

Patrick FOULON

Born 17 June 1954

French citizenship

CURRENT PROFESSIONAL ADDRESS

Institut de Mathématiques de Marseille (I2M)

Aix-Marseille Université, Campus de Luminy

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EDUCATION

1986 *Doctorat d'Etat* in Mathematical Sciences, Université Paris 6. Advisor : Jean-Pierre Bourguignon

1983 Doctoral thesis in Mathematics, Ecole polytechnique, Paris. Advisor : Jean-Pierre Bourguignon

1979 DEA (Master of Adv. Studies) in Atomic Physics and Statistics, Ecole normale supérieure, Paris

1978 *Agrégation* - qualification to teach Physics in France

1975 Ecole normale supérieure de Cachan

PROFESSIONAL EXPERIENCE

since Sept 2020 - Emeritus CNRS Senior Research Scientist at I2M, Aix-Marseille Université

2010-2020 CNRS Senior Research Scientist at the *Centre International de Rencontres Mathématiques*

2008-2010 Distinguished Professor of Mathematics, Université de Strasbourg

1994-2008 Full Professor, *UFR de Mathématique et Informatique*, Université Louis Pasteur, Strasbourg

1992-2004 Part time Teaching Associate, Ecole polytechnique, Paris

1993-1994 CNRS Associate scientist (1st class) at *Centre de Mathématiques* - École polytechnique

1988-1993 CNRS Associate scientist (1st class) at *Centre de Physique Théorique* - École polytechnique

1984-1988 CNRS Associate scientist (2nd class) at *Centre de Physique Théorique* - École polytechnique

1983-1984 Research Assistant - École polytechnique

PROFESSIONAL SERVICE

2010-2020 Director of CIRM (*Centre International de Rencontres Mathématiques*)- Luminy Marseille

2016-2020 Vice President of ERCOM (European Research Centres on Mathematics)

2016-2019 Member of the *Jury de l'Agrégation externe de mathématiques*

2012-2015 Vice-President of the *Jury de l'Agrégation externe de mathématiques*

2013 President of the SIMI1 Committee of the ANR (French National Research Agency)

2008-2011 President of the *Jury de l'Agrégation externe de mathématiques*

2008-2010 Director of the *Collège Doctoral Européen de l'Université de Strasbourg*

2001-2003 Advisor on ACI Committee on Young Researchers in Pure Mathematics, Ministry of Research

2000-2008 Director of the *Collège Doctoral Européen des Universités de Strasbourg* (joint project)

1998-2000 Project Manager for the *Collège Doctoral Européen des Universités de Strasbourg*

1996-2000 Director of the *Institut de Recherche Mathématique Avancée*, Univ. Louis Pasteur, Strasbourg

HONOURS

- *Chevalier des Palmes Académiques*

RESEARCH AREAS

- Ergodic geometry, Rigidity, Structure of the boundary at infinity, Group action, Ergodic theory, Entropy
- Finsler geometry, Ordinary differential second-order equations, Negative curvature, Space form

ADMINISTRATIVE AND ACADEMIC DUTIES**Committees**

- since 2017** Member of the ICMS Edinburgh Board (Int. Centre for Mathematical Sciences)
- since 2016** Rapporteur for EPSRC (Engineering and Physical Sciences Research Council - UK).
- 2016-2020** Guest member on the Board of Directors, Société Mathématique de France.
- 2015** Member of the ANR Committee on Project Evaluation
- 2010-2016** Member of the Board of Directors, Société Mathématique de France
- 2012-2013** Member of the ANR Committee on *Programme Blanc*
- 2004-2005** Scientific director for an Alliance programme with the University of Warwick
- 2002** Member of the *Etat de la Recherche* Programmation Committee, SMF
- 2001-2008** Member of the *Commission de Spécialistes for Section 25 Mathématiques*, Strasbourg 1
- 2001-2004** Member of the *Commission de Spécialistes for Section 25 Mathématiques*, Lyon 1
- 2001-2002** Member of the Advisory Committee for Mathematics - ACI Jeunes chercheurs, Ministry
- 2000-2005** Member of the editorial team of Journal of Ergodic Theory and Dynamical Systems (CUP)
Rapporteur for Mathematische Annalen – Annales E.N.S. – Archiv. Der Math – Journal of Differential Geometry etc.
Rapporteur on projects for the National Science Foundation (US) and EPSRC (UK)
Member of the American Mathematical Society and Société Mathématique de France

Past doctoral supervision

- **Thomas Barthelmé** (University of Strasbourg) : "A new Laplace operator in Finsler geometry and periodic orbits of Anosov flows". Joint supervision with B. Hasselblatt (Tufts University, Boston). Defended on 24/01/ 2012. T. Barthelmé is an Assistant Professor at Queen's University, Kingston, Canada.
- **Mickael Crampon** (University of Strasbourg) : "Invariant measures and entropy in Hilbert geometry". Joint supervision with G. Knieper (Ruhr Universität Bochum). Defended on 18/03/2011. M. Crampon worked as a Researcher at the University of Santiago of Chile in 2011-2012.
- **Yong Fang** : "Structures Géométriques Rigides et Systèmes Dynamiques Rigides". Joint supervision with P. Pansu (Paris Sud). Defended on 13/12/2004. Y. Fang is a Lecturer at Université de Cergy Pontoise, France.
- **Edith Socié-Méthou** (Université Louis Pasteur, Strasbourg 1) : "Géométrie de Hilbert". Defended on 15/12/2000. E. Socié-Méthou teaches in Classes préparatoires in France.
- **Alexandre Reissman** : "Etude de bord à l'infini des flots d'Anosov". A. Reissmann teaches in Classes préparatoires in France.
- **Daniel Egloff** (Fond Nat. Suisse) : "Some new developments in Finsler geometry". Joint supervision with E. Ruh (Fribourg, Suisse). Defended on 5/09/1996. D. Egloff works in insurance.

Talks and addresses at international conferences

- 2019 Dynamics of Group Actions in honour of Yves Benoist, Cetraro (27-31 May 2019)
- 2017 Integrability and Orbital Classification of Geodesic Flows of Finsler Metrics of Constant Positive Flag Curvature, Queen's University, Kingston (7-11 August)
- 2017 Finite Dimensional Integrable Systems in Geometry and Mathematical Physics, Barcelona (3-7 July)
- 2016 New Methods in Finsler Geometry, Leipzig (4-10 July)
- 2016 Short Communication in honor of F. Labourie, Bonn (15-17 Jan)
- 2014 Entropy and Deformation of Real Projective Structures on Surfaces (short communication), ICM Seoul (14 Aug)
- 2014 Geometry on Groups and Spaces (Plenary speaker), ICM Seoul Satellite Conference on Geometric Group Theory and Geometric Structures, Daejeon (7-12 Aug)
- 2014 School on Geometry and Dynamics, CIRM Luminy Marseille (31 March-04 April)
- 2013 Differential Geometry and Global Analysis, Leipzig (7-11 Oct)
- 2013 Conference in honour of Jean-Pierre Bourguignon, IHES Gif-sur-Yvette (13 Sept)
- 2012 Anosov systems, CIRM Luminy Marseille (18-22 June)
- 2011 Chern Centennial, MSRI Berkeley (24 Oct-5 Nov)
- 2010 Ergodic Theory and Dynamical Systems : 30th Anniversary of the journal, Warwick (6-10 Sept)
- 2010 "Regards sur des systèmes hyperboliques via l'entropie", Tours (20-22 Jan)
- 2009 AIM-ETH-NSF Volume entropy rigidity, ETH Zurich (15-19 June)
- 2009 Integral Geometry and Finsler Geometry, Fribourg (21-23 Jan)
- 2009 EUA-CDE Enhancing Supervision, London (8-9 Jan)
- 2006 Geometrie, MFO Oberwolfach (01-07 Oct)
- 2005 On Finsler Geometry, CIRM Luminy Marseille (14-18 Nov)
- 2005 Geodesic Flow and Periodic Orbits, Leipzig (3-4 Oct)
- 2004 Progress in Finsler Geometry. Tianjin (10-14 Aug)
- 2003 Séminaire Besse, Palaiseau (7 April)
- 2002 Geometrie, MFO Oberwolfach (30 Sept-5 Oct)
- 2002 Finsler Geometry, MSRI Berkeley (3-7 June)

Organization of conferences, workshops, celebratory events, open days etc.

- 2016 Exhibition stand CIRM-CNRS-SMF, ECM Berlin (18-21 July)
- 2016 Exhibition stand CIRM at Congrès de la SMF, Tours (6-9 June)
- 2014 Exhibition stand CIRM-CNRS-SMF, ICM 2014 Seoul (13-20 August)
- 2014 SMF Roundtable on new audiovisual material in mathematics, IHP Paris (20 June)
- 2013 Lagrange Days at CIRM, Marseille (18-19 October)
- 2013 European Research Centres on Mathematics- Annual Meeting, CIRM Marseille (22-23 March)
- 2011 30 Year Anniversary of CIRM Luminy, Marseille (6-8 Oct)

Participation in international meetings

- ERCOM (European Research Centres on Mathematics), 2020, Virtual event
- ERCOM (European Research Centres on Mathematics), 2019, Cambridge
- Heidelberg Laureate Forum, 2018, Heidelberg
- ERCOM (European Research Centres on Mathematics), 2018, Bonn
- Current Trends in Dynamical Systems and the Mathematical Legacy of Rufus Bowen, 2017, Vancouver
- ERCOM (European Research Centres on Mathematics), 2017, Linz
- Heidelberg Laureate Forum, 2016, Heidelberg
- ECM (European Congress of Mathematics), 2016, Berlin
- EMS (European Mathematical Society) meeting, 2016, Berlin

- ERCOM 2016, St Petersburg
- Heidelberg Laureate Forum, 2015, Heidelberg
- ERCOM 2015, Zurich
- IMSI (International Mathematical Sciences Institutes), 2014, Seoul
- ICM (International Congress of Mathematicians), 2014, Seoul
- ERCOM 2014, Roma
- ERCOM 2013, CIRM Marseille
- ERCOM 2012, Budapest
- ERCOM 2011, Oberwolfach

Participation in Research in Pairs

- Convex Real Projective Structures V with In Kang Kim (KIAS), CIRM, 17-21 June 2019
- Convex Real Projective Structures IV with In Kang Kim (KIAS), CIRM, 10-22 July 2018
- Research in pairs with Thomas Barthelmé (Queen's University), Kingston, August 2017
- 2016 Convex Real Projective Structures III, with In Kang Kim (KIAS), CIRM Marseille (10-17 July)
- 2015 Research in Pairs with Yong Fang (Univ. Cergy-Pontoise), CIRM Marseille (21-24 July)
- 2015 Convex Real Projective Structures II, with In Kang Kim (KIAS), CIRM Marseille (6-17 July)
- 2015 Research in Pairs with Rafael Ruggiero (PUC Rio), CIRM Marseille (4-17 Jan)
- 2014 Convex Real Projective Structures I, with In Kang Kim (KIAS), CIRM Marseille (14-25 July)
- 2014 Periodic Orbits of Contact Anosov Flows on Hyperbolic 3-Manifolds, with Boris Hasselblatt (Tufts) and Anne Vaugon (Paris-sud), CIRM Marseille (14-17 April)
- 2014 Weak Contact Flows and Transverse Rigidity, with Thomas Barthelmé (Penn State) and Boris Hasselblatt (Tufts), CIRM Marseille (03-14 March)
- 2013 On Real Projective Geometry, with In Kang Kim (KIAS), CIRM Marseille (15-26 July)
- 2012 Contact Anosov Flows II, with Thomas Barthelmé (Penn State) and Boris Hasselblatt (Tufts), CIRM Marseille (04-15 June)
- 2011 Contact Anosov Flows I, with Boris Hasselblatt (Tufts), CIRM Marseille (11-24 July)

Teaching until 2010

- Undergraduates 3rd year : Probability and statistics; Magistère in actuary; Risk management.
- Masters First year : Functional Analysis
- Masters First and 2nd years : Geometry and Topology; General topology; Fundamental group; Covering
- Masters 2nd year : Functional analysis; Riemann and Hilbert geometry of surfaces.

Outreach activities, publications and talks

- Article in *La Gazette des mathématiciens* SMF, April 2020 : "CIRM"
- Article in *La Gazette des mathématiciens* SMF, April 2014 : "The Jean-Morlet Chair at CIRM"
- Talk on "New Developments at CIRM", Annual Congress of the SMF, June 2016
- Articles on CIRM infrastructural extension (2RCIRM and restaurant)
- Articles On CIRM new scientific programmes
- TV LCM 2011 : "CIRM and how to boost women participation in mathematics conferences"
- Radio interview Radio Gazelle Marseille 2011 : "What is CIRM?"
- Press conference at IHP Paris 2011 for the launch of the "LabEx CARMIN" (CIMPA, CIRM, IHES, IHP) National Excellence Initiative .

PUBLICATIONS**Theses**

PhD. thesis : 24.11.1983. "Contribution à l'étude géométrique des problèmes de la dynamique lagrangienne". Supervisor : Jean Pierre Bourguignon

Thèse d'état : 5.04.1986. Subject : Mathematical sciences. "Nouveaux invariants géométriques des systèmes dynamiques du second ordre. Applications à l'étude de leur comportement ergodique". Supervisor : Jean Pierre Bourguignon

Articles

- [1] R.L.Bryant, P. Foulon, S. Ivanov, V.S. Matveev, W. Ziller. **Geodesic behavior for Finsler metrics of constant positive flag curvature on S^2** . *Journal of Differential Geometry*, 117 (2021) 1-22
- [2] Patrick Foulon, Boris Hasselblatt, Anne Vaugon. **Orbit growth of contact structures after surgery**. *Annales Henri Lebesgue*, 1 (2020)
- [3] FOULON, P., and KIM, I. (2020). **Continuity of the SRB entropy of convex projective structures**. *Ergodic Theory and Dynamical Systems*, 1-13. doi :10.1017/etds.2020.48
- [4] Patrick Foulon, Vladimir S. Matveev. **Zermelo deformation of finsler metrics by killing vector fields**. *Electronic Research Announcements* 2018, 25 : 1-7. doi : 10.3934/era.2018.25.001
- [5] Foulon, Patrick; Hasselblatt, Boris. **Godbillon–Vey invariants for maximal isotropic C^2 foliations**. *Geometry, Dynamics, and Foliations 2013 : In honor of Steven Hurder and Takashi Tsuboi on the occasion of their 60th birthdays*, 349–365, Mathematical Society of Japan, Tokyo, Japan, 2017. doi :10.2969/aspm/07210349. <https://projecteuclid.org/euclid.aspm/1538671775>
- [6] Patrick Foulon, In Kang Kim. **Topological Entropy and bulging deformation of real projective structures on surface**. *arXiv :1608.06799* (2016)
- [7] Foulon, Patrick., Ruggiero, Rafael. **A first integral for C^∞ , k-basic Finsler surfaces and applications to rigidity**. *Proc. Amer. Math. Soc* 144 (2016), 3847-3858.
- [8] Fang, Yong., Foulon, Patrick. **On Finsler manifolds of negative flag curvature**. *Journal of Topology and Analysis*, Vol.07, No.03, pp. 483-504 (2015) <https://doi.org/10.1142/S1793525315500181>
- [9] Foulon, Patrick; Hasselblatt, Boris. **Contact Anosov flows on hyperbolic 3-manifolds**. *Geometry and Topology* 17 (2013), no. 2, 1225–1252. doi :10.2140/gt.2013.17.1225.
- [10] Foulon, Patrick., Hasselblatt, Boris. **Dynamical Lagrangian Foliations : Essential nonsmoothness and Godbillon-Vey classes**. *Geometry and Foliations*, 2013.
- [11] Patrick Foulon, Boris Hasselblatt. **Lipschitz continuous invariant forms for algebraic Anosov systems**. *Journal of Modern Dynamics*, 2010, 4 (3) : 571-584. doi : 10.3934/jmd.2010.4.571
- [12] Yong Fang, Patrick Foulon, Boris Hasselblatt **Zygmund strong foliations in higher dimension**. *Journal of Modern Dynamics*, 2010, 4, (3), 549-569. doi : 10.3934/jmd.2010.4.549
- [13] Yong Fang, Patrick Foulon, Boris Hasselblatt **Longitudinal foliation rigidity and Lipschitz-continuous invariant forms for hyperbolic flows**. *Electronic Research Announcements*, 2010, 17 : 80-89. doi : 10.3934/era.2010.17.80
- [14] Foulon, Patrick. **Systèmes dynamiques hyperboliques**. (French) [Hyperbolic dynamical systems] Berlin, Nicole (ed.) et al., *Aspects des systèmes dynamiques*. Palaiseau : Les Éditions de l'École Polytechnique. Journées mathématiques X-UPS, 2009, 29–52.
- [15] Foulon, P., Hasselblatt, B. **Zygmund strong foliations**. *Isr. J. Math.*138, 157–169 (2003). <https://doi.org/10.1007/BF02783424>
- [16] Foulon, Patrick. **Curvature and global rigidity in Finsler manifolds**. *Special issue for S. S. Chern. Houston J. Math.*, 2002, vol. 28, no. 2, 263–292. doi=10.1.1.638.9076

- [17] FOULON, P. (2001) **Entropy rigidity of Anosov flows in dimension three.** *Ergodic Theory and Dynamical Systems*, 21(4), 1101-1112. doi :10.1017/S0143385701001523
- [18] Patrick Foulon, **Locally symmetric Finsler spaces in negative curvature**, *Comptes Rendus de l'Académie des Sciences - Series I - Mathematics*, Volume 324, Issue 10, 1997, Pages 1127-1132, ISSN 0764-4442, [https://doi.org/10.1016/S0764-4442\(97\)87899-8](https://doi.org/10.1016/S0764-4442(97)87899-8)
- [19] Foulon, P. **Feuilletages des sphères et dynamiques Nord-Sud.** (French) [Foliations of spheres and North-South dynamics] *Comptes Rendus de l'Académie des Sciences - Series I - Mathematics*, Volume 318, Issue 11, 1994, Pages 1041-1042.
- [20] Foulon, P. **Estimation de l'entropie des systèmes lagrangiens sans points conjugués.** (French) [Estimation of the entropy of Lagrangian systems without conjugate points]. With an appendix, "About Finsler geometry" in English, *Ann. Inst. H. Poincaré Phys. Théor.*, 1992, vol. 57, no. 2, 117-146.
- [21] Foulon, P., Labourie, F. **Sur les variétés compactes asymptotiquement harmoniques.** (French) [On asymptotically harmonic compact manifolds] *Invent. Math.*, 109, 97-111 (1992). <https://doi.org/10.1007/BF01232020>
- [22] Benoist, Yves., Foulon, Patrick., Labourie, François. **Flots d'Anosov à distributions stable et instable différentiables.** (French) [Anosov flows with stable and unstable differentiable distributions] *J. Amer. Math. Soc.*, 5 (1992), 33-74. <https://doi.org/10.1090/S0894-0347-1992-1124979-1>
- [23] Delyon, F., Foulon, P. **Complex entropy for dynamical systems.** *Ann. Inst. H. Poincaré Phys. Théor.*, 1991, vol. 55, no. 4, 891-902.
- [24] Benoist, Yves., Foulon, Patrick., Labourie, François. **Flots d'Anosov à distributions de Liapounov différentiables. I.** (French) [Anosov flows with differentiable Lyapunov distributions. I] *Ann. Inst. H. Poincaré Phys. Théor.*, 1990, vol. 53, no. 4, 395-412.
- [25] Benoist, Yves., Foulon, Patrick., Labourie, François. **Flots d'Anosov à distributions stable et instable différentiables.** (French) [Anosov flows with smooth stable and unstable foliations] *C. R. Acad. Sci. Paris Sér. I Math.*, 1990, vol. 311, no. 6, 351-354.
- [26] Foulon, Patrick., Labourie, François., **Flots d'Anosov à distributions de Liapounov différentiables.** (French) [Anosov flows with differentiable Lyapunov distributions] *C. R. Acad. Sci. Paris Sér. I Math.*, 1989, vol. 309, no. 5, 255-260.
- [27] Delyon, François., Foulon, Patrick. **Adiabatic theory, Liapunov exponents, and rotation number for quadratic Hamiltonians.** *J. Statist. Phys.*, 1987, vol. 49, no. 3-4, 829-840.
- [28] Foulon, P. **Réductibilité de systèmes dynamiques variationnels.** (French) [Reducibility of variational dynamical systems] *Ann. Inst. H. Poincaré Phys. Théor.*, 1986, vol. 45, no. 4, 359-388.
- [29] Delyon, François., Foulon, Patrick. **Adiabatic invariants and asymptotic behavior of Lyapunov exponents of the Schrödinger equation.** *J. Statist. Phys.*, 1986, vol. 45, no. 1-2, 41-47.
- [30] Foulon, Patrick. **Géométrie des équations différentielles du second ordre.** (French) [The geometry of second-order differential equations] *Ann. Inst. H. Poincaré Phys. Théor.*, 1986, vol. 45, no. 1, 1-28.

Preprints

- [1] Foulon Patrick., Kim Inkang. **Entropy and Deformation of Real Projective Structure on Surface**, 2014.
- [2] with Reissman A. - **Finsler structure of constant curvature of the two-sphere.**, 2000.

Textes divers

- [1] with M. Audin : Planche à dessins de Fasenachtkuechle feuilletés, L'ouvert, 1996, no. 83.
- [2] Systèmes dynamiques hyperboliques, le premier retour. Journées X-U.P.S, 1996, Aspects des systèmes dynamiques. Ecole Polytechnique, 2009, ISBN 10 : 2730215603, 117 pages.
- [3] Ecole Hasania de Géométrie, 1990, Rabbat

Editorial activities

- [1] Babillot, Martine; Feres, Renato; Zeghib, Abdelghani **Rigidité, groupe fondamental et dynamique.** (French) [Rigidity, fundamental group and dynamics] With the collaboration of Emmanuel Breuillard. Edited by Patrick Foulon. *Panoramas et Synthèses [Panoramas and Syntheses], 13. Société Mathématique de France*, Paris, 2002. xiv+188 pp. ISBN : 2-85629-134-1 37-06 (53-06)

Beamers

- [1] Integrability and Orbital Classification of Geodesic Flows of Finsler Metrics of Constant Positive Flag Curvature, 2017, Barcelone
- [2] Finsler Geometry, Dynamics and Projective Geometry, 2016, Leipzig
- [3] Women at CIRM, ERCOM 2016, St Petersburg
- [4] Entropy and Deformation of Real Projective Structures on Surfaces : A tribute to Francois Ledrappier, 2016, Bonn
- [5] Entropy and Deformation of Real Projective Structures on Surfaces - ICM, 2014, Seoul
- [6] Entropy of Convex Real Projective Structures, 2014, CIRM Marseille
- [7] Conférence en l'honneur de Jean-Pierre Bourguignon - IHES 2013
- [8] Chern Centennial, MSRI, 2011, Berkeley
- [9] Forms, Pressure and Rigidity for Anosov fFows, 2010, Warwick
- [10] Integral Geometry and Finsler Geometry, 2009, Fribourg