CHIARA VILLA

Sorbonne Université ◇ Postdoc ◇ Mathematical Biology

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Website	https://chiaravilla.github.io/website/index.html
Languages	Italian, English, French
Software	MATLAB, Python, LaTeX, Fortran90, COMSOL, Maple, R, HTML5, MS Office
Memberships	European Society for Mathematical and Theoretical Biology, Society for Mathematical Biology, Société de Mathématiques Appliquées et Industrielles

ACADEMIC APPOINTMENTS

01/23 - today	**PRFP postdoc**, *Laboratoire Jacques-Louis Lions, Sorbonne Université*, Paris (FR) Laureate of the Paris Region Fellowship Programme (PR and EU MSCA funding) Project "Mechanistic modelling of cell migration and cancer invasion"
04/22 - 12/22	**Postdoc**, *Laboratoire Jacques-Louis Lions, Sorbonne Université*, Paris (FR) Postdoctoral researcher in the group of Prof Benoît Perthame (ERC ADORA funding)

EDUCATION & RESEARCH EXPERIENCE

09/18 - 03/22	**PhD, Mathematics**, *University of St Andrews*, St Andrews (UK) Supervisors: Prof Mark Chaplain, Dr Tommaso Lorenzi Thesis title: 'Partial differential equation modelling in cancer and development'
2014 - 2018	**MMaths, Applied Mathematics**, *University of St Andrews*, St Andrews (UK) Fast Track, First Class Honours awarded.
Summer 2017	Undergraduate Summer Research Internship, *University of St Andrews*
Summer 2016	Complex Systems Biology Research Internship, *Università degli Studi di Torino*

FUNDING, GRANTS AND PRIZES AWARDED

2023	**BOUM SMAI funding** for the organisation to the workshop "Mathematical challenges in modelling cancer dynamics" in Paris in October 2023 (**€1000**).
2023	**PEPS JCJC** funding for the project "Conservative numerical schemes for novel structured PDE models of cancer invasion" with Alexandre Poulain (**€4900**).
2023	**UFR funding** for the organisation to the workshop "Mathematical challenges in modelling cancer dynamics" in Paris in October 2023 (**€1500**).
2022	**Junior Fellowship** for the participation to the workshop "Parabolic and kinetic models in population dynamics" in Toulouse in September 2022.
2022	**Paris Region Fellowship Programme** laureate with the proposed project on "Mechanistic models of cell migration and cancer invasion" (**€257760**).
2021	**IHP financial support** awarded by the Institute Henri Poincaré for the participation to the "Mathematical modeling of organization in living matter" thematic program in Paris during 10/01-01/04 2022 (**€4500**).
2020	**SMBdevBio Poster Prize 1** awarded by the Society for Mathematical Biology, Developmental Biology subgroup, at the online SMB2020 meeting (**$250**)
2020	**LMS ECR Travel Grant** awarded by the London Mathematical Society to attend the 12th European Conference on Mathematical and Theoretical Biology (**£500**)
2018	**PhD funding** awarded by the School of Mathematics and Statistics, UoStA (**£49124.25**)
2018	**The Principal's Scholarship for Academic Excellence**, prize awarded to the top 50 academically performing students in their final year at the UoStA(**£1000**)
2014 - 2018	**The Deans' list**, annual award for academic excellence by the Deans of the UoStA
2017	**Research scholarship** awarded by the UoStA to participate in the Undergraduate Summer Research Internship (**£1684.29**)

PROFESSIONAL RESPONSIBILITIES

01/23 - today	**Member of 'Comité Parité'**, *Laboratoire Jacques-Louis Lions, Sorbonne Université*
10/22 - today	**Postdoctoral Research Rep**, *Laboratoire Jacques-Louis Lions, Sorbonne Université*
03/21 - today	**Journal Peer Reviewer**, *International Journal of Non-Linear Mechanics*, *Bulletin of Mathematical Biology*, *iScience*, *European Journal of Applied Mathematics*, *Mathematical Biosciences*, *European Control Conference 2022*, *Frontiers in Ecology and Evolution* (Special issue: From Ecology to Cancer Biology and Back Again)
11/20	**Piscopia Society**, *School of Mathematics and Statistics, University of St Andrews*, PhD testimonial to encourage female/non-binary students who are considering a PhD in mathematics, promoting equality and diversity in STEM
09/18 - 09/19	**Postgraduate Research Rep & Postgraduate Research Executive Rep***
09/18 - 09/19	**University of St Andrews Student Rep**, *SMSTC*

MENTORING, TEACHING AND MARKING

All activities of 2017-2022 undertaken with the School of Mathematics and Statistics, University of St Andrews. Teaching activities undertaken with groups of 50 (demonstrating) or 11 (tutoring) students. Feedback on Explanation (E), Organisation (O) and Availability (A) on a scale of 1 (excellent) to 5 (poor).

01/23 - 08/23	**Master thesis supervision** of Federica Padovano (EPFL), at LJLL (SU)
09/18 - 06/22	**Mentor in Peer Mentoring scheme** of 4 Undergraduate, 3 Master, 2 PhD students
Autumn 2020	**MT2000 Computing Workshop**, Demonstrator of computing in Python
Autumn 2019	**MT2000 Computing Workshop**, Demonstrator of computing in Python
Autumn 2019	**MT2501 Linear Mathematics**, Tutor of 2 groups (E=1.44, O=1.33, A=1.33)
Spring 2019	**MT2507 Mathematical Modelling**, Tutor of 2 groups (E=1.45, O=1.85, A=1.45), Demonstrator of 3 groups
Autumn 2018	**MT2503 Multivariate Calculus**, Tutor of 2 groups (E=1.17, O=1.5, A=1.17)
Autumn 2018	**MT2504 Combinatorics and Probability**, Marking of 100 computing projects
Autumn 2017	**UK Undergraduate Ambassadors Scheme**, weekly teaching assistance and activities with secondary school pupils (S1, S3, Advanced Higher Maths), UoSA module ID4001 - Communication and Teaching in Science, *Waid Academy, Anstruther (UK)*

SELECTED SCIENTIFIC MEETINGS

Scientific meetings organised

07/24	**Minisymposium** on 'Recent advances in modelling cancer invasion' at *ECMTB2024*
10/23	**Workshop 'Mathematical challenges in modelling cancer dynamics'**, *Laboratoire Jacques-Louis Lions, Sorbonne Université*, The workshop hosted 12 invited speakers from renowned research institutions across Europe and attracted 48 registered participants (https://mc2d.sciencesconf.org/)
09/20 - 12/21	**StAMBio seminar series**, Weekly talks (online) by members of the St Andrews Mathematical Biology research group and international guest speakers, e.g. from University of Dundee, Edinburgh University, Heriot-Watt University (GB), University of Torino (IT), LJLL - Sorbonne University (FR), Leiden University (NL), BCAM (ES), ETH Zurich (SZ)
01/20	**Postgraduate Interdisciplinary Mathematics Symposium**, for PhD students of the School of Mathematics and Statistics of the University of St Andrews, *Edzell*
11/18	**'MT234 Research and Party'**, Organiser and speaker at the event, aimed at displaying research topics within the School of Mathematics and Statistics with Undergraduate students of the University of St Andrews

Scientific meetings where I was invited to present my research

Nov 2024	**Séminaire de modélisation mathématique en sciences de la vie et santé** *Université Sorbonne Paris Nord, Sorbonne Université, Université Paris Cité*, Paris
July 2024	**13th European Conference for Mathematical and Theoretical Biology** Minisymposium, *ESMTB & University of Castilla La Mancha*, Toledo
July 2024	**European Congress of Mathematics** Minisymposium, *ECM & Universidad de Sevilla*, Sevilla
May 2024	**Mathematical Biology Seminar** *University of Leeds*, Leeds
April 2024	**Mathematical and numerical tools for Oncology Workshop** *Oncolille Institut*, Lille
April 2024	**Seminar of the Puissant Lab** *St Louis Research Institute*, Saint-Louis Medical Center, Paris
Nov 2023	**Mechanistic models for continuous phenotypic adaptation Workshop** *University of Leeds*, Leeds
Aug 2023	**SIMAI 2023** Minisymposium, *SIMAI*, Matera
Jun 2023	**Mathematical Biology: Analysis and Application Workshop** *Technische Universität Dresden*, Dresden
May 2023	**The Evolution Seminar** *Bielefeld University (Evolutionary Biology group)*, Bielefeld
Apr 2023	**Seminar 'Analyse Numérique et Équations aux Dérivées Partielles'** *Université de Lille (Laboratoire Paul Painlevé)*, Lille
Feb 2023	**Multiscale analysis and methods for PDEs Workshop** *Institute for Mathematical Sciences*, Singapore
Nov 2022	**Synthsys Seminar** *Centre for Synthetic and Systems Biology*, Edinburgh
Oct 2022	**Modelling cell and tissue biomechanics Workshop** *Sorbonne University (LJLL)*, Paris
Sep 2022	**12th European Conference for Mathematical and Theoretical Biology** Minisymposium, *ESMTB*, Heidelberg
Jun 2021	**SoftMech Workshop** *University of St Andrews*, Online
May 2021	**Mathematical Biology on the Mediterranean Coast** *Sorbonne University (LJLL)*, Online
Jun 2020	**Interplay between Oncology, Mathematics and Numerics** *Sorbonne University (LJLL), Inserm, University of Poitiers*, Online conference

MAJOR RESEARCH OUTPUTS

Preprints

[15] B. Perthame, C. Villa, Regularity and stability in a strongly degenerate nonlinear diffusion and haptotaxis model of cancer invasion, 2024. **arXiv:2412.18261**

[14] T. Lorenzi, N. Loy, C. Villa, Phenotype-structuring of non-local kinetic models of cell migration driven by environmental sensing, 2024. **arXiv:2412.18261**

[13] T. Lorenzi, K.J. Painter, C. Villa, Phenotype structuring in collective cell migration: a tutorial into mathematical models and methods, 2024. **arXiv:2410.13629**

[12] A.P. Browning, R. Crossley, C. Villa, P. K. Maini, A.L. Jenner, T. Cassidy and S. Hamis, Identifiability of heterogeneous phenotype adaptation from low-cell-count experiments and a stochastic model, 2024. **bioRxiv 2024.08.19.608540**

[11] S. Hamis, A.P. Browning, A.L. Jenner, C. Villa, P. K. Maini and T. Cassidy, Growth rate-driven modelling reveals how phenotypic adaptation drives drug resistance in BRAFV600E-mutant melanoma

2024. **bioRxiv 2024.08.14.607616**

[**10**] C. Villa, P. K. Maini, A.P. Browning, A.L. Jenner, S. Hamis and T. Cassidy, Reducing phenotype-structured PDE models of cancer evolution to systems of ODEs: a generalised moment dynamics approach, 2024. **hal-04599519**

[**9**] L. Almeida, A. Poulain, A. Pourtier, C. Villa, Mathematical modelling of the contribution of senescent fibroblasts to basement membrane digestion during carcinoma invasion, 2024. **hal-04574340**

Papers published in peer-reviewed journals

[**8**] F. Padovano, C. Villa, The development of drug resistance in metastatic tumours under chemotherapy: an evolutionary perspective, *Journal of Theoretical Biology*, 595(1):111957, 2024. DOI: 10.1016/j.jtbi.2024.111957, **hal-04595087v3**

[**7**] L. Almeida, J.A. Denis, N. Ferrrand, T. Lorenzi, M. Sabbah, C. Villa, Evolutionary dynamics of glucose-deprived cancer cells: insights from experimentally-informed mathematical modelling, *Journal of the Royal Society Interface*, 21(210):20230587, 2024. DOI: 10.1098/rsif.2023.0587, **hal-03947209v2**.

[**6**] C. Villa, A. Gerisch, M.A.J. Chaplain, A novel nonlocal partial differential equation model of endothelial progenitor cell cluster formation during the early stages of vasculogenesis, *Journal of Theoretical Biology*, 534(1):110963, 2022. DOI: 10.1016/j.jtbi.2021.110963, **hal-04415625**.

[**5**] F. Mottes, C. Villa, M. Osella, M. Caselle, The impact of whole genome duplications on the human gene regulatory networks, *PLOS Computational Biology*, 17(12):e1009638, 2021. DOI: 10.1371/journal.pcbi.1009638 **hal-04415666**.

[**4**] C. Villa, M.A.J. Chaplain, A. Gerisch, T. Lorenzi, Mechanical models of pattern and form in biological tissues: the role of stress-strain constitutive equations, *Bulletin of Mathematical Biology*, 83:80, 2021. DOI: 10.1007/s11538- 021-00912-5, **hal-04415645**.

[**3**] C. Villa, M.A.J. Chaplain, T. Lorenzi, Evolutionary dynamics in vascularised tumours under chemotherapy: Mathematical modelling, asymptotic analysis and numerical simulations, *Vietnam Journal of Mathematics*, 49, 143–167, 2021. DOI: 10.1007/s10013-020-00445-9, **hal-04415601**.

[**2**] C. Villa, M.A.J. Chaplain, T. Lorenzi, Modelling phenotypic heterogeneity in vascularised tumours, *SIAM Journal on Applied Mathematics*, 81, 434–453, 2021. DOI: 10.1137/19M1293971, **hal-04415631**.

Conference proceedings

[**1**] T. Lorenzi, F.R. Macfarlane, C. Villa, Discrete and continuum models for the evolutionary and spatial dynamics of cancer: a very short introduction through two case studies, (pp. 359-380) in *Trends in Biomathematics: Modeling Cells, Flows, Epidemics, and the Environment*, Ed. R. Mondaini, Springer, Cham, 2019. DOI: 10.1007/978-3-030-46306-9_22, **hal-04415585**.

Doctoral thesis

[**T1**] C. Villa, Partial differential equation modelling in cancer and development, PhD thesis, University of St Andrews, St Andrews, 2022. HAL Id: **tel-04442733**.

Available code

[**C4**] C. Villa and N. Loy. VLorenziEtAl2024Modelling: Simulate microscopic and macroscopic models of cell migration (Matlab code). https://github.com/ChiaraVilla/LorenziEtAl2024Modelling, 2024. GNU General Public License.

[**C3**] A. Poulain and C. Villa. TumInvasion-BM: Simulation of the rupture of the basement membrane by the effect of tumor cells, Matlab code. https://github.com/alexandrepoulain/TumInvasion-BM, 2024. BSD 2-Clause License.

[**C2**] C. Villa. Almeidaetal2023evolutionary: calibrate phenotype-structured equation models with experimental data (Matlab code). https://github.com/ChiaraVilla/AlmeidaEtAl2023Evolutionary, 2023. GNU General Public License.

[**C1**] C. Villa and A. Gerisch. Villaetal2021bullmathbio: simulate mechanical models of pattern formation (Matlab code). https://git-ce.rwth-aachen.de/alf.gerisch/VillaEtAl2021BullMathBiol, 2021. GNU General Public License.