

Curriculum Vitæ

Paul ALPHONSE

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1 Education

Since 2017: PhD student in Mathematics at the Université de Rennes 1 under the directorship of Prof. Karel PRAVDA-STAROV. Thesis entitled *Regularity of solutions and controllability of evolution equations associated to non-selfadjoint operators*.

2013 - 2017: Student at Ecole Normale Supérieure de Rennes (ENS Rennes).

2017 Master 2 in Mathematics, Université de Rennes 1, with highest honors.

2016 Nationally ranked 41th at the Agrégation de Mathématiques (national teaching competitive exam).

2015 Master 1 in Mathematics, Université de Rennes 1, with highest honors.

Bachelor's degree in Computer Science, Université de Rennes 1, with honors.

2014 Bachelor's degree in Mathematics, Université de Rennes 1, with highest honors.

2010 - 2013: Student in Preparatory Classes (first 2 years after high school), MPSI and MP*, Lycée Camille Guérin, Poitiers (France).

2010: Baccalauréat Scientifique (end of high school degree), Lycée Camille Guérin, Poitiers (France), with honors.

2 Research

2.1 Research interests

My research topic deals with the description of the smoothing properties of some classes of semigroups of bounded operators on $L^2(\mathbb{R}^n)$. Until now, I have been interested in semigroups generated by two classes of non-selfadjoint operators: the class of fractional Ornstein-Uhlenbeck operators and the class of accretive quadratic differential operators. Due to a possible non-commutation between the selfadjoint and the skew-selfadjoint parts for these two classes of operators, some hypoellipticity phenomena can occur that allow the associated semigroups to enjoy partial regularizing properties in specific directions of the phase space we aim at sharply describing. The main motivation of my work arises from the study of the null-controllability of

parabolic linear partial differential equations posed on the whole Euclidean space.

Keywords: Gevrey regularity, Gelfand-Shilov regularity, microlocal analysis, null-controllability, quadratic operators, fractional Ornstein-Uhlenbeck operators.

2.2 Publications

Article accepted for publication:

1. *Quadratic differential equations : partial Gelfand-Shilov smoothing effect and null-controllability*, accepted for publication in the Journal of the Institute of Mathematics of Jussieu, [arXiv:1902.04459](#).

Submitted preprints:

1. *Smoothing properties of fractional Ornstein-Uhlenbeck semigroups and null-controllability*, with J. BERNIER, preprint (2018), [arXiv:1810.02629](#).
2. *Polar decomposition of semigroups generated by non-selfadjoint quadratic differential operators and regularizing effects*, with J. BERNIER, preprint (2019), [arXiv:1902.04459](#).

3 Talks

3.1 Conferences / Workshops :

1. Workshop as part of the ANR project QuAMProcs, Orsay, 17-18th March 2020. *Smoothing properties of semigroups generated by fractional Ornstein-Uhlenbeck operators*.

3.2 Laboratory seminars:

1. Analysis seminar of LMJL, Université de Nantes, on 29/11/2019. *Effets régularisants des semi-groupes engendrés par les opérateurs quadratiques accréatifs*.
2. Probability and Statistics seminar, Université de Poitiers, June 2014. *Lois des grands nombres pour des fermés aléatoires*.

3.3 PhD students seminars and meetings:

1. Day of PhD students in analysis of IRMAR, Université de Rennes 1, on 28/03/2019. *Effets régularisants des semi-groupes engendrés par les opérateurs quadratiques*.
2. Lambda seminar of PhD students of IMB, Université de Bordeaux, on 30/11/2018. *Contrôlabilité à zéro des équations d'Ornstein-Uhlenbeck fractionnaires*.
3. Lebesgue PhD meeting 2018, Pôle Numérique de Brest, 15-18th October 2018, *Effets régularisants des semi-groupes d'Ornstein-Uhlenbeck*.
4. Landau seminar of PhD students in analysis of IRMAR, Université de Rennes 1, on 24/09/2018. *Some properties of fractional Ornstein-Uhlenbeck operators*.
5. Landau seminar of PhD students in analysis of IRMAR, Université de Rennes 1, on 19/03/2018. *Regularizing effects of quadratic semigroups and null-controllability of quadratic differential equations*.

4 Conferences and workshops attended

1. Workshop “Journées Jeunes EDPistes 2017”, GDR AEDP, Autrans, 20-22th March 2017,
2. Workshop “Analysis of transport equations: Vlasov equation and related models”, Université de Rennes 1, 17-19th May 2017,
3. Workshop “Journées EDP 2017”, GDR AEDP, Roscoff, 05-09th June 2017,
4. Workshop “Journées Jeunes EDPistes 2018”, GDR AEDP, Nancy, 21-23th March 2018,
5. Conference “Spectral Problems in Mathematical Physics”, Université de Bourgogne, 28-31th May 2018,
6. Workshop “Journées EDP 2018”, GDR AEDP, Obernai, 03-07th June 2018,
7. Workshop “Journées Jeunes EDPistes 2019”, GDR AEDP, Rennes, 20-22th March 2019,
8. Conference “Problems in mathematical physics and spectral theory” (in honor of the 70th birthday of Bernard Helffer), Université de Nantes, 23-26th April 2019,
9. Workshop “Journées EDP 2019”, GDR AEDP, Obernai, 08-12th June 2019.

5 Teaching

I taught at ENS Rennes, a multidisciplinary school of excellence that offers advanced and varied courses, among others in mathematics, but also at ENSAI, a statistics school and at ECAM Rennes and INSA Rennes, two engineering schools. Here is the precise list of my teachings year by year:

2019 - 2020 as a Teaching assistant at ENS Rennes.

- . Exercise sessions on normed vector spaces and differential calculus, 36h, Bachelor degree.
- . Complementary courses in Hilbert analysis and elliptic partial differential equations, 9h, Master degree.
- . Oral trainings for students preparing the Agrégation de Mathématiques, 21h, Master degree.

2018 - 2019 as a Teaching assistant at ENS Rennes.

- . Exercise sessions on normed vector spaces and differential calculus, 36h, Bachelor degree.
- . Complementary courses in Hilbert analysis and elliptic partial differential equations, 6h, Master degree.
- . Oral trainings for students preparing the Agrégation de Mathématiques, 14h, Master degree.

2017 - 2018 as a Teaching assistant at ENS Rennes.

- . Exercise sessions on normed vector spaces and differential calculus, 36h, Bachelor degree.
- . Exercice sessions on Lebesgue integration at ENSAI (as part of an exchange of services), 21h, Bachelor degree.
- . Test of a subject for the competitive entrance examination at ENS Rennes, 10h, Master degree.

2016 - 2017 as a Master student.

- . Exercice sessions on Riemann integration, ordinary differential equations and linear recurrence relations at INSA Rennes, 30h, Bachelor degree.
- . Oral examinations in integrated Preparatory Classes at ECAM Rennes, 49h, Bachelor degree.

6 Administrative responsibilities

- . Member of the organizing committee of the 2019 session of the Lebesgue PhD meeting (supported by the Centre Henri Lebesgue), which took place from 28/10/2019 to 30/10/2019 at the Université de Nantes.
- . Member of the organizing committee of the Landau seminar of PhD students in analysis of IRMAR at the Université de Rennes 1 since September 2018.
- . Member of the organizing committee of the regional phase of the Tournoi Français des Jeunes Mathématiciennes et Mathématiciens (TFJM²), a french championship for young mathematicians, which took place in ENS Rennes from 14/04/2018 to 15/04/2018.

7 Other skills**Languages spoken:**

- . French - Mother tongue.
- . English - Fluent - TOEIC: 890/990 in 2015.
- . Spanish - Basics.

Computing:

- . Programming language: OCaml.
- . Numerical-analysis softwares: Maple, Mathematica, Scilab, Sage.
- . Document preparation system: \LaTeX .