

# Simon Pepin Lehalleur

## Curriculum Vitae

### PERSONAL INFORMATION

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**Nationality:** French

**Date of birth :** 9th of January 1986

**Personal situation:** Married, three children

**Professional adress:**

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6525 AJ Nijmegen, Netherlands

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**Webpage:** <http://simon-pepin.github.io/>

### RESEARCH

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#### Research interests (Algebraic and arithmetic geometry, homotopy theory):

- Motivic homotopy theory, motivic sheaves, six-operations formalism
- Motives of moduli spaces: vector bundles, Higgs bundles, quiver representations
- $\mathbb{A}^1$ -enumerative geometry and Grothendieck-Witt Euler characteristics
- Exponential motives and exponential periods
- Relative 1-motives, abelian schemes, Picard schemes, Néron models and related objects

#### Research positions

Postdoc (research group of Prof. Ben Moonen, Radboud University Nijmegen)	01/2020-
Principal Investigator SPP 1786 (Wissenschaftlicher Mitarbeiter) (research group of Prof. Hélène Esnault, Freie Universität Berlin)	04/2019- 12/2019
Postdoc (Wissenschaftlicher Mitarbeiter) (research group of Prof. Hélène Esnault, Freie Universität Berlin)	04/2018- 04/2019
Einstein fellowship postdoctoral position (research group of Prof. Hélène Esnault, Freie Universität Berlin)	04/2016- 04/2018
Ph.D. with Prof. Joseph Ayoub (Universität Zürich), defended 6/11/2015 <b>Title:</b> “An abelian category of relative 1-motives”	09/ 2011-11/2015
2 years as a Ph.D. student in Paris 13 under the supervision of Prof. Jörg Wildeshaus 09/2009-09/2011	

#### Publications

Subgroups of maximal rank of reductive groups, in “Autour des schémas en groupes”, *Panoramas et Synthèses* 47, 2015

On the relative motive of a commutative group scheme (with G. Ancona and A. Huber), *Algebraic geometry*, vol. 3 issue 2, 2016

Triangulated categories of relative 1-motives, *Advances in Mathematics*, vol. 347, 473-596, 2019

Constructible 1-motives and exactness of realisation functors, *Documenta Mathematica* 24, 1721-1737, 2019

On the Voevodsky motive of the moduli stack of vector bundles on a curve (with V. Hoskins), *The Quarterly Journal of Mathematics* 72 (2021), no. 1-2, 71–114.

A formula for the Voevodsky motive of the moduli stack of vector bundles on a curve (with V. Hoskins), *Geometry & Topology* 25 (2021), no. 7, 3555–3589

On the Voevodsky motive of the moduli space of Higgs bundles on a curve (with V. Hoskins), *Selecta Math.* (N.S.) 27 (2021), no. 1, Paper No. 11

Motives of moduli spaces of rank 3 vector bundles and Higgs bundles on a curve (with V. Hoskins and L. Fu), *Electronic Research Archive* 30 (2022), no. 1, 66–89

## Preprints

Voevodsky motives of stacks of coherent sheaves on a curve (with V. Hoskins), arXiv preprint 2208.03204

Motivic mirror symmetry for Higgs bundles (with V. Hoskins), arXiv preprint 2205.15393

Euler characteristics of homogeneous and weighted-homogeneous hypersurfaces (with M. Levine and V. Srinivas), arXiv preprint 2101.00482

Motives of moduli spaces of bundles on curves via variation of stability and flips (with V. Hoskins and L. Fu), arXiv preprint 2011.14872

## In preparation

Exponential motives I: exponentiation of coefficient systems (with M. Gallauer)

Exponential motives II: motivic Fourier transform (with M. Gallauer)

## Invited research visits

Tokyo Institute of Technology, Tokyo 09/2018

Mittag-Leffler Institute, Stockholm 01/2017

Tata Institute, Mumbai 10/2016

## Lecture series/minicourses

Triangulated categories of motivic sheaves, University of Freiburg 02/2020

Motives of moduli of bundles on curves, Indian Institute of Technology Madras (online) 11/2021

## Conference talks

*Motivic mirror symmetry for Higgs bundles*, Harnessing motivic invariants, Essen 6/2022

*Motivic mirror symmetry for Higgs bundles*, Motives and Hodge theory, Mittag-Leffler Institute, Stockholm (online) 10/2021

*A motivic non-abelian Hodge theorem*, Higgs bundles and relative topics (online) 05/2020

*On the motive of the moduli space of Higgs bundles*, SPP Jahrestagung, Essen 10/2019

*A formula for the motive of the moduli stack of vector bundles*, GLEN, Manchester 03/2019

*Generic Foliated cohomology*, Motives, Foliations and the Conservativity conjecture, Berlin 09/2018

<i>E-localisation, Motives, Foliations and the Conservativity conjecture</i> , Berlin	09/2018
<i>E-localisation, Conservativity conjecture workshop</i> , Harumura	09/2018
<i>The Voevodsky motive of the moduli stack of vector bundles</i> , NoGAGS Berlin	11/2017
<i>Reductive group schemes, Workshop on equivariant and motivic homotopy</i> , Osnabrück	10/2017
<i>The motivic t-structure for relative 1-motives</i> , Annual Meeting of the SPP 1786	03/2017
<i>The motivic t-structure for relative 1-motives, Generalizations of <math>\mathbb{A}^1</math>-Homotopy Invariance in Algebraic Geometry and Homotopy Theory</i> , Usedom	04/2016
<i>An introduction to motivic homotopy theory</i> , Motivic Homotopy theory day, FU Berlin	03/2016
<i>The Borel-De Siebenthal theorem</i> , SGA3 summer school, Luminy	09/2011

## Seminar talks

<i>Motivic mirror symmetry for Higgs bundles</i> , Academia Sinica, Taiwan (online)	07/2022
<i>Motivic mirror symmetry for Higgs bundles</i> , Topology seminar, Wuppertal (online)	01/2022
<i>Quadratic enumerative geometry and the Deligne-Milnor formula</i> , Quadratic forms, linear algebraic groups and beyond (online)	10/2020
<i>Exponential periods and Exponential motives</i> , GADEPs, IMPA (Rio) (online)	05/2021
<i>Motives of moduli spaces of bundles on curves</i> , Jussieu (Paris) (online)	10/2020
<i>Motives of moduli spaces of bundles on curves</i> , Purdue (online)	10/2020
<i>Constructible 1-motives</i> , Amsterdam	02/2020
<i>A formula for the Voevodsky motive of the moduli stack of vector bundles</i> , Berlin	10/2018
<i>A formula for the Voevodsky motive of the moduli stack of vector bundles over a curve</i> , Tokyo Institute of Technology	09/2018
<i>Triangulated categories of relative 1-motives</i> , University of Illinois Urbana Champaign	03/2018
<i>The Voevodsky motive of the moduli stack of vector bundles</i> , University of Illinois Chicago	03/2018
<i>Constructible 1-motives</i> , KTH Stockholm	02/2018
<i>On the motive of the stack of vector bundles on a curve</i> , University of Oxford	02/2018
<i>The Voevodsky motive of the moduli stack of vector bundles</i> , FU Berlin	02/2017
<i>The motivic t-structure for relative 1-motives</i> , Rennes	11/2016
<i>Relative 1-motives</i> , Tata Institute Mumbai	10/2016
<i>Triangulated categories of 1-motivic sheaves</i> , Singapore	08/2016
<i>The motivic t-structure for relative 1-motives</i> , Regensburg	01/2016
<i>The motivic t-structure for relative 1-motives</i> , Freiburg (Oberseminar)	10/2015
<i>Deligne 1-motives in the triangulated categories of mixed motives</i> , Paris Réga	12/2012

## Machine Learning talks

<i>Markov Chain Monte Carlo, a space odyssey</i> , Seminar at the company Lateral (NLP, Machine Learning), Berlin	10/2015
<i>Introduction to Topological Data Analysis</i> , Zürich Data Analysis and Machine Learning meetup	09/2014

## RESEARCH GRANTS

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Van Gogh scholarship (travel grant for Dutch-French collaboration), 2240 EUR	2021
SPP 1786, Project “Exponential motivic homotopy theory, foliations and applications”, Principal investigator, 213 600 EUR	2018-2020
Forschungskredit: Candoc, Principal investigator, University of Zürich, 55200 CHF	2013-2014

## TEACHING

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### Teaching activities

#### **Radboud Universiteit/University of Amsterdam (2020-)**

Lecturer Mastermath course “Commutative Algebra”	WS21
Lecturer Graduate course “Categories and Infinity-categories”	WS20

#### **Freie Universität Berlin (2016-2019)**

Student seminar “Categories and infinity-categories”	WS18
Teaching assistant for “Local Class Field Theory”	WS18
Student seminar “Differential Galois Theory”	SS18
Teaching assistant for “Complex Analysis”	SS18
Lecturer Graduate course “Models of curves and abelian varieties”	SS17

#### **University of Zürich (2011-2015): teaching assistant**

Linear Algebra I-II (Bachelor course, in German)	WS14-SS15
Programming in Python (Bachelor course)	WS13
Differential forms in topology (Masters course)	SS13
Algebraic Geometry (Masters course)	WS12
Probability and statistics for science students (Bachelor course, in German)	SS12
Linear Algebra and Geometry for teaching students (Bachelor course, in German)	WS 11

#### **Université Paris XIII: (2009-2011): teaching assistant**

Mathematics for Computer science (Bachelor course for computer science students, in French)	SS11
Linear Algebra (Bachelor course, in French)	WS10

### Student supervision

- Bachelor thesis: *Representations of compact groups and the Peter-Weyl theorem*, R. Gisolf (UvA), 2020
- Master thesis: *Relative Galois theory of  $\infty$ -topoi and the relative Étale homotopy type*, L. Martini (FU Berlin), 2019
- Master thesis: *Galois representations attached to modular forms of weight 2*, D. Loutchko (FU Berlin), 2019
- Master thesis: *Model categories and unstable  $\mathbb{A}^1$ -homotopy category*, V. Tabakov (FU Berlin), 2019
- Bachelor thesis: *The Étale fundamental group and the regular inverse Galois problem*, L. Martini (FU Berlin), 2018

## EDUCATION

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Master in mathematics with distinction in University Paris 7 Denis Diderot	09/2008
“Agrégation de Mathématiques”	09/2007
Bachelor in mathematics with distinction, University Paris 11 Orsay	09/2006
Passed the competitive examination to enter the Ecole Normale Supérieure	09/2005

## ORGANISATION AND SERVICE

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### Conference organisation

Co-organisation of Arbeitsgemeinschaft “Motives, Foliations and the Conservativity Conjecture” (Humboldt University)	24/09/18-28/09/18
Co-organisation of summer school “Motives for periods” (FU Berlin)	28/08/2017-1/09/2017

### Research seminar organisation

Organised seminar on “Hilbert schemes of points on surfaces” (Radboud/University of Amsterdam)	Spring 2020
Supervised seminar on “Motivic Galois groups and periods” (FU Berlin)	2016
Co-organised the Graduate Colloquium of the Graduate School of Mathematics of Zürich	2013-2014

### PhD defense committees

Peter Badea (Radboud, Nijmegen)	09.12.2020
Eva Martinez (FU Berlin)	29.06.2018
Irem Portakal (FU Berlin)	27.04.2018
Matej Filip (FU Berlin)	09.03.2018

### Committees

Advisory board of the Mathematics department, Radboud University	2020-
Hiring committees for several postdocs in the research group of Prof. Esnault	2016-2019

### Referee work

Refereed for Advances in Mathematics, Annales scientifiques de l'ENS, Tohoku mathematical journal, Mémoires de la Société Mathématique de France., Kodai Mathematical Journal, Journal of Pure and Applied Algebra, Bulletin of the London Mathematical Society.

### Zentralblatt and Mathreviews

Reviewed 8 papers for Zentralblatt and Mathreviews.

## LANGUAGES

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French : native  
English : written, spoken (fluent)  
Spanish : written, spoken (B2)

German : written, spoken (B1)

Dutch : written, spoken (A2)