Quentin Richard

Post-doc

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Born 26 September 1992 (27 years old),
French citizenship

Research Interests

Mathematical biology modelling, population dynamics, cellular dynamics, predator-prey systems, evolutionary epidemiology.

Partial Differential or delayed Equations, transport, transport-diffusion, reaction-diffusion equations and integro-differential equations.

Structured models, in age, age since infection, size, space or phenotypic trait.

Dynamical systems, asymptotic behavior of solutions, local and global stability of equilibria, bifurcation study, spectral analysis of operators, well-posedness in L^1.

Numerical schemes (finite volumes).

Current professional situation

Since 01/01/2020 — **Post-doctorat**, UMR Maladie Infectieuses et Vecteurs Écologie, Génétique, Évolution et Contrôle (MiVEGEC). Grant ANR STORM. In collaboration with Ramsès Djidjou-Demasse, Thierry Lefèvre and Marc Choisy.
Subject: Mathematical modelisation applied to theoretical evolutive epidemiology.

Professional experience

2019 (Jan-Dec) — **Postdoctorat**, Institut of Mathematics of Bordeaux (IMB), University of Bordeaux, in the Mathematics for the Populations Dynamics team. In collaboration with with Jean-Baptiste Burie (IMB), Arnaud Ducrot (University of Havre) and Frédéric Fabre (INRA of Bordeaux). Grant IdEx, cluster SysNum.
Subject: Mathematical modelling and simulations for evolutionary plant epidemiology in agricultural landscapes.

2015 (March-September) — **Master Internship**, Chrono-Environnement Laboratory (UBFC), Besançon, France..
Advisers: Antoine Perasso and Virgile Baudrot.
Subject: Mathematical analysis and simulations of predator-prey models with various functional responses

Education and diplomas

2015 - 2018 — **Ph.D. in applied Mathematics**, Laboratory of Mathematics of Besançon (LMB), University of Bourgogne Franche-Comté (UBFC). Presidential grant. Defended on 08, October 2018.
Subject: Asymptotic behavior of structured populations models.
Supervisers: Mustapha Mokhtar-Kharroubi and Antoine Perasso.
President of the jury: Magali Ribot.
Referees: Vincent Calvez and Laurent Desvillettes.
Examinators: Nabile Boussaïd, Arnaud Ducrot and Ryszard Rudnicki..

2014 - 2015 — **Master 2 Degree: Mathematics for biology and medicine, theory and applications**, University Claude Bernard (UCBL), Lyon 1, France.

2013 - 2014 — **Master 1 Degree in Mathematical Engineering**, UCBL.
Research project: Invasion of the eastern grey squirrel in Europe, reaction-diffusion model.
Adviser: Laurent Pujo-Menjouet.

2011 - 2013 — **Licence of Mathematics**, UCBL.

2010 - 2011 — **French Intensive Preparatory Classes**, post-bachelor courses in mathematics and physics, Lycée Jean Perrin, Lyon.

Research stay

May 2017 **3 weeks visit in the Dipartimento di Matematica "Giuseppe Peano" (International Mobility of PhD Students scholarship)**, Università di Torino, Italy.

Oral communications and participations in conferences

The (*) indicate participations without communications (neither oral or poster).

Sep 2019 **GDR MAMOVI**, Institut Denis Poisson, Tours.
"Asymptotic behavior of age-structured and delayed Lotka-Volterra models.".

Aug 2019 **Mathematical Modeling in Population Dynamics**, Bordeaux.
"Asymptotic behavior of age-structured and delayed Lotka-Volterra models".

Oct 2018 **Semigroups of Operators: Theory and Applications**, Kazimierz Dolny, Poland.
"Time asymptotics of structured populations with diffusion".

June 2018 3^{rd} **Mathematical Biology Modelling days of Besançon** $\{\mathbf{MB}\}^2$, Besançon.
"Dynamics of predator-prey interactions: from age-structured to delay differential equations models".

Dec 2017 * **Partial Differential Equations and semigroups**, Besançon, France..

Oct 2017 **VI^e Colloque EDP-Normandie**, Caen.
Poster : "Bifurcations of an age-structured predator-prey model".

May 2017 **2nd Franco-Italian Mathematical Ecology Days**, Università di Torino, Italy.
"Some dynamics of an age-structured predator-prey model".

Nov 2016 **International Workshop Franco-Italian Mathematical Ecology Days**, Università di Torino.
"Some dynamics of an age-structured predator-prey model".

Aug 2016 * **Helsinki Summer School on Mathematical Ecology and Evolution: Structured Populations**, Turku, Finland.

Jul 2015 MB^2 **Conference: Days BioMathematical Modeling of Besançon**, Métabief. Poster :
"Study of the predation behavior by mathematical analysis and numerical computations of predator/preys systems".

Oral communications in seminar and workshop

May 2020 **Seminar (visio) of the Theoretical and Experimental Evolution (ETE) team**, MIVEGEC, Montpellier. "Some mathematical models in population dynamics".

Jan 2020 **Bio-Maths seminar**, Institut Denis Poisson, Orléans.
"Concentration estimates in a multi-hosts evolutive epidemiological model.".

Dec 2019 **General Assembly of SysNum**, IMB, Bordeaux.
"A mathematical multi-hosts model in evolutionary epidemiology".

Jan 2019 **Mathematics for the Population dynamics seminar**, IMB, Bordeaux.
"Asymptotic behavior of structured populations models".

June 2018 **Ph.D seminar**, LMB, Besançon.
"Asymptotic behavior of structured populations models".

June 2018 **PDE seminar**, LMB, Besançon.
"Study of a structured population model with diffusion".

Jan 2018 **Analysis and PDE seminar**, Laboratory of Mathematics of Versailles, France.
"Asymptotic behavior of an age-structured predator-prey model".

Oct 2017 **Working group**, INRIA, Lyon.
"Asymptotic behavior of a delayed predator-prey model".

May 2016 **Days of Carnot-Pasteur doctoral school**, UBFC.
"Implication of an age-structure on the dynamics of Lotka-Volterra equations", First prize of the jury.

Publications and accepted papers in journals with lecture committee

[1] **M. Mokhtar-Kharroubi, Q. Richard**, Time asymptotics of structured populations with diffusion and dynamic boundary conditions, *Discrete and Continuous Dynamical Systems - B*, **23(10)** (2018), 4087–4116.

[2] **A. Perasso, Q. Richard**, Implication of age-structure on the dynamics of Lotka Volterra equations, *Differential and Integral Equations*, **32** (2019), 91–120.

[3] **M. Mokhtar-Kharroubi et Q. Richard**, Spectral theory and time asymptotics of size-structured two-phase population models, *Discrete and Continuous Dynamical Systems - B*, **25(8)** (2020), 2969–3004.

[4] **Q. Richard**, Global stability in a competitive infection-age structured model, *Mathematical Modelling of Natural Phenomena*, **15**(54), (2020), 1–39.

[5] **A. Perasso and Q. Richard**, Asymptotic behavior of age-structured and delayed Lotka-Volterra models, *SIAM, Journal on Mathematical Analysis*, **52(5)**, (2020) 4284–4313.

[6] **J.B. Burie, A. Ducrot, Q. Griette and Q. Richard**, Concentration estimates in a multi-host epidemiological model structured by phenotypic traits. *Journal of Differential Equations*, **269(12)**, (2020) 11492–11539.

[7] **A. Perasso, Q. Richard, I. Azzali et E. Venturino**, Well-posedness and positivity property for a reaction-diffusion model of plankton communities, involving a rational nonlinearity with singularity. *Studies in Applied Mathematics* **146(1)**, (2021) 211–232.

[8] **Q. Richard, S. Alizon, M. Choisy, M. T. Sofonea and R. Djidjou-Demasse**, Age-structured non-pharmaceutical interventions for optimal control of COVID-19 epidemic. To appear in *PLOS Computational Biology*, **17(3)**, (2021) 1–25.

Submitted papers

[9] **R. Djidjou-Demasse, S. Lion, A. Ducrot, J.B. Burie, Q. Richard et F. Fabre**, An evolutionary epidemiology model to predict spore-producing pathogens adaptation to quantitative resistance in heterogeneous host environments. Submitted, bioRxiv (2020).

[10] **Q. Richard, R. Djidjou-Demasse, M. Choisy and T. Lefèvre**, Human-vector malaria transmission model structured by age, time since infection and waning immunity. Submitted, Hal (2020).

Teaching experience

During my three years of Ph.D, I had teaching duties in the Université of Bourgogne Franche-Comté:

2017-2018 **Project monitoring**, Licence 3rd year of mathematics. Subject: study of the Lotka-Volterra model.
Analysis and Algebra, First year science students, duration: 38 hours.
Mathematics, First year of biology students, duration: 20 hours.

2016-2017 **Analysis**, First year science students, duration: 39 hours.
Mathematics, First year biology students, duration: 25 hours.

2015-2016 **Mathematics**, First year biology students, duration: 64 hours..

Responsabilities

2019-2020 Referee of papers for *Mathematical Modelling of Natural Phenomena* and the *Journal of Physics A: Mathematical and Theoretical.*

2018 Member of the organization committee of Mathematical Biology Modelling days of Besançon $\{MB\}^2$.

2016-2018 Representing PhD students for the IT committee.

IT and languages

IT Matlab, Scilab, Maple, Julia, Latex, R and Microsoft Office.

Languages French (mother tongue), English (fluent, TOEIC 865/990), Spanish (basics).

Miscellaneous

Sport Table tennis for 20 years.

Hobbies Reading, music, piano, movies and documentaries.