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Born on January 28, 1981  
French citizen

### Inria research scientist within the project team RAPSODI

Associate member of Paul Painlevé Laboratory (UMR 8523, Univ. Lille 1 & CNRS)

### Scholarship

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| 2015 | <b>Habilitation thesis in applied mathematics</b> , UPMC Paris 6.<br><i>“Analyse mathématique et numérique d’équations aux dérivées partielles issues de la mécanique des fluides : applications aux écoulements en milieux poreux”</i>                     |
| 2008 | <b>PhD in applied mathematics</b> , Université de Provence, Marseille.<br><i>“Two-phase flows in heterogeneous porous media : modeling and analysis of the effects resulting from capillary pressure discontinuity”</i> . Supervisor : Pr. Thierry Gallouët |
| 2004 | <b>Agrégation of Mathematics</b> (French highest level teacher degree)  |

### Positions

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| 2019–     | Lecturer at Université de Lille   |
| 2018–     | Lecturer at École Centrale de Lille   |
| 2017–     | <b>Research scientist</b> at Inria team RAPSODI (Lille)                                       |
| 2015–2016 | On leave at Inria team RAPSODI (Lille)  |
| 2013–2014 | On leave in CNRS ( <i>6 months</i> )  |
| 2012      | Lecturer at ENSAE ParisTech   |
| 2009–     | <b>Assistant professor</b> ( <i>tenure</i> ) at UPMC Paris 6, laboratoire Jacques-Louis Lions |
| 2008–2009 | Assistant professor ENS Cachan Bretagne   |
| 2005–2008 | <b>PhD student</b> with teaching duty at Université de Provence ( <i>AMN grant</i> )          |
| 2000–2005 | Scholarship as civil servant, ENS Cachan  |

### Keywords

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- **Applications** : fluid mechanics, multiphase flows, porous media flows, stratigraphy problems
- **Partial Differential Equations** : hyperbolic balance laws, degenerate parabolic systems, gradient flows.
- **Numerical methods** : Finite Volume schemes, minimizing movement scheme, a posteriori error analysis, adaptive modeling.

## Main research projects

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2019–2024	Leader of the task <i>Numerical methods for HPC of coupled processes</i> of the EURAD H2020 EJP COFUND project
2019–2022	Collaboration with IFPEN on robust numerical methods for porous media flows
2016–2020	Head of the MaNu research group (CNRS) : <a href="http://gdr-manu.math.cnrs.fr/">http://gdr-manu.math.cnrs.fr/</a>
2015 –	Vice-head of the Inria research team RAPSODI
2015–2018	Collaboration with IFPEN on numerical stratigraphic modeling
2014–2017	PI of the GEOPOR project, granted by the french national research agency (ANR-13-JS01-0007-01)
2013–2015	PI of the MANON project, granted by NEEDS (CNRS–CEA–IRSN–EDF–AREVA)
2012–2015	Vice-head of the MoMaS research group (CNRS)
2011–2015	Member of the research laboratory MANON (UPMC / CEA)
2008–2015	Member of the research group MoMaS (CNRS/PACEN–ANDRA–BRGM–CEA–EDF–IRSN)

## PhD students and post-docs

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Oct. 2020 – Mar. 2022	Supervision of the post-doc of Federica Raimondi (H2020 EURAD) : <i>Variational modelling of corrosion.</i>
Oct. 2017 – Oct. 2018	Supervision of the post-doc of David Maltese (Inria) : <i>Derivation and simulation of reduced models for hydrocarbon migration in geological basins.</i>
Oct. 2015 – Aug. 2016	Supervision of the post-doc of Flore Nabet (ANR Geopor) : <i>Numerical simulation with nonlinear methods of complex porous media flows</i>
Jan. 2019 – Jan. 2022	Supervision with G. Enchéry (IFPEN) of the PhD thesis of Sabrina Bassetto (IFPEN) : <i>Towards more robust and precise computations of capillary effects in multiphase porous media flows.</i>
Oct. 2018 – Sep. 2021	Supervision with T. O. Gallouët (Inria) and J.-D. Benamou (Inria) of the PhD thesis of Gabriele Todeschi (Inria) : <i>Finite Volumes schemes for some problems related to optimal transportation.</i>
Sep. 2018 – Aug. 2021	Supervision with C. Chainais-Hillairet (Univ. Lille) of the PhD thesis of Benoît Gaudeul (Univ. Lille) : .
Oct. 2015 – Oct. 2018	Supervision with Q.-H. Tran (IFPEN) of the PhD thesis of Nicolas Peton (IFPEN) : <i>Numerical methods for a stratigraphic model with nonlinear diffusion and moving frontier areas.</i>
Oct. 2014 – Dec. 2017	Supervision with C. Chainais-Hillairet (Univ. Lille) of the PhD thesis of Ahmed Ait Hammou Oulhaj (Univ. Lille) : <i>Design and analysis of nonlinear numerical schemes for parabolic problems : application to porous media flows.</i>

## Organization of scientific meetings

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June 2020	Program comity of the FVCA9 conference (Bergen, Norway)
July 2019	Minisymposium at ICIAM '19 on cross-diffusion systems
Aug. 2018	Workshop <i>ABPDE3 : Asymptotic behavior of PDE problems</i> in Lille
July 2018	Scientific meeting of the GdR MaNu in Roscoff
May 2018	Minisymposium on cross-diffusion at the CANUM'18
Nov. 2017	Closing day of the GEOPOR project
June 2017	FVCA8 conference in Lille, in charge of the proceedings
Oct. 2016	Scientific meeting of the GdR MaNu in Saint-Valéry-sur-Somme
June 2016	Workshop <i>ABPDE2 : Asymptotic behavior of PDE problems</i> in Lille
June 2015	Workshop <i>Gradient flows in Paris</i> held in LJLL, Paris
Nov. 2014	MoMaS'14 Conference held at the CIRM in Marseille
Déc. 2013	MAC-Days on model adaptation and coupling held in Paris
Aug. 2013	Minisymposium on nonlinear numerical methods for diffusion at ENUMATH 2013
June 2013	Minisymposium on porous media flows at SIAM Computational Geosciences 2013
Nov. 2012	Session on Asymptotics : Theory and Numerical Analysis (SATHAN) held in Paris
May 2012	Minisymposium at CANUM'12 on porous media flows

## Edited books

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- [B1] *Finite Volumes for Complex Applications VIII - Methods and Theoretical Aspects*, C. Cancès and P. Omnes (Eds), Springer Proceedings in Mathematics and Statistics, vol. 199, **2017** (doi : 10.1007/978-3-319-57397-7).
- [B2] *Finite Volumes for Complex Applications VIII - Hyperbolic, Elliptic and Parabolic Problems*, C. Cancès and P. Omnes (Eds), Springer Proceedings in Mathematics and Statistics, vol. 200, **2017** (doi : 10.1007/978-3-319-57394-6).

## Articles in international journals

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- [A1] C. Cancès, T. O. Gallouët, G. Todeschi. *A variational finite volume scheme for Wasserstein gradient flows*. To appear in Numer. Math.
- [A2] C. Cancès, B. Gaudeul. *A convergent entropy diminishing finite volume scheme for a cross-diffusion system*. To appear in SIAM J. Numer. Anal.
- [A3] C. Cancès, F. Nabet, M. Vohralík. *Convergence and a posteriori error analysis for energy-stable finite element approximations of degenerate parabolic equations*. To appear in Math. Comp.
- [A4] O. Blondel, C. Cancès, M. Sasada, M. Simon. *Convergence of a degenerate microscopic dynamics to the porous medium equation*, to appear in Ann. Inst. Fourier.
- [A5] C. Cancès, C. Chainais-Hillairet, J. Fuhrmann , B. Gaudeul. *A numerical analysis focused comparison of several Finite Volume schemes for an Unipolar Degenerated Drift-Diffusion Model*. To appear in IMA J. Numer. Anal.
- [A6] C. Cancès, C. Chainais-Hillairet, M. Herda, S. Krell. *Large time behavior of nonlinear finite volume schemes for convection-diffusion equations*. SIAM J. Numer. Anal., 58(5), pp. 2544-2571, **2020**.
- [A7] N. Peton, C. Cancès, D. Granjeon, Q.-H. Tran, S. Wolf. *Numerical scheme for a water flow-driven forward stratigraphic model*. 24, pp. 37-60, **2020**.
- [A8] A. Ait Hammou Oulhaj, C. Cancès, C. Chainais-Hillairet, P. Laurençot. *Large time behavior of a two phase extension of the porous medium equation*, Interfaces Free Bound., 21, pp. 199-229, **2019**.

- [A9] C. Cancès, D. Matthes, F. Nabet. *A two-phase two-fluxes degenerate Cahn-Hilliard model as constrained Wasserstein gradient flow*, Arch. Rational Mech. Anal., 233(2), pp. 837-866, **2019**.
- [A10] C. Cancès, T. O. Gallouët, M. Laborde, L. Monsaingeon. *Simulation of multiphase porous media flows with minimizing movement and finite volume schemes*, Simulation of multiphase porous media flows with minimizing movement and finite volume schemes, European J. Appl. Math, 30(6), pp. 1123-1152, **2019**.
- [A11] C. Cancès, C. Chainais-Hillairet, A. Gerstenmayer, A. Jüngel. *Convergence of a Finite-Volume scheme for a degenerate cross-diffusion model for ion transport*, Numer. Meth. Partial Differential Equations, 35(2), pp. 545-575, **2019**.
- [A12] C. Cancès. *Energy stable numerical methods for porous media flow type problems*, Oil & Gas Science and Technology - Revue de l'IFP Énergies Nouvelles, 73(78), pp. 1-18, **2018**.
- [A13] C. Cancès, C. Chainais-Hillairet, S. Krell. *Numerical analysis of a nonlinear free-energy diminishing Discrete Duality Finite Volume scheme for convection diffusion equations*, Comput. Methods Appl. Math., **2018**, 18(3), pp. 407-432.
- [A14] A. Ait Hammou Oulhaj, C. Cancès, C. Chainais-Hillairet. *Numerical analysis of a nonlinearly stable and positive Control Volume Finite Element scheme for Richards equation with anisotropy*, ESAIM : M2AN, **2018**, 52(4), pp. 1532-1567.
- [A15] B. Andreianov, C. Cancès, A. Moussa. *A nonlinear time compactness result and applications to discretization of degenerate parabolic-elliptic PDEs*, J. Funct. Anal., **2017**, 273(12), pp. 3633-3670.
- [A16] C. Cancès, T. O. Gallouët, L. Monsaingeon, *Incompressible immiscible multiphase flows in porous media : a variational approach*, Analysis & PDE, **2017**, 10(8), pp. 1845-1876.
- [A17] K. Brenner, C. Cancès, *Improving Newton's method performance by parametrization : the case of Richards equation*, SIAM J. Numer. Anal., **2017**, 55(4), pp. 1760-1785.
- [A18] C. Cancès, C. Guichard. *Numerical analysis of a robust free energy diminishing finite volume scheme for degenerate parabolic equations with gradient structure*, Found. Comput. Math, **2017**, 17(6), pp. 1525-1584.
- [A19] C. Cancès, M. Ibrahim, M. Saad. *Positive nonlinear CVFE scheme for degenerate anisotropic Keller-Segel system*, SMAI-JCM, **2017**, 3, pp. 1-28.
- [A20] C. Cancès, H. Mathis, N. Seguin, *Error estimate for time-explicit finite volume approximation of strong solutions to systems of conservation laws*, SIAM J. Numer. Anal., **2016**, 54(2), pp. 1263-1287.
- [A21] C. Cancès, C. Guichard, *Convergence of a nonlinear entropy diminishing Control Volume Finite Element scheme for solving anisotropic degenerate parabolic equations*, Math. Comp., **2016**, 85(298), pp. 549-580.
- [A22] C. Cancès, F. Coquel, E. Godlewski, H. Mathis, N. Seguin, *Error analysis of a dynamic model adaptation procedure for nonlinear hyperbolic equations*, Comm. Math. Sci., **2016**, 14(1), pp. 1-30.
- [A23] C. Cancès, T. O. Gallouët, L. Monsaingeon, *The gradient flow structure for incompressible immiscible two-phase flows in porous media*, C. R. Acad. Sci. Paris, Série I, **2015**, 353, pp. 985-989.
- [A24] B. Andreianov, C. Cancès, *On interface transmission conditions for conservation laws with discontinuous flux of general shape*, J. Hyp. Diff. Eq., **2015**, 12(2), pp. 343-384.
- [A25] H. Mathis, C. Cancès, E. Godlewski, N. Seguin, *Dynamic model adaptation for multiscale simulation of hyperbolic systems with relaxation*, J. Sci. Comput., **2015**, 63(3), pp. 820-861.
- [A26] B. Andreianov, C. Cancès, *A phase-by-phase upstream scheme that converges to the vanishing capillarity solution for countercurrent two-phase flow in two-rocks media*, Comput. Geosci., **2014**, 18(2), pp. 211-226.
- [A27] B. Andreianov, K. Brenner, C. Cancès, *Approximating the vanishing capillarity limit of two-phase flow in multi-dimensional heterogeneous porous medium*, ZAMM Z. Angew. Math. Mech., **2014**, 94(7-8), pp. 651-667.
- [A28] C. Cancès, M. Vohralík, I. S. Pop, *An a posteriori error estimate for vertex-centered finite volume discretizations of immiscible incompressible two-phase flow*, Math. Comp., **2014**, 83(285), pp. 153-188.
- [A29] C. Cancès, M. Cathala, C. Le Potier, *Monotone coercive cell-centered finite volume schemes for anisotropic diffusion equations*, Numer. Math., **2013**, 125 (3), pp. 387-417.
- [A30] B. Andreianov, C. Cancès, *Vanishing capillarity solutions of Buckley-Leverett equation with gravity in two-rocks' medium*, Comput. Geosci., **2013**, 17(3), pp. 551-572.

- [A31] K. Brenner, C. Cancès, D. Hilhorst, *Finite volume approximation for an immiscible two-phase flow in porous media with discontinuous capillary pressure*, Comput. Geosci., **2013**, 17(3), pp. 573-597.
- [A32] C. Cancès, N. Seguin, *Error estimate for Godunov approximation of locally constrained conservation laws*, SIAM J. Numer. Anal., **2012**, 50(6), pp. 3036-3060.
- [A33] C. Cancès, M. Pierre, *An existence result for multidimensional immiscible two-phase flows with discontinuous capillary pressure field*, SIAM J. Math. Anal., **2012**, 44 (2), pp. 966-992.
- [A34] B. Andreianov, C. Cancès, *The Godunov scheme for scalar conservation laws with discontinuous bell-shaped flux functions*, Appl. Math. Letters, **2012**, 25, pp. 1844-1848.
- [A35] C. Cancès, T. Gallouët, *On the time continuity of entropy solutions*, J. Evol. Equ., **2011**, 11 (1), pp. 43-55.
- [A36] C. Cancès, *Asymptotic behavior of two-phase flows in heterogeneous porous media for capillarity depending only on space. I. Convergence to the optimal entropy solution*, SIAM J. Math. Anal., **2010**, 42 (2), pp. 946-971.
- [A37] C. Cancès, *Asymptotic behavior of two-phase flows in heterogeneous porous media for capillarity depending only on space. II. Non-classical shocks to model oil-trapping*, SIAM J. Math. Anal., **2010**, 42 (2), pp. 972-995.
- [A38] C. Cancès, *Finite volume scheme for two-phase flow in heterogeneous porous media involving capillary pressure discontinuities*, ESAIM : M2AN, **2009**, 43, pp. 973-1001.
- [A39] C. Cancès, T. Gallouët, A. Porretta, *Two-phase flows involving capillary barriers in heterogeneous porous media*, Interfaces Free Bound., **2009**, 11, pp. 239-258.
- [A40] C. Cancès, *Nonlinear parabolic equation with spatial discontinuities*, NoDEA Nonlinear Differential Equations Appl., **2008**, 15, pp 427-45

## Peer-reviewed proceedings

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- [C1] C. Cancès, F. Nabet. *Energy stable discretization of two-phase porous media flows*. FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.
- [C2] C. Cancès, B. Gaudeul. *Entropy diminishing finite volume approximation of a cross-diffusion system*. FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.
- [C3] C. Cancès, C. Chainais-Hillairet, J. Fuhrmann, B. Gaudeul. *On four numerical schemes for a unipolar degenerate drift-diffusion model*. FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.
- [C4] S. Bassetto, C. Cancès, G. Enchéry, Q.-H. Tran. *Robust Newton solver based on variable switch for a finite volume discretization of Richards equation*. FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.
- [C5] D. Matthes, C. Cancès, F. Nabet. *A degenerate Cahn-Hilliard model as constrained Wasserstein gradient flow*. GAMM annual meeting, International Association for Applied Mathematics and Mechanics, 2019, Vienna, Austria. DOI : 10.1002/pamm.201900158.
- [C6] C. Cancès, D. Granjeon, N. Peton, Q.-H. Tran, S. Wolf. *Numerical scheme for a stratigraphic model with erosion constraint and nonlinear gravity flux*. FVCA8 conference proceedings, **2017**.
- [C7] C. Cancès, F. Nabet. *Finite volume approximation of a degenerate immiscible two-phase flow model of Cahn-Hilliard type*. FVCA8 conference proceedings, **2017**.
- [C8] C. Cancès, C. Chainais-Hillairet, S. Krell. *A nonlinear Discrete Duality Finite Volume Scheme for convection-diffusion equations*. FVCA8 conference proceedings, **2017**.
- [C9] C. Cancès, M. Ibrahim, M. Saad. *A nonlinear CVFE scheme for an anisotropic degenerate nonlinear Keller-Segel model*, Journal of Mathematics in Industry, **2014**.
- [C10] C. Cancès, C. Guichard. *Entropy-diminishing CVFE scheme for solving anisotropic degenerate diffusion equations*. FVCA7 conference proceedings, **2014**.
- [C11] A.-C. Boulanger, C. Cancès, H. Mathis, K. Saleh, N. Seguin, *OSAMOAL : Optimized simulations by adapted models using asymptotic limits*, to appear in ESAIM Proceedings : CEMRACS 2011, **2012**.

- [C12] C. Cancès, C. Choquet, Y. Fan, I.S. Pop, *An existence result related to two-phase flows with dynamic capillary pressure*, MAMERN, **2011**.
- [C13] K. Brenner, C. Cancès, D. Hilhorst, *A Convergent Finite Volume Scheme for Two-Phase Flows in Porous Media with Discontinuous Capillary Pressure Field*, Finite volumes for complex applications VI, **2011**.
- [C14] C. Cancès, *On the effects of discontinuous capillarities for immiscible two-phase flows in porous media made of several rock-types*, Netw. Heterog. Media., A special issue New Trends in Model Coupling, Theory, Numerics and Applications, **2010**, 5 (3), pp. 635-647.
- [C15] C. Cancès, *Two-phase Flows Involving Discontinuities on the Capillary Pressure*, Finite volumes for complex applications V : problems and perspectives Robert Eymard and Jean-Marc Hérard (Eds), Hermes, **2008**.

## Preprints

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- [P1] C. Cancès, V. Ehrlacher, L. Monasse. *Finite Volumes for the Stefan-Maxwell cross-diffusion system*. HAL : hal-02902672, **2020**.
- [P2] C. Cancès, F. Nabet. *Finite Volume approximation of a two-phase two fluxes degenerate Cahn-Hilliard model*. HAL : hal-02561981, **2020**.
- [P3] C. Cancès, D. Matthes. *Construction of a two-phase flow with singular energy by gradient flow methods*. HAL : hal-02510535, **2020**.
- [P4] C. Cancès, D. Maltese. *A gravity current model with capillary trapping for oil migration in multilayer geological basins*. HAL : hal-02272965, **2019**.