Internships**, *IMUS, Universidad de Sevilla*, Advisor: Juan Casado Díaz
Étude d'un problème d'homogénéisation

May 2013 — **L3 Internships**, *LAMA, Université de Savoie*, Advisor: Didier Bresch
Incursion autour d'EDPs non linéaires en mécanique des fluides