

Sylvain Lavau

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Research topics

- Poisson geometry, Lie/Courant algebroids and Lie ∞ -algebroids
- Singular foliations, holonomy groupoid
- Gauge theories in supergravity, embedding tensor and tensor hierarchies
- Philosophy of the mathematical practice

Research Experience

Current Position

2024 ● **Postdoc**, *Ruder Boskovic Institute*, Zagreb,

Jan. – July 2024. Affiliated to the research project 'Symmetries in Quantum Gravity'.

Past Positions

2022
2024 **Visiting Researcher**, *Aristotle University of Thessaloniki*, Thessaloniki,

April 2022 – Jan. 2024. Visiting scholar at the AUTH from April 2022.

2021 ● **Junior Researcher**, *Euler Institute & Steklov Institute*, Saint-Petersburg,

Jan. 2021 – June 2022. Grant No. 075-15-2019-1620 from the Russian Federation. I left Russia at the beginning of the war in Ukraine and then I resigned from the research contract in June as working from abroad had been prohibited.

2016
2020 **Postdoc positions**, *Institut Elie Cartan* (Nancy), *CMUP* (Porto), *Max Planck Institut* (Bonn), *IMJ-PRG* (Paris).

Education

2010 – 2012 **Master in Theoretical Physics**, *Ecole Normale Supérieure*, Lyon, Paris,

Physics : majoring in quantum and statistical field theories.

Mathematics : attending the masters in Mathematics at ENS Lyon and at IMJ-PRG.

Thesis M1 : *General Relativity as an almost topological field theory* (Etera Livine)

Thesis M2 : *Le formalisme BRST canonique et covariant* (Laurent Baulieu)

2012 – 2016 **PhD in Mathematics**, *Université Claude Bernard*, Lyon,

Doctorate in Geometry and Mathematical Physics under the supervision of T. Strobl and H. Samtleben. Title : *Lie ∞ -algebroids and singular foliations*.

2018 – 2020 **Master in Philosophy of Science**, *Université de Lorraine*, Nancy,

Master of Philosophy and History of sciences (by distance learning).

Thesis : *What is a theorem (in practice)?* (Valeria Giardino)

Languages

French, English (fluent), Spanish (B2), Russian (B1), Japanese (JLPT 3), Greek (A2), Arabic (A1)

Publication List

Mathematics

- ◇ S. L., "The modular class of a singular foliation", *J. Geom. Phys.* (2023) **192** :104902. arXiv :2203.10861
- ◇ S. L., J. Palmkvist and J. Stasheff, "Corrigendum to 'From Lie algebra crossed modules to tensor hierarchies' [*J. Pure Appl. Algebra* (2023) **227**(6) :107311]", *J. Pure Appl. Algebra* (2023) **227**(12) :107428.
- ◇ S. L. and J. Stasheff, "From Lie algebra crossed modules to tensor hierarchies", *J. Pure Appl. Algebra* (2023) **227**(6) :107311. arXiv :2003.07838
- ◇ S. L. and J. Palmkvist, "Infinity-enhancing of Leibniz algebras", *Lett. Math. Phys.* (2020) **110**(11) :3121–3152. arXiv :1907.05752
- ◇ C. Laurent-Gengoux, S.L. and T. Strobl, "The universal Lie ∞ -algebroid of a singular foliation", *Doc. Math.* (2020) **25** :1571–1652. arXiv :1806.00475
- ◇ S. L., "Tensor hierarchies and Leibniz algebras", *J. Geom. Phys.* (2019) **144** :147–189. arXiv :1708.07068
- ◇ S. L., "A short guide through integration theorems of generalized distributions", *Differ. Geom. Appl.* (2018) **61** :42–58. arXiv :1710.01627
- ◇ S. L., H. Samtleben and T. Strobl, "Hidden Q-structure and Lie 3-algebra for non-abelian superconformal models in six dimensions", *J. Geom. Phys.* (2014) **86** :497–533. arXiv :1403.7114

Philosophy and Sociology of Science

- ◇ S.L., "What is a theorem (in practice) ?", *Trilogia Ciencia Tecnologia Sociedad* (2021), **13**(25) :e1765. revistas.itm.edu.co/index.php/trilogia/article/view/1765
- ◇ S.L., "Qu'est-ce qu'un théorème (en pratique) ?", *Rev. Anthropol. Connaiss.* (2021), **15**(2). journals.openedition.org/rac/22479
- ◇ Julien Larregue, S.L and Mahdi Khelifaoui, "La sociobiologie est morte, vive la psychologie évolutionniste!", *Zilsel* (2021) **8** :104–143. HAL-SHS :03201759

Lecture notes

- ◇ Lecture notes (270+ pages) that I have started for a three semesters long graduate course on differential geometry, Poisson geometry and constrained Hamiltonian systems (Dirac and BRST formalisms) whose first part was hosted at Steklov Institute during the spring semester of 2021, while its continuation was hosted at the Saint-Petersburg State University for the academic year 2021-2022. The notes – entitled *A geometric perspective on gauging procedures in the Hamiltonian formalism* – will be continuously updated and can be found at www.sylvainlavau.com/teaching/.

Scientific Life and Outreach

Involvement in the scientific community

Since 2021 **Reviews.**

Recurrent reviewer for *Mathematical Reviews*; reviewer for *JHRS* and *IMRN*.

Since 2017 **Edition.**

Chief editor of the mathematics section of the open-access journal *Emergent Scientist*. The creation of this journal, published by EDP Sciences and supported by the French Society of Physics, comes from the observation that the scientific publication process is an integral part of the scientist's work, but that it is not much emphasized during the initial training of students in Bachelor and Master. Thus, *Emergent Scientist* is primarily aimed at students who would like to get acquainted with the process of submission and publication in a scientific journal, starting from the Bachelor level. It is open to all types of submissions (original as well as expository) and emphasizes the pedagogical aspect, since the readership is mainly composed of other students. The Physics section was created and thought from the beginning to be backed by the International Tournament of Physicists, while I have collaborated to set up and organize the Mathematics section since 2017. On the long run we are trying to make the publication completely free of publications fees by looking for sponsors. Website : <https://emergent-scientist.edp-open.org/>.

Since 2014 **Seminar Organization.**

Co-organizer of the seminar of the Mathematical Physics team at the Institut Camille Jordan (Lyon) in 2014-2015. Co-organizer of the seminar on deformation theory at the Max Planck Institute in 2018 : <https://www.mpim-bonn.mpg.de/node/8756>. Co-organizer of a student reading seminar on spinors in field theory at Steklov Institute in 2021. Several talks given on the period 2021-2023 at the online "Singular Foliations And Related Structures" (SFARS) seminar gathering young researcher working on singular foliations. Co-organizer of the reading club on Florian Schatz' thesis "Coisotropic submanifolds and the BFV-complex" at the Aristotle University of Thessaloniki in 2023.

Scientific outreach and popularization

Oct. 2018 – March 2020 **Event management.**

Event manager of the science popularization festival *Pint of Science* in Paris (2019 and 2020), in charge of sessions dedicated to theoretical physics and astrophysics.

Dec. 2017 **Community management.**

Community manager of the Twitter account *@endirectdulabo* which gives researchers the opportunity to present their work.

Sept. – Dec. 2016 **Radio broadcasting.**

Columnist in the weekly science popularization program of *Radio Campus Lorraine*.

2012 – 2015 **Interventions in schools.**

Interventions in middle and high schools in the Lyon area with the association *MathàLyon* for educational activities promoting mathematical research and reasoning.

Invited and Contributed Talks

National and international conferences

- 21 Dec. 2023 *Algebra & Geometry Day at Thessaloniki*, Thessaloniki.
- 25-27 June 2023 *Workshop on singular foliations*, Paris.
- 9-27 Jan. 2023 *Higher Structures, Gravity and Fields*, Mainz.
- 23-26 Aug. 2022 *Geometric Structures and Supersymmetry*, Tromsø.
- 23-24 June 2022 *Hi-Phi International Conference*, Lisbon.
- 6-7 Sept. 2021 *Dévaluations et contestations des savoirs légitimes*, Paris.
- 13-14 May 2019 *Singular Foliations*, Leuven.

- 1 Feb. 2019 *Colloque tournant*, Poitiers.
- 13-14 June 2018 *Rencontres Poisson*, La Rochelle.
- 5-8 March 2018 *Higher Structures 2*, Philadelphia.
- 23-24 Nov. 2017 *Feuilletages singuliers*, Metz.
- 2-5 Nov. 2016 *Géométrie non commutative et applications*, Metz.
- 12-16 Jan. 2015 *Winter School in Mathematical Physics*, Les Diablerêts.

University seminars

- Dec. 2023 *Department Seminar*, Galatasaray Universitesi, Istanbul.
- July 2023 *Geometry Seminar*, Universidade de Coimbra.
- June 2023 *Mathematical Physics Seminar*, Université Claude Bernard - Lyon 1.
- June 2023 *Homotopy Seminar*, Université Paul Sabatier, Toulouse.
- Jan. 2023 *Topology and Geometry Seminar*, Universitat Gottingen.
- Feb. 2022 *Mathematical Physics Seminar*, Université de Bourgogne, Dijon.
- July 2021 *Higher structures Seminar*, Universitat Gottingen.
- March 2021 *Topology Seminar*, Institut Steklov, Saint-Petersburg.
- Nov. 2020 *Sciences Sociales des Sciences et Techniques*, EHESS, Paris.
- Feb. 2020 *Geometry Seminar*, Université Paul Sabatier, Toulouse.
- Nov. 2019 *Algebra, Geometry & Topology Seminar*, Université de Montpellier.
- Jan. 2019 *Operator Algebra Seminar*, Université Paris Diderot.
- Sept. 2018 *Oberseminar*, Max Planck Institut fur Mathematik, Bonn.
- Sept. 2018 *Geometry Seminar*, ETH-Univ. Zurich.
- Aug. 2018 *Topology and Geometry Seminar*, Universitat Gottingen.
- July 2018 *Higher Geometry Seminar*, Max Planck Institut fur Mathematik, Bonn.
- June 2018 *Geometry Seminar*, CMUP, Universidade do Porto.
- Nov. 2017 *Geometry & Mathematical Physics Seminar*, SISSA, Trieste.
- Oct. 2017 *Joint Geometry & Algebra Seminar*, CMUP, Universidade do Porto.
- May 2017 *Geometry Seminar*, Penn State, State College.
- May 2017 *Deformation Theory Seminar*, UPenn, Philadelphia.
- March 2017 *Geometry Seminar*, KU Leuven.
- March 2017 *Geometry Seminar*, National and Kapodistrian University of Athens.
- May 2015 *Graduate Colloquium*, ETH-Univ. Zurich.
- March 2015 *Séminaire des doctorantes & doctorants*, Université Claude Bernard, Lyon.

Lectures at schools and universities

- 10-14 July 2023 *Lie groupoid and algebroid week in Coimbra II*, Coimbra.
- May – June 2023 *Courant and Leibniz algebroids*, Aristotle University of Thessaloniki.

Affiliation to scientific institutions

- Affiliated researcher to the **Archives Henri Poincaré** (Nancy) since November 2020.
- Member of the **Association of the Philosophy of Mathematical Practice** (APMP) since November 2020. Scientific association created in 2009 to encourage philosophical research on mathematical practice.