Javier Fresán

Centre de mathématiques Laurent Schwartz
École Polytechnique
91128 Palaiseau Cedex
France

Office: 06 10 07
Phone: +33 1 69 33 49 78

email: javier.fresan@polytechnique.edu

Born: September 15, 1987
Nationality: Spanish
Languages: Spanish (mother tongue), English, French, Italian (fluent), German (beginner)

Career and education

from 2017	École Polytechnique, Professeur Hadamard (from September 2017).
2014/2017	ETH Zürich, SNSF Postdoctoral fellow (September 2014–August 2017).
2013/2014	Max-Planck-Institut für Mathematik Bonn, Postdoctoral fellow (September 2013–August 2014).
2010/2013	PhD in Mathematics, Université Paris 13 (October 2010-November 2013).
	Sur les périodes des structures de Hodge à multiplication complexe. Mention "très honorable". Defended on 18/11/2013. Advisors: C. Soulé, J. Wildeshaus. Jury: J.-B. Bost, L. Breen, H. Esnault, C. Sabbah, T. Saito.
2010/2013	Monitorat, Université Paris 13.
2009/2010	Master 2 in "Mathématiques fondamentales", Université Paris 13. Mention "très bien".
	Master thesis *Une approche arakélovienne à la conjecture de Gross-Deligne*, supervised by C. Soulé.
2008/2009	Master 1 in "Mathématiques fondamentales", Université Paris 6. Mention "très bien".
2005/2008	Undergraduate studies in Mathematics, Universidad Complutense de Madrid.

Grants, honors & awards

2015	Premio Vicent Caselles RSME-Fundación BBVA.
2012	Prize *Prismas "Casa de las Ciencias"* to the best article of dissemination of science published in the Spanish media in 2011.

List of publications

[1] (with J. Fernández de Bobadilla, V. Muñoz, and A. Murillo) The Hilali conjecture for hyperelliptic spaces. *Mathematics without boundaries: Surveys in Pure Mathematics* (P. Pardalos and Th. M. Rassias, eds.), Springer-Verlag, 2014, 21-36.

[2] Periods of Hodge structures and special values of the gamma function. *Inventiones mathematicae* **208** (2017), no. 1, 247-282.

[3] (with O. Amini, S. Bloch, and J.I. Burgos Gil) Feynman amplitudes and limits of heights. *Izvestiya Mathematics* **80**, no. 5, special issue in honor of J-P. Serre (2016).

[4] (with J.I. Burgos Gil) Multiple zeta values: from numbers to motives. With contributions by U. Kühn. *Clay Mathematics Proceedings*, to appear.

[5] A reciprocity law for periods of cyclic covers, preprint.

[6] (with M. Asakura) On the Gross-Deligne conjecture for variations of Hodge-de Rham structures, preprint.

[7] (with P. Jossen) Exponential motives, preprint.

[8] Équirépartition de sommes exponentielles [travaux de Katz], Séminaire Bourbaki. Vol. 2017/2018. Exposé 1141. *Astérisque*, to appear.

Research visits

2018 *Varieties: Arithmetic and Transformations.* Simons Semester, Banach Center, Warsaw, October 2018.

2018 *Hausdorff Trimester Program "Periods in Number Theory, Algebraic Geometry and Physics"*, Hausdorff Institute Bonn, January-April 2018.

2017 *Taida Institut for Mathematical Sciences*, Taipei, October 25-November 4 2017.

2017 *Institut des Hautes Études Scientifiques*, Bures sur Yvette, September-December 2017.

2017 *Max-Planck Institute for Mathematics*, Bonn, January-February 2017.

2016 *School of Mathematics*, University of Edinburgh, March 21-25, 2016.

2015 *Institute for Advanced Study*, Princeton, April 1-15, 2015.

2015 *École Normale Supérieure*, Paris, January 12-23, 2015.

2014 *Laboratory of Algebraic Geometry and its Applications*, Higher School of Economics, Moscow, December 11-23, 2014.

2014 *Instituto de Ciencias Matemáticas*, Madrid, October 6-10, 2014.

2014 *Forschungsinstitut für Mathematik*, ETH Zürich, April 7-11, 2014.

Teaching (at master or graduate level)

Courses

2017 Master course *Class Field Theory* (6oh). ETH, Zürich, Spring 2017.

2016 (with P. Jossen) Reading course *Abelian varieties over finites field* (6oh). ETH, Zürich, Autumn 2016.

2016 Seminar *Algebraic Number Theory* (6oh). ETH, Zürich, Autumn 2016.

2016 Reading course *Deformation Theory* (6oh). ETH, Zürich, Spring 2016.

2015 (with P. Jossen) Reading course *Geometric Invariant Theory* (6oh). ETH, Zürich, Autumn 2015.

2015 Graduate course *Epsilon factors of connections and ℓ-adic sheaves* (6oh). ETH, Zürich, Spring 2015.

2014 Reading course *Topics in Fermat curves* (6oh), ETH, Autumn 2014.

2019	*Exponential motives* (3h). GAGC, Luminy, November 25-29, 2019.
2017	*Iterated integrals* (4h30). IMPRS Minicourse, MPIM Bonn, January 2017.
2016	*Exponential motives* (4h30), National Taiwan University, Taipei, December 2016.
2016	*Multiple zeta values: from classical to motivic* (6h). Albert-Ludwigs Universität, Freiburg, July 2016.
2014	*An introduction to the Grothendieck period conjecture* (4h30). Laboratory of Algebraic Geometry and its applications, Higher School of Economics, Moscow, December 2014.
2014	*Mixed Tate motives* (3h), IMPRS Max-Planck Institute Bonn, June 2014.

Invited research talks

2018	D-modules, quantum geometry, and related topics. Kyoto, December 3-7, 2018.
2018	Cohomology of algebraic varieties. Luminy, October 15-19, 2018.
2018	Arithmetic Geometry: l-adic and p-adic aspects, Tokyo, September 10-14, 2018.
2018	Arithmetic Algebraic Geometry (Banaszak 60), Bedlevo, August 27-31, 2018.
2018	N-cube week, Institut Mittag-Leffler, June 25-29, 2018.
2018	Congrès de la Société Mathématique de France, June 4-8, 2018.
2018	Groupes algébriques et géométrisation du programme de Langlands. Lyon, May 22-25, 2018.
2018	Periods and L-values of Motives, Simons Foundation, Schloss Elmau, April 29-May 5, 2018.
2018	Sino-French Conference in Algebraic and Arithmetic Geometry. Lyon, April 23-26, 2018.
2018	Motives in Tokyo (Shuji 60). Tokyo, March 26-30, 2018.
2018	*Realisations of exponential motives.* Riemann-Hilbert correspondences. Padova, February 5-9, 2018.
2017	*Exponential motives.* Algebraic K-theory and arithmetic. Bedlevo, August 20-26, 2017.
2017	*Exponential motives.* Théorie de Hodge, phénomène de Stokes et applications. CIRM Luminy, April 10-14, 2017.
2017	*A Galois theory of exponential periods.* Galois Theory of Periods and Applications. MSRI Berkely, March 27-31, 2017.
2016	*Periods of irregular connections and exponential motives.* Iberian Meeting on Algebraic Analysis, Lisbon, June 8-10, 2016.
2016	*Exponential motives.* Generalizations of $\mathbb{A}^1-$Homotopy Invariance in Algebraic Geometry and Homotopy Theory. April 3-8, 2016.
2016	*Une théorie de Galois pour les périodes exponentielles.* Autour des équations différentielles. Grenoble March 7-9, 2016.
2015	*Gamma values: regular and irrregular.* 9th Workshop of Young Researches in Mathematics, Universidad Complutense de Madrid, September 21-23, 2015.
2015	*On the Gross-Deligne conjecture for fibrations.* D-modules and singularities, Università degli Studi di Padova, September 16, 2015.
2015	*Some remarks on Colmez's conjecture.* Intercity seminar on Arakelov geometry, University of Kyoto, September 7, 2015.
2015	*Periods of CM motives, gamma values and a reciprocity law.* Regulators, Mahler measures, and special values of L-functions, CRM Montréal, February 19, 2015.

2013	*Periods of CM Hodge structures and special values of the gamma function.* Conference "Explicit formulae and Arakelov Geometry", Jussieu, September 20, 2013.
2013	*Periods of connections and special values of the gamma function.* Conference "Heights and moduli spaces", Lorentz Center, Leiden, June 11, 2013.
2012	*Determinants of periods.* Workshop "Periods and Motives", ICMAT Madrid, July 4, 2012.

AT REGULAR SEMINARS

2018	Réseau des Étudiants en Géométrie Algébrique, IHP Paris, May 9, 2018.
2018	*Hodge theory of Kloosterman sheaves.* Seminar on Algebra, Geometry and Physics, MPIM, Bonn, March 6, 2018.
2018	*Sur la réduction modulo p des motifs exponentiels.* SAGA, Orsay, January 23, 2018.
2017	*Exponential motives.* Belgian-Dutch Algebraic Geometry Seminar, Nijmegen, December 15, 2017.
2017	*Exponential motives.* Séminaire de Géométrie Arithmétique Paris-Pékin-Tokyo, IHES, December 13, 2017.
2017	*Sommes exponentielles sur les groupes algébriques commutatifs.* Séminaire de Géométrie Arithmétique et Motivique, Paris 13, December 1, 2017.
2017	*Gamma values as exponential periods.* London-Paris Number Theory Seminar, Jussieu, November 27, 2017.
2017	*Annulation générique, convolution abélienne et sommes exponentielles.* Séminaire autour des cycles algébriques, Jussieu, November 15, 2017.
2017	*Equidistribution of exponential sums on commutative algebraic groups (after Katz).* TIMS Seminar in Algebraic Geometry, Taipei, November 1, 2017.
2017	*Exponential motives.* Alpbach 2017: Arithmetic Algebraic Geometry, Alpbach, July 11, 2017.
2017	*Exponential motives.* Oberseminar zur Algebra und Zahlentheorie, Augsburg, June 27, 2017.
2017	*ε-factors and exponential motives.* Guest seminar "Arithmetic geometry", FU Berlin, June 8, 2017.
2016	*Gamma values : regular and irregular.* Number Theory Seminar, Taida Institute for Mathematical Sciences, Taipei, December 16, 2016.
2016	*Gamma values : regular and irregular.* Symposium about pure mathematics, University of Zürich, December 7, 2016.
2016	*Exponential motives.* Arithmetic Geometry Seminar, Oxford, November 28, 2016.
2016	*Motifs exponentiels.* Journée Singulière, Université de Rennes, November 2, 2016.
2016	*Motifs exponentiels.* Séminaire de Géométrie Algébrique, Université de Montpellier, October 25.
2016	*Exponential motives.* Arithmetic and Algebraic Geometry Seminar, University of Amsterdam, October 19.
2016	*Exponential motives.* SFB/TRR45 Kolloquium, Johannes Gutenberg-Universität, Mainz, June 2.
2016	*A Galois theory for exponential periods.* Number Theory Lunch Seminar, Max-Planck Institute, Bonn, March 30, 2016.
2016	*Amplitudes and the asymptotic of the height pairing.* Talks in Mathematical Physics, ETH Zürich, March 17, 2016.
2016	*Une théorie des motifs pour les périodes exponentielles.* Séminaire 'Arithmétique et géométrie algébrique", Strasbourg, January 22, 2016.
2015	*Gamma values: regular and irregular.* Number Theory Seminar, Basel. December 3, 2015.
2015	*Symanzik polynomials and limits of heights.* ICMAT Madrid. October 7, 2015.

2015   *Feynman amplitudes and limits of heights.* Algebraic geometry and moduli seminar, ETH, September 30 and October 2, 2015.

2015   *Une loi de réciprocité pour les périodes des fibrés à connexion.* Séminaire "Autour des cycles algébriques", Paris, April 29, 2015.

2015   *Epsilon factors of connections and a conjecture of Gross-Deligne.* Québec-Vermont Number Theory Seminar, February 12, 2015.

2015   *Epsilon factors of connections and ℓ-adic sheaves with finite monodromy.* ETH, January 6, 2015.

2014   *Periods of connections and a conjecture of Gross-Deligne.* Shafarevich Seminar, Steklov Institute, Moscow, December 16, 2014.

2014   *Sur la formule du produit pour les connexions et les faisceaux ℓ-adiques.* Séminaire de théorie des nombres, Bordeaux, November 21, 2014.

2014   *Periods of connections and a conjecture of Gross-Deligne.* Number Theory Seminar, ETH, October 31, 2014.

2014   *The arithmetic of flat vector bundles.* Seminar "Algebra and Combinatorics", UAM-ICMAT Madrid, October 10, 2014.

2014   *Periods of Hodge structures and special values of the gamma function.* Junior Number Theory Seminar, Oxford University, May 19, 2014.

2014   *Periods of Hodge structures and special values of the gamma function.* Oberseminar "Algebra, Geometrie und Zahlentheorie", Universität Duisburg-Essen, May 8, 2014.

2014   *Periods of Hodge structures and special values of the gamma function.* Algebra/Topology Seminar, University of Copenhague, March 31, 2014.

2014   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Institut Fourier, Grenoble, March 20, 2014.

2014   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Séminaire d'algèbre et de théorie des nombres, EPFL, Lausanne, February 27, 2014.

2014   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Séminaire "Arithmétique et géométrie algébrique", Strasbourg, February 17, 2014.

2014   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Laboratoire Paul Painlevé, Lille, January 23, 2014.

2014   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Séminaire d'arithmétique, ENS Lyon, January 14, 2014.

2013   *Periods of connections and special values of the gamma function.* Number Theory Lunch Seminar, MPIM Bonn, November 27, 2013.

2013   *Périodes des fibrés à connexion et valeurs spéciales de la fonction gamma.* Séminaire de théorie des nombres de l'IMG-PRG, Paris, November 25, 2013.

2013   *Autour de la conjecture des périodes de Gross-Deligne.* Séminaire "autour de la géométrie d'Arakelov", IMJ, Paris, June 3, 2013.

2013   *Périodes des connexions et révêtements cycliques.* Séminaire Mathjeunes, ÉNS, February 2, 2013.

2012   *Periods of motives with complex multiplication.* "Visiteurs jeunes", IHÉS. October 30, 2012.

2012   *Periodos de variedades con multiplicación compleja.* Seminario de Geometría y Topología, Universidad Complutense de Madrid. April 25, 2012.

Other contributed talks (selection)

2018   *Équirépartition de sommes exponentielles [travaux de Katz].* Séminaire Bourbaki, January 13, 2018.

2015	*The Faltings height of CM elliptic curves.* "Special cycles on Shimura curves", Alpbach, July 9, 2015.
2015	*Tannakian categories for the working number theorist.* ITS Informal Analytic Number Theory Seminar, ETH, May 12, 2015.
2015	*Périodes: un survol.* Séminaire des Mathématiques Pures, Université Blaise Pascal, January 27, 2015.
2014	*What is... a period?.* Zürich Graduate Colloquium, ETH, October 28, 2014.
2014	*An introduction to mixed Tate motives.* Research trimester on MZV, Polylogarithms and QFT, ICMAT, Madrid, October 2014.
2014	*La verdad del caso $e^{\pi\sqrt{163}}$.* Universidad de Sevilla, April 30, 2014.

Organization of conferences and seminars

2017	(with G. Ancona, M. Maculan, and L. Migliorini) *Hodge theory of character varieties and the $P = W$ conjecture.* Tatihou Island, July 22-27, 2018.
from 2017	(with P. Vanhove and F. Zerbini) *Séminaire Motifs et intégrales de Feynmann.*
from 2017	(with A. Cadoret, F. Charles and M. Morrow) *Séminaire autour des cycles algébriques.* Jussieu.
2017	(with G. Ancona, Y. André, and M. Maculan) *Periods and differential equations: from $\mathbb{C}$ to $\mathbb{C}_p$.* Tatihou Island, September 25-29, 2017.
2017	(with G. Ancona and S. Pepin-Lehalleur) *Motives for periods.* Freie Universität Berlin, August 28-September 1, 2017.
2016	(with P. Jossen and R. Pink) *Motives and complex multiplication.* Monte Verità, August 15-19, 2016.
2016	(with G. Ancona, J-B. Bost, and M. Maculan) *Algebraization theorems: from GAGA to foliations over number fields.* Tatihou Island, July 4-8, 2016.
2014	(with G. Ancona, D. Eriksson, G. Freixas i Montplet, M-H. Nicole and S. Sankaran) *Arithmetic intersection theory and Shimura varieties.* Hausdorff Institute, Bonn, February 3-7 2014
2011/2013	(with G. Ancona, Y. Brunebarbe and M. Maculan) *Réseau des Étudiants en Géométrie Algébrique*, Institut Henri Poincaré, Paris.

Profesional service

Member of the professional commission of the Real Sociedad Matemática Española (January 2016–).

Member of the editorial board of the *EMS Newsletter* (January 2015–).

Member of the examination committee for the doctoral dissertations of Q. Xu (Toulouse, June 2014), R. Mboro (Polytechnique, October 2017) and M. Bilu (Orsay, November 2017).

Supervision of the master thesis of Samuel Stark and Nicola Nesa.

Referee for *Annales Scientifiques de l'École Normale Supérieure, Canadian Journal of Mathematics, Inventiones mathematicae, Journal of Algebraic Geometry, Journal of Number Theory, Journal of Singularities, Publications mathématiques de l'IHES, Mathematische Zeitschrift.*

Reviewer for *Zentralblatt* and *Mathscinet.*

Popularization and other writings

Books

| 2013 | (with J. Rué) *Los números trascendentes.* Colección ¿Qué sabemos de...?, CSIC-Los Libros de la Catarata, Madrid, 2013. |

2012   *Hasta que el álgebra os separe. La teoría de grupos y sus aplicaciones.* Colección "El mundo es matemático", RBA, Barcelona, 2012. Translated into English, French, Italian, Polish and Russian.

2011   *El sueño de la razón. La lógica matemática y sus paradojas.* Colección "El mundo es matemático", RBA, Barcelona, 2011. Translated into English, French, Italian, Portuguese, Polish and Russian.

2007   *Gödel. La lógica de los escépticos.* Colección "La matemática en sus personajes", Nivola, Madrid, 2007. Second revised edition in 2008.

ARTICLES

2016   Los matemáticos se estrellan contra la solución a uno de sus grandes desafíos, El País, 1/1/16.

2015   Review of "Mathematics without apologies', *EMS Newsletter*, December 2015, 66-67.

2015   El milagroso año (y medio) de los números primos, El País, January 11, 2015.

2014   Review of "Emil Artin and Helmut Hasse. The Correspondence 1923-1958", *EMS Newsletter*, December 2014, 60-61.

2012   Review of "Correspondance entre Henri Cartan et Andre Weil (1928-1991)", *EMS Newsletter*, June 2012, 58-60.

2012   Mathematics: a Beautiful Elsewhere, *LMS Newsletter*, January 2012, 20-21.

2010   The Full Potential of Storytelling, *Notices of the AMS*, 57, 5 (2010), 637-638.

2009   The Castle of Groups. Interview with Pierre Cartier, *EMS Newsletter*, December 2009, 31-34.

2009   (with P. Cartier) Notes sur l'histoire et la philosophie des mathématiques V: le problème de l'espace, *Prépublications de l'IHÉS* M/09/41.