Pierre J. Clavier

Curriculum Vitae

▬▬▬ Education

2015–Present	**Post-doc**, *Institute für Mathematik*, Potsdam.
2012–2015	**PhD**, *Pierre et Marie Curie University (UPMC)*, Paris.
2010–2012	**MSc**, *Paris-Sud University*, ENS Ulm and Imperial College London.
2007–2010	**BSc**, *Paris-Sud University*, Orsay.

▬▬▬ Experiences in Research

2015–Present — **Post-Doc**, Institut für Mathematik; Potsdam Universität.

Formalisation of the physical concept of locality and application to renormalisation and geometry. I am also interested by the theory of rough paths. Adressed topics:
- Locality structures and applications to renormalisation and distributions over manifolds.
- Hopf algebra of renormalisation.
- Universal property of rooted forests and generalisation.
- Analytic renormalistion, multivariate complex analysis (through the geometry of cones).
- Rough paths theory and regularity structures.

2012–2015 — **PhD**, *Analytic and geometric approaches of non-perturbative aspects of quantum field theories*, Advisor: Pr Marc P. Bellon, LPTHE; Paris VI.

I mainly studied Schwinger–Dyson equations, in particular through the prism of Ecalle's resurgence theory. With other collaborators (C. Brouder, V. Dang Nguyen and F. Hélein) I have also studied geometric aspects of the BRST and Batalin–Vilkovisky formalisms. Adressed topics:
- Alien calculus and resurgence applied to Schwinger–Dyson equations.
- Integration of polyvector fields (Batalin–Vilkovisky formalism).
- BRST cohomology.

Spring 2012 — **Msc internship**, *Representation of a generalisation of the Virasoro algebra*, Supervisors: Dr. Robin Zegers & Pr Vincent Rivasseau, LPT; Paris XI.

My goal was to extend a generalisation of the Virasoro algebra stepping from the random tensors theory to obtain a semi-simple algebra.

Spring 2011 — **Msc internship**, *Orbiting Branes in Supergravity*, Supervisor: Pr. Kellogg Stelle, Theoretical Physics Group; Imperial College.

I have studied the stability of BPS solutions to eleven dimensional supergravity under various kind of perturbations.

2010-2011 — **MSc Project**, *BPS Branes and Supergravity*, Supervisor: Pr. Kellogg Stelle, Theoretical Physics Group; Imperial College.

This six month project was the foreword of the internship above. I have learnt there the basics of differential geometry which were not part of the curriculum. I have also seen how the BPS solutions to eleven dimensional supergravity were built.

Summer 2010   **Bsc internship**, *Introduction to the Bethe ansatz and to spin chains*, Superviseur: Dr. Robin Zegers, LPT; Paris XI.
This was an introduction to the notion of integrability through the notion of spin chains.

Teaching experiences

The usual tasks of preparation, corrections, coordination with other members of the teaching teams will not be mentionned below.

In post-doc (2-4h/semaine)

2017-2018   **Analysis I & II**, second year, Teaching assistant (in german).

2016-2017   **Mathematics for physicists III & IV**, second year, Teaching assistant (in english).

2016-2017   **Supervising of internships**, Master, Management of two master students, about branched zeta values and Feynman integrals (in french and english).

2015-2016   **Mathematics for physicists I & II**, first year, Teaching assistant (in english).

2015-2017   **Mathematics for physicists I-IV**, first and second year, Full lecture (in english).
Occasional substitution for full lectures

During PhD (192h in three years)

Fall 2015   **Elements of Theoretical Physics**, third year, Teaching assistant.

Spring 2015   **Concepts and Methods of Physics**, first year, Responsible of oral examination.

Spring 2014   **Concepts and Methods of Physics**, first year, Teaching assistant and responsible of oral examination.

Fall 2013   **Wave Mechanics**, second year, Teaching assistant and practical exercices.

Spring 2013   **Dynamics of Systems**, first year, Teaching assistant and responsible of oral examination.

Before PhD

2009-2011   **Tutoring**, Middle and High school, Private lessons in mathematics and physics.

Publications list

Published in referred journals

○ **Alien calculus and a Schwinger–Dyson equation: two-point function with a nonperturbative mass scale**; *Marc Bellon & P.J.C.*; Lett. Math. Phys., DOI:10.1007/s11005-017-1016-1, arXiv:1612.07813v2.

○ **Batalin–Vilkovisky formalism as a theory of integration for polyvectors**; *P.J.C. & Viet Dang Nguyen*; in book: "Quantization, Geometry and Noncommutative Structures in Mathematics and Physics", DOI:10.1007/978-3-319-65427-0_8, arXiv:1609.02326.

○ **A Schwinger–Dyson Equation in the Borel Plane: singularities of the solution**; *Marc P. Bellon & P.J.C.*; Lett. Math. Phys., DOI:10.1007/s11005-015-0761-2, arXiv:1411.7190v2.

○ **Solving a Dyson–Schwinger equation around its first singularity in the Borel plane**; *Marc Bellon & P.J.C.*; in book: "Dyson-Schwinger Equations in Modern Mathematics and Physics", Front. Phys. (2016) DOI: 10.1007/s11467-016-0582-5.

- **Analytic results for Schwinger–Dyson equations with a mass term**; *P.J.C.*; Lett. Math. Phys., DOI:10.1007/s11005-015-0762-1, arXiv:1409.3351.

- **Higher Order Corrections to the Asymptotic Perturbative Solution of a Schwinger-Dyson Equation**; *Marc P. Bellon & P.J.C.*; Lett. Math. Phys, DOI:10.1007/s11005-014-0686-1, arXiv:1311.1160v2.

Preprints

- **An algebraic formulation of the locality principle in renormalisation**; *P.J.C, Li Guo, Sylvie Paycha & Bin Zhang*, arXiv:1711.00884v2.

- **Analytical and Geometric approches of non-perturbative Quantum Field Theories**; *P.J.C*; arXiv:1511.09190; PhD thesis.

In preparation

- **Local algebraic structure of trees and associated branched ζ-functions**; *P.J.C., Li Guo, Syvie Paycha & Bin Zhang*.

- **Analycity domain of a Quantum Field Theory and Accelero-summation**; *Marc P. Bellon & P.J.C.*

Selected list of presentations

Nov. 2017 **Alien calculus and non-perturbative mass generation**, *Analysis and Geometry in Cargèse*, Cargèse, France.

May 2017 **Branching processes and renormalization**, *7th Annual ERC Berlin-Oxford on Applied Stochastic Analysis*, Berlin, Germany.

March 2017 **Renormalization of Feynman integrals**, *Mathematics and Physics meet in la Habana*, La Habana, Cuba.

Dec. 2016 **A generalization of the universal property of rooted trees**, *Seminar of the group: Probability theory and Mathematical Finance*, TU Berlin, Allemagne.

Aout 2016 **Branching procedure and tree-like iterated sums**, *Workshop on Renormalization and Mathematical Physics*, Sichuan University, Chengdu, Chine.

Aout 2015 **Alien calculus and transeries for a Schwinger-Dyson equation**, *Renormalization in statistical physics and lattice field theories*, Université de Montpellier, France.

Sept. 2014 **Solving a Dyson–Schwinger equation around its first singularities in the Borel plane**, *Dyson-Schwinger Equations in Modern Mathematics and Physics*, ECT*, Trento, Italie.

Professional Skills

Languages

French	**Mothertongue**	
English	**Fluent**	*Professional and colloquial*
German	**Intermediate**	*A2 level, under study*
Russian	**Basic**	*Basic words and phrases only*

IT expertises

Daily use of Linux (Mint, Ubuntu, Scientific Linux, Fedora) and Windows (XP, Vista, Seven)

Knowledge of Mathematica, LaTeX and SVN

Programming skills in C and C++

Others

Organiser of the Analysis group seminar

Co-editor of the proceeding of the Ouagadougou summer school

Organiser of a PhD students seminar for two years

Hobbys

Sport	Climbing and running.
Reading	litterature, philosophy, poetry

References

Pr. Dr. Sylvie Paycha, Supervisor.
paycha@math.uni-potsdam.de

Pr. Marc Bellon, Phd advisor.
bellon@lpthe.jussieu.fr

Pr. Dominique Manchon, Colleague.
Dominique.Manchon@math.univ-bpclermont.fr