

# CURRICULUM VITAE

Martin MION-MOUTON

## Administrative address

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**Current situation** (since september 2025): Postdoctorate at the *Institute of Mathematics of Marseille* (AMU) where I work with Pierre Dehornoy, member of the ANR project *AnoDyn*.

Previous situations:

- 2023-2025: Postdoctorate, Max-Planck institute for Maths in the Sciences (Leipzig), Anna Wienhard's group.
- 2021-2023: Postdoctorate, Technion university (mentor: Tali Pinsky);
- 2020-2021: Temporary Researcher and Teacher (*ATER*), Strasbourg university;
- 2017-2020: PhD student under contract, Strasbourg university.

## EDUCATION

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### Mathematics

- 2017 - 2020 **Ph.D in Mathematics**, University of Strasbourg, defended on 11 december 2020.  
Title: *Some geometrical and dynamical global properties of Lagrangian contact structures*.  
Advisor: Charles Frances. Thesis committee: T. Barbot (referee), S. Crovisier, S. Dumitrescu, E. Falbel (referee), C. Frances, O. Guichard (president), A. Rechtman.  
Recipient of the **best PhD poster award**, doctoral school MSII.
- 2016 - 2017 **Master 2 of fundamental Mathematics**, theme *Geometry and Topology*, graduated *with honors*, University of Strasbourg (Master 2 thesis under the supervision of Charles Frances).  
Recipient of the **pre-doctoral fellowship** of the Labex IRMIA.
- 2015 - 2016 **Master 1 of fundamental Mathematics**, École Normale Supérieure de Lyon (Master 1 thesis under the supervision of Charles Frances).
- 2014 - 2015 **Bachelor of Sciences in fundamental Mathematics**, École Normale Supérieure de Lyon (graduate thesis under the supervision of Gwénaél Massuyeau).
- 2012 - 2014 **Preparatory classes** to french "Grandes écoles", Lycée Saint-Louis, Paris.  
Undergraduate studies in Mathematics and Physics.

### Music

- 2011 - 2012 **Bachelor of Arts in Percussion**, graduated *with highest honors*, National Conservatory of Music of the Region of Rouen (class of Catherine Favre and Ronan Quelen).
- 2012 Admission to the session 2012 of the **French Youth Orchestra** (conducted by Dennis Russell Davies).

## Research interests

- Rigid geometric structures, Parabolic Cartan geometries, Flag structures in dimension 3;
- Partially Hyperbolic diffeomorphisms, Anosov flows;
- Singular Lorentzian surfaces, Homomographic interval exchange maps.

My research interests lie at the intersection between differential geometry and differentiable dynamical systems. On a geometrical point of view, I am interested in rigid geometric structures on manifolds and in their singular counterparts on surfaces, and on a dynamical point of view in (partially) hyperbolic systems and one-dimensional dynamics. I am particularly interested by the interactions between these dynamical and geometrical objects, of which the following situations give typical examples: (partially) hyperbolic systems having smooth (central,) stable and unstable distributions; rigid geometric structures having a “large” group of automorphisms; singular Lorentzian surfaces whose lightlike foliations are suspensions of homomographic interval exchange maps.

## Complete list of publications and preprints with abstracts

### Preprints

6. [Rigidity of singular de-Sitter tori with respect to their lightlike bi-foliation](#) (2024). Submitted. ([arXiv:2410.03260](#), [hal-04661986](#))

*Abstract:* In this paper, we introduce a natural notion of constant curvature Lorentzian surfaces with conical singularities, and provide a large class of examples of such structures. We moreover initiate the study of their global rigidity, by proving that de-Sitter tori with a single singularity of a fixed angle are determined by the topological equivalence class of their lightlike bi-foliation. While this result is reminiscent of Troyanov’s work on Riemannian surfaces with conical singularities, the rigidity will come from topological dynamics in the Lorentzian case.

5. [Reductions of path structures and classification of homogeneous structures in dimension three](#) (avec E. Falbel et J. M. Veloso, 2024). Submitted. ([arXiv:2406.11509](#), [hal-04612815](#))

*Abstract:* In this paper we show that if a path structure has non-vanishing curvature at a point then it has a canonical reduction to a  $\mathbb{Z}/2\mathbb{Z}$ -structure at a neighbourhood of that point. A simple implication of this result is that the automorphism group of a non-flat path structure is of maximal dimension three (a result by Tresse of 1896). We also classify the invariant path structures on three-dimensional Lie groups.

4. [Geometric surgeries of three-dimensional flag structures and non-uniformizable examples](#) (avec E. Falbel, 2024). Accepted at Transactions of the American Mathematical Society. ([arXiv:2406.02053](#), [hal-04598551](#))

*Abstract:* Dans cet article, nous introduisons une notion de chirurgie pour les structures drapeaux, qui sont des structures géométriques localement modélées sur l’espace des drapeaux de dimension trois sous l’action de  $\mathrm{PGL}_3(\mathbb{R})$ . Nous utilisons ces chirurgies pour construire de nouveaux exemples de structures drapeaux, de type uniformisable et de type non-uniformisable.

### Publications

3. [Geometrical compactifications of geodesic flows and path structures](#). Geometriae Dedicata **217**(2) (2022), 18. ([doi:10.1007/s10711-022-00751-1](#))

*Abstract :* In this paper, we construct a geometrical compactification of the geodesic flow of non-compact hyperbolic surfaces  $\Sigma$  without cusps having a finitely generated fundamental group, and we study the dynamical properties of the compactified flow. This compactification is done with respect to a uniformizable flag structure, for which  $T^1\Sigma$  is identified to the quotient of an open subset of the flag space by a discrete subgroup  $\Gamma$  of  $\mathrm{PGL}_3(\mathbb{R})$ . Our study relies on a detailed description of the dynamics of  $\mathrm{PGL}_3(\mathbb{R})$  on the flag space, and on the construction of an explicit fundamental domain for the action of  $\Gamma$ .

2. [Cartan connections and path structures with large automorphism groups](#) (with E. Falbel et J.M. Veloso).  
 International Journal of Mathematics **32**(12) (2021). ([doi:10.1142/S0129167X21400164](https://doi.org/10.1142/S0129167X21400164))  
*Abstract:* We classify compact manifolds of dimension three equipped with a path structure and a fixed contact form (which we refer to as a strict path structure) under the hypothesis that their automorphism group is non-compact. We use a Cartan connection associated to the structure and show that its curvature is constant.
1. [Partially hyperbolic diffeomorphisms and Lagrangian contact structures](#).  
 Ergodic Theory and Dynamical Systems **42**(8) (2022), 2583-2629. ([doi:10.1017/etds.2021.54](https://doi.org/10.1017/etds.2021.54))  
*Abstract:* In this paper, we classify the three dimensional partially hyperbolic diffeomorphisms whose invariant distributions are smooth, such that  $E^s \oplus E^u$  is a contact distribution and whose non-wandering set equals the whole manifold. We prove that up to a finite quotient or a finite power, they are smoothly conjugated either to the time-one map of an algebraic contact-Anosov flow, or to an affine partially hyperbolic automorphism of a nil-manifold. The rigid geometric structure induced by the invariant distributions plays a fundamental role in the proof.

## Communications

### Conferences

- April 2025, *Translation, Dilation, Affine and other Structures on Surfaces*, Institute of Mathematics of Toulouse.
- January 2025, *Special structures in dynamics and geometry*, Institute of Mathematics of Jussieu.
- March 2024, *Aspects of ergodic theory for hyperbolic groups*, university of Leipzig (contributed talk).
- April 2023, *Anosov systems*, CIRM, Marseille (short talk).
- July 2022, *Complex Hyperbolic Geometry and Related Topics*, CIRM, Marseille.
- June 2022, *Geometric structures, compactifications and group actions*, Strasbourg university (short talk).
- December 2020, *Jeunes géomètres dynamiques*, GDR Platon.
- August 2019, *1<sup>st</sup> Joint Meeting Brazil-France in Mathematics* (session 10), IMPA, Rio de Janeiro.

### Seminars

- April 2025, Analysis and Dynamics seminar, Côte d'Azur university.
- January 2025, Darboux seminar, university of Montpellier.
- October 2024, Geometry seminar, university of Bordeaux.
- October 2024, Dynamical systems, Analysis and Geometry seminar, university of Avignon.
- April 2024, Geometry and Topology seminar, university of Luxembourg.
- March 2024, Spectral theory and Geometry seminar, Grenoble university.
- February 2024, seminar of Ergodic theory and dynamical systems, university Paris-13.
- February 2024, Ergodic theory seminar, Rennes university.
- February 2024, Geometry and Topology seminar, Aix-Marseille university.
- October 2023, Geometry seminar, Max-Planck institute for Mathematics in the Sciences, Leipzig.
- February 2023, Geometry and Topology seminar, Sorbonne university.
- January 2023, Differential Geometry seminar, Heidelberg university.

- March 2022, seminar Geometry and Topology, Technion university.
- March 2022, seminar The mathematics of motion, Technion university.
- October 2021, Geometry seminar, university of Bordeaux.
- October 2021, Darboux seminar, university of Montpellier.
- March 2021, seminar of Dynamical systems and geometry, university of Angers.
- March 2021, Teich seminar, university of Marseille.
- February 2021, seminar of Geometry, topology and dynamical systems, university Paris-Saclay.
- February 2021, seminar of Ergodic theory and dynamical systems, university Paris-13.

## Ph.D student Seminars

- 2021, university of Strasbourg.
- 2019, university of Nantes.
- 2018, university of Dijon.
- 2017, university of Strasbourg.

## Reading groups

- 2025, two talks in a working seminar *Topological manifolds and algebraic varieties in practice*, institute of Mathematics of Marseille.
- 2022, two talks (about *Circle and Seifert bundles* and *Torus bundles and their geometrization*) in a working seminar about *Three-manifolds and their geometrization*, Technion university.
- 2018, two talks (about *Oseledec's theorem* and *Pesin's theory*) in a working seminar about *Brown-Fisher-Hurtado's results and Zimmer's program*, Strasbourg university.

## Scientific and administrative activities

- 2025, Co-organization of the summer school *Dynamics and geometry in dimension 1, 2 and 3*, CIRM. Responsibilities: creating the scientific program and invitation of speakers; drafting funding applications; budget management with CIRM.
- 2024, Co-organization of the *Winter school in Geometry and Dynamics* in Aussois. Responsibilities: co-creation of the scientific program and invitation of speakers; drafting of funding applications; budget co-management with CAES Paul Langevin.
- 2024, Co-organization of the Geometry seminar, MPI MiS, Leipzig. Co-responsibilities (with Mireille Soergel): inviting speakers; administrative management with MPI MiS.
- 2022, Proofreading and advice on the drafting of the guide *Codes et logiciels de la recherche* by the SCD of the University of Lille, as part of the *Passeport pour la science ouverte*.
- 2022, Organization of a working seminar about *Three-manifolds and their geometrization*, Technion university.
- 2021, Co-organization of a working seminar about *Mostow rigidity*, university of Strasbourg.

## Awards and distinctions

- 2025, post-doctorate with ANR AnoDyn.
- 2025, recipient, with Florestan Martin-Baillon, of INSMI's PEPS JCJC 2025 call for projects, for funding of 3000 euros for the project *Singular Lorentzian surfaces: rigidity, geometry and dynamics*.
- 2024, recipient of the Kick-off workshop call for projects from the Max-Planck Society, with funding of 13500 euros for the summer school *Dynamics and Geometry in Dimensions 1, 2 and 3*.
- 2023, post-doctoral fellowship, Max-Planck institute for Mathematics in the sciences, Leipzig.
- 2021, post-doctoral fellowship, Technion.
- 2020, best poster award, doctoral school MSII, Strasbourg university.
- 2017, doctoral fellowship, Strasbourg university.
- 2016, pre-doctoral fellowship, labex IRMIA, Strasbourg university.

## Visiting positions

- January 2023, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche* under invitation of Elisha Falbel.  
Theme of work: Rigidity of higher-dimensional partially hyperbolic diffeomorphisms.
- July 2022, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche*, under invitation of Elisha Falbel.  
Themes of work: Regularity of Lyapunov distributions and rigidity.
- September-October 2021, visit at the *Institut de mathématiques de Jussieu Paris Rive Gauche*, under invitation of Elisha Falbel.  
Theme of work: Rigidity of higher-dimensional path geometries.
- July 2019, visit at the *Instituto de Matemática e Estatística* (São Paulo) under invitation of Uirá Matos, with support of the Fondation Louis D-Institut de France (project coordinated by M. Viana).  
Themes of work: Rigid geometric structures defined by distributions of specific growth vectors.

## Selection of attended conferences

- 2025    *Translation, Dilation, Affine and other Structures on Surfaces*, Toulouse.  
         *Special structures in dynamics and geometry*, Jussieu.
- 2024    *Group Actions and Rigidity: Around the Zimmer Program*, CIRM, Luminy.  
         *Aspects of ergodic theory for hyperbolic groups*, Leipzig.
- 2023    *GRAZP: Groups and Rigidity Around the Zimmer Program*, Ventotene.  
         *Anosov systems*, CIRM, Luminy.  
         *Spring school in geometry and dynamics*, Lille university.
- 2022    *Israel Mathematical Union annual meeting*, Ben-Gurion University, Be'er Sheva.  
         *Complex Hyperbolic Geometry and Related Topics*, CIRM, Luminy.  
         *Geometric structures, compactifications and group actions*, Strasbourg.  
         *Action now meeting*, université du Technion.
- 2021    *Action now meeting*, institut Weizmann.  
         *A Hyperbolic Day Online*, online.  
         *Topics at the Interface of Low Dimensional Group Actions and Geometric Structures*, online.
- 2020    *Jeunes géomètres dynamiques*, GDR Platon, online.
- 2019    *Paroles aux jeunes chercheurs en géométrie et dynamique*, GDR Platon.  
         *1<sup>st</sup> Joint Meeting Brazil-France in Mathematics*, IMPA (Rio de Janeiro).  
         *Géométrie et Dynamique de A à Z* in the honor of Abdelghani Zeghib, University of Avignon.

- 2018 *Topology and Dynamics in the Swiss Alps*, Borel seminar, Les Diablerets.  
*Paroles aux jeunes chercheurs en groupes et géométrie*, GDR Platon, University of Lyon 1.  
*Pseudo-riemannian geometry and Anosov representations*, University of Luxembourg.  
*Geometry in Action, and Actions in Geometry*, third edition, University of Lorraine.  
*Geometry in Action, and Actions in Geometry*, 2<sup>nd</sup> edition, University of Luxembourg.
- 2017 *Conference in honor of Christophe Bavard*, University of Bordeaux.  
*Paroles aux jeunes chercheurs en systèmes dynamique et géométries*, GDR Platon.
- 2016 *Paroles aux jeunes chercheurs en géométrie et groupes*, GDR Platon, University of Strasbourg.

## TEACHING AND SCIENTIFIC OUTREACH

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### Teaching

#### Teaching assistant at the University of Strasbourg

- 2020 - 2021 Oral examinations in Mathematics.  
 Course on *Linear algebra*, first year undergraduate students in Mathematics and Physics.
- 2018 - 2021 Problem sessions on *Topology* and *Differential and Integral calculus*, for third year undergraduate students in Mathematics.
- 2017 - 2018 Course on *Elementary Logic and Set theory*, for 1<sup>st</sup> year undergraduate students in Mathematics.  
 Course on *Maple*, for 1<sup>st</sup> year undergraduate students in Mathematics.  
 Problem sessions on *Differential equations*, for 1<sup>st</sup> year undergraduate students in Biology.

#### Examinator in the **Lycée du Parc** (Lyon)

- 2015 - 2016 Oral examinations in Mathematics, for undergraduate students of selective 2<sup>nd</sup> year "MP\*" of preparatory classes.

### Supervision

- 2025 Co-supervision, with Pierre Dehornoy, of the research internship of Sébastien Dhellemmes, L3 student at ENS Rennes. Subject: *Topology and geometry of knots complements*.
- 2020 - 2021 Supervision of the master's thesis of Justin Rieber (M2 agrégation).  
 Subject: *Vector fields of the plane and Poincaré-Bendixson theorem*.

### Scientific outreach

- 2022, 2025 Around the *Week of mathematics*, discussion with pupils and animations in the elementary school of Mellionnec (Côtes-d'Armor, Brittany, France).
- 2018 - 2019 Voluntary supervision of a "Maths En Jeans" session (popularization in mathematics for High School students), Lycée Marc Bloch (Strasbourg).
- 2014 - 2015 Voluntary tutoring in Mathematics.

## OTHER INFORMATION

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*Language skills:* French (mother tongue), English (fluent), German (good knowledge).

*Programming:* Latex, Maple, Html.

*Other teaching experiences:* Dance and Tap Dance classes (2018-2021); Percussion and Musical theory classes (2010-2012).

*Associative experiences:* Participation to the organization of swing dance festivals in the association *Lindy Spot* (2017-2021); Treasurer of the association *Champ Libre* for cinema at the *ENS de Lyon* (2014-2016).