

Paris Arithmetic Homotopic Galois Theory Days 2026

Homotopy Geometries and Arithmetic

Program and schedule of the workshop

NOVEMBER 9-10, 2026 - JUSSIEU FRANCE

ORG.: B. COLLAS, RIMS KYOTO UNIVERSITY, JAPAN & P. DÈBES, UNIVERSITÉ DE LILLE, FRANCE & A. MÉZARD, IMJ-PRG, FRANCE

SCHEDULE

Talks are 60 minutes long. All talks take place at the Campus Jussieu (“Room AA-BB/FRR” is to be read “between tower AA and tower BB, at floor F, room RR”). Some ~ 30 minutes long breaks between talks and extended lunch break allow informal exchanges between participants.

Monday - 9 Nov.	Room TBA	Tuesday - Nov. 10	Room TBA
9:00	Welcome	9:30	K. KONDO
9:15	B. COLLAS	Lubin–Tate representations and Aut-intrinsic Hodge–Tate-ness	
Stack Homotopy Geometry – Arithmetic and Anabelian Aspects			
11:00	C. DUPONT	11:00	G. HOREL
Little disks, tangential basepoints, and motives		Title to be announced	
12:00	Lunch & Discussions	12:00	Lunch & Discussions
14:00	Y. HOSHI	14:00	K. SAWADA
Title to be announced		A historical overview of higher dimensional anabelian geometry	
15:30	C. DEMARCHE	15:30	S. TUBACH
When is a complex Lie algebra defined over the real numbers?		Title to be announced	
16:45	M. ROBALO	16:30	Free Discussions & Closing
Title to be announced			

“Restauration” - a selection

- LES PETITS POIS, 3 Rue Linné, 75005 Paris - [\[Google Map\]](#)
- BRASSERIE COSMO, 1 Rue des Écoles, 75005 Paris - [\[Google Map\]](#)
- LES BELLES PLANTES, 47 Rue Cuvier, 75005 Paris - [\[Google Map\]](#)
- NARRO, 72 Rue du Cardinal Lemoine, 75005 Paris - [\[Google Map\]](#)
- IPPUDO SAINT-GERMAIN, 714 Rue Grégoire de Tours, 75006 Paris - [\[Google Map\]](#)

A cafeteria at the corner of towers 16-26-25 on the “parvis” provides drinks for the session breaks.

The homotopy theory of algebraic spaces, as encoded by their étale fundamental groups, provides an original perspective on arithmetic properties of number fields and p -adic fields. These properties emerge as invariants of moduli phenomena and through the anabelian reconstruction of geometric objects over their fields of definition. This talk explores these connections from the viewpoint of algebraic stacks.

We first discuss a stack-theoretic approach to Oda’s problem, which concerns the stabilization of number fields arising from the Galois action on the moduli spaces of curves as the genus and the number of marked points vary. In number theory, this problem is closely related to Ihara’s question and the Rasmussen–Tamagawa conjecture. We then turn to the Grothendieck conjecture for Deligne–Mumford curves, explaining how, surprisingly, stack-theoretic methods extend its scope beyond the classical hyperbolic setting.

Time permitting, we will conclude with recent directions of research of potential interest to algebraic number theorists, such as the effect of “mono-analyticity vs arithmetic-holomorphy” on the arithmetic of fields.

- [CP25] B. COLLAS, S. PHILIP, [On Oda’s problem and special loci](#), *J. Inst. Math. Jussieu* **24** (2025), no. 2, 503–539.
- [CPY26] B. COLLAS, S. PHILIP, N. YAMAGUCHI, [Anabelian geometry for Deligne–Mumford curves](#) (2026), arXiv:2605.02577.
- [MR25] C. MCLEMAN, C. RASMUSSEN, [Equivalence of conjectures on heavenly elliptic curves](#) (2025), arXiv:2505.17474.
- [Moc15] S. MOCHIZUKI, [Topics in absolute anabelian geometry III: global reconstruction algorithms](#), *J. Math. Sci. Univ. Tokyo* **22** (2015), no. 4, 939–1156.

The operad of little disks is a central object of topology (where it organizes the structure of double loop spaces), of mathematical physics (due to its relationship to deformation quantization), but also of arithmetic geometry, where it is part of Grothendieck’s “Lego–Teichmüller game” in genus zero.

For arithmetic applications, it is crucial to be able to say that the operad of little disks is ‘motivic’, in the sense of mixed Tate motives over $\mathbb{Z}$. However, there are two obvious obstructions: the operation of inserting a collection of disks inside a bigger disk is not obviously algebro-geometric, and it is not clear how to make sense of Deligne’s “tangential basepoints” in purely motivic terms (in some cases it was explained by Deligne–Goncharov how one can do so by transcendental methods).

I will explain how one can use (a modified version of) logarithmic geometry to define motivic incarnations of the little disks operad together with its tangential basepoints. This talk is based on joint work with Erik Panzer (Oxford) and Brent Pym (McGill, Montreal).

- [Del89] P. DELIGNE, [Le groupe fondamental de la droite projective moins trois points](#), *Galois groups over $\mathbb{Q}$* (Berkeley, CA, 1987), Math. Sci. Res. Inst. Publ. **16**, Springer, New York, 1989, 79–297.
- [DG05] P. DELIGNE, A. B. GONCHAROV, [Groupes fondamentaux motiviques de Tate mixte](#), *Ann. Sci. École Norm. Sup. (4)* **38** (2005), no. 1, 1–56.

[DPP24] C. DUPONT, E. PANZER, B. PYM, [Logarithmic morphisms, tangential basepoints, and little disks](#) (2024), arXiv:2408.13108.

TITLE TO BE ANNOUNCED

HOSHI Yuichiro (RIMS Kyoto University)

Title and abstract to be announced. Announced theme: reduction of curves and of their Jacobians from the point of view of Deligne–Mumford stacks, and combinatorial models in anabelian geometry.

WHEN IS A COMPLEX LIE ALGEBRA DEFINED OVER THE REAL NUMBERS?

Cyril DEMARCHE (IMJ-PRG)

A real Lie algebra defines by extension of scalars a complex Lie algebra that is isomorphic to its Galois conjugate. We are interested in the converse property: given a complex Lie algebra that is isomorphic to its conjugate, is it defined over the real numbers? This is related to the more general problem of understanding the difference between the field of moduli and a field of definition of an algebro-geometric object.

After recalling the history, with examples, of this problem, we will explain the recent construction of a 10-dimensional nilpotent complex Lie algebra isomorphic to its conjugate but not defined over the reals, disproving a conjecture by Deré. In addition, we will explain the obstruction to this descent problem in terms of Brauer groups.

[Dem26] C. DEMARCHE, [A note on complex Lie algebras isomorphic to their conjugate](#) (2026), arXiv:2604.06979.

[BdGG26] M. BOROVoi, W. A. DE GRAAF, R. M. GURALNICK, [Constructing a complex Lie algebra isomorphic to its complex conjugate but not definable over reals](#) (2026), arXiv:2607.19513.

TITLE TO BE ANNOUNCED

Marco ROBALO (IMJ-PRG)

Title and abstract to be announced. Announced theme: motives of categories with singularities and derived geometry – non-commutative motives, the Morel–Voevodsky formalism, and vanishing cycles.

LUBIN–TATE REPRESENTATIONS AND AUT-INTRINSIC HODGE–TATE-NESS

KONDO Kaiji (RIMS Kyoto University)

Let p be a prime number, k a nontrivial finite Galois extension of $\mathbb{Q}_p$, and G_k the absolute Galois group of k . A central question in anabelian geometry is to what extent the field structure of k is reflected in the group structure of G_k . In this context, it is known that a continuous automorphism of G_k preserves the Hodge–Tate-ness of every Hodge–Tate p -adic representation if and only if it is induced by a field automorphism of k (Mochizuki, Hoshi).

This result naturally leads to the question of which p -adic representations remain Hodge–Tate after precomposition with every continuous automorphism of G_k , a property known as Aut-intrinsic Hodge–Tate-ness. It is known that, for one-dimensional representations and reducible two-dimensional representations, this property is equivalent to ordinary Hodge–Tate-ness.

In this talk, we study this question for Lubin–Tate representations in the context of local class field theory. We show that, for any prime p (assuming $\sqrt{-1} \in k$ when $p = 2$), the $\mathbb{Q}_p$ -linear representation associated with a Lubin–Tate character of k is not Aut-intrinsically Hodge–Tate, regardless of the choice of uniformizer. More precisely, the set of outer automorphisms of G_k that preserve its Hodge–Tate-ness has Haar measure zero in $\text{Out}(G_k)$. The proof combines mono-anabelian reconstruction algorithms with techniques from mapping class groups and p -adic Lie theory, reducing the Hodge–Tate condition to a linear-algebraic condition.

- [Hos13] Y. HOSHI, [A note on the geometricity of open homomorphisms between the absolute Galois groups of \$p\$ -adic local fields](#), *Kodai Math. J.* **36** (2013), no. 2, 284–298.
- [Hos24] Y. HOSHI, [On intrinsic Hodge–Tate-ness of Galois representations of dimension two](#), *Kodai Math. J.* **47** (2024), no. 1, 99–111.
- [Kon25] K. KONDO, [Anabelian aspects of the outer automorphism groups of the absolute Galois groups of mixed-characteristic local fields](#), RIMS Preprint 1991 (2025).
- [Kon26] K. KONDO, [Lubin–Tate representations over nontrivial finite Galois extensions of \$\mathbb{Q}_p\$ are not Aut-intrinsically Hodge–Tate](#), RIMS Preprint 1993 (2026).

TITLE TO BE ANNOUNCED

Geoffroy HOREL (IMJ-PRG)

Title and abstract to be announced. Announced theme: schematic homotopy types and unstable models; see https://geoffroy.horel.org/Unstable_models.pdf.

A HISTORICAL OVERVIEW OF HIGHER DIMENSIONAL ANABELIAN GEOMETRY

SAWADA Koichiro (RIMS Kyoto University)

One of the central problems in anabelian geometry, now called Grothendieck’s anabelian conjecture, is whether the geometric structure of “anabelian varieties” is determined by the isomorphism classes of their étale fundamental group. Although no appropriate characterization of “anabelian varieties” has been given for the higher dimensional case, hyperbolic polycurves (i.e., successive fibrations of hyperbolic curves) have been considered examples of anabelian varieties.

Historically, Grothendieck’s anabelian conjecture for hyperbolic polycurves was proved by Mochizuki in 1999 for the 2-dimensional case and by Hoshi in 2014 for cases up to 4 dimensions. Furthermore, independently, Schmidt and Stix obtained a result under certain conditions in 2016. And in 2026, Carlson published a preprint of a proof for the general case. In this talk, I will provide an overview of this problem and related topics in higher dimensional anabelian geometry.

- [Car26] M. CARLSON, [Elementary anabelian varieties are anabelian](#) (2026), arXiv:2604.24898 [math.NT].
- [Col26] B. COLLAS, [Anabelian perspectives in Galois–Teichmüller theory](#), *Low Dimensional Topology, Number Theory and Arithmetic Galois Theory: In honor of Hiroaki Nakamura’s 60th birthday*, World Scientific (accepted), 2026, arXiv:2603.02848 [math.AG].

- [Hos14] Y. HOSHI, [The Grothendieck conjecture for hyperbolic polycurves of lower dimension](#), *J. Math. Sci. Univ. Tokyo* **21** (2014), no. 2, 153–219.
- [HMM22] Y. HOSHI, A. MINAMIDE, S. MOCHIZUKI, [Group-theoreticity of numerical invariants and distinguished subgroups of configuration space groups](#), *Kodai Math. J.* **45** (2022), no. 3, 295–348.
- [SS16] A. SCHMIDT, J. STIX, [Anabelian geometry with étale homotopy types](#), *Ann. of Math. (2)* **184** (2016), no. 3, 817–868.

TITLE TO BE ANNOUNCED

Swann TUBACH (IMJ-PRG)

Title and abstract to be announced. Announced theme: Nori motives, perverse sheaves, and mixed Hodge modules.

This workshop is part of the “Arithmetic & Homotopic Galois Theory” project, supported by the CNRS-RIMS AHGT International Research Network between Lille University, RIMS Kyoto University, and ENS PSL – see <https://ahgt.math.cnrs.fr> for workshops, seminars, and list of members. It is held jointly with the France–Japan “Autumn in Paris 2026” visiting programme.