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# *Resume*

JÉRÔME DRONIOU

20/04/2026

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## 1 Career

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

Last name: **Droniou**

Citizenship: French, Australian

Position: **Directeur de Recherche CNRS** at the **Institute of Mathematics Alexander Grothendieck** (University of Montpellier).

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### Positions:

- 01/2024 – ... : Adjunct Professor (research) in the School of Mathematics at Monash University.
- 12/2023 – ... : Directeur de Recherche (Senior Research Fellow) at the CNRS (France), in the Institut Montpellierain Alexander Grothendieck (IMAG, University Montpellier).
- 07/2020 – 11/2023: Professor at Monash University (Australia).
- 01/2018 – 06/2020: Associate Professor at Monash University (Australia).
- 01/2012 – 12/2017: Senior Lecturer at Monash University (Australia).
- 09/2006 – 08/2011: Professor at the University Montpellier 2 (France).
- 2002-2006: “Maître de Conférences” at the University Montpellier 2.
- 2001-2002: “Agrégé préparateur” at the “Ecole Normale Supérieure de Lyon”.
- 1998-2001: PhD student in Applied Mathematics (supervisor: Prof. Thierry Gallouët).

### Diplomas and titles:

- 2004: “Habilitation à Diriger des Recherches”<sup>1</sup>, University Montpellier 2.
- 2001: PhD thesis, University Aix-Marseille I (supervisor: T. Gallouët).

## 2 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.

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

## Books

- [1] *The Hybrid High-Order Method for Polytopal Meshes: Design, Analysis, and Applications*. Daniele Antonio Di Pietro and Jérôme Droniou. Modeling, Simulation and Applications, vol. 19. Springer International Publishing, **2020**, xxxi + 525p. DOI: 10.1007/978-3-030-37203-3. URL: <https://hal.archives-ouvertes.fr/hal-02151813>.
- [2] *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>.

## Book chapters

- [3] Clément Cancès, Jérôme Droniou, Cindy Guichard, Gianmarco Manzini, Manuela Bastidas Olivares, and Iuliu Sorin Pop. “Error Estimates for the Gradient Discretisation Method on Degenerate Parabolic Equations of Porous Medium Type”. In: *Polyhedral Methods in Geosciences*. Ed. by Daniele Antonio Di Pietro, Luca Formaggia, and Roland Masson. Vol. 27. SEMA–SIMAI series. Springer International Publishing, Cham, **2021**, pp. 37–72. DOI: 10.1007/978-3-030-69363-3\_2. URL: [www.uhasselt.be/Documents/CMAT/Preprints/2020/UP2004.pdf](http://www.uhasselt.be/Documents/CMAT/Preprints/2020/UP2004.pdf).
- [4] Jérôme Droniou, Robert Eymard, Thierry Gallouët, and Raphaèle Herbin. “Non-conforming Finite Elements on Polytopal Meshes”. In: *Polyhedral Methods in Geosciences*. Ed. by Daniele Antonio Di Pietro, Luca Formaggia, and Roland Masson. Vol. 27. SEMA–SIMAI series. Springer International Publishing, Cham, **2021**, pp. 1–35. DOI: 10.1007/978-3-030-69363-3\_1. URL: <https://arxiv.org/abs/2007.06958>.

## Articles in international peer-reviewed journals:

### *To appear:*

- [5] A higher order polytopal methods for contact mechanics with Tresca friction. Jérôme Droniou, Raman Kumar, Roland Masson, and Ritesh Singla. *J. Comput. Phys.* 39p, **2026**. DOI: 10.1016/j.jcp.2026.114923. URL: <http://arxiv.org/abs/2601.07586>.
- [6] Error estimates for numerical approximations of a nonlinear gradient flow model. Jérôme Droniou, Kim-Ngan Le, and Huateng Zhu. *Comput. Math. Appl.* 32p, **2026**. URL: <http://arxiv.org/abs/2505.13929>.
- [7] Analysis of BDDC preconditioners for non-conforming polytopal hybrid discretisation methods. Santiago Badia, Jérôme Droniou, Jordi Manyer, and Jai Tushar. *SIAM J. Numer. Anal.* 24p, **2025**. URL: <https://arxiv.org/abs/2506.11956>.
- [8] A discrete trace theory for non-conforming polytopal hybrid discretisation methods. Santiago Badia, Jérôme Droniou, and Jai Tushar. *Found. Comput. Math.* 50p, **2025**. DOI: 10.1007/s10208-025-09734-6. URL: <http://arxiv.org/abs/2409.15863>.
- [9] An exterior calculus framework for polytopal methods. Francesco Bonaldi, Daniele A. Di Pietro, Jérôme Droniou, and Kaibo Hu. *Journal of the European Mathematical Society*, 55p, **2025**. DOI: 10.4171/JEMS/1602. URL: <https://arxiv.org/abs/2303.11093>.

### *Published:*

- [10] A Reynolds-Semirobust Method with Hybrid Velocity and Pressure for the Unsteady Incompressible Navier–Stokes Equations. L. Beirão da Veiga, D. A. Di Pietro, J. Droniou, K. B. Haile, and T. J. Radley. *SIAM J. Numer. Anal.* 63 (6), pp. 2317–2342, **2025**. DOI: 10.1137/25M1736104. URL: <https://arxiv.org/abs/2502.15293>.
- [11] Analysis of a VEM–fully discrete polytopal scheme with bubble stabilisation for contact mechanics with Tresca friction. Jérôme Droniou, Ali Haidar, and Roland Masson. *ESAIM: M2AN Math. Model. Numer. Anal.* 59 (2), pp. 1043–1074, **2025**. DOI: 10.1051/m2an/2025013. URL: <http://arxiv.org/abs/2404.03045>.

- [12] A polytopal discrete de Rham complex on manifolds, with application to the Maxwell equations. Jérôme Droniou, Marien Hanot, and Todd Oliynyk. *J. Comput. Phys.* 529, Paper No. 113886, 31p, **2025**. DOI: 10.1016/j.jcp.2025.113886. URL: <https://arxiv.org/abs/2401.16130>.
- [13] Numerical analysis of a mixed-dimensional poromechanical model with frictionless contact at matrix–fracture interfaces. Francesco Bonaldi, Jérôme Droniou, and Roland Masson. *Math. Comp.* 93 (349), pp. 2103–2134, **2024**. DOI: 10.1090/mcom/3949. URL: <https://arxiv.org/abs/2201.09646>.
- [14] A pressure-robust Discrete de Rham scheme for the Navier-Stokes equations. Daniele A. Di Pietro, Jérôme Droniou, and Jia Jia Qian. *Comput. Methods Appl. Mech. Engrg.* 421, Paper no. 116765, 21p, **2024**. DOI: 10.1016/j.cma.2024.116765. URL: <https://arxiv.org/abs/2401.04456>.
- [15] Optimal error estimates for non-conforming approximations of linear parabolic problems with minimal regularity. J. Droniou, R. Eymard, T. Gallouët, C. Guichard, and R. Herbin. *SeMA J.* 82 (3), pp. 289–316, **2024**. DOI: 10.1007/s40324-024-00360-w. URL: <https://hal.science/hal-04183945>.
- [16] A bubble VEM–fully discrete polytopal scheme for mixed-dimensional poromechanics with frictional contact at matrix fracture interfaces. Jérôme Droniou, Guillaume Enchéry, Isabelle Faille, Ali Haidar, and Roland Masson. *Comput. Methods Appl. Mech. Engrg.* 422, Paper no. 116838, 25p, **2024**. DOI: 10.1016/j.cma.2024.116838. URL: <http://arxiv.org/abs/2312.09319>.
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- [19] The eXtended Virtual Element Method for elliptic problems with weakly singular solutions. Jérôme Droniou, Gianmarco Manzini, and Liam Yemm. *Comput. Methods Appl. Mech. Engrg.* 429, Paper No. 117129, 16p, **2024**. DOI: 10.1016/j.cma.2024.117129. URL: <https://arxiv.org/abs/2402.02902>.
- [20] Two arbitrary-order constraint-preserving schemes for the Yang–Mills equations on polyhedral meshes. Jérôme Droniou and Jia Jia Qian. *Mathematics in Engineering*, 6 (3), pp. 468–493, **2024**. DOI: 10.3934/mine.2024019. URL: <https://arxiv.org/abs/2306.09751>.
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- [23] A polytopal method for the Brinkman problem robust in all regimes. Daniele A. Di Pietro and Jérôme Droniou. *Comput. Methods Appl. Mech. Engrg.* 409, Paper no. 115981, 33p, **2023**. DOI: 10.1016/j.cma.2023.115981. URL: <https://arxiv.org/abs/2301.03272>.
- [24] An arbitrary-order discrete de Rham complex on polyhedral meshes: Exactness, Poincaré inequalities, and consistency. Daniele A. Di Pietro and Jérôme Droniou. *Found. Comput. Math.* 23, pp. 85–164, **2023**. DOI: 10.1007/s10208-021-09542-8. URL: <https://arxiv.org/abs/2101.04940>.
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- [130] 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. URL: [https://imag.umontpellier.fr/~droniou/articles/droniou-gallouet\\_fvca3.pdf](https://imag.umontpellier.fr/~droniou/articles/droniou-gallouet_fvca3.pdf).
- [131] 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] A low-order hybrid method for the variable-density incompressible Navier-Stokes equations. Mathias Dauphin, Daniele Di Pietro, Jérôme Droniou, and Alexandros Skouras, 23p, **2026**. URL: <https://arxiv.org/abs/2601.14405>.

- [2] A Reynolds- and Hartmann-semirobust hybrid method for magnetohydrodynamics. Daniele A. Di Pietro, Jérôme Droniou, and Vito Patierno, 25p, **2026**. URL: <https://arxiv.org/abs/2602.09626>.
- [3] A locking-free nodal-based polytopal method for linear elasticity. Jérôme Droniou and Raman Kumar, 21p, **2026**. URL: <https://arxiv.org/abs/2601.16728>.
- [4] A Hybrid High-Order method for the power-law Brinkman problem robust in all regimes. Daniel Castañón-Quiroz, Daniele A. Di Pietro, Jérôme Droniou, and Marwa Salah, 23p, **2025**. URL: <https://arxiv.org/abs/2507.12140>.
- [5] Commuting quasi-interpolators and Maxwell compactness for a polytopal de Rham complex. Théophile Chaumont-Frelet, Jérôme Droniou, and Simon Lemaire, 30p, **2025**. URL: <https://arxiv.org/abs/2510.18835>.
- [6] Uniform Poincaré inequalities for the discrete de Rham complex of differential forms. Daniele A. Di Pietro, Jérôme Droniou, Marien-Lorenzo Hanot, and Silvano Pitassi, 32p, **2025**. URL: <https://arxiv.org/abs/2501.16116>.
- [7] Design and analysis of twisted and BGG Stokes-de Rham polytopal complexes. Daniele A. Di Pietro, Jérôme Droniou, Kaibo Hu, and Arax Leroy, 32p, **2025**. URL: <https://arxiv.org/abs/2507.17333>.
- [8] Ghost stabilisation for cut finite element exterior calculus. Daniele A. Di Pietro, Jérôme Droniou, and Erik Nilsson, 18p, **2025**. URL: <https://arxiv.org/abs/2510.14772>.
- [9] Conforming lifting and adjoint consistency for the Discrete de Rham complex of differential forms. Daniele A. Di Pietro, Jérôme Droniou, and Silvano Pitassi, 28p, **2025**. URL: <https://arxiv.org/abs/2509.21449>.
- [10] Efficient iterative linearised solvers for numerical approximations of stochastic Stefan problems. Muhammad Awais Khan, Jérôme Droniou, Kim-Ngan Le, and Sorin Pop, 34p, **2025**. URL: <https://arxiv.org/abs/2508.06867>.
- [11] Reaching the equilibrium: Long-term stable approximations for stochastic non-Newtonian Stokes equations with transport noise. Jérôme Droniou, Kim-Ngan Le, and Jörn Wichmann, 48p, **2024**. URL: <https://arxiv.org/abs/2412.14316>.

Software:

- HARD::CORE (Hybrid Arbitrary Degree::Core) – Libraries to implement schemes with face/edge and cell polynomial unknowns on generic 2D and 3D polygonal meshes.
- Other implementations of some of the schemes designed and analysed in my papers can be found on my github page.

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/](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>.

### 3 Grants

- 2024–2029: Principal Investigator for the ERC Synergy projet “NEMESIS” (NEW generation METHods for numerical SIMulationS, No. 101115663).  
*Aim: development of polytopal methods (discretisation methods for PDEs that support generic meshes, such as DDR or VEM), with a focus on designing and analysing discrete version of differential complexes (e.g., the de Rham complex), that preserve analytical and homological properties. Multi-level solvers for these methods will also be considered, and applications are geared towards magneto-hydro-dynamics and porous media flow models.*
- 2023–2025: Chief Investigator for the ARC Linkage Project “Three-dimensional Bayesian Modelling of Geological and Geophysical data” (LP210301239, Lead Chief Investigator: Dr Laurent Ailleres).  
*Aim: develop technologies enabling rapid informed decision-making related to the management of natural resources, including critical metals, copper and water.*
- 2022–2024: Lead Chief Investigator for the ARC Discovery Project “A new numerical analysis for partial differential equations with noise” (DP220100937); investigators: J. Droniou, K.-N. Le, Z. Brzezniak, A. Prohl.  
*Aim: develop a framework for the design and analysis of a variety of numerical schemes (FE, FV, etc.) for stochastic PDEs.*
- 2021–2023: Lead Chief Investigator for the ARC Discovery Project “Interface-aware numerical methods for stochastic inverse problems” (DP210103092); investigators: J. Droniou, S. Badia, T. Cui, Y. Marzouk, J. Carrerra.  
*Aim: develop and analyse high-performance numerical algorithms for PDEs in presence of interfaces with unknown precise location.*
- 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.*
- 2017–2020: 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 ANR 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.]*

## 4 Conferences and seminars (since 2020)

(slides available on my webpage)

- *A polytopal exterior calculus framework with application to the Maxwell equations on manifolds*, HONOM 2026 [keynote]. Trento (Italy). **2026** (30 April – 3 June).
- *Topics around a polytopal complex: from design to Maxwell compactness*, Indo-European Conference on Mathematics [minisymposium invited talk]. Savitribai Phule Pune University, Pune (India). **2026** (12–16 January).
- *Polytopal complexes: introduction, examples and some associated results*, 7e Congrès International de la Société Marocaine de Mathématiques Appliquées [keynote]. Faculté des Sciences, Université Moulay Ismaël, Meknes (Morocco). **2025** (1–3 December).
- *Conforming lifting, quasi-interpolators and Maxwell compactness for a polytopal de Rham complex*, Frontiers in Numerical Methods for Nonlinear Partial Differential Equations (2025) [Invited Presentation]. Bernoulli center, EPFL, Lausanne, Switzerland. **2025** (8–10 October).
- *The Discrete De Rham method for electromagnetic models: from Maxwell to Yang–Mills to manifolds*, 9th Advanced Computational Methods in Engineering and Applied Mathematics (ACOMEN 25) [keynote]. Ghent, Belgium. **2025** (15–19 September).
- *Polytopal schemes for flows in fractured porous media*, ICOSAHOM 2025 [regular presentation]. Montreal, Canada. **2025** (16 July).
- *A discrete trace theory for polytopal methods, with application to BDDC preconditioners*, International Conference on Advanced Numerical Schemes for Challenging PDEs [regular presentation]. CityU Hong Kong. **2025** (12–15 June).
- *Introduction to the Discrete De Rham method, and application to a (weird) formulation of the Navier-Stokes equations*, Seminaire CEA-CESTA. Le Barp, France. **2025** (29 April).
- *An HHO-DDR polytopal method for the Brinkman problem that is robust in pure Stokes and Darcy regimes*, 23rd IACM Computational Fluids Conference (CFC 2025) [minisymposium keynote]. Santiago de Chile. **2025** (17–20 March).
- *Discrete polytopal complexes for fluid mechanics, electromagnetism (and solid mechanics)*, CEA-SMAI/GAMNI seminar on numerical fluid mechanics [keynote]. Paris, France. **2025** (27 January).
- *The exterior calculus Discrete De Rham method on manifolds and application to the Maxwell equations*, POEMS 2024 [regular presentation]. Paris, France. **2024** (5 December).
- *Design and analysis of an extended virtual element method*, CTAC 2024 [regular presentation]. Melbourne, Australia. **2024** (21 November).
- *A complete theory of discrete trace and lifting for hybrid polytopal methods*, Seminaire Laboratoire Jacques-Louis Lions. Paris, France. **2024** (25 October).
- *Bubble-stabilised polytopal scheme for flows in fractured media with frictional contact*, WCCM-PANCAM 24 [regular presentation]. Vancouver, Canada. **2024** (23 July).

- *Analysis approaches for polytopal schemes – the linear and nonlinear cases*, NEMESIS Kick-off workshop [keynote]. Montpellier, France. **2024** (19 June).
- *The Exterior Calculus Discrete De Rham complex*, New Trends in the Numerical Analysis of PDE [keynote]. Lille, France. **2024** (11 June).
- *A bubble-enriched polytopal method for contact mechanics*, Seminaire ACSIOM, IMAG. Montpellier, France. **2024** (2 April).
- *The discrete de Rham complex, and its application to the Navier–Stokes equations*, PAMIR (Point values, Averages and Moments and their Inter-Relation) workshop [keynote]. Cambridge, UK. **2024** (8 March).
- *Arbitrary-order polytopal schemes for the Yang–Mills equations*, Seminaire NAGANA. Montpellier, France. **2023** (12 September).
- *A polytopal exterior calculus framework*, ICIAM 2023 [regular presentation]. Tokyo, Japan (hybrid). **2023** (23 August).
- *Serendipity discrete de Rham method*, ICOSAHOM 2023 [regular presentation]. Seoul, South Korea. **2023** (16 August).
- *Introduction to the Discrete De Rham complex*, Seminar of the Mathematical Institute. Oxford, UK. **2022** (13 October).
- *Pressure-Robust Discrete De Rham and Virtual Element Schemes for the Stokes Problem*, SIAM Annual Meeting [regular presentation]. Pittsburg, USA (hybrid). **2022** (11–15 July).
- *Next generation methods for the simulation of geophysical flows (and more...)*, Mathematica Solis et Terrae conference [keynote]. ANU, Canberra. **2022** (11–12 April).
- *An arbitrary-order robust polygonal scheme for the Reissner–Mindlin plate problem*, AustMS annual meeting [regular presentation]. Online. **2021** (7 December).
- *Convergence and error estimates of numerical schemes for the porous medium equation*, ANZIAM annual meeting [regular presentation]. Online. **2021** (4 February).
- *A discrete exact grad-curl-div complex on generic polyhedral meshes Part II: Analytical properties*, 16th U.S. National Congress on Computational Mechanics [regular presentation]. Online. **2021** (26 July).
- *Numerical analysis of two-phase flows models with mechanical deformation in fracture porous media*, AustMS annual meeting [regular presentation]. UNE (Armidale, Australia). **2020** (10 December).
- *Polynomial de Rham sequences of arbitrary degree on polyhedral meshes*, Seminar. Marseille, France. **2020** (8 December).
- *High-order methods for linear and non-linear elliptic equations*, Algoritmy 2020 [keynote]. Podbanske (Slovakia). **2020** (10-15 September).
- *Interplay between diffusion anisotropy and mesh skewness in Hybrid High-Order schemes*, FVCA9 [keynote]. Bergen (Norway). **2020** (15-19 June).
- *A fully discrete exact de Rham sequence, with application to magnetostatics*, CTAC [regular presentation]. UNSW (Sydney, Australia). **2020** (30 August - 2 September).
- *B-char: an efficient (and feasible!) approach for mass-conserving characteristic schemes in 2D and 3D*, MWNDEA [regular presentation]. Monash (Melbourne, Australia). **2020** (10-14 February).

## 5 Supervisions (PhD, Postdocs)

### Ongoing PhD students

- VITO PATIERNO. *Discrete de Rham methods on domains with non-trivial topology* (co-supervised with D. Di Pietro; started October 2024).

- ARAX LEROY. *Extended discrete polytopal complexes: design and analysis* (co-supervised with D. Di Pietro; started October 2024).
- HUATENG ZHU. *Stochastic PDEs and Numerical Analysis* (co-supervised with K.-N. Le)

#### Completed PhD students

- JIA JIA QIAN. *Arbitrary-order constraint-preserving polytopal schemes for Yang–Mills equations* (co-supervised with T. Oliynyk; Feb 2022 - July 2025).  
 ◇ Jia Jia received the best student presentation prize at the Computational Techniques and Applications Conference in 2024.
- MUHAMMAD AWAIS KHAN. *Numerical analysis of the stochastic porous media equation* (co-supervised with K.-N. Le, funded by the Higher Education Commission of Pakistan; July 2021 - Jan 2025).
- LIAM YEMM. *Hybrid High-Order methods for singular situations* (funded by Monash University, with an Excellence Scholarship top-up; Feb 2020 - Nov 2023).
- 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; Jan 2017–Jun 2021 [IITB=Indian Institute of Technology Bombay]).  
 ◇ Gopi was awarded the Prof. Prabhulal Bhatnagar Memorial Prize for most outstanding student in PhD in Mathematics, IITB (2020-2021).  
 ◇ Gopi received the first prize of the Three Minute Thesis Talk, IITB – Monash Research Academy in 2020.
- DEVIKA SHYLAJA. *Numerical methods for elliptic PDEs and optimal control problems* (co-supervised with N. Nataraj (IITB), funded by the IITB–Monash academy; Jul 2015–Sep 2019).  
 ◇ Devika was awarded a best student presentation prize at the Computational Techniques and Applications Conference in 2016.  
 ◇ Devika received the IIT Bombay “Excellence in PhD” research award for the years 2018–2020.
- HANZ MARTIN CHENG. *Design and analysis of numerical methods for flows in porous media* (Funded by a Monash PhD scholarship; Mar 2016–Aug 2019).
- 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 Postdocs

- ESTEBAN COIFFIER. *Polytopal methods for Maxwell equations* (started January 2026; funded by the ERC Synergy NEMESIS).
- ERIK NILSSON. *Cut finite element exterior calculus and numerical methods on manifolds* (started January 2025; funded by the ERC Synergy NEMESIS).
- RAMAN KUMAR. *Locking-free polytopal schemes for contact mechanics problems* (started January 2025; funded by the University of Montpellier (i-Site program), then by the ERC Synergy NEMESIS).

#### Past Postdocs

- RITESH SINGLA. *High-order polytopal methods for mechanics problems in fractured media* (October 2024–December 2025; funded by the ERC Synergy NEMESIS).
- JÖRN WICHMANN. *Numerical methods for stochastic non-Newtonian flows* (2023–2025; funded by the ARC Discovery Project SGDM).
- JAI TUSHAR. *Domain decomposition solvers for polytopal methods* (2022–2025; funded by the ARC Discovery Project IANM).
- KIM-NGAN LE. *Numerical methods for porous media flows* (2018–2020; funded by the ARC Discovery Project DFA).

## 6 Teaching

#### Monash University:

- 2023:
  - *Partial Differential Equations* (3<sup>rd</sup> year undergraduate): lectures (18h).
  - *Advanced numerical analysis of partial differential equations* (Master): lectures (18h), applied class (6h) and coordination.
  - *Advanced engineering mathematics* (2<sup>nd</sup> year undergraduate, Engineering): lectures (24h) and coordination.
- 2022:
  - *Real Analysis* (2<sup>nd</sup> and 3<sup>rd</sup> year undergraduate): lectures (36h) and coordination.
  - *Partial Differential Equations* (3<sup>rd</sup> year undergraduate): lectures (18h) and tutorials (17h).
  - *Advanced numerical analysis of partial differential equations* (Master): lectures (18h), applied class (6h) and coordination.
- 2021:
  - *Real Analysis* (2<sup>nd</sup> and 3<sup>rd</sup> year undergraduate): lectures (36h), applied class (17h) and coordination.

– *Partial Differential Equations* (3<sup>rd</sup> year undergraduate): lectures (18h).

AMSI (Australian Mathematical Sciences Institute):

- 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).

## 7 Recent scientific activities

(items marked  $\diamond$  are ongoing)

Editorial roles

- $\diamond$  2014-...: Associate editor of *North-Western European Journal of Mathematics*<sup>2</sup>.
- $\diamond$  2013-...: Associate editor of *Mathematical Modelling and Numerical Analysis (M2AN)*.
- 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)*.
- 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

- 2025: co-organiser of the mini-symposium “New generation methods for numerical challenges in curl-div problems: Electromagnetism, MHD, and derived models” in the ACOMEN conference (Ghent, Belgium, 15–19/09).
- 2025: co-organiser of the mini-symposium “Discrete complexes and polytopal methods: a NEMESIS minisymposium” in the ICOSAHOM conference (Montreal, Canada, 13–18/07).
- 2025: co-organiser of the mini-symposium “Polytopal methods and applications: a NEMESIS minisymposium” in the Maths 2 Product conference (Valencia, Spain, 04–06/06).
- 2024: co-organiser of the NEMESIS workshop (Montpellier, France, 19–21/06).
- 2023: Member of the Scientific Committee of the FVCA10 (“Finite Volumes for Complex Applications 10”) conference (Strasbourg, France, 30/10–03/11).
- 2021: Co-organisation (with P. Antonietti, L. Beirão da Veiga and D. Di Pietro) of the workshop on “NEW generation MMethods for numerical SImulationS” (NEMESIS) (online, 14–15/06).
- 2020: Co-organisation (with D. Di Pietro and I. S. Pop) of a minisymposium “Low and high-order numerical methods for porous media: developments and applications” in the ALGORITMY 2020 conference (Podbanske, Slovakia, 10–15/09).
- 2020: Co-organisation (with S. Badia) of the “Monash Workshop on Numerical Differential Equations and Applications 2020” (Melbourne, Australia, 10–14/02).
- 2019: 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, France, 29/04–03/05).

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<sup>2</sup>Recently created open-access journal by a non-profit publisher, supported by the French Mathematical Society (SMF).

### Administrative roles

- ◇ 2025-...: board member of the IMAG (UMR CNRS 5149 & University of Montpellier).
- ◇ 2024-...: coordinator of the postgraduate program in Mathematics & Modelisation in the doctoral school “Information, Structures, Systems” at the University of Montpellier.
- 2022: Member of the invited speakers committee for the ANZIAM annual meeting 2023.
- 2019-2023: head of the Applied and Computational Mathematics section in the School of Mathematics at Monash.
- 09/2018-12/2021: coordinator of the Master of Mathematics in the Faculty of Science at Monash.
- 2018-2020: chair of the AustMS implementation group for the re-development of the website
- 01/08/2018–31/12/2020: member of the Monash Academic Board.
- 2016-2020: 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 2019–2020.
- 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).