

# Olivier Ley

Professeur des universités en mathématiques appliquées (CNU 26)

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## Poste et coordonnées/General information

Né en 1973, marié, 3 enfants/*born in 1973, married, 3 children*

Professeur à l'Institut National des Sciences Appliquées (INSA) de Rennes

*Full professor in Applied Mathematics at INSA Rennes*

Membre de l'Institut de Recherche Mathématique de Rennes (IRMAR), CNRS UMR 6625

Équipe d'Analyse Numérique

*Member of IRMAR, Numerical Analysis group*

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Page personnelle/*Homepage* : <http://ley.perso.math.cnrs.fr/>

## Formation/Education

**2008.** Habilitation à Diriger des Recherches de l'université de Tours.

**2001.** Thèse de doctorat en mathématiques, université de Tours/*Ph.D University of Tours*

Directeur/*Advisor:* Guy Barles.

**1997.** Magistère de Mathématiques ENS Lyon et Lyon I. Agrégation de mathématiques.

*Graduated from Ecole Normale Supérieure Lyon and University of Lyon*

**1991–1994.** École normale supérieure de Lyon/*student at the ENS Lyon*

## Cursus professionnel/Appointments

**Septembre 2009–.** Professeur à l'INSA de Rennes/*Full Professor, INSA Rennes*

**2002–2009.** Maître de conférences, université de Tours/*Associate Professor, University of Tours*

**1998–2002.** Allocataire-moniteur à l'université de Tours avec un séjour de 16 mois à l'université de Padoue (Bourse européenne)/*Ph.D grant from the French Ministry of Research, 16 months research stay at University of Padova (European Union fellowship)*

**1994–1998.** Élève normalien de l'ENS de Lyon/*French government fellowship at ENS Lyon*

## Responsabilités administratives et scientifiques/Service activities

**2016–2020.** Responsable local du projet ANR MFG ANR-16-CE40-0015-01/ *Local coordinator of the ANR project MFG “Mean Field Games”*

**2015–2019.** Membre du CNU 26/ *Member of the University National Committee for Applied Mathematics.*

**2013–2016.** Responsable du projet ANR Blanc HJnet ANR-12-BS01-0008-01/ *Principal Investigator of the ANR project HJnet “Hamilton-Jacobi equations on networks”*

**2012–2016.** Président de la commission des thèses et HDR du Réseau Doctoral Ouest de Mathématiques (Brest, Vannes, Rennes, Nantes, Angers, Le Mans)/ *President of the committee in charge of the Ph.D thesis in Mathematics in the West of France*

**2011–2014.** Conseil d’administration de l’INSA de Rennes/ *Board member, INSA Rennes*

**2010–2014.** Conseil Scientifique de l’Institut National des Sciences Mathématiques (INSMI) du CNRS/ *Scientific Council of the INSMI-CNRS*

**2006–2008, 2011–2014.** Bureau du groupe Mathématiques de l’Optimisation et de la décision (MODE) de la SMAI/ *Steering board, Interest group MODE of the French Applied Mathematical Society*

**2006–2008.** Conseil Scientifique de l’université de Tours/ *Scientific Council, University of Tours*

## Enseignement/Teaching

Service statutaire 192 h/an INSA de Rennes, interventions occasionnelles en M2 ou cours doctoraux à l’université de Rennes 1, en oraux blancs d’agrégation à l’ENS Rennes, en M2 dans le Master franco-vietnamien de Ho Chi Minh Ville.

*Usual duty of 192 h/year at INSA Rennes, sometimes M2 or doctoral courses at the university of Rennes or ENS Rennes, courses in the French-Vietnamese Master in Ho Chi Minh City.*

Responsable des stages en entreprises pour le département Génie Mathématique.

*Responsible for internships in companies for students in Mathematical Engineering.*

Coordinateur local pour le master international Franco-Vietnamien délocalisé à Ho Chi Minh Ville.

*Local coordinator of the French-Vietnamese Master in Ho Chi Minh City.*

## Recherche/Research

### Domaines de recherche/Research Interests.

Équations aux dérivées partielles non-linéaires / *Nonlinear partial differential equations*

Solutions de viscosité / *Viscosity solutions*

Équations de Hamilton-Jacobi, contrôle optimal / *Hamilton-Jacobi equations, Optimal control*

Équations géométriques, mouvement par courbure moyenne, dislocations / *Geometric equations, mean curvature motion, dislocations*

Équations non-locales intégro-différentielles / *Nonlocal PDE, integro-differential operators*

Temps long pour Hamilton-Jacobi / *Large time behavior of solutions to HJ equations*

Analyse convexe / *Convex analysis*

**Encadrement doctoral/Ph.D students.** Ali Srour (2005–2008), Thierry Tabet Tchamba (2006–2010), Vinh Duc Nguyen (2010–2013), Thanh Viet Phan (2012–2015), Thi Tuyen Nguyen (2013–2016), Manh Khang Dao (2015–2018).

**Invitations à l'étranger/Invitations abroad.** University of Toronto (2001), Unniversità di Padoue (2002), Waseda and Hokkaido University (2004, 2008), Roma La Sapienza (2006, 2007), ETH Zürich (2007, 2009, 2013), CRM Barcelone (2010), Universidad Talca, Chile (2011), Tohoku University (2015, 2018), Università Salerno (2016), Universidad Santiago de Chile (2017).

**Expertises.** INdAM (Italy), ANR (France), Normandie University.

**Membre du comité éditorial/Editorial board :** Nonlinear Differential Equations and Applications NoDEA

**Conférences invitées/Invited speaker.**

November 2018. Viscosity Solutions and related Topics, Tohoku University, Japon.

April 2017. Mostly Maximum Principle, Banff, Canada.

January 2017. Beyond Hamilton-Jacobi, Last call to Bordeaux, Bordeaux.

February 2016. Nonlinear PDEs (in honor of M. Bardi), Padova, Italie.

September 2015. Nonlinear PDE workshop at Tohoku University, Sendai, Japon.

December 2014. Nonlocal days in Basel, Bâle, Suisse.

February 2014. PDEs and Related Topics in Nonlinear Problems, Hiroshima, Japon.

December 2012. 4 Mini-courses. GIRAGA14, IMSP, Porto-Novo, Bénin.

September 2012. Mostly Maximum Principle, Rome.

December 2011. Dynamical Optimization in PDE and Geometry, Weak KAM, Bordeaux.

March 2011. ITN SADCO, Kick off Meeting, Paris.

January 2011. Nonlinear PDEs in Valparaiso, Valparaiso, Chili.

July 2010. Viscosity Methods and Nonlinear PDE. Hokkaido University, Sapporo, Japon.

March 2010. MODE 2010 : Conférence de la SMAI sur l'optimisation et la décision, Limoges.

June 2009. Nonsmooth Analysis (in honor of F. Clarke), Rome (canceled for personal reasons).

June 2008. RIMS meeting, Viscosity solutions, Kyoto University, Japon.

June 2008. Deuxième congrès Canada-France, UQÀM, Montréal.

May 2008. Sixièmes Journées Franco-Chiliennes d'Optimisation, Toulon.

June 2007. 25th Anniversary of Viscosity Solution (In honor of H. Ishii), Univ. of Tokyo, Japon.

July 2006. New trends in viscosity solutions, Instituto Superior Tecnico, Lisbonne.

July 2006. Mathematics and its applications, Torino (Italy).

January 2005. VII French-Latin American Congress on Applied Mathematics, Santiago, Chile.

August 2004. 29th Sapporo Symposium on PDE, Hokkaido University, Japon.

July 2004. 1er Congrès Franco-Canadien de Mathématiques, Toulouse.

June 2004. ACI workshop : front propagation and PDEs, Université de Rouen.

March 2001. TMR meeting Viscosity solutions and applications, Université de Palma, Espagne.

**Publications.** voir/see <http://ley.perso.math.cnrs.fr/>

- [1] O. LEY. Lower-bound gradient estimates for first-order Hamilton-Jacobi equations and applications to the regularity of propagating fronts. *Adv. Differential Equations*, 6(5), 547–576, 2001.
- [2] O. LEY. A counter-example to the characterization of the discontinuous value function of a reflected control problem. *C. R. Acad. Sci. Paris, Ser. I*, 335, 469–473, 2002.
- [3] G. BARLES, S. BITON, and O. LEY. Quelques résultats d'unicité pour l'équation de mouvement par courbure moyenne dans  $\mathbb{R}^n$ . *ESAIM: Proceedings, Actes du 32ème Congrès d'Analyse Numérique : Canum 2000*, 8, 2000.
- [4] G. BARLES, S. BITON, and O. LEY. A Geometrical Approach to the Study of Unbounded Solutions of Quasilinear Parabolic Equations. *Arch. Rational Mech. Anal.*, 162, 287–325, 2002.

- [5] G. BARLES, S. BITON, and O. LEY. Uniqueness for parabolic equations without growth conditions and applications to the mean curvature flow in  $\mathbb{R}^2$ . *J. Differential Equations*, 187, 456–472, 2003.
- [6] G. BARLES, S. BITON, M. BOURGOING, and O. LEY. Uniqueness results for quasilinear parabolic equations through viscosity solutions’ methods. *Calc. Var. Partial Differential Equations* 18, 159–179, 2003.
- [7] S. BITON, E. CHASSEIGNE, O. LEY. Uniqueness without growth condition for the mean curvature equation with radial initial data. *Comm. Partial Differential Equations*, 28(9-10), 1503–1526, 2003.
- [8] G. BARLES, and O. LEY. Nonlocal first-order Hamilton-Jacobi equations modelling dislocations dynamics. *Comm. Partial Differential Equations*, 31(8), 1191-1208, 2006.
- [9] F. DA LIO, O. LEY. Uniqueness results for second Order Bellman-Isaacs equations under quadratic growth assumptions and applications. *SIAM J. Control Optim.*, 45(1), 74–106, 2006.
- [10] P. CARDALIAGUET, O. LEY. Some flows in shape optimization. *Arch. Rational Mech. Anal.*, 183 (1), 21-58, 2007.
- [11] P. CARDALIAGUET, O. LEY. On the energy of a flow arising in shape optimization. *Interfaces Free Boundaries*, 10, 221–241, 2008.
- [12] S. BITON, P. CARDALIAGUET, O. LEY. Non fattening condition for the generalized evolution by mean curvature an applications. *Interfaces Free Boundaries*, 10, 1–14, 2008.
- [13] G. BARLES, P. CARDALIAGUET, O. LEY, and R. MONNEAU. Global results for dislocation type equations. *SIAM J. Math. Anal.*, 40, 44–69, 2008.
- [14] O. LEY. Weak solutions for dislocation type equations. *Gakuto International Series, Mathematical Sciences and Applications 30, 117–132, 2008 (Proceedings of the International Conference for the 25th Anniversary of Viscosity Solution, Tokyo, 2007)*.
- [15] F. CAMILLI, O. LEY, P. LORETI. Homogenization of monotone systems of Hamilton-Jacobi equations. *ESAIM: Control, Optim. Calc. Var.*, 16, 58-76, 2010.
- [16] G. BARLES, P. CARDALIAGUET, O. LEY, and A. MONTEILLET. Uniqueness results for nonlocal Hamilton-Jacobi equations. *J. of Funct. Anal.*, 257 (5), 1261-1287, 2009.
- [17] G. BARLES, P. CARDALIAGUET, O. LEY, and A. MONTEILLET. Existence of weak solutions for general nonlocal and nonlinear second-order parabolic equations. *Nonlinear Analysis. Theory, Methods and Applications*, 71 (7-8), 2801-2810, 2009.
- [18] J. BOLTE, A. DANILIDIS, O. LEY et L. MAZET. Characterizations of Lojasiewicz inequalities and applications. *Trans. Amer. Math. Soc.* 362 (6), 3319-3363, 2010.
- [19] F. DA LIO, O. LEY. Uniqueness results for convex Hamilton-Jacobi equations under  $p > 1$  growth conditions on data. *Appl. Math. Optim.* 63, 309-339, 2011.
- [20] A. DANILIDIS, O. LEY et S. SABOURAU. Asymptotic behaviour of self-contracted planar curves and gradient orbits of convex functions *J. Math. Pures Appl.* 94, 183-199, 2010.
- [21] P. CARDALIAGUET, O. LEY, and A. MONTEILLET. Viscosity solutions for a polymer crystal growth model. *Indiana Univ. Math. J.* 60, 895-936, 2011.
- [22] G. BARLES, O. LEY and H. MITAKE. Short time uniqueness results for solutions of nonlocal and non-monotone geometric equations. *Math. Ann.* 352, 409-451, 2012.
- [23] S. KOIKE and O. LEY. Comparison principle for unbounded viscosity solutions of degenerate elliptic PDEs with gradient superlinear terms. *J. Math. Anal. Appl.* 381, 110-120, 2011.
- [24] F. CAMILLI, O. LEY, P. LORETI and V. D. NGUYEN. Large time behavior of weakly coupled systems of first-order Hamilton-Jacobi equations. *NoDEA Nonlinear Differential Equations Appl.* 19, 719-749, 2012.

- [25] O. LEY and V. D. NGUYEN. Large time behavior for some nonlinear degenerate parabolic equations. *J. Math. Pures Appl.* 102, 293–314, 2014.
- [26] G. BARLES, S. KOIKE, O. LEY and E. M. TOPP. Regularity Results and Large Time Behavior for Integro-Differential Equations with Coercive Hamiltonians. *Calc. Var. Partial Differential Equations*, 54, 539–572, 2015.
- [27] O. LEY and V. D. NGUYEN. Gradient bounds for nonlinear degenerate parabolic equations and application to large time behavior of systems. *Nonlinear Analysis. Theory, Methods and Applications*, 130, 76–101, 2016.
- [28] G. GALISE, S. KOIKE, O. LEY, A. VITOLO. Entire solutions of fully nonlinear elliptic equations with a superlinear gradient term. *J. Math. Anal. Appl.* 441, 194–210, 2016.
- [29] G. BARLES, O. LEY and E. M. TOPP. Lipschitz regularity for integro-differential equations with coercive Hamiltonians and applications to large time behavior. *Nonlinearity* 30, 703–734, 2017.
- [30] O. LEY and V. D. NGUYEN. Lipschitz regularity results for nonlinear strictly elliptic equations and applications. *J. Differential Equations* 263, 4324–4354, 2017.
- [31] E. CHASSEIGNE, O. LEY and T. T. NGUYEN. A priori Lipschitz estimates for solutions of local and nonlocal Hamilton-Jacobi equations with Ornstein-Uhlenbeck operator. *To appear in Rev. Mat. Iberoam.*
- [32] A. DANILIDIS, M. HADDOU, E. LE GRUYER and O. LEY. Explicit formulas for  $C^{1,1}$  Glaeser–Whitney extensions of 1-fields in Hilbert spaces. *Proc. Amer. Math. Soc.* 146, 4487–4495, 2018.
- [33] G. BARLES, O. LEY, T.-T. NGUYEN and T. V. PHAN. Large time Behavior of unbounded solutions of first-order Hamilton-Jacobi in  $\mathbb{R}^N$ . *Asymptotic Anal.* 112, 1–22, 2019.
- [34] Y. ACHDOU, M. K. DAO, O. LEY, and N. TCHOU. A class of infinite horizon Mean Field Games on networks. *To appear in Netw. Heterog. Media.*

**Prépublications/Preprints :**

- [35] Y. ACHDOU, M. K. DAO, O. LEY, and N. TCHOU. Finite Horizon Mean Field Games on Networks. *Preprint*, 2019.

**Autres publications/Other publications :**

- [36] O. LEY. Thèse de doctorat. *Université de Tours*, 2001.
- [37] O. LEY. Geometric flows and Bernoulli problems. *Proceedings of the 29th Sapporo Symposium on PDE, Hokkaido University Technical Report Series in Mathematics*, 84 : 1-8, 2004.
- [38] O. LEY. Motion by mean curvature and level-set approach. *Proceedings of Muroran Institute of Technology, Japan*, 2004.
- [39] O. LEY. Évolution de fronts avec vitesse non-locale et équations de Hamilton-Jacobi *Mémoire d’Habilitation à Diriger des Recherches, Université François Rabelais Tours*, 2008.
- [40] O. LEY. Nonlocal Hamilton-Jacobi equations related to dislocation dynamics and a FitzHugh-Nagumo system. *Proceedings of the “Viscosity solutions of differential equations and related topics” (Kyoto 2008) RIMS Kokyuroku* 1651, 2009.