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1 Professional history

Current professional status

Position: Senior Research Scientist (D.R.2 INRIA, \approx tenured research full professor) since October 2013

Institution: INRIA Grenoble Rhône-Alpes, Antenne de Lyon, France.

Previous professional experiences

Start	End	Institutions	Positions and status
10/2009	09/2013	INRIA Lyon	Chargé de Recherche INRIA (C.R.1)
09/2006	09/2009	INRIA Saclay	Chargé de Recherche INRIA (C.R.1)
09/2004	08/2006	INRIA Saclay	Détachement INRIA
09/2000	08/2004	Univ. Cergy-Pontoise, Life Sci Dept	Maître de Conférences
09/1999	08/2000	Univ. Cergy-Pontoise, Life Sci Dept	A.T.E.R.
09/1996	08/1999	Univ. Technology of Compiègne	PhD Student (MESR grant)

Major organizational activities

- **Deputy Scientific Director** of Inria for “Digital Health, Biology and Earth” (2018 - today). Inria is organised around five fields of research. Each field of research is headed up by a Deputy Scientific Director, who coordinates research and forward planning in his/her field.
- **Vice-Chair** of INRIA’s “Evaluation Committee” (Commission d’Evaluation) (Oct. 2016- Feb. 2018). The goal of INRIA’s Evaluation Committee is to assess the calibre of research conducted at INRIA and guarantee the quality of its hiring and internal promotions.
- Chair of the Search Committee for “Junior Research Scientists” (Président Jury d’admissibilité CR2) of INRIA Grenoble Research Center, for three years 2014, 2015 & 2016.
- Vice-Chair of the Search Committee for “INRIA Senior Research Scientists” (Vice-Président Jury d’admissibilité DR2) 2017.
- Member of INRIA’s “Scientific Board” (Conseil Scientifique), 2014-2016. The Scientific Board plays a role as consultant and expert to assist the Board of Directors.
- Member of INRIA’s “Evaluation Committee” (2011-2015).

2 Diplomas

Habilitation à diriger des recherches (Habilitation Thesis)

“Modeling Complex Biological Systems: Examples in Computational Cell Biology, Computational Neuroscience and applications to Computer Science”

Date of the defense : June 2008

Granting institution : Ecole Doctorale d’Informatique - University of Orsay Paris-Sud - Orsay

Jury: *F. Alexandre* (Project-team Cortex, INRIA, Nancy, France, Rapporteur), *E. Ben Jacob* (School of Physics and Astronomy, Tel Aviv University, Israel, Rapporteur), *K. Burrage* (Computation Laboratory, University of Oxford, Oxford, UK and Institute for Molecular Biology, University of Queensland, Brisbane, Australia, Rapporteur), *H. de Jong* (Project-Team Helix, INRIA Rhône-Alpes, Grenoble, France), *J. Demongeot* (TIMC-IMAG Laboratory, University Joseph Fourier, Grenoble, France), *A. Lesne* (IHES, Bures-sur-Yvette and LPTMC, Univ. P & M. Curie, Paris, France), *O. Temam* (Project-Team Alchemy, INRIA Saclay-Île-de-France, France).

Ph.D.

“Gelification et catalyse enzymatique des transitions gel-sol de la fibronectine: Implications dans le Remodelage de la Matrice Extracellulaire et l’Invasion Tumorale.”

Date of the defense of the Ph.D. : October 08, 1999

Granting institution : Université de Technologie de Compiègne

Host institution. : UMR 6022 CNRS, Génie Enzymatique et Cellulaire, Univ. Technol. Compiègne and ERRMECe, EA 1391, Université de Cergy-Pontoise.

Supervisor: Pr. V. Larreta-Garde

Other diplomas (Masters and above):

- Master2 (“D.E.A”) in Enzyme Technology, Université de Technologie de Compiègne, 1995
- Engineer Diploma in Biotechnology, Université de Technologie de Compiègne, 1994

3 Other synergetic activites

3.1 Other organizational activities

- My activities as Deputy Scientific Director of Inria have led me to serve in a number of committees, that I list here:
 - Conseiller Scientifique, ITMO Technologies pour la santé (<https://its.aviesan.fr>), 2018-
 - Comité d’Orientation Scientifique et Stratégique, Institut Français de Bioinformatique (IFB, <https://www.france-bioinformatique.fr>), 2018-
 - Comité Directeur, GIS IBISA (<https://www.ibisa.net>), 2018-
 - Comité des Tutelles, INBS France Life Imaging (FLI, <https://www.francelifeimaging.fr>), 2018-
 - Comité des Tutelles, INBS France BioImaging (FBI, <https://france-bioimaging.org>), 2018-
 - Comité de Pilotage, Action de Recherche Prospective Biologie Predictive INRA (2018)
 - Comité de Pilotage et de Programmation, interCPP “Santé Numérique”, ANR (2018)
- Member of the “Commission des thèses” of the Doctoral School “Info-Maths” (ED 512) that brings together most of the laboratories and researchers in Computer Science and Mathematics in Lyon.
- Member of the Steering Committee (comité de pilotage) of GdR IMaBIO (Imagerie et Microscopie pour la Biologie, <http://imabio-cnrs.fr>), 2016-2017. This GdR is a federation of the

french research groups (> 120 labs) implicated in biophotonics, super-resolution microscopy and related simulation and analysis tools.

- Facilitator (with R. Guillemaud, CEA/Leti) of the “Groupe de Travail CEA/Leti-INRIA on Numerical Health”.
- Representative for INRIA on the Administrative Board (“Conseil d’Administration”) of the RNSC (“Réseau National des Systèmes Complexes”, <http://rnsc.csregistry.org>), 2016.
- Member of the evaluation committee for research program ROSIRIS of the IRSN (Institut de radioprotection et de sûreté nucléaire), 2016.
- Member of INRIA’s “Parity-Equality” Committee (2015-2016) (parite.inria.fr/en/). This committee ensures that parity, gender issues and equality have been taken into account within INRIA activities.
- Member of several INRIA’s Search Committees 2012-2017 (hiring research scientists, jury d’admissibilité et d’admission, CR2, CR1 and DR2).
- Member of the Scientific Board (comité scientifique) of GdR MIV (Microscopie et Imagerie du Vivant, GdR 2588) 2016 (gdr-miv.fr). The predecessor of GdR IMA BIO, see above.
- Member of the Science Steering Committee of the Rhône-Alpes Complex Systems Institute (IXXI) 2013-2016 (www.ixxi.fr). This Committee reviews and gives recommendations to the direction committee on all faculty appointments, workshops, ongoing research activities, and policy issues which affect how science is conducted at IXXI.
- Member of the SPECIF Committee, that awards each year the Gilles Kahn award, for the best French PhD in Computer Science, 2011-2014.
- Member of the Evaluation committee for the calls for funding “Systems Biology and cancer” of the “ITMO Cancer” (consortium of all the French national research institutes for research against cancer) for years 2012 to 2015.
- Member of the AERES committee for the evaluation of the UR protection radiologique de l’homme, IRSN, 2010. AERES is the National Evaluation Agency that is tasked with evaluating French research and higher education institutions and research organizations.

3.2 Conference Organization

- Co-organizer (with C. Favard, IRIM Montpellier, I. Izeddin, ESPCI Paris and A. Coulon, Curie Institute, Paris) of the workshop “Dynamiques des molécules et assemblages moléculaires”, Montpellier, France, 4 December 2017.
- Co-organizer (with C. Favard, CNRS Montpellier and L. Häfiliot, CNRS Lille) of the module “Molecular assembling and dynamics: from experimentation to modeling” at the thematic school “Functional Microscopy in Biology” (MiFoBio 2016), Seignosse, France, 30 Sep-07 Oct 2016.
- Co-organizer (with R. Thijl, Univ Nottingham, UK) of the minisymposium “Modeling Spatiotemporal Calcium Dynamics” at ECMTB 2016 (10th European Conference on Mathematical and Theoretical Biology), The University of Nottingham, UK, 11-15 July 2016.
- Main organiser of the 2-day workshop “Molecule Trajectories in Cellular Spaces: promoting interactions between theoreticians and experimentalists” (traece.inria.fr), Ecole Normale Supérieure de Lyon (France), November 16-17, 2015.

- Member of the organization committee of the bis-annual CNRS thematic school “**CompSysBio**: Advanced Lecture Course on Computational Systems Biology”, 2015 and 2017 (compsysbio.inria.fr). The Course emphasis is methodological and targets participants from Computer Science, Mathematics and Physics, in addition to biologists motivated by Systems Biology.
- Co-organizer (with M. De Pittá, Beagle) of the workshop “Computational Methods and Modeling of Astrocyte Physiology and Neuron-Glia Interactions”, held as part of the conference OCNS (Organization for Computational Neuroscience) 2014 in Quebec, Canada, July 26-31, 2014. see <https://team.inria.fr/beagle/ocns-2014-workshop/>.
- Co-organizer (with V. Calvez, ENS Lyon) of the conference “Mathematical modeling in cell biology” in Lyon, March 25-29, 2013 (mathbio2013.sciencesconf.org/resource/page?id=3), mainly funded by the "laboratoire d'excellence" MILYON (“Mathématique et Informatique Fondamentale de Lyon”). Topics: spatio-temporal patterns of signaling, cytoplasmic reaction-diffusion, intracellular trafficking, mechanisms of cell polarization, models for protein aggregation and prion proliferation.
- Member of the organization committee of the annual CNRS-INRA thematic school “**EIEFB**: Ecole interdisciplinaire d’échanges et de formation en biologie”, 2008-2017 (projects.inria.fr/berder2017). This spring school aims at stimulating scientific innovation around the major current questions arising in biology, by promoting unusual interactions between researchers from various disciplines.
- Main organizer of the Autumn School/Conference, NeuroComp 2007 on Computational Neurosciences, 14-16 November, Paris (www.neurocomp.fr/2007.html).

3.3 Other committees

- Selection committees (committees to hire professors / assistant professors)
 - position INSA0050, Assistant Professor, INSA Lyon (Biosciences Dept, sections 64-65-27), 2017
 - position 64PR0157, Full Professor position in Biology, University P & M Curie, Paris, (Sections 64-65-66-69), 2017
 - positions 64PR0596 and 65PR3266, two Full Professor positions in Systems Biology, University P & M Curie, Paris, (Sections 64 & 65), 2016
 - position INSA0050, Assistant Professor, INSA Lyon (Computer Science Dept), 2014
 - position MCF 0333, Assistant Professor, chaire CNRS/UCP section 27-61, University Cergy-Pontoise (Computer Science Dept), 2011
 - position MCF 1706, section 64, University Cergy-Pontoise (Life Science Dept), 2010
 - position MCF 1701 , section 27-61, University Cergy-Pontoise (Computer Science Dept), 2010
 - position MCF 283, section 65-27, Evry University, 2009
 - position MCF 0744 , section 26, University Grenoble 1, 2009
- PhD / HdR committees
 - HdR (Habilitation a diriger les recherches / Habilitation thesis) :
 - * D. Martinez, “Modelisation biologique, biocapteurs et inspiration pour la robotique autonome”, Univ. de Lorraine, Nancy, March 2017 (reviewer)

- * A. Stephanou, “Une approche computationnelle pour l’étude de processus morphogénétiques”, Univ. Grenoble, December 2011 (examiner)
- PhD juries
 - * Alexandre Mendes, “Homo- et hétérosynaptique spike-timing-dependent plasticity aux synapses cortico- et thalamo-striatales”, Univ. P & M Curie, Paris, Sep 2017 (examiner).
 - * Ilyas Djafer-Cherif, “Descriptions continues et stochastiques de la matière active”, Univ. Paris-Saclay, Paris, July 2017 (reviewer).
 - * Martin Potier, “Un cadre théorique pour l’intégration des niveaux d’organisation dans les modèles”, Univ. Paris-Est, Creteil, July 2017 (examiner).
 - * Guillaume Rodriguez, “Modélisation des bases neuronales de la mémoire de travail paramétrique dans le cortex préfrontal”, Univ. P & M Curie, Paris, October 2016 (reviewer).
 - * A. Garnier, “Dynamiques neuro-gliales locales et réseaux complexes pour l’étude de la relation entre structure et fonction cérébrales”, Univ. P & M Curie, Paris, December 2015 (examiner).
 - * N. Subramaniyam “Recurrence network analysis of EEG signals: A geometric approach”, Tampere University of Technology, Finland, December 2015 (examiner)
 - * Z. Chaker, “Rôle de la signalisation IGF dans la régulation de l’homéostasie tissulaire durant le vieillissement”, Univ. Paris Descartes, December 2014 (examiner)
 - * V. Ady, “Développement et plasticité des connexions des cellules de Purkinje”, Univ. Paris Descartes, November 2013 (reviewer)
 - * G. Detorakis, “Cortical Plasticity, Dynamic neural fields and self-organisation”, Univ. Nancy, October, 2013 (reviewer)
 - * Mathieu Lefort, “Apprentissage spatial de corrélations multimodales par des mécanismes d’inspiration corticale”, Univ. Nancy, July 04, 2012 (reviewer)
 - * Guillaume Corre, “Hétérogénéité phénotypique dans les populations d’origine clonale: origine et conséquences”, Ecole Pratique des Hautes Etudes, Paris, June 27, 2012 (reviewer)
 - * Hana Belmabrouk, “Modélisation et simulation du complexe macroglobulaire des papillons de nuit”, Univ. Nancy, May 15, 2012 (reviewer)
 - * R. Martinez, “Dynamique des systèmes cognitifs et des systèmes complexes : étude du rôle des délais de transmission de l’information” Univ. Lyon, September 26, 2011 (examiner).
 - * L. Alecu, “Structuration de traitements visuels par la boucle sensorimotrice : Une approche neuromimétique d’inspiration corticale”, Uni. Nancy, June 30, 2011 (examiner)
 - * A. Demarez, “Investigating proteostasis and ageing of Escherichia coli using spatio-temporal algorithms”, January 31, 2011, Univ. Paris Descartes (reviewer).
 - * T. Girod, “Un modèle d’apprentissage multimodal pour un substrat distribué d’inspiration corticale”, November 10, 2010, Univ. Nancy 1 (reviewer).
 - * A. Coulon, “Stochastité de l’expression génique et régulation transcriptionnelle – Modélisation de la dynamique spatiale et temporelle des structures multiprotéiques”, July 01 2010 Univ. Lyon 1, 2010 (examiner).
 - * M. Valvassori, “Modélisation et programmation d’ordinateurs amorphes: de l’ordinateur amorphe à la machine Blob”, July 10, 2009, Univ. Paris 8 (reviewer)
 - * M. Ambard, “Influence de l’inhibition synaptique sur le codage de l’information par les cellules mitrales du bulbe olfactif”, June 08, 2009, Univ. Nancy 1 (reviewer)
 - * J.-B. Rouquier, “Robustesse et émergence dans les systèmes complexes: le cas de automates cellulaires”, Dec. 08 2008, ENS Lyon (examiner)

- * David Meunier, “Une modélisation évolutionniste du liage temporel”, Oct. 19, 2007, Université Lumière Lyon 2. (examiner).

- Editorial activities

- Editorial Board membership
 - * Guest Editor for PLoS Computational Biology (3 articles in 2017-2018)
 - * AIMS Biophysics (<http://aimspress.com/aimsbpoa/ch/index.aspx/>)
- Member of the Technical Program Committee for HPCS 2013 (<http://hpcs2013.cisedu.info>)
- Frequent reviewer for journals: PLoS Comput Biol, Scientific Reports, Bull Math Biol, PLoS One, Frontiers Synaptic Neuroscience, Frontiers Computational Neuroscience, J Theor Biol, Physical Biol, J Biol Physics, New J Physics

- Reviewer for calls for funding:

- NSF (US National Science Foundation), call “Early-career Program”, 2016
- FRC (Fond pour la Recherche sur le Cerveau) “Espoir en tête” 2016.
- FNRS, Belgium, 2012-2017.
- COFECUB (France-Bresil cooperations), Campus France, 2011,
- DIM (Domaine d’interet majeur) LSC (Logiciel et systemes complexes) 2011, Region Ile de France
- ANR (French National Research Agency) Calls “Programme Blanc” (2008 & 2011) and “SysComm” (2008 & 2009),

4 Supervision of research activities

Together, I have (co)-supervised or am currently (co)-supervising 1 software engineer, 2 postdoctoral researchers, 10 PhD students and 10 Master (M2) students. Unless otherwise indicated, all students listed below were full supervisions. For PhD students, I also indicate the funding source.

- Engineers / Software developers
 - * **Magali Vangkeosay** (Software developer) - 10/2012 - 09/2014 - *Development of a software for automated quantitative analysis of time-lapse microscopy movies of growing bacterial populations*. Funded by INRIA via ADT “Multi*Pop”.
- Postdoctoral researchers
 - * **Maurizio de Pitta** (Postdoctoral researcher) - 06/2013-05/2017 - *Understanding the functional relevance of neuron-astrocyte interactions in brain function*. Funded by the EU by an ERCIM grant followed by an IOF Marie Curie grant “Neuron-Astro-Nets” (collaboration with N. Brunel, Univ. Chicago).
 - * **Pierre Gabriel** (Postdoctoral researcher, now Assistant Professor in mathematics, Univ. Versailles, France) - 09/2011-08/2012 - *Mathematical modeling of protein aggregation and aging in E coli*. Funded by the French National Agency for Research (ANR), Project Pagdeg
- PhD Students
 - * **Audrey Denizot** (Ph.D. Student) - 2016-Present : *Simulation of calcium signaling in fine astrocytic processes*, ED Info-Maths Lyon, CDSN ENS Lyon, co-supervised (50%) with HÃ¢di Soula (CRC, Univ. P&M Curie, Paris)

- * **Marie Fernandez** (Ph.D. Student) - 2015-2017 : *Extraction and analysis of the acoustic network of social birds*, co-supervised (33%) with HÃdi Soula (CRC, Univ. P&M Curie, Paris) and ClÃmentine Vignal (Univ. J. Monnet, Saint-Etienne). Ph.D. defended and completed: April 9, 2017. ED Info-Maths Lyon, Bourse rÃgion RhÃne-Alpes (ADR ARC 3).
- * **Alexandre Foncelle** (Ph.D. Student) - 2014-2017 : *Data-driven computational modelling for some of the implications of dopamine in the brain: from subcellular signalling to area networks*, Ph.D. defended and completed: April 5, 2017. ED Info-Maths Lyon, ANR grant (project Dopaciumcity).
- * **Alvaro Mateos Gonzalez** (PhD student in Mathematics, ENS Lyon, now postdoc researcher in Montpellier University) 2014-2017: *Asymptotic analysis of partial differential equations arising in biological processes of anomalous diffusion.*, co-supervised (30%) with Vincent Calvez (EPI Numed) and Thomas Lepoutre (EPI Dracula), Ph.D. defended and completed: September 22, 2017. ED Info-Maths Lyon, CDSN ENS Lyon.
- * **Ilya Prokin** (Ph.D. Student) - 2013-2016 : *Modeling and simulation of signal transduction in living cells: synaptic plasticity of basal ganglia neurons*, Ph.D. defended and completed: December 02, 2016, ED Info-Maths Lyon, INRIA grant.
- * **Jules Lallouette** (Ph.D. Student) - 2011-2014 : *ModÃllisation des rÃponses calciques de rÃseaux d'astrocytes: relation entre topologie et dynamiques.*, Ph.D. defended and completed: December 04, 2014. ED Info-Maths Lyon, MESR grant.
- * **Anne-Sophie Coquel** (Ph. D. Student, now Head of Genomics, Sanofi France) - 2009-2012 - Co-Supervised (50%) with A. Lindner (INSERM U1001, Cochin Medical School, Paris, France). *Deciphering the molecular mechanisms underlying the role of protein aggregation in aging of E. coli.* hal.inria.fr/tel-00778887. Ph.D. defended and completed: November 16, 2012. ED Info-Maths Lyon. INRIA Grant to AEN (Action d'Envergure Nationale) ColAge.
- * **Fei Jiang** (Ph.D. Student, now private entrepreneur, Shanghai) - 2006-2009 - INRIA Saclay & Orsay University. Co-Supervised (40%) with M. Schoenauer (TAO, INRIA, Saclay, France). *Evolution and optimization of large neural networks.* Ph.D. defended and completed: December 16, 2009. INRIA Grant.
- * **Benoit Siri** (Ph.D. Student, now R&D engineer, Henix, Paris) - 2005-2008 - INRIA Saclay & Orsay University, *Topology-dynamics-learning interactions in complex bioinspired neural networks*, Ph.D. defended and completed: December 18th, 2008. Ph.D. funded by a grant by the French National Agency for Research (ANR) (Call JC/JC, Project ASTICO).
- * **Delphine Pellenc** (Ph. D. Student; St Josephs College, Reading, UK) - 2002-2005 - UniversitÃ de Cergy-Pontoise- Co-Supervision (50 %) with O. Gallet, *Adsorption-induced fibronectin self-assembling: experimental characterization on hydroxyapatite and study by numerical simulation.* Ph.D. defended and completed: October 21st, 2005. MESR Grant.

– Master students

- * **Carlos Vivar-Rios** (Erasmus+ master internship) March-July 2017, co-supervised (50%) with Audrey Denizot, *Spatial stochastic simulations of calcium waves in astrocytes.*
- * **Audrey Denizot** (Master 2 Bioscience, ENS Lyon) September-December 2015, *Multiscale simulations of Ca waves dynamics in fine astrocytic processes.*
- * **Raphael Bournhonesque** (Master 2 Computer Science, ENS Lyon) February-June 2015, *Role of glutamate transporter diffusion in glutamate clearance.*

- * **Alvaro Mateos Gonzalez** (Master 2 Mathematics, ENS Lyon) March-June 2014, co-supervised (30%) with Vincent Calvez (EPI Numed) *Anomalous subdiffusion equations as diffusion limits to integro PDEs with age structure.*
- * **Osama Khalil** (Master in Medicine, Univ. of Cairo, Egypt, now Graduate Fellow, Ohio State University, USA) - Feb-May - 2013 - *Computational systems biology of signal transduction in living cells: synaptic plasticity of striatum neurons.* EGIDE grant.
- * **Amanda Lo Van** (Master 2 IADE, Lyon, now a PhD Student, Carmen, Lyon, France) - Feb-June 2013 - *Individual-based modeling of simple genetic circuits.*
- * **Jean-Marie Gomes** (Master 2, Computer Science, ENS Lyon, now PhD student, UNIC, Gif-sur-Yvette, France) - Feb-June - 2011 - *The bidirectional response of corticostriatal synapses to 2-arachidonyl-glycerol*
- * **Jules Lallouette** (Master 2 IADE, Lyon, now PhD student with me) - Feb-June 2011 : *Transport in complex networks: the case of mixed neuron/glial cell networks.*
- * **Zayna Chaker** (Master 2 AIV, Univ. Paris 5 Descartes, now PhD student, Saint Antoine Hospital, Paris), April-July 2010 - *Protein aggregation underlying bacterial aging : Computer simulations.*
- * **Edouard Garnier de Labareyre** (Ecole polytechnique, Internship, co-supervised (50%) with O. Teman, Alchemy, INRIA Saclay, Now Systems Engineer, Safran, Paris) - April-July 2008 - *Emergence of computation and abstraction functions on biological neural networks.*
- * **Geoffrey Caron-Lormier** (Master 2, now researcher at Rothamsted Research, Harpenden, UK) - September 2001-July 2002 - Université de Cergy-Pontoise, *Biomathematics of the early steps of integrin signaling pathway: FAK and Src auto- and co-activation.*

5 Grants / Management

I list below under “Research projects”, the research projects I am supervising or have supervised, while the “Other grants” section lists research projects of which I have been a partner, but not supervisor.

- Research Projects (as supervisor)

- **Neuron-Astro-Nets**: 2013-2017, Marie-Curie International Outgoing Fellowship (IOF) grant from EU FP7.

- * This project aims at developing a new model of synaptic plasticity that takes into account astrocyte signaling, its extension to astrocytes-synapse biochemical interactions in ensembles of synapses enwrapped by the same astrocyte and, eventually, to the firing of a single neuron or networks.

- * I am coordinator of the project. Nicolas Brunel (University of Chicago, Dept Statistics and Neurobiology) is the other participant.

- * The project has funded Maurizio De Pittá’s postdoc for 4 years (June 2013- May 2017). M. De Pittá first spent one year in Beagle, Lyon funded by an EU ERCIM grant (06/2013-05/2014) then two years in N. Brunel’s group in Chicago (06/2014-05/2016) and one year back in Beagle in Lyon (06/2016-05/2017). The IOF grant funded the last three years.

- * Total amount funded: 270 k€.

- **MultiPop**: 2012-2014, an ADT funded by INRIA’s Technological Development Department D2T.

- * The objective was to develop a new software for automated quantification of bacterial cells in microscopy movies, in collaboration with INSERM U1001 and Paris 5 MAP (Applied Mathematics) Labs. The mathematical and methodological aspects at the basis of the software had already been laid out during A-S Coquel’s PhD (defended in 2012, co-supervised with A. Lindner, INSERM U1001). Our goal was assemble these algorithms into a real software that would be usable for all the experimental biology labs that try to derive single-cell data from bacteria growth microscopy movies.

- * I was supervisor of the ADT and head of the Steering Committee that coordinates the development (the steering committee also included members of the collaborating groups, INSERM U1001 and MAP5 Paris). The software was developed by one junior software engineer (full time) and one senior engineer (part time), both funded by the ADT, as well as an INSERM engineer payed by our partner INSERM U1001.

- * For more information, see Section 9 below.

- * Total amount funded : 200 k€.

- **Astrocytic regulation of neuronal network activity**: 2012-2013, a Research Networks Program of the High Council for Scientific and Technological Cooperation between France-Israel, with groups from Tel Aviv University.

- * The specific objectives of this project were to determine the properties of astrocytic calcium wave propagation and to reveal how astrocyte signals dynamically affect synaptic information transfer, thus regulating neuronal network activity. To this aim, we combined theoretical and experimental investigations of small neuron-glia networks.

- * I was coordinator of the project for the French side and supervised the modeling aspects. The coordinator for the Israeli group was Pr. Y. Hanein (Tel Aviv University Institute for Nanoscience and Nanotechnology, nano.tau.ac.il/hanein), who was responsible for the experimental parts. The other partner was Pr. E. Ben-Jacob (School of Physics and Astronomy, Tel Aviv University, tamar.tau.ac.il/~eshel/EBJG/). The project also gathered 4 PhD or Master students in Tel Aviv and Lyon.

- * Total amount funded : 160 k€.
- **ColAge**: 2008-2012, an INRIA AEN (“Action d’Envergure Nationale”) project on modeling and simulation of systems biology.
 - * We have searched for natural and engineering solutions to the control of bacterial growth and aging using both systems biology and synthetic biology approaches. Our main strategy was to leverage synergies resulting from day-to-day collaborations between computer scientists and cell biologists
 - * I have supervised the project. Other participants were INSERM U1001 Paris, LAPM Lab CNRS Grenoble, EPI Ibis Grenoble, EPI Biocore Sophia and EPI Contraintes Rocquencourt.
 - * Over the 4 years, ColAge has gathered more than 20 members (14 permanent researchers, 3 postdocs and 4 PhD students), led directly to the publications of > 25 peer-reviewed articles and was at the origin of 3 closely related research projects funded by the ANR or INRIA.
 - * website (incl. publication list): colage.saclay.inria.fr
 - * Total amount funded: 626 k€.
- **ASTICO**, 2005-2008, grant ANR-05-JCJC-0128, Apprentissage dans les SysTemes bI-ologiques COmplexes / Learning in complex biological systems, a project funded by the French National Agency for Research (ANR), Call “Jeunes Chercheurs” / Young Researchers.
 - * Our goal was to investigate how the structure complexity in complex biological neural networks conditions their functional capacities, and more specifically, their learning characteristics.
 - * I have supervised this project. Other participants were Non Linear Institute, UMR 6618 CNRS, Nice; ANIM, U742 INSERM/UPMC, Paris and ETIS, UMR 8051 CNRS, Cergy-Pontoise (total 5 permanent researchers).
 - * The project funded B. Siri’s PhD and directly led to the publications of 7 peer-reviewed articles (journals and conferences).
 - * Total amount funded: 110 k€.
- Other grants (as partner)
 - “Dallish” (Data Assimilation and Lattice LIght SHEet imaging for endocytosis/exocytosis pathway modeling in the whole cell), Call AAPG ANR 2016 (2016-2020). Supervisor: C. Kervrann (INRIA Rennes). Other participants: J. Salamero (Institute Curie, Paris) and B. Laroche (INRA, Jouy-en-Josas). Total amount funded: 440 k€.
 - “Dopaciumcity” (Dopamine modulation of calcium influx underlying synaptic plasticity): ANR-14-NEUC-0003, a 4-year project (2014-2018) funded by a grant from the ANR-NSF-NIH Call for French-US Projects in Computational Neuroscience. With L. Venance, College de France, CIRB, CNRS/UMR 7241 - INSERM U1050, Paris, France and Kim Blackwell, Krasnow Institute of Advanced Studies, George Mason University, Fairfax, VA, USA. Supervisor: L. Venance (for France) and K.L. Blackwell (for US) . Total amount funded: 880 k€.
 - “PAGDEG” (Causes and consequences of protein aggregation in cellular degeneration): grant ANR-09-PIRI-0030, a three-year project (2009-2012) funded by the French National Agency for Research (ANR), Call “PIRIBIO” - Programme interdisciplinaire de recherches sur les systèmes moléculaires et cellulaires, et d’innovation biomédicale. Supervisor: A. Lindner (INSERM, Paris) ; Other participants: Y. Chen (ENS Paris), L. Moisan (Univ. Paris 5). Total amount funded: 450 k€.

- “NeoBG” (towards a biologically realistic theory of reinforcement learning), 2011-2012, Appel Projets exploratoires pluridisciplinaires inter-instituts (PEPII) CNRS - Supervisor : B. Delord (Univ. P & M Curie, Paris). With Ph. Faure and L. Venance (College de France, Paris). Total amount funded : 24 k€.
- “RASMOT”: A one year (2010) research project funded by the call “Programme interdisciplinaire CNRS Neuro-IC : Neurosciences et neuroinformatique computationnelle”. Supervisor: E. Guigon (ISIR, CNRS, Univ. P&M Curie Paris). Total amount funded : 24 k€.
- “AMYBIA” (Aggregating Myriads of Bio-Inspired Agents); a two-year project (2008-2009) funded by an INRIA ARC (Collaborative Research Initiative). Supervisor: N. Fatès (Project-Team MAIA, INRIA Nancy-Lorraine); Other participants: B. Girau (Project-Team Cortex, INRIA Nancy-Lorraine). Total amount funded : 24 k€.
- “MACACC” (Modeling cortical activity and analysis of the cerebral code); a two-year project (2008-2009) funded by an INRIA ARC (Collaborative Research Initiative). Supervisor: B. Cessac (Institut Non-Linéaire de Nice and Project-Team Odyssee, INRIA Nice); Other participants: EPI Odyssee, INRIA Nice), Cortex, INRIA Nancy, Mediterranean Institute for Cognitive Neuroscience, Marseille, Lab. J.A. Dieudonné, Lab. Neurobiology, Univ. Nice. Total amount funded: 66 k€.

6 Prizes and awards

Conference Fellowship (1998) of the United Engineering Foundation (Mount Vernon, VA, USA) for the paper: Berry *et al.* (1998) *Annals of the New York Academy of Sciences*, **864**, 198–202. This price is awarded at each biennial “Enzyme Engineering” Conference (the biggest conference in enzyme technology) and rewards the best paper from a young scientist.

7 Teaching

Almost all my teaching dates back from my years as a PhD student in Univ Technology Compiègne (1996-1999) and an assistant professor in the University of Cergy Pontoise (1999-2004). Since my hiring at INRIA, I have been teaching approx. 10 hours per year at Master levels (at INSA Lyon and ENS Lyon). The topics of these lectures concerns diffusion and reaction in intracellular environments.

- Total: 1000 hours (eq. TD)
- Level: from L2 to M2
- Main Subjects:
 - Computer programming basics for biologists (L2)
 - Biochemistry/Metabolism (L2)
 - Enzyme kinetics (L2 & L3)
 - Biomathematics and modeling (L3)
 - Biophysics: Neutron and light scattering (M1)
 - Protein/Ligand interactions (M1)
 - Diffusion and reaction in intracellular environments (M2)

8 Dissemination of scientific knowledge

- Interview for a news of the Journal “Biotechniques” <http://www.biotechniques.com/news/Floating-in-a-Sea-biotechniques-350103.html>
- “Inria - Alan Turing aurait 100 ans : témoignage”, a 2 min interview on Turing’s 1952 paper on chemical morphogenesis (in french). www.youtube.com/watch?v=3HQH9irJZ24
- “Alan Turing : l’Ãltrange origine des formes” (short paper for A. Turing centuary), with C. Castro, on INRIA’s web site, June 2012 www.inria.fr/actualite/le-saviez-vous/alan-turing-l-etrange-origine-des-formes.
- “Du chaos dans les neurones” (chaos in neurons), with B. Cessac, *Pour La Science*, Nov. 2009, 385:108-115 (in french). Also an online article on the *interstices* web journal (interstices.info/chaosneurones).
- “Quand les bactéries se mêlent du calcul des ordinateurs...” (about bacteria and computer calculations) : a short vulgarization text plus a longer podcast on the *interstices* web journal (interstices.info/jcms/c_40644/).
- “Alchimistes de l’informatique” (computer alchemists), *La Recherche*, may 2008.
- “Why computers are like the weather”, *NewScientist*, July 2005. A comment on our paper : Berry, Graia Perez and Temam (2006) Chaos in computer performance. *CHAOS*, 16:013110.

9 Technology development : software or other realization

“FluoBacTracker” is a software for the automated analysis and quantification of the growth dynamics of individual bacterial cells. “FluoBacTracker” identifies and tracks bacterial cells and their lineages throughout microscopy movies (time lapse microscopy) and quantifies individual growth dynamics. The development was initiated as part of the INRIA-funded (ADT) project “Multipop” (see above) in 2012-2014. In 2016, the development of the software was continued by a short-track ADT (6 months) led by Hidde De Jong (INRIA, EPI Ibis) with the goal to extend the software applicability from experiments using micro-colonies to experiments using microfluidic devices.

Specificity. The specificity of FluoBacTracker lies in the fact that (*i*) bacterial cells are very small objects with current microscope magnifications (no more than 10-15 pixels in width). This imposes specific constraints on cell tracking and segmentation; (*ii*) because of the natural variability of our measurements, we need strong statistical power. This demands very large number of samples so that minimizing the number of correction steps by human / users is vital and (*iii*) all the measurements have to be put in the context of the cell lineage.

Organization. FluoBacTracker is a plugin to ImageJ (rsbweb.nih.gov/ij) co-developed by INRIA, INSERM and Univ. Paris Descartes. It is an open source (GPL-licensed) software, currently hosted by INRIAGforge (gforge.inria.fr/projects/fluoibt/) and downloadable at <http://fluobacktracker.inrialpes.fr>.

Personal contribution. I supervised the first development wave (2012-2104), heading the Steering Committee, supervising and ratifying all the design and architectural choices. I also served as a day-to-day technical support to the developers for basic questions on the biological aspects. The second development effort (2016-2017) is supervised by H. De Jong. My role is to provide support to the developer for issues related to the software architecture, its operation in the “micro-colony” mode and advice for the development of the “microfluidic” mode.

10 Publications

10.1 Articles & Conference Proceedings

Article type	# articles
Book Chapters	4
Peer-Reviewed Journals	49
Peer-Reviewed Internatl. Conferences	23
Peer-Reviewed Workshops & Abstracts	12
Patents	1

Hugues BERRY

Complete Publication List

Almost all the articles below can be downloaded at
<http://www.inrialpes.fr/Berry/PublisHB.html>

Book Chapters

- [1] Caré, B., LoVan, A., Berry, H. and Soula, H., (2015). Signalisation sous contraintes spatiales. Conséquences sur les conditions de stabilité et de bifurcation. In Glade, N. and Stephanou, A., eds., *Le vivant critique et chaotique*, volume 1, chapter 6, pages 199–222. Editions Matériologiques, Paris.
- [2] Berry, H., (2013). Modélisation de la diffusion-réaction dans les milieux intracellulaires encombrés. In Glade, N. and Stephanou, A., eds., *Le vivant discret et continu*, chapter 9, pages 241–266. Editions Matériologiques, Paris.
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Preprints / submitted

- [1] Lallouette, J., De Pittà, M. and Berry, H., (2018). Astrocyte networks and intercellular calcium propagation. *bioRxiv*. Submitted, URL <https://www.biorxiv.org/content/early/2018/01/17/248989>.

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- [1] Xu, H., Perez, S., Cornil, A., Detraux, B., Prokin, I., Cui, Y., Degos, B., Berry, H., De Kerchove Dexaerde, A. and Venance, L., October (2018). Dopamine-endocannabinoid interactions mediate spike-timing dependent potentiation in the striatum. *Nature Communications*, **9**:4118. URL <https://doi.org/10.1038/s41467-018-06409-5>.

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