
Resume

JÉRÔME DRONIOU

07/05/2019

Curriculum Vitae

Given names: **Jérôme, Daniel, Raymond**

Last name: **Droniou**

Citizenship: French, Australian

Languages: French (mother tongue), English (fluent)

Address: School of Mathematics, Monash University, Clayton, Victoria 3800, AUSTRALIA.

E-mail: jerome.droniou@monash.edu

Webpage: <http://users.monash.edu.au/~jdroniou/>

Positions:

- 2018-...: Associate Professor at Monash University.
- 2012-2017: Senior Lecturer at Monash University.
- 2006-2011: “Professeur des Universités” at the University Montpellier 2.

Diplomas and titles:

- 2004: “Habilitation à Diriger des Recherches”¹.
Defended the 26/11/2004 at the University Montpellier 2. Title: “Theoretical and numerical study of elliptic, parabolic and non-local partial differential equations”.
- 2001: PhD thesis.
Defended the 18/06/2001 at University Aix-Marseille I. Title: “Study of some Partial Differential Equations”.
- 1998: “Agrégation” of Mathematics (rank: 1st/400)².
- 1998: Master of Pure and Applied Mathematics at the “Ecole Normale Supérieure de Lyon”³.
- 1993-1995: “Classes préparatoires” at Lycée Pierre de Fermat (Toulouse, France).

Publications

Research interests: theoretical and numerical analysis of partial differential equations. My main focus is on the conception and rigorous analysis of numerical schemes on generic polytopal meshes, for linear and non-linear elliptic and parabolic models. I design analysis techniques that cover a wide range of numerical schemes (low- and high-order methods: finite volume schemes, hybrid high-order methods, etc.), and enable complete convergence analysis (via error estimates or compactness techniques) for a variety of models, including some encountered in real-world applications.

¹“Habilitation à Diriger des Recherches”, which translates as “Authorisation to Supervise Research”, is the highest diploma in France and is required to become “Professeur des Universités” in a French university.

²The “Agrégation” is the national competitive examination to become teacher at the highest level in French secondary schools. However, in Mathematics, many successful applicants do not take jobs in secondary schools (they undergo PhD studies) and success in this competitive examination is thus also considered as an honorary title.

³The “Ecole Normale Supérieure de Lyon” is a French higher education establishment (“Grande Ecole”). The admission of students is performed through a competitive examination that is very selective: for example, only about 35 students are admitted each year in the mathematics curriculum.

Book

- [1] *The gradient discretisation method*. Jérôme Droniou, Robert Eymard, Thierry Gallouët, Cindy Guichard, and Raphaèle Herbin. Mathematics & Applications, vol. 82. Springer, **2018**, 511p. DOI: 10.1007/978-3-319-79042-8. URL: <https://hal.archives-ouvertes.fr/hal-01382358>.

Articles in international peer-reviewed journals:

To appear:

- [2] A unified analysis of elliptic problems with various boundary conditions and their approximation. Jérôme Droniou, Robert Eymard, Thierry Gallouët, and Raphaèle Herbin. *Czechoslovak Mathematical Journal*, 22p, **2018**. URL: <https://arxiv.org/abs/1806.10482>.
- [3] The Hessian discretisation method for fourth order linear elliptic equations. Jérôme Droniou, Bishnu Lamichhane, and Devika Shylaja. *Journal of Scientific Computing*, 32p, **2018**. DOI: 10.1007/s10915-018-0814-7. URL: <https://arxiv.org/abs/1803.06985>.

Published:

- [4] A Hybrid High-Order method for the incompressible Navier–Stokes equations based on Temam’s device. Lorenzo Botti, Daniele A. Di Pietro, and Jérôme Droniou. *J. Comput. Phys.* 376, pp. 786–816, **2019**. DOI: 10.1016/j.cma.2014.09.009. URL: <https://arxiv.org/abs/1807.07345>.
- [5] An HMM–ELLAM scheme on generic polygonal meshes for miscible incompressible flows in porous media. Hanz Martin Cheng and Jérôme Droniou. *J. Petrol. Science and Engineering*, 172, pp. 707–723, **2019**. DOI: 10.1016/j.petrol.2018.08.062. URL: <https://arxiv.org/abs/1706.02452>.
- [6] Convergence analysis of a family of ELLAM schemes for a fully coupled model of miscible displacement in porous media. Hanz Martin Cheng, Jérôme Droniou, and Kim-Ngan Le. *Numer. Math.* 141 (2), pp. 353–397, **2019**. DOI: 10.1007/s00211-018-1002-2. URL: <https://arxiv.org/abs/1710.01897>.
- [7] Unified convergence analysis of numerical schemes for a miscible displacement problem. Jérôme Droniou, Robert Eymard, Alain Prignet, and Kyle S. Talbot. *Found. Comput. Math.* 19 (2), pp. 333–374, **2019**. DOI: 10.1007/s10208-018-9387-y. URL: <https://arxiv.org/abs/1707.06034>.
- [8] Numerical analysis of a two-phase flow discrete fracture matrix model. Jérôme Droniou, Julian Hennicker, and Roland Masson. *Numer. Math.* 141 (1), pp. 21–62, **2019**. DOI: 10.1007/s00211-018-0994-y. URL: <https://arxiv.org/abs/1612.07373>.
- [9] A mixed finite element method for a sixth-order elliptic problem. Jérôme Droniou, Muhammad Ilyas, Bishnu P. Lamichhane, and Glen E. Wheeler. *IMA J. Numer. Anal.* 39 (1), pp. 374–397, **2019**. DOI: 10.1093/imanum/drx066. URL: <https://arxiv.org/abs/1710.02663>.
- [10] A Gradient Discretization Method to Analyze Numerical Schemes for Nonlinear Variational Inequalities, Application to the Seepage Problem. Yahya Alnashri and Jérôme Droniou. *SIAM J. Numer. Anal.* 56 (4), pp. 2375–2405, **2018**. DOI: 10.1137/16M1105517. URL: <https://arxiv.org/abs/1611.08338>.
- [11] An arbitrary-order scheme on generic meshes for miscible displacements in porous media. Daniel Anderson and Jérôme Droniou. *SIAM J. Sci. Comput.* 40 (4), B1020–B1054, **2018**. DOI: 10.1137/17M1138807. URL: <https://arxiv.org/abs/1707.04038>.
- [12] An Eclectic View on Numerical Methods for PDEs: Presentation of the Special Issue “Advanced Numerical Methods: Recent Developments, Analysis and Applications”. Paola F. Antonietti, Jérôme Droniou, and Robert Eymard. *Comput. Methods Appl. Math.* 18 (3), pp. 323–325, **2018**. DOI: 10.1515/cmam-2018-0011. URL: <https://www.degruyter.com/view/j/cmam.2018.18.issue-3/cmam-2018-0011/cmam-2018-0011.xml?format=INT>.
- [13] A Hybrid High-Order discretisation of the Brinkman problem robust in the Darcy and Stokes limits. Lorenzo Botti, Daniele A. Di Pietro, and Jérôme Droniou. *Comput. Methods Appl. Mech. Engrg.* 341, pp. 278–310, **2018**. DOI: 10.1016/j.cma.2018.07.004. URL: <http://arxiv.org/abs/1803.10964>.

- [14] A third Strang lemma and an Aubin-Nitsche trick for schemes in fully discrete formulation. Daniele A. Di Pietro and Jérôme Droniou. *Calcolo*, 55 (3), Art. 40, 39p, **2018**. DOI: 10.1007/s10092-018-0282-3. URL: <https://arxiv.org/abs/1804.09484>.
- [15] Discontinuous skeletal gradient discretisation methods on polytopal meshes. Daniele A. Di Pietro, Jérôme Droniou, and Gianmarco Manzini. *J. Comput. Phys.* 355, pp. 397–425, **2018**. DOI: 10.1016/j.jcp.2017.11.018. URL: <https://arxiv.org/abs/1706.09683>.
- [16] Improved L^2 estimate for gradient schemes and super-convergence of the TPFA finite volume scheme. Jérôme Droniou and Neela Nataraj. *IMA J. Numer. Anal.* 38 (3), pp. 1254–1293, **2018**. DOI: 10.1093/imanum/drx028. URL: <https://arxiv.org/abs/1602.07359>.
- [17] Numerical analysis for the pure Neumann control problem using the gradient discretisation method. Jérôme Droniou, Neela Nataraj, and Devika Shylaja. *Comput. Methods Appl. Math.* 18 (4), pp. 609–637, **2018**. DOI: 10.1515/cmam-2017-0054. URL: <https://arxiv.org/abs/1705.03256>.
- [18] Analysis of miscible displacement through porous media with vanishing molecular diffusion and singular wells. Jérôme Droniou and Kyle S. Talbot. *Ann. Inst. H. Poincaré (C) Anal. Non Linéaire*, 35 (1), pp. 1–25, **2018**. DOI: 10.1016/j.anihpc.2017.02.002. URL: <https://arxiv.org/abs/1609.03244>.
- [19] $W^{s,p}$ -approximation properties of elliptic projectors on polynomial spaces, with application to the error analysis of a Hybrid High-Order discretisation of Leray–Lions problems. Daniele A. Di Pietro and Jérôme Droniou. *Math. Models Methods Appl. Sci.* 27 (5), pp. 879–908, **2017**. DOI: 10.1142/S0218202517500191. URL: <https://arxiv.org/abs/1606.02832>.
- [20] A Hybrid High-Order method for Leray–Lions elliptic equations on general meshes. Daniele A. Di Pietro and Jérôme Droniou. *Math. Comp.* 86 (307), pp. 2159–2191, **2017**. DOI: 10.1090/mcom/3180. URL: <http://arxiv.org/abs/1508.01918>.
- [21] The gradient discretization method for optimal control problems, with superconvergence for non-conforming finite elements and mixed-hybrid mimetic finite differences. Jérôme Droniou, Neela Nataraj, and Devika Shylaja. *SIAM J. Control Optim.* 55 (6), pp. 3640–3672, **2017**. DOI: 10.1137/17M1117768. URL: <https://arxiv.org/abs/1608.01726>.
- [22] Gradient schemes for the Signorini and the obstacle problems, and application to hybrid mimetic mixed methods. Yahya Alnashri and Jérôme Droniou. *Computers and Mathematics with Applications*, 72, pp. 2788–2807, **2016**. DOI: 10.1016/j.camwa.2016.10.004. URL: <https://arxiv.org/abs/1502.05765>.
- [23] Uniform-in-time convergence of numerical methods for non-linear degenerate parabolic equations. Jérôme Droniou and Robert Eymard. *Numer. Math.* 132 (4), pp. 721–766, **2016**. DOI: 10.1007/s00211-015-0733-6. URL: <http://dx.doi.org/10.1007/s00211-015-0733-6>.
- [24] Gradient Schemes for Stokes problem. Jérôme Droniou, Robert Eymard, and Pierre Feron. *IMA J. Numer. Anal.* 36 (4), pp. 1636–1669, **2016**. DOI: 10.1093/imanum/drv061. URL: <https://hal.archives-ouvertes.fr/hal-01070703/>.
- [25] Gradient schemes: generic tools for the numerical analysis of diffusion equations. Jérôme Droniou, Robert Eymard, and Raphaële Herbin. *M2AN Math. Model. Numer. Anal.* 50 (3). Special issue – Polyhedral discretization for PDE, pp. 749–781, **2016**. DOI: 10.1051/m2an/2015079. URL: <http://dx.doi.org/10.1051/m2an/2015079>.
- [26] Convergence in $C([0; T]; L^2(\Omega))$ of weak solutions to perturbed doubly degenerate parabolic equations. Jérôme Droniou, Robert Eymard, and Kyle S. Talbot. *J. Differential Equations*, 260 (11), pp. 7821–7860, **2016**. DOI: 10.1016/j.jde.2016.02.004. URL: <http://dx.doi.org/10.1016/j.jde.2016.02.004>.
- [27] A discontinuous-skeletal method for advection-diffusion-reaction on general meshes. Daniele A. Di Pietro, Jérôme Droniou, and Alexandre Ern. *SIAM J. Numer. Anal.* 53 (5), pp. 2135–2157, **2015**. DOI: 10.1137/140993971. URL: <http://dx.doi.org/10.1137/140993971>.
- [28] Gradient schemes for linear and non-linear elasticity equations. Jérôme Droniou and Bishnu P. Lamichhane. *Numer. Math.* 129 (2), pp. 251–277, **2015**. DOI: 10.1007/s00211-014-0636-y. URL: <http://dx.doi.org/10.1007/s00211-014-0636-y>.

- [29] Finite volume schemes for diffusion equations: introduction to and review of modern methods. Jérôme Droniou. *Math. Models Methods Appl. Sci.* 24 (8), pp. 1575–1619, **2014**. DOI: 10.1142/S0218202514400041. URL: <http://dx.doi.org/10.1142/S0218202514400041>.
- [30] On a miscible displacement model in porous media flow with measure data. Jérôme Droniou and Kyle S. Talbot. *SIAM J. Math. Anal.* 46 (5), pp. 3158–3175, **2014**. DOI: 10.1137/130949294. URL: <http://dx.doi.org/10.1137/130949294>.
- [31] Gradient schemes: a generic framework for the discretisation of linear, nonlinear and nonlocal elliptic and parabolic equations. Jérôme Droniou, Robert Eymard, Thierry Gallouët, and Raphael Herbin. *Math. Models Methods Appl. Sci.* 23 (13), pp. 2395–2432, **2013**. DOI: 10.1142/S0218202513500358. URL: <http://dx.doi.org/10.1142/S0218202513500358>.
- [32] General fractal conservation laws arising from a model of detonations in gases. Matthieu Alfaro and Jérôme Droniou. *Appl. Math. Res. Express. AMRX*, 2012 (2), pp. 127–151, **2012**.
- [33] Convergence rate of the Allen-Cahn equation to generalized motion by mean curvature. Matthieu Alfaro, Jérôme Droniou, and Hiroshi Matano. *J. Evol. Equ.* 12 (2), pp. 267–294, **2012**. DOI: 10.1007/s00028-011-0132-0. URL: <http://dx.doi.org/10.1007/s00028-011-0132-0>.
- [34] A unified approach for handling convection terms in finite volumes and mimetic discretization methods for elliptic problems. Lourenço Beirão da Veiga, Jérôme Droniou, and Gianmarco Manzini. *IMA J. Numer. Anal.* 31 (4), pp. 1357–1401, **2011**. DOI: 10.1093/imanum/drq018. URL: <http://dx.doi.org/10.1093/imanum/drq018>.
- [35] Finite-volume schemes for noncoercive elliptic problems with Neumann boundary conditions. Claire Chainais-Hillairet and Jérôme Droniou. *IMA J. Numer. Anal.* 31 (1), pp. 61–85, **2011**. DOI: 10.1093/imanum/drp009. URL: <http://dx.doi.org/10.1093/imanum/drp009>.
- [36] Construction and convergence study of schemes preserving the elliptic local maximum principle. Jérôme Droniou and Christophe Le Potier. *SIAM J. Numer. Anal.* 49 (2), pp. 459–490, **2011**. DOI: 10.1137/090770849. URL: <http://dx.doi.org/10.1137/090770849>.
- [37] The G method for heterogeneous anisotropic diffusion on general meshes. Léo Agélas, Daniele A. Di Pietro, and Jérôme Droniou. *M2AN Math. Model. Numer. Anal.* 44 (4), pp. 597–625, **2010**. DOI: 10.1051/m2an/2010021. URL: <http://dx.doi.org/10.1051/m2an/2010021>.
- [38] A numerical method for fractal conservation laws. Jérôme Droniou. *Math. Comp.* 79 (269), pp. 95–124, **2010**. DOI: 10.1090/S0025-5718-09-02293-5. URL: <http://dx.doi.org/10.1090/S0025-5718-09-02293-5>.
- [39] A unified approach to mimetic finite difference, hybrid finite volume and mixed finite volume methods. Jérôme Droniou, Robert Eymard, Thierry Gallouët, and Raphaèle Herbin. *Math. Models Methods Appl. Sci.* 20 (2), pp. 265–295, **2010**. DOI: 10.1142/S0218202510004222. URL: <http://dx.doi.org/10.1142/S0218202510004222>.
- [40] Study of the mixed finite volume method for Stokes and Navier-Stokes equations. Jérôme Droniou and Robert Eymard. *Numer. Methods Partial Differential Equations*, 25 (1), pp. 137–171, **2009**. DOI: 10.1002/num.20333. URL: <http://dx.doi.org/10.1002/num.20333>.
- [41] Noncoercive convection-diffusion elliptic problems with Neumann boundary conditions. Jérôme Droniou and Juan-Luis Vázquez. *Calc. Var. Partial Differential Equations*, 34 (4), pp. 413–434, **2009**. DOI: 10.1007/s00526-008-0189-y. URL: <http://dx.doi.org/10.1007/s00526-008-0189-y>.
- [42] Occurrence and non-appearance of shocks in fractal Burgers equations. Nathaël Alibaud, Jérôme Droniou, and Julien Vovelle. *J. Hyperbolic Differ. Equ.* 4 (3), pp. 479–499, **2007**. DOI: 10.1142/S0219891607001227. URL: <http://dx.doi.org/10.1142/S0219891607001227>.
- [43] Convergence analysis of a mixed finite volume scheme for an elliptic-parabolic system modeling miscible fluid flows in porous media. Claire Chainais-Hillairet and Jérôme Droniou. *SIAM J. Numer. Anal.* 45 (5), 2228–2258 (electronic), **2007**. DOI: 10.1137/060657236. URL: <http://dx.doi.org/10.1137/060657236>.

- [44] Equivalence between entropy and renormalized solutions for parabolic equations with smooth measure data. Jérôme Droniou and Alain Prignet. *NoDEA Nonlinear Differential Equations Appl.* 14 (1-2), pp. 181–205, **2007**. DOI: 10.1007/s00030-007-5018-z. URL: <http://dx.doi.org/10.1007/s00030-007-5018-z>.
- [45] Finite volume schemes for fully non-linear elliptic equations in divergence form. Jérôme Droniou. *M2AN Math. Model. Numer. Anal.* 40 (6), pp. 1069–1100, **2006**. DOI: 10.1051/m2an:2007001. URL: <http://dx.doi.org/10.1051/m2an:2007001>.
- [46] A mixed finite volume scheme for anisotropic diffusion problems on any grid. Jérôme Droniou and Robert Eymard. *Numer. Math.* 105 (1), pp. 35–71, **2006**. DOI: 10.1007/s00211-006-0034-1. URL: <http://dx.doi.org/10.1007/s00211-006-0034-1>.
- [47] Fractal first-order partial differential equations. Jérôme Droniou and Cyril Imbert. *Arch. Ration. Mech. Anal.* 182 (2), pp. 299–331, **2006**. DOI: 10.1007/s00205-006-0429-2. URL: <http://dx.doi.org/10.1007/s00205-006-0429-2>.
- [48] An error estimate for the parabolic approximation of multidimensional scalar conservation laws with boundary conditions. Jérôme Droniou, Cyril Imbert, and Julien Vovelle. *Ann. Inst. H. Poincaré (C) Anal. Non Linéaire*, 21 (5), pp. 689–714, **2004**. DOI: 10.1016/j.anihpc.2003.11.001. URL: <http://dx.doi.org/10.1016/j.anihpc.2003.11.001>.
- [49] Error estimates for the convergence of a finite volume discretization of convection-diffusion equations. Jérôme Droniou. *J. Numer. Math.* 11 (1), pp. 1–32, **2003**. DOI: 10.1163/156939503322004873. URL: <http://dx.doi.org/10.1163/156939503322004873>.
- [50] Global and local estimates for nonlinear noncoercive elliptic equations with measure data. Jérôme Droniou. *Comm. Partial Differential Equations*, 28 (1-2), pp. 129–153, **2003**. DOI: 10.1081/PDE-120019377. URL: <http://dx.doi.org/10.1081/PDE-120019377>.
- [51] Vanishing non-local regularization of a scalar conservation law. Jérôme Droniou. *Electron. J. Differential Equations*, No. 117, 20 pp. (electronic), **2003**. URL: <https://www.emis.de/journals/EJDE/Volumes/2003/117/abstr.html>.
- [52] Convergence of a finite-volume mixed finite-element method for an elliptic-hyperbolic system. Jérôme Droniou, Robert Eymard, Danielle Hilhorst, and Xue Dong Zhou. *IMA J. Numer. Anal.* 23 (3), pp. 507–538, **2003**. DOI: 10.1093/imanum/23.3.507. URL: <http://dx.doi.org/10.1093/imanum/23.3.507>.
- [53] A finite volume scheme for a noncoercive elliptic equation with measure data. Jérôme Droniou, Thierry Gallouët, and Raphaële Herbin. *SIAM J. Numer. Anal.* 41 (6), 1997–2031 (electronic), **2003**. DOI: 10.1137/S0036142902405205. URL: <http://dx.doi.org/10.1137/S0036142902405205>.
- [54] Global solution and smoothing effect for a non-local regularization of a hyperbolic equation. Jérôme Droniou, Thierry Gallouët, and Julien Vovelle. *J. Evol. Equ.* 3 (3). Dedicated to Philippe Bénilan, pp. 499–521, **2003**. DOI: 10.1007/s00028-003-0503-1. URL: <http://dx.doi.org/10.1007/s00028-003-0503-1>.
- [55] Parabolic capacity and soft measures for nonlinear equations. Jérôme Droniou, Alessio Porretta, and Alain Prignet. *Potential Anal.* 19 (2), pp. 99–161, **2003**. DOI: 10.1023/A:1023248531928. URL: <http://dx.doi.org/10.1023/A:1023248531928>.
- [56] A density result in Sobolev spaces. Jérôme Droniou. *J. Math. Pures Appl.* 81 (7), pp. 697–714, **2002**. DOI: 10.1016/S0021-7824(01)01241-7. URL: [http://dx.doi.org/10.1016/S0021-7824\(01\)01241-7](http://dx.doi.org/10.1016/S0021-7824(01)01241-7).
- [57] Non-coercive linear elliptic problems. Jérôme Droniou. *Potential Anal.* 17 (2), pp. 181–203, **2002**. DOI: 10.1023/A:1015709329011. URL: <http://dx.doi.org/10.1023/A:1015709329011>.
- [58] Finite volume methods for convection-diffusion equations with right-hand side in H^{-1} . Jérôme Droniou and Thierry Gallouët. *M2AN Math. Model. Numer. Anal.* 36 (4), pp. 705–724, **2002**. DOI: 10.1051/m2an:2002031. URL: <http://dx.doi.org/10.1051/m2an:2002031>.
- [59] A uniqueness result for quasilinear elliptic equations with measures as data. Jérôme Droniou and Thierry Gallouët. *Rend. Mat. Appl. (Ser. VII)*, 21 (1-4), pp. 57–86, **2001**.

- [60] Solving convection-diffusion equations with mixed, Neumann and Fourier boundary conditions and measures as data, by a duality method. Jérôme Droniou. *Adv. Differential Equations*, 5 (10-12), pp. 1341–1396, **2000**.
- [61] Optimal pointwise control of semilinear parabolic equations. Jérôme Droniou and Jean-Pierre Raymond. *Nonlinear Anal.* 39 (2, Ser. A: Theory Methods), pp. 135–156, **2000**. DOI: 10.1016/S0362-546X(98)00170-9. URL: [http://dx.doi.org/10.1016/S0362-546X\(98\)00170-9](http://dx.doi.org/10.1016/S0362-546X(98)00170-9).

Publications in peer-reviewed conference proceedings:

Published:

- [62] An introduction to the gradient discretisation method. Jérôme Droniou, Robert Eymard, Thierry Gallouët, Cindy Guichard, and Raphaële Herbin. Lecture Notes in Computational Science and Engineering. *Numerical Mathematics and Advanced Applications ENUMATH 2017*. Springer-Verlag, **2019**. Ed. by Florin Adrian Radu, Kumar Kundan, Berre Inga, Jan Martin Nordbotten, and Iuliu Sorin Pop, pp. 451–459. DOI: 10.1007/978-3-319-96415-7_40.
- [63] Combining the hybrid mimetic mixed method and the Eulerian Lagrangian localised adjoint method for approximating miscible flows in porous media. Hanz Martin Cheng and Jérôme Droniou. Springer Proc. Math. Stat. Vol. 200. Finite volumes for complex applications VIII—hyperbolic, elliptic and parabolic problems. Springer, Cham, **2017**, pp. 367–376.
- [64] The asymmetric gradient discretisation method. J. Droniou and R. Eymard. Springer Proc. Math. Stat. Vol. 199. Finite volumes for complex applications VIII—methods and theoretical aspects. Springer, Cham, **2017**, pp. 311–319.
- [65] An error estimate for the approximation of linear parabolic equations by the gradient discretization method. J. Droniou, R. Eymard, T. Gallouët, C. Guichard, and R. Herbin. Springer Proc. Math. Stat. Vol. 199. Finite volumes for complex applications VIII—methods and theoretical aspects. Springer, Cham, **2017**, pp. 371–379.
- [66] Uniform-in-time convergence of numerical schemes for a two-phase discrete fracture model. J. Droniou, J. Hennicker, and R. Masson. Springer Proc. Math. Stat. Vol. 199. Finite volumes for complex applications VIII—methods and theoretical aspects. Springer, Cham, **2017**, pp. 275–283.
- [67] Benchmark: two hybrid mimetic mixed schemes for the lid-driven cavity. Jérôme Droniou and Robert Eymard. Springer Proc. Math. Stat. Vol. 199. Finite volumes for complex applications VIII—methods and theoretical aspects. Springer, Cham, **2017**, pp. 107–124.
- [68] Introduction to discrete functional analysis techniques for the numerical study of diffusion equations with irregular data. Jérôme Droniou. ANZIAM J. Vol. 56. Proceedings of the 17th Biennial Computational Techniques and Applications Conference (CTAC-2014, Canberra). **2015**. Ed. by Jason Sharples and Judith Bunder, pp. C101–C127. DOI: <http://dx.doi.org/10.21914/anziamj.v56i0.9365>. URL: <http://journal.austms.org.au/ojs/index.php/ANZIAMJ/article/view/9365>.
- [69] Gradient schemes for an obstacle problem. Yahya Alnashri and Jérôme Droniou. Springer Proc. Math. Stat. Vol. 77. Finite volumes for complex applications. VII. Methods and theoretical aspects (Berlin, 2014). Springer, Cham, **2014**, pp. 67–75. DOI: 10.1007/978-3-319-05684-5_5. URL: http://dx.doi.org/10.1007/978-3-319-05684-5_5.
- [70] Uniform-in-time convergence of numerical schemes for Richards’ and Stefan’s models. Jérôme Droniou, Robert Eymard, and Cindy Guichard. Springer Proc. Math. Stat. Vol. 77. Finite volumes for complex applications. VII. Methods and theoretical aspects (Berlin, 2014). Springer, Cham, **2014**, pp. 247–254. DOI: 10.1007/978-3-319-05684-5_23. URL: http://dx.doi.org/10.1007/978-3-319-05684-5_23.
- [71] A uniformly converging scheme for fractal conservation laws. Jérôme Droniou and Espen R. Jakobsen. Springer Proc. Math. Stat. Vol. 77. Finite volumes for complex applications. VII. Methods and theoretical aspects (Berlin, 2014). Springer, Cham, **2014**, pp. 237–245. DOI: 10.1007/978-3-319-05684-5_22. URL: http://dx.doi.org/10.1007/978-3-319-05684-5_22.

- [72] Remarks on discretizations of convection terms in hybrid mimetic mixed methods. Jérôme Droniou. *Netw. Heterog. Media*, 5 (3). Proceedings of “New Trends in Model Coupling”, pp. 545–563, **2010**. DOI: 10.3934/nhm.2010.5.545. URL: <http://dx.doi.org/10.3934/nhm.2010.5.545>.
- [73] Benchmark on Anisotropic Problems – Use of the mixed finite volume method. Claire Chainais-Hillairet, Jérôme Droniou, and Robert Eymard. *Finite volumes for complex applications V (Aussois, 2008)*. ISTE, London, **2008**, pp. 751–760.
- [74] A recipe to couple two finite volume schemes for elliptic problems. Jérôme Droniou. *Finite volumes for complex applications V (Aussois, 2008)*. ISTE, London, **2008**, pp. 69–86.
- [75] Fractal conservation laws: global smooth solutions and vanishing regularization. Jérôme Droniou. *Progr. Nonlinear Differential Equations Appl. Vol. 63. Fifth European Conference on Elliptic and Parabolic Problems: A special tribute to the work of Haim Brezis (Gaeta 2004)*. Birkhäuser, Basel, **2005**, pp. 235–242. DOI: 10.1007/3-7643-7384-9_24. URL: http://dx.doi.org/10.1007/3-7643-7384-9_24.
- [76] A finite volume scheme for noncoercive Dirichlet problems with right-hand sides in H^{-1} . Jérôme Droniou and Thierry Gallouët. *Finite volumes for complex applications, III (Porquerolles, 2002)*. Hermes Sci. Publ., Paris, **2002**, pp. 181–188.
- [77] Contrôle de l’architecture et des représentations internes dans les réseaux de neurones multicouches, Jérôme Droniou, André Elisseeff, Hélène Paugam-Moisy, and Olivier Teytaud. *Actes de la Conférence sur l’Apprentissage CAP’99 (Palaiseau, 1999)*. **1999**, pp. 185–194.

Submitted articles

- [1] High-order mass-lumped schemes for nonlinear degenerate elliptic equations. Jérôme Droniou and Robert Eymard, 28p, **2019**. URL: <https://arxiv.org/abs/1902.04662>.
- [2] The gradient discretisation method for linear advection problems. Jérôme Droniou, Robert Eymard, Thierry Gallouët, and Raphaèle Herbin, 21p, **2019**. URL: <https://arxiv.org/abs/1903.12415>.
- [3] The gradient discretisation method for nonlinear porous media equations. Jérôme Droniou and Kim-Ngan Le, 21p, **2019**. URL: <https://arxiv.org/abs/1905.01785>.
- [4] Design and analysis of finite volume methods for elliptic equations with oblique derivatives; application to Earth gravity field modelling. Jérôme Droniou, Matej Medla, and Karol Mikula, 37p, **2019**. URL: <https://arxiv.org/abs/1905.01813>.
- [5] A combined GDM–ELLAM–MMOC scheme for advection dominated PDEs. Hanz Martin Cheng, Jérôme Droniou, and Kim-Ngan Le, 35p, **2018**. URL: <https://arxiv.org/abs/1805.05585>.
- [6] Limits of the Stokes and Navier–Stokes equations in a punctured periodic domain. Michel Chipot, Jérôme Droniou, Gabriela Planas, and James C. Robinson, 25p, **2017**. URL: <https://arxiv.org/abs/1407.6942>.

Software:

- HARD::CORE2D (Hybrid Arbitrary Degree::Core 2D) – Library to implement schemes with edge and cell polynomial unknowns on generic 2D polygonal meshes.

Textbook:

- MATHÉMATIQUES ET STATISTIQUE POUR LES SCIENCES DE LA NATURE (modéliser, comprendre et appliquer) (*Mathematics and statistics for the natural sciences (modelling, understanding and applying)*), G. Biau, J. Droniou et M. Herzlich, Collection Enseignement Sup / Mathématiques, EDP Sciences, mars 2010, 530p, ISBN 978-2-7598-0481-8.
This book is based on our experience of teaching mathematics to undergraduate students enrolled mainly in Biology, Chemistry and Earth Sciences studies.

Booklets:

- *A beginner’s course in finite volume approximation of scalar conservation laws* (39p), J. Droniou, Pau – Toulouse – Zaragoza – summer school on nonlinear conservation laws, Jaca (Spain) 11-13/09/2008. http://users.monash.edu/~jdroniou/jaca_summer_school/.
- *Degrés topologiques et applications* (Topological degrees and applications) (56 p.), J. Droniou, 2006. <http://users.monash.edu.au/~jdroniou/docs/degre.pdf>.
- *Quelques Résultats sur les Espaces de Sobolev* (Some results on Sobolev spaces) (85 p.), J. Droniou, Polycopiés de l’Ecole Doctorale de Maths-Info de Marseille, 2001. <https://hal.archives-ouvertes.fr/hal-01382370>.
- *Intégration et Espaces de Sobolev à Valeurs Vectorielles* (Vector-valued integration and Sobolev spaces) (71 p.), J. Droniou, Polycopiés de l’Ecole Doctorale de Maths-Info de Marseille, 2001. <https://hal.archives-ouvertes.fr/hal-01382368>.

Grants

- 2019–2021: Co-Lead Chief Investigator, together with Prof. R. Masson (INRIA Nice Sophia-Antipolis), of the INRIA Associate Team project “Mathematical and numerical methods for thermo-hydro-mechanical models in porous media with discontinuities”.
Aim: design and rigorously analyse numerical methods for hybrid-dimensional matrix fracture models, motivated by applications to geothermal systems (thermo-hydro models and hydro-mechanical models).
- 2018–2021: Chief Investigator for the ARC Linkage Project “Enabling three dimensional stochastic geological modelling” (LP170100985, Lead Chief Investigator: Dr Laurent Ailleres).
Aim: develop technologies to mitigate three dimensional (3D) geological risk in resources management, using mathematical methods, structural geology concepts and probabilistic programming.
- 2017–2019: Lead Chief Investigator for the ARC Discovery Project “Discrete functional analysis: bridging pure and numerical mathematics” (DP170100605).
Aim: develop numerical analysis tools for fully nonlinear real-world models of elliptic and parabolic PDEs.
- 2011–2014: Chief Investigator for the ANR research grant “IDEE” (ANR-2010-0112-01, Lead Chief Investigator: Matthieu Alfaro).
Aim: study interface dynamics in reaction-diffusion partial differential equations. [My participation to this project ended mid-2011 when I moved to Australia.]
- 2009–2012: Lead Chief Investigator for the ANR⁴ research grant “VFSitCom” (ANR-08-BLAN-0275-01).
Aim: study numerical methods for flows in porous media, with targeted applications in oil recovery, carbon storage and the study of nuclear waste disposal hazards. [My participation to this project ended mid-2011 when I moved to Australia.]
- 2008–2010: Member of the GnR MoMaS (CNRS⁵)
The GnR MoMaS was a research group, funded by several French agencies, around mathematical modelling and numerical simulation for nuclear waste management problems.

Selected invitations (since 2008)

- 24–28/07/2017: keynote speaker at the “Equadiff 14” conference, Bratislava (Slovakia). *The beauty and efficiency of the gradient discretisation method.*

⁴French equivalent of ARC.

⁵French equivalent of CSIRO.

- 22–26/05/2017: keynote speaker at the “10th International Conference on Elliptic and Parabolic Problems”, Gaeta (Italy). *Uniform-in-time stability of doubly degenerate parabolic equations*.
- 15/09/2016–15/10/2016: invited for one month at the Institute Henri Poincaré (Paris), in the framework of a thematic quarter on Numerical PDEs.
- 1-3/12/2014: keynote speaker at the “Computational Techniques and Applications Conference (CTAC)” 2014, ANU (Canberra). *Mathematical tools for the numerical analysis of partial differential equations under real-world constraints*.
- 17-21/11/2014: keynote speaker at the “Scientific workshop of the GNR MoMaS”, CIRM Marseille (France). *A review of Finite Volume methods for anisotropic heterogeneous diffusion*.
- 19-23/03/2012: Invited to give a lecture to the Spring School “Analytical and Numerical Aspects of Evolution Equations”. Had to cancel due to my move to Australia and the uncertainty of my availability in March 2012.
- 6-10/06/2011: Invited keynote speaker to “FVCA6 – 6th International Symposium on Finite Volumes for Complex Applications”, Prague (Czech Republic). Had to cancel due to my move to Australia.
- 2-4/09/2009: Invited speaker at “New trends in Model Coupling (Theory, numerics and applications)”, Paris (France), *Discretizations of convection terms in hybrid mimetic mixed methods*.
- 26-27/01/2009: Invited speaker at the CEA-GAMNI workshop “Mécanique des fluides numérique”, Paris (France), *Some Finite Volume Methods to Handle Heterogeneous Anisotropic Diffusion*.
- 11-13/09/2008: keynote lecture at the “Pamplona–Pau–Toulouse–Zaragoza summer school on non-linear conservation laws”, Jaca (Spain), *A beginner’s course in finite volume approximation of scalar conservation laws*.
- 8-13/06/2008: keynote speaker at “FVCA5 – 5th International Symposium on Finite Volumes for Complex Applications”, Aussois (France), *A recipe to couple two finite volume schemes for elliptic problems*.

PhD supervisions

Completed PhD students

- JEAN-JEROME CASANOVA. *Self-regulation of flow in networks* (co-supervised with Jean-Pierre Raymond (University Toulouse III Paul Sabatier), funded by a scholarship of the French ministry of education; Sep 2015–Jul 2018).
- YAHYA ALNASHRI. *Numerical approximation of variational inequalities* (funded by the Saudi Arabia government; Jul 2013–Jul 2017).
- KYLE TALBOT. *Theoretical and numerical analysis of porous media flow models* (funded by a Monash PhD Scholarship with Faculty of Science top-up; Feb 2013–Apr 2017, with a 5-month Endeavour Fellowship in 2016).
 ◇ Kyle was awarded the 2017 Vice-Chancellor’s Commendation for Thesis Excellence in recognition of his outstanding doctoral thesis.
- MATHIEU CATHALA, from 09/2010 to 06/2011 (after my departure from France, F. Marche replaced me as supervisor). *Numerical analysis for flows in porous media* (funded by the French ministry of research; Sep 2010–Dec 2013).
- PIERRE ALIFRANGIS, co-supervised with M. Alfaro from 10/2009 to 06/2011 (after my departure from France, R. Carles replaced me as co-supervisor) *Partial differential equations and interface dynamics* (funded by the French ministry of research; Oct 2009–Jun 2013).

- THANH HAI ONG, co-supervised with C. Le Potier (CEA: French Nuclear Agency) from 11/2009 to 06/2011 (after my departure from France, R. Eymard replaced me as supervisor). *Cell-centered scheme for heterogeneous anisotropic diffusion problems on general meshes* (funded by the CEA; Nov 2009–Nov 2012).
- NATHAËL ALIBAUD, co-supervised with C. Imbert. *Study of some partial differential equations involving nonlocal terms* (funded by the French ministry of research; Sep 2003–Dec 2006).

Ongoing PhD students

- MOHAMMAD NAZMUL HOSSEIN. (co-supervised with M. Flegg (Monash); started January 2018).
- CHIRAPPURATHU REMESAN GOPIKRISHNAN. *Numerical methods for free boundary problems in three dimensions with applications in biology* (co-supervised with N. Nataraj (IITB) and Jennifer Flegg (University of Melbourne), funded by the IITB–Monash academy; started January 2017 [IITB=Indian Institute of Technology Bombay]).
- HANZ MARTIN CHENG. *Design and analysis of numerical methods for flows in porous media* (Funded by a Monash PhD scholarship; started March 2016).
- DEVIKA SHYLAJA. *Numerical methods for elliptic PDEs and optimal control problems* (co-supervised with N. Nataraj (IITB), funded by the IITB–Monash academy; started July 2015 [IITB=Indian Institute of Technology Bombay]).

Teaching

Monash University:

- 2019:
 - *Real Analysis* (2nd and 3rd year undergraduate): lectures (36h) and coordination.
 - *Differential Equations and Applications* (2nd year undergraduate): lectures (18h) and coordination.
- 2018:
 - *Real Analysis* (2nd and 3rd year undergraduate): lectures (36h), tutorials (22h) and coordination.
 - *Differential Equations and Applications* (2nd year undergraduate): lectures (18h) and coordination.
 - *Partial Differential Equations* (4th year – honours): lectures (18h).
- 2017:
 - *Real Analysis* (2nd and 3rd year undergraduate): lectures (36h), tutorials (22h) and coordination.
 - *Differential Equations and Applications* (2nd year undergraduate): lectures (18h) and coordination.
 - *Mathematics Research Project* (3rd year): coordination.
- 2016:
 - *Real Analysis* (2nd and 3rd year undergraduate): lectures (36h), tutorials (22h) and coordination.
 - *Differential Equations and Applications* (2nd year undergraduate): lectures (18h) and coordination.

- *Measure Theory* (4th year – honours): lectures (12h).
- *Mathematics Research Project* (3rd year): coordination.

AMSI:

- December 2012: *A beginner’s course in finite volume approximation of scalar conservation laws*, AGR short course (12h).
- January 2016: *Modern numerical methods for diffusion equations on generic grids*, AMSI Summer School, RMIT (Melbourne), 4-29 January 2016 (28h).

Scientific activities (◇ *items are ongoing*)

Editorial roles

- ◇ 2017–2018: Co-editor (with P. Antonietti and R. Eymard) of the special issue “Advanced numerical methods: recent developments, analysis, and applications” of *Computational Methods in Applied Mathematics (CMAM)*.
- ◇ 2014-...: Associate editor of *North-Western European Journal of Mathematics*⁶.
- ◇ 2013-...: Associate editor of *Mathematical Modelling and Numerical Analysis (M2AN)*.
- 2017: Co-editor (with M. Page and S. Clarke) of the proceedings of the 18th CTAC, published in the *ANZIAM electronic journal*. See <http://dx.doi.org/10.21914/anziamj.v58i0.11569>.

Conferences

- ◇ 2019 (29/04–03/05): Co-organisation (with P. Antonietti, L. Beirão da Veiga, D. Di Pietro and S. Krell) of the 3rd POEMS (Polytopal Element Methods in Mathematics and Engineering) workshop, CIRM (Marseille).
- 2017 (22/05–26/05): Co-organisation (with B. Andreianov and E. R. Jakobsen) of a mini-symposium *Stability for evolution problems* during the 10th International Conference on Elliptic and Parabolic Problems, Gaeta (Italy).
- 2016-2017: Member of the Scientific Committee of the FVCA8 conference (“Finite Volumes for Complex Applications 8”, Lille (France), 12–16 June 2017).
- 2016 (3/10–7/10): co-organisation of the international conference on “Advanced numerical methods: recent developments, analysis, and applications” (one of the main events of the thematic quarter “Numerical PDEs at the IHP”, Paris).
- 2016 (27/11–30/11): co-chair of the “Computational Techniques and Applications Conference 2016” (CTAC16; Monash University, Melbourne).
- 2016 (15/02–19/02): co-organisation of the “Monash Workshop on Numerical PDEs” (Monash University, Melbourne).
- 2013-2014: Member of the Scientific Committee of the FVCA7 conference (“Finite Volumes for Complex Applications 7”, Berlin, 16-20 June 2014).

Administrative roles

- ◇ 01/2019-...: head of the Applied Mathematics section in the School of Mathematics at Monash.
- ◇ 01/08/2018-...: member of the Monash Academic Board.

⁶Recently created open-access journal by a non-profit publisher, supported by the French Mathematical Society (SMF).

- ◇ 2016-...: co-founder and co-chair (until December 2018) of the Mathematics of Computation and Optimisation special interest group of the AustMS (Australian Mathematical Society). Regular member of the executive board since January 2019.
- 2014-2016: Chair of the Computational Mathematics Group, special interest group of the ANZIAM (Australian and New-Zealand Industrial and Applied Mathematics, division of the Australian Mathematical Society).
- 2013-2016: Honours coordinator for the School of Mathematical Sciences at Monash University.
- 2013-2016: Member of the AustMS Student Support Scheme Committee (chair in 2015).
- 2010-2011: Associate Dean of the Faculty of Sciences at the University Montpellier 2.
- 2009-2010: Deputy Head of the “pôle MIPS”⁷ (and elected member of its board from 2008 to 2011.)
- 2007-2010: Vice-President (publications) of the French Society for Applied and Industrial Mathematics (SMAI).
- 2008-2009: Head of the team ACSIOM (Analysis, scientific computing and optimization) of the Institute of Mathematics and Modelling of Montpellier (I3M) at the University Montpellier 2 (and member of the executive board of I3M from 2003 to 2009).
- 2003-2011: member of the executive board of the Teaching Department of Mathematics at the University Montpellier 2.
- 2003-2009: member of the executive board of the Institut de Mathématiques et de Modélisation de Montpellier (I3M, UMR CNRS 5149) of Mathematics at the University Montpellier 2.

⁷MIPS is like a School of Sciences gathering Mathematics, Computer Sciences, Physics, Electronics, Robotics and Mechanics. It has in charge the reflection and management of research and teaching in these sciences within the University Montpellier 2.