

Tommaso Lorenzi
Research fellow in Applied Mathematics
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Born on May 29th, 1984 in Verbania, Italy

Academic appointments

10/2015 – today

Research fellow in Applied Mathematics – University of St Andrews
Research group led by M.A.J. Chaplain (School of Mathematics and Statistics)

11/2014 – 09/2015

Postdoctoral fellow – École Normale Supérieure de Cachan
Research group led by L. Desvillettes (Centre de Mathématiques et Leurs Applications)

11/2013 – 10/2014

Postdoctoral fellow – Université Pierre et Marie Curie
Research group led by B. Perthame (Laboratoire Jacques-Louis Lions)

04/2013 – 06/2013

Visiting postdoctoral fellow – Princeton University
Research group led by I.D. Couzin (Department of Ecology and Evolutionary Biology)

04/2013 – 10/2013

Postdoctoral fellow – Politecnico di Torino
Research group led by M. Delitala (Dipartimento di Scienze Matematiche “G.L. Lagrange”)

Education and qualifications

2018

National Scientific Qualification as Associate Professor of Mathematical Physics (Abilitazione scientifica nazionale alla funzione di professore universitario di seconda fascia per il settore scientifico-disciplinare MAT/07)

2013

PhD in Applied Mathematics – Politecnico di Torino

12/2012 – 03/2013

Visiting PhD student – Politecnico di Milano

01/2012 – 06/2012

Visiting PhD student – Université Pierre et Marie Curie

2008

MSc in Engineering Physics – Politecnico di Torino
Final grade: 110/110 cum laude. Average grade: 30/30

2006

BSc in Engineering Physics – Politecnico di Torino
Final grade: 110/110 cum laude. Average grade: 28/30

Awards, fellowships and prizes

2015

INdAM-SIMAI-UMI 2014 prize for the best Italian PhD thesis in Applied Mathematics

2014

Postdoctoral research fellowship for two years from the Fondation Mathématique Jacques Hadamard

2013

Postdoctoral research fellowship for one year from the Fondation Sciences Mathématiques de Paris

2012

Postdoctoral grant for one year from the MIUR-FIRB Project RBID08PP3J – ‘Mathematical methods and tools for the modelling and simulation of the onset of cancer’

2009

Doctoral grant for three years from the MIUR-FIRB Project RBID08PP3J – ‘Mathematical methods and tools for the modelling and simulation of the onset of cancer’

2008

Top graduating-student award from the Industrial Union of Turin

Grants

2018

CNRS – Projet International de Coopération Scientifique (3,500 €)

Role: Foreign principal investigator

2017

Edinburgh Mathematical Society – Research Support Fund (£600)

Role: Co-principal investigator

London Mathematical Society – Research Grant Scheme 1 (£4,000)

Role: Principal investigator

Glasgow Mathematical Journal Trust – Learning and Research Support Fund (£2,950)

Role: Co-principal investigator

Edinburgh Mathematical Society – Research Support Fund (£750)

Role: Co-principal investigator

CNRS – Projet International de Coopération Scientifique (3,500 €)

Role: Foreign principal investigator

2016 – 2020

ITMO Cancer – Tumor Heterogeneity and Ecosystem program (1,268,384 €)

Role: Co-coordinator of the task ‘*In vitro* modelling of glioblastoma response to treatment’ within the project ‘Modeling of glioblastoma treatment-induced resistance and heterogeneity by multi-modal imaging’

Selected invited talks, lectures and research visits

09/2018 | Invited talk at the workshop ‘Differential Equations Arising from Organising Principles in Biology’ (Mathematisches Forschungsinstitut Oberwolfach)

07/2018 | Invited talk at the minisymposium ‘The Interplay Between Short- and Long-range Interactions in Biology’ (ECMTB2018)

07/2018 | Invited talk at the workshop ‘Mathematical Perspectives in the Biology and Therapeutics of Cancer’ (CIRM, Marseille)

07/2018 | Invited talk at the workshop ‘Asymptotic Approach to Spatial and Dynamical Organizations’ (Université Pierre et Marie Curie)

- 06/2018** | ‘BioMaths Colloquium’ (Swansea University)
- 05/2018** | ‘Seminar of the Department of Excellence Project’ (Politecnico di Torino)
- 01/2018** | ‘Applied & Numerical Analysis and Mathematical Biology Seminar’ (Heriot-Watt University)
- 12/2017** | Research visit at the Université Pierre et Marie Curie (host: B. Perthame)
- 09/2017** | ‘Seminar of the Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences’ (Universität Heidelberg)
- 09/2017** | Research visit at the Universität Heidelberg (host: A. Marciniak-Czochra)
- 07/2017** | Invited talk at the minisymposium ‘Multiscale mathematical approaches for cancer development’ (SMB2017)
- 07/2017** | Invited talk at the workshop ‘Mathematical Modeling of Therapeutic Resistance’ (Université Pierre et Marie Curie)
- 07/2017** | Research visit at the Université Pierre et Marie Curie (host: B. Perthame)
- 06/2017** | ‘Seminaire du Laboratoire Jacques-Louis Lions’ (Université Pierre et Marie Curie)
- 06/2017** | Invited talk at the workshop ‘Modeling and computational approaches to biology and medicine’ (Istituto Nazionale di Alta Matematica “F. Severi”)
- 05/2017** | Research visit at the Politecnico di Torino (host: L. Preziosi)
- 03/2017** | Invited lecture at the Vanderbilt Integrative Cancer Biology Center (Vanderbilt University)
- 12/2016** | Research visit at the Université Pierre et Marie Curie (host: B. Perthame)
- 07/2016** | Invited talk at the minisymposium ‘Numerical methods for surface PDE problems in biology’ (ECMTB2016)
- 07/2016** | Invited talk at the workshop ‘Models in cancer therapy’ (Wolfgang Pauli Institute)
- 06/2016** | Invited talk at the minisymposium ‘Nonlocal models in mathematical biology’ (CAIMS2016)
- 06/2016** | ‘Seminar of the Mathematics and Statistics Group’ (University of Stirling)
- 06/2016** | ‘Seminar of the Biomathematics Group’ (INRIA Lyon)
- 03/2016** | Research visit at the Universität Heidelberg (host: A. Marciniak-Czochra)
- 01/2016** | ‘Seminar of the Biomathematics Group’ (Université Paul Sabatier)
- 02/2015** | Invited lecture at the Department of Oncology, University of Alberta
- 02/2015** | Invited talk at the workshop ‘Partial differential equations in cancer modelling’ (Banff International Research Station)
- 12/2014** | Invited talk at the workshop ‘Mathematical models for social sciences’ (Université Pierre et Marie Curie)
- 07/2014** | Invited talk at the minisymposium ‘Deterministic and stochastic models in biology and medicine’ (10th AIMS)
- 07/2014** | Invited talk at the minisymposium ‘Transport processes in biology: modelling and analysis’ (10th AIMS)
- 05/2014** | Invited talk at the outreach conference ‘Mathématiques en mouvement 2014’ (organised by the Fondation Sciences Mathématiques de Paris at the Université Paris 1 Panthéon-Sorbonne)
- 04/2014** | Invited talk at the workshop ‘Structured integro-differential models in mathematical biology’ (Wolfgang Pauli Institute)

Organisation of conferences and scientific meetings

2018

Member of the organising committee of the 60th British Applied Mathematics Colloquium

Organiser of the minisymposium ‘A Snapshot of Scottish Mathematical Biology’ (BAMC2018)

2017

Organiser of the Fifth Scottish PDE Colloquium

2016

Organiser of the minisymposium ‘Evolutionary dynamics in cancer cell populations: multiscale modelling, simulation and analysis’ (ECMTB2016)

Referee activity

Referee for: Acta Applicandae Mathematicae, Applied Mathematical Modelling, Biology Direct, Birkhäuser Books in Mathematics, Bulletin of Mathematical Biology, Communications in Mathematical Sciences, Journal of Mathematical Biology, Journal of Theoretical Biology, Mathematics and Computers in Simulation, ESAIM: Mathematical Modelling and Numerical Analysis, Mathematical Modelling of Natural Phenomena, Open Biology, Physica A: Statistical Mechanics and its Applications, Physics Letters A, PLOS Computational Biology, PLOS ONE, SIAM Journal on Mathematical Analysis (SIMA), Zeitschrift für angewandte Mathematik und Physik (ZAMP)

Teaching

AY 2017/2018

Co-coordinator and lecturer of the PhD course ‘Differential and integrodifferential equations for evolutionary dynamics of structured populations – qualitative analysis and oncology applications’ (Università degli Studi di Trento)

Tutor of the BSc course ‘Mathematical modelling’ (University of St Andrews)

Coordinator and lecturer of the MSc course ‘Mathematical Biology II’ (University of St Andrews)

Co-coordinator and lecturer of the BSc and MSc minicourse ‘Mathematical models of evolutionary and spatial dynamics of cancer’ (Università degli Studi di Verona)

AY 2016/2017

Coordinator and lecturer of the MSc course ‘Mathematical Biology II’ (University of St Andrews)

Co-coordinator and lecturer of the BSc and MSc minicourse ‘Reaction-diffusion equations arising in the mathematical modelling of population dynamics’ (Università degli Studi di Verona)

AY 2015/2016

Co-coordinator and lecturer of the BSc course ‘Mathematical modelling’ (University of St Andrews)

AY 2014/2015

Tutor of the MSc course ‘Mathematics for life sciences’ (Université Paris-Sud)

AY 2011/2012

Lecturer of the PhD course ‘Complex systems in engineering’ (Politecnico di Torino)

Tutor of the BSc course ‘Analisi Matematica I’ (Politecnico di Torino)

Supervision of PhD students

Starting from 09/2018 | PhD co-supervisor of Chiara Villa – University of St Andrews

Starting from 09/2018 | PhD co-supervisor of Moataz Alosaimi – University of St Andrews

09/2016 – today | PhD co-supervisor of Fiona R. Macfarlane – University of St Andrews

09/2016 – today | PhD co-supervisor of Linnéa Franßen – University of St Andrews

Supervision of BSc and MSc dissertations

AY 2017/2018

E. Dewhurst (BSc) – University of St Andrews
 M. Iacovidou (MSc) – University of St Andrews
 Y. Wu (BSc) – University of St Andrews
 Y. Xiao (MSc) – University of St Andrews

AY 2016/2017

A. Archibald (MSc) – University of St Andrews
 G. Fiandaca (MSc) – Università degli Studi di Verona
 J. McKinney (BSc) – University of St Andrews
 I. Maresi (BSc) – University of St Andrews
 R. Stace (MSc) – University of St Andrews

Committees

05/2018 | Member of interdisciplinary PhD selection committee and interview panel (School of Medicine, University of St Andrews)

04/2017 | Member of international PhD examining committee (Laboratoire Jacques-Louis Lions, Université Pierre et Marie Curie and Dipartimento di Ingegneria Meccanica, Energetica, Gestionale e dei Trasporti, Università degli Studi di Genova)

01/2017 – 09/2017 | Member of library committee (School of Mathematics and Statistics, University of St Andrews)

Publications

Journal articles

[29] **T. Lorenzi**, C. Venkataraman, A. Lorz, M.A.J. Chaplain, The role of spatial variations of abiotic factors in mediating intratumour phenotypic heterogeneity, *J. Theoret. Biol.*, 451, 101-110, 2018

[28] F.R. Macfarlane, **T. Lorenzi**, M.A.J. Chaplain, Modelling the immune response to cancer: an individual-based approach accounting for the difference in movement between inactive and activated T cells, *Bull. Math. Biol.*, 80, 1539–1562, 2018

[27] A.E.F. Burgess, **T. Lorenzi**, P.G. Schofield, S.F. Hubbard, M.A.J. Chaplain, Examining the role of individual movement in promoting coexistence in a spatially explicit prisoner’s dilemma, *J. Theoret. Biol.*, 419, 323-332, 2017

[26] **T. Lorenzi**, A. Lorz, B. Perthame, On interfaces between cell populations with different mobilities, *Kinet. Relat. Models*, 10, 299–311, 2017

[25] M. Delitala, **T. Lorenzi**, Emergence of spatial patterns in a mathematical model for the co-culture dynamics of epithelial-like and mesenchymal-like cells, *Math. Biosci. Engin.*, 14, 79-93, 2017

[24] A.E.F. Burgess, P.G. Schofield, S.F. Hubbard, M.A.J. Chaplain, **T. Lorenzi**, Dynamical patterns of coexisting strategies in a hybrid discrete-continuum spatial evolutionary game model, *Math. Mod. Nat. Phen.*, 11, 49-64, 2016

[23] **T. Lorenzi**, R.H. Chisholm, J. Clairambault, Tracking the evolution of cancer cell populations through the mathematical lens of phenotype-structured equations, *Biol. Direct*, 11, 1-17, 2016

[22] R.H. Chisholm, **T. Lorenzi**, J. Clairambault, Cell population heterogeneity and evolution towards drug resistance in cancer: biological and mathematical assessment, theoretical treatment optimisation, *Biochim. Biophys. Acta, Gen. Subj.*, 1860, 2627-2645, 2016

- [21] R.H. Chisholm, **T. Lorenzi**, L. Desvillettes, B.D. Hughes, Evolutionary dynamics of phenotype-structured populations: from individual-level mechanisms to population-level consequences, *Z. angew. Math. Phys.*, 67, 1-34, 2016
- [20] R.H. Chisholm, **T. Lorenzi**, A. Lorz, Effects of an advection term in nonlocal Lotka-Volterra equations, *Commun. Math. Sci.*, 14, 1181-1188, 2016
- [19] **T. Lorenzi**, R.H. Chisholm, L. Desvillettes, B.D. Hughes, Dissecting the dynamics of epigenetic changes in phenotype-structured populations exposed to fluctuating environments, *J. Theoret. Biol.*, 386, 166-176, 2015
- [18] **T. Lorenzi**, R.H. Chisholm, M. Melensi, A. Lorz, M. Delitala, Mathematical model reveals how regulating the three phases of T-cell response could counteract immune evasion, *Immunology*, 46, 271-280, 2015
- [17] R.H. Chisholm, **T. Lorenzi**, A. Lorz, A.K. Larsen, L. Neves de Almeida, A. Escargueil, J. Clairambault, Emergence of drug tolerance in cancer cell populations: an evolutionary outcome of selection, non-genetic instability and stress-induced adaptation, *Cancer Res.*, 75, 930-939, 2015
- [16] C.J. Torney, **T. Lorenzi**, I.D. Couzin, S.A. Levin, Social information use and the evolution of unresponsiveness in collective systems, *J. R. Soc. Interface*, 12(103), 20140893, 2015
- [15] E. Faggiano, **T. Lorenzi**, A. Quarteroni, Metal artifact reduction in computed tomography images by a fourth-order total variation flow, *CMBBE: Imaging & Visualization*, DOI: 10.1080/21681163.2014.940629, 2014
- [14] A. Lorz, **T. Lorenzi**, J. Clairambault, A. Escargueil, B. Perthame, Modeling the effects of space structure and combination therapies on phenotypic heterogeneity and drug resistance in solid tumors, *Bull. Math. Biol.*, 77, 1-22, 2015
- [13] G. Dimitriu, **T. Lorenzi**, R. Stefanescu, Evolutionary dynamics of cancer cell populations under immune selection pressure and optimal control of chemotherapy, *Math. Mod. Nat. Phen.*, 9, 88-104, 2014
- [12] **T. Lorenzi**, A. Lorz, G. Restori, Asymptotic dynamics in populations structured by sensitivity to global warming and habitat shrinking, *Acta Appl. Math.*, 131, 49-67, 2013
- [11] M. Delitala, **T. Lorenzi**, Evolutionary branching patterns in predator-prey structured populations, *Disc. Cont. Dyn. Syst. B*, 18, 2267-2282, 2013
- [10] M. Delitala, **T. Lorenzi**, A mathematical model for value estimation with public information and herding, *Kinet. Relat. Models*, 7, 29-44, 2014
- [9] M. Delitala, **T. Lorenzi**, Drift-diffusion limit of a model for the dynamics of epithelial and mesenchymal cell monolayers, *Appl. Math. Letters*, 26, 826-830, 2013
- [8] M. Delitala, U. Dianzani, **T. Lorenzi**, M. Melensi, A mathematical model for immune and autoimmune response mediated by T-cells, *Comp. Math. Appl.*, 66, 1010-1023, 2013
- [7] D. Borra, **T. Lorenzi**, Asymptotic analysis of continuous opinion dynamics models under bounded confidence, *Commun. Pure Appl. Anal.*, 12, 1487-1499, 2013
- [6] M. Delitala, **T. Lorenzi**, Recognition and learning in a mathematical model for immune response against cancer, *Disc. Cont. Dyn. Syst. B*, 18, 891-914, 2013
- [5] A. Lorz, **T. Lorenzi**, M.E. Hochberg, J. Clairambault, B. Perthame, Populational adaptive evolution, chemotherapeutic resistance and multiple anti-cancer therapies, *ESAIM Math. Model. Numer. Anal.*, 47, 377- 399, 2013
- [4] D. Borra, **T. Lorenzi**, A hybrid model for opinion formation, *Z. angew. Math. Phys.*, 64, 419-437, 2013
- [3] M. Delitala, **T. Lorenzi**, Asymptotic dynamics in continuous structured populations with mutations, competition and mutualism, *J. Math. Anal. Appl.*, 389, 439-451, 2012

[2] M. Delitala, **T. Lorenzi**, A mathematical model for the dynamics of cancer hepatocytes under therapeutic actions, *J. Theoret. Biol.*, 297, 88-102, 2012

[1] M. Delitala, **T. Lorenzi**, A mathematical model for progression and heterogeneity in colorectal cancer dynamics, *Theor. Popul. Biol.*, 79, 130–138, 2011

Book chapters

[3] M. Delitala, **T. Lorenzi**, M. Melensi, A structured population model of competition between cancer cells and T-cells under immunotherapy (pp. 47-58) in *Mathematical Models of Tumor-Immune System Dynamics*, Eds. A. Eladdadi, P. Kim, D. Mallet, Springer Proceedings in Mathematics & Statistics, Vol. 107, 2014

[2] M. Delitala, **T. Lorenzi**, Mathematical modeling of cancer cells evolution under targeted chemotherapies (pp. 81-89) in *Managing Complexity, Reducing Perplexity*, Eds. M. Delitala, G. Ajmone Marsan, Springer Proceedings in Mathematics & Statistics, Vol. 67, 2014

[1] M. Delitala, **T. Lorenzi**, Formation of evolutionary patterns in cancer dynamics (pp. 179–190) in *Pattern Formation in Morphogenesis. Problems and mathematical issues*, Eds. V. Capasso, M. Gromov, A. Harel-Bellan, N. Morozova, L.L. Pritchard, Springer Proceedings in Mathematics, Vol. 15, 2013