

Florence BANSEPT

ECOLOGY & EVOLUTION OF HOST-ASSOCIATED MICROBIOTA

Laboratoire de Chimie Bactérienne
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ACADEMIC PATH

2023 - ...	<p>GROUP LEADER – <i>Laboratoire de Chimie Bactérienne, Marseille, France</i> Since 11/2024: Chargée de Recherche at CNRS (permanent researcher) Fellow of the Turing Center for Living Systems (CENTURI, AMU) Permanent Visitor at the Center for Theoretical Physics (CPT, AMU) Max Planck Partner Group of the Max Planck Institute for Evolutionary Biology (Plön, Germany)</p>
2019 - 2022	<p>POSTDOC - <i>Max Planck Institute for Evolutionary Biology, Plön, Germany</i> <u>Advisor:</u> Arne TRAULSEN - Department of Theoretical Biology <u>Project:</u> <i>Modeling of microbial communities</i></p>
2015 - 2018	<p>PHD THESIS - <i>Laboratoire Jean Perrin, Sorbonne Université, Paris, France</i> <u>Supervisors:</u> Raphaël VOITURIEZ & Claude LOVERDO <u>Dissertation title:</u> <i>“Biophysical modeling of bacterial population dynamics & the immune response in the gut”</i> <u>Defense date:</u> 05-12-2018 <u>Funding:</u> 3 years full fellowship (EDPIF) & teaching assistantship (UPMC) <u>Jury:</u> Aleksandra WALCZAK, DR, LPTENS Paris – president Bahram HOUCHMANDZADEH, DR, LIPHY Grenoble – reporter Agnese SEMINARA, CR, LPMC Nice – reporter Silvia DE MONTE, CR, IBENS Paris – examiner Andrea PARMEGGIANI, PR, L2C Montpellier – examiner Raphaël VOITURIEZ, DR, LJP Paris – supervisor Claude LOVERDO, CR, LJP Paris – invited member Emma WETTER-SLACK, Ass. Prof., ETH Zurich – invited member</p>
2012 - 2015	<p>ENS DIPLOMA - <i>École Normale Supérieure, Paris, France</i> Major Physics - minor Musicology</p>
2013 - 2015	<p>MASTER “Macroscopic physics and Complexity” - with honors <i>École Normale Supérieure, International Center for Fundamental Physics, Paris, France</i> 2nd year research internship (6 months) - <i>Laboratoire Jean Perrin, UPMC, Paris, France</i> <u>Supervisor:</u> Claude LOVERDO <u>Project:</u> <i>Colonization dynamics of Salmonella Typhimurium in mice</i> 1st year research internship (5 months) - <i>Institut de Physique, UFRGS, Porto Alegre, Brazil</i> <u>Supervisor:</u> Jeferson ARENZON <u>Project:</u> <i>Bootstrap percolation: Fast algorithm and applications</i></p>
2012 - 2013	<p>BACHELOR in Fundamental Physics – <i>École Normale Supérieure, Paris, France</i> Experimental internship (1 month) – <i>EC2M, Gulliver, ESPCI, Paris, France</i> <u>Supervisor:</u> Olivier DAUCHOT <u>Project:</u> <i>Vibrated self-propelled particles under flexible confinement</i></p>
2010 - 2012	<p>CLASSES PRÉPARATOIRES aux Grandes Écoles – <i>Lycée Kléber, Strasbourg, France</i> Intensive undergraduate training in mathematics and physics to join top engineering schools</p>
2010	<p>BACCALAURÉAT Série S - with first class honors – <i>Lycée Lambert, Mulhouse, France</i> A-Levels in mathematics and physics</p>

SCIENTIFIC OUTPUT

Peer reviewed publications in international scientific journals	9
<i>Nature, PLOS Comp Bio, Evolution, Trends in Microbio, ISME-J, BMC EcoEvo, eLife</i>	
Preprints and manuscripts in preparation	4
Oral presentation at an international conference	15
<i>Circle Meeting, IUPAB & EBSA, BIFI, MME, PLM, SFE2...</i>	
Poster presentation at an international conference	5
<i>StatPhys, PhysBio, AMR 2017, AMR 2018 – including 2 abroad</i>	
Seminars – including 10 invited seminars	15
Presentation at a local conference	13
Summer schools and thematic schools – including 1 as a lecturer	4

GRANTS, AWARDS & PRIZES

- 2024 - 2029 **Max Planck Partner Group** – Collaborating grant of the MPG – 100 000 €
- 2023 - 2028 **CENTURI fellowship** – Group starting package – 100 000 € + 3 PhD/postdoc positions
- 2019 **CRC 1182 Lynn Margulis Prize** – Funding for a one-month research stay – 5000 €
- 2015 - 2018 **Three-year teaching assistantship** – selected by Université Pierre et Marie Curie, Paris
- 2015 - 2018 **Three-year full PhD fellowship** – selected by École Doctorale Physique en Île-de- France
- 2014 **Alsace and Lorraine General Association (AGAL) scholarship** - 1000€

RESEARCH INTERESTS

My research interests revolve around the modeling of microbial communities, in particular those that live in associations with hosts, in ecosystems named microbiomes I am particularly interested in importing classical models of ecology and evolution to the field of microbiome studies, by including some constraints that are specific to living in symbiosis with a host. For example, I aim at characterizing the selection gradient that results from the intertwining of the microbes and their host life cycles, taking into account traits like the host finite lifespan, migration of microbes from the environment and between hosts, possible interactions with the immune system, or microbial inheritance. I am also interested in identifying the mechanisms that favor the maintenance of the microbial community diversity and function.

Keywords: mathematical modeling; microbiota; microbial communities; population dynamics; stochastic processes; ecology; evolution; selection gradient; life cycles; immunity; feeding behavior; metabolism

TEACHING

- 2021 **Teaching assistantship for master students** - *CAU zu Kiel, Germany*
Tutorials and evaluations - Evolutionary game theory for biologists
- 2019 **Teaching assistantship for master students** - *Universität zu Lübeck, Germany*
Tutorials and evaluations - Evolutionary dynamics: Game theory
- 2015 - 2018 **Teaching assistantship for undergraduates (192 h)** - *UPMC, Paris, France*
Tutorials and oral interrogations in basic mechanics and thermodynamics
Practicals in electrokinetics and electromagnetism
- 2014 - 2015 **Physics lessons** - *Institut Bossuet, Paris, France*
Monthly oral examinations in “classes préparatoires” (undergraduate level)

PEER-REVIEWED PUBLICATIONS

1. R. Zapién-Campos, F. Bansept, A. Traulsen, Stochastic models allow improved inference of microbiome interactions from time series data, [PLoS Biology](#), 2024
2. N. Obeng, A. Czerwinski, D. Schütz, J. Michels, J. Leipert, F. Bansept, M. J. García García, T. Schultheiß, M. Kemlein, J. Fuß, A. Tholey, A. Traulsen, H. Sondermann & H. Schulenburg, Bacterial c-di-GMP has a key role in establishing host–microbe symbiosis, [Nature Microbiology](#), 2023
3. D. Hoces, G. Greter, M. Arnoldini, M.L. Stäubli, C. Moresi, A. Sintsova, S. Berent, I. Kolinko, F. Bansept, A. Woller, J. Häfliger, E. Martens, W-D. Hardt, S. Sunagawa, C. Loverdo, E. Slack, Fitness advantage of *Bacteroides thetaiotomicron* capsular polysaccharide in the mouse gut depends on the resident microbiota, [eLife](#), 2023
4. R. Zapién-Campos, F. Bansept, M. Sieber, and A. Traulsen, On the effect of inheritance of microbes in commensal microbiomes, [BMC Ecol Evo](#), 2022
5. F. Bansept, N. Obeng, H. Schulenburg, and A. Traulsen, Modeling host-associating microbes under selection, [The ISME Journal](#), 2021
6. N. Obeng, F. Bansept, M. Sieber, A. Traulsen, H. Schulenburg, Evolution of microbiota-host associations: the microbe's perspective, [Trends in Microbiology](#), 2021
7. F. Bansept, L. Marrec, A-F. Bitbol and C. Loverdo, Antibody-mediated cross-linking of gut bacteria hinders the spread of antibiotic resistance, [Evolution](#), 2019 ([arXiv:1903.05723v1](#))
8. F. Bansept, K. Moor, M. Diard, W-D Hardt, E. Slack and C. Loverdo, Enchained growth and cluster dislocation: a possible mechanism for microbiota homeostasis, [PLoS Comput Biol](#), 2019
9. K. Moor, M. Diard, M. E. Sellin, B. Felmy, S. Y. Wotzka, A. Toska, E. Bakkeren, M. Arnoldini, F. Bansept, A. Dal Co, T. Völler, A. Minola, B. Fernandez-Rodriguez, G. Agatic, S. Barbieri, L. Piccoli, C. Casiraghi, D. Corti, A. Lanzavecchia, R. R. Regoes, C. Loverdo, R. Stocker, D. R. Brumley, WD Hardt, E. Slack, High-avidity IgA protects the intestine by en chaining growing bacteria, [Nature](#), 2017

PREPRINTS AND SUBMITTED MANUSCRIPTS

- V. M. Marquioni, A-C. Hofacker, J. V. Villavicencio, F. Bansept, Optimizing microbial intake helps to maintain the gut microbiome diversity, (preprint on [bioRxiv](#))
- F. J. F. Labourel, F. Bansept, D. M. McCandlish, Weakest link epistasis and the geometry of genetic load, (preprint on [bioRxiv](#))
- A. Galeev, F. Bansept, N. Benny, V. Chaves Vargas, A. Habich, A. Traulsen, D. Unterweger, Type VI secretion systems of *Pseudomonas aeruginosa* modulate infection dynamics and immune responses in *Galleria mellonella* larvae, *in revision*

MANUSCRIPTS IN PREPARATION

- F. Bansept, L. Espinosa, C. Carrère, Evolution of microbial biphasic life cycles, *in preparation*

SUPERVISION & MENTORING

POSTDOC

- 2025 - 2026 **Advising of Alessandra Lütz** - CAPES-COFECUB fellow – *Aix-Marseille University, France*
Postdoc (1 year) - An evolutionary graph theory framework for host-associated microbiomes
- 2024 - 2026 **Advising of Vitor Marquioni-Monteiro** - *Aix-Marseille University, France*
Postdoc (2 years) - Modeling microbial dynamics resulting from intermittent feeding
- 2024 - 2026 **Advising of Florian Labourel** - *Aix-Marseille University, France*
Postdoc (2 years) - Metabolism and multi-stable equilibria

PHD

- 2024 - 2027 **Co-supervision (20%) of Matthew Jones' PhD** - *LCB & Aix-Marseille University, France*
Co-supervisor: Maxence VINCENT - *Salmonella HOCl stress response & resulting population dynamics*

INTERNS

- 2026 **Supervision of Julien Vogelweid** - *AMU, France*
M2 internship (6 months) - Intermittent feeding & GLV dynamics
- 2026 **Co-supervision of Abdelli Benazzouz & Pierre Burnier** - *AMU, France*
BTS (2nd year) internship (6 weeks) - Building online applications for the group
- 2025 **Co-supervision of Sherine Touchene & Myriam Bensalem** - *AMU, France*
BTS (1st year) internship (6 weeks) - Building an html website for the group
- 2025 **Supervision of Moez Gouiaa** - *Aix-Marseille University, France*
M2 internship (6 months) - Using phages to control the gut microbiome: a mathematical model
- 2025 **Supervision of Valentine Baud** - *Aix-Marseille University, France*
M1 internship (3 months) - Metabolic fitness landscapes in fluctuating environments
- 2024 **Supervision of Dorothée Bertin** - *Aix-Marseille University, France*
M1 internship (3 months) - Biphasic life cycles with mutations
- 2024 **Supervision of Miguel Pedraza** - *Aix-Marseille University, France*
M2 internship (3 months) - tRNA genes evolution
- 2023 **Supervision of Jocksan Villaviciencio-Villavicencio** - *Aix-Marseille University, France*
M1 internship (5 months) - Modeling microbial dynamics resulting from intermittent feeding
- 2022 **Supervision of Ann-Cathrin Hofacker** - *Christian-Albrechts-Universität zu Kiel, Germany*
M1 (6 weeks) & Student helper contract (160h) financed by the program via:mento
Bibliographic project and simulations investigating the link between gut microbiota and feeding
- 2020 - 2021 **Supervision of Carla Gensana Claus** - *Christian-Albrechts-Universität zu Kiel, Germany*
Undergraduate internship, 2 months (2020) and Bachelor thesis (2021)
Epidemiological modeling around the COVID-19 pandemic in Spain
- 2020 **Co-supervision of Andonis Gerardos** - *Sorbonne Université, Paris, France*
Master internship, 4 months, co-advised with Claude Loverdo
Development of infering methods applied to the modeling of bacterial infections

THESIS COMMITTEE

- 2024 - 2027 **Thesis committee (tutor) of Marie-Jose Chaaya** - *Aix-Marseille University, France*
Supervisor: Florence HUBERT - Mathematical modeling of cancer/nervous system interactions
- 2024 - 2027 **Thesis committee (invited) of Florian Saby** - *LCB, Aix-Marseille University, France*
Supervisor: Tâm MIGNOT & Aurore LOISY - Understanding Decision-Making in *Myxococcus xanthus*

CONFERENCES & WORKSHOPS

- SEPT 18-19, 2025 **International Course on Multiscale Integration** - *Institut Curie, France* - invited talk
- SEPT 18-19, 2025 **Symposium “Systems Bio of Microbial Infections** - *Jena, Germany* - invited talk
- JULY 28-31, 2025 **Partner Groups Workshop** - *Plön, Germany* - talk
- MARCH 21, 2025 **MathBio Day** - *Marseille, France* - invited talk
- Nov 19, 2024 **IM2B Scientific Day** - *Marseille, France* - invited talk
- OCT 21-25, 2024 **Congress of the French Society for Eco & Evo** - *Lyon, France* - talk
- SEPT 16-17, 2024 **Physics of Living Matter** - *Marseille, France* - invited talk
- JULY 9-12, 2024 **Workshop “Math mod of microbial communities”** - *Leeds, UK* - invited talk
- JUNE 17-19, 2024 **Workshop “Developments in evolutionary Theory”** - *Plön, Germany* - talk
- MAY 20-24, 2024 **Conference “Stochastic Processes in Evol Bio”** - *CIRM, France* - talk
- JAN 9, 2024 **μ Net day** - *Marseille, France* - talk
- OCT 4-6, 2023 **Horizons in Metaorganism Research** - *Kiel, Germany* - talk
- MAY 11, 2023 **CENTURI day** - *Marseille, France* - talk
- APRIL 17-21, 2023 **BEvAS workshop** - *Bernouilli center, EPFL, Switzerland* - invited talk
- OCT 24-26, 2022 **CRC 1182 Retreat** - *Schleswig, Germany* - poster
- SEPT 5-7, 2022 **Workshop “Phys & chem det. of bio. evo.”** - *Plön, Germany* - invited talk
- JULY 18-20, 2022 **Mathematical Models in Ecology and Evolution** - *Reading, UK* - talk
- MARCH 21-25, 2022 **Workshop “Math. mod. in eco-evo”** - *Paris, France* - invited talk
- MARCH 10-12, 2022 **Workshop “Role of microbiomes”** - *Luzern, Switzerland* - invited talk
- Nov 8-9, 2021 **Workshop Mathématiques & Microbiote** - *Besançon, France* - invited talk
- Nov 4-5, 2021 **CRC 1182 Retreat** - *Timmendorfer Strand, Germany* - talk
- JUNE 17-18, 2021 **Aquavit - Internal symposium** - online edition - *MPI Plön, Germany* - poster
- JUNE 1-12, 2021 **Summer School: Stat Mech & Emergent Phenomena** - *Beg Rohu, France* - poster
- OCT 26, 2020 **CRC1182 Retreat** - *Online* - short talk
- JUNE 19-23, 2020 [Cancelled] **Evolution 2020 (ASN, SSE, SSB)** - *Cleveland, Ohio, USA* - talk
- JUNE 11, 2020 **Aquavit - Internal symposium** - online edition - *MPI Plön, Germany* - talk
- AUG 8-9, 2019 **Young Investigator Research Day of CRC 1182** - *Kiel, Germany* - poster
- JULY 16-19, 2019 **Mathematical Models in Ecology and Evolution** - *Lyon, France* - talk
- Nov 23, 2018 **Rencontre des Jeunes Physiciens** - *Paris, France* - talk
- MARCH 19-21, 2018 **AMR 2018** - *Institut Pasteur, Paris, France* - poster
- FEB 6-8, 2018 **BIFI: Complexity, networks & coll. behaviour** - *Zaragoza, Spain* - short talk
- JUL 24-AU 5, 2017 **Summer School: Out-of-Eq Dyn, Evo & Gen** - *Beg Rohu, France* - poster
- JULY 20-21, 2017 **AMR 2017** - *Edinburgh, UK* - poster
- JULY 16-20, 2017 **IUPAB & EBSA congress** - *Edinburgh, UK* - talk
- JUNE 19, 2017 **Journée des Doctorants 2017 - EDPIF** - *Paris, France* - poster
- MARCH 8-10, 2017 **Physical Biology Circle Meeting** - *Heidelberg, Germany* - talk
- Nov 3-9, 2016 **Course “Multiscale integration in Bio Sys”** - *Institut Curie, Paris, France* - talk
- OCT 24-26, 2016 **Physics and Biological Systems 2016** - *École Polytechnique, France* - poster
- JULY 18-22, 2016 **Statphys26** - *Lyon, France* - poster
- JAN 28-29, 2016 **Days of statistical physics** - *Paris, France* - short talk
- Nov 10, 2015 **Rencontre des Jeunes Physiciens** - *Paris, France* - poster

SEMINARS

- NOVEMBER 24, 2025 **Invited webinar for the Biophysics Brazilian Society - *online***
- JUNE 11, 2025 **Invited seminar at Centre de Recherche en Cancérologie - *Marseille, France***
- APRIL 25, 2025 **Invited seminar at Institut Denis Poisson - *Orléans, France***
- OCTOBER 1, 2024 **Invited seminar at the Institute of Ecology and Evolution - *Bern, Switzerland***
- SEPTEMBER 26, 2024 **Invited seminar at Computational Biology Dept., Pasteur - *Paris, France***
- FEBRUARY 26, 2024 **Invited seminar at MABioS (I2M) & SB (MMG) - *Marseille, France***
- JUNE 29, 2023 **Internal seminar at LCB - *Marseille, France***
- JUNE 19, 2023 **Internal seminar at CENTURI - *Marseille, France***
- APRIL 26-28, 2023 **Invited seminar at Inria/INRAE, Pléiade team - *Bordeaux, France***
- APRIL 4, 2023 **Invited seminar (SammBa) at Institut Pasteur - *Paris, France***
- JULY 8, 2022 **Invited seminar at the Leibniz Institute on Aging - *Jena, Germany***
- JUNE 2, 2022 **Invited seminar at the Turing Center for living systems - *Marseille, France***
- NOVEMBER 18, 2021 **Invited seminar at the LBBE lab - *Lyon, France***
- NOVEMBER 17, 2021 **Invited seminar at the Ecobio lab - *Rennes, France***
- SEPTEMBER 29, 2020 **CRC1182 - Metaorganism Seminar - *Online* - talk**
- APRIL 25, 2018 **Invited seminar at the MPI for Evolutionary Biology - *Plön, Germany***
- MAY 24, 2016 **LJP internal seminar - *Paris, France* - talk**
- JUNE 17, 2015 **Institute for integrative biology seminar - *ETH Zürich, Switzerland* - short talk**

LANGUAGES

- FRENCH Native
- ENGLISH Fluent
- PORTUGUESE Good understanding and expression
- GERMAN Good understanding, basic conversation

COMPUTER SKILLS

- OPERATING SYSTEMS proficient user of Mac OS X, working knowledge of Linux and Windows
- PROGRAMMING proficient user of R, working knowledge of Python and C
- SCIENTIFIC SOFTWARE proficient user of Mathematica, working knowledge of Maple, Vision Assistant, Image J, Labview, git
- TYPESETTING proficient user of L^AT_EX and Pack Office

ACADEMIC SERVICES

- OCT. 2026 **Co-organizer of the CENTURI Scientific conference - Cargèse, France**
- 2025 **Jury of the annual CENTURI PhD Call - Aix-Marseille University, France**
- DEC. 6, 2024 **Thesis Jury (examiner) of Mario Desallais - Toulouse III University, Moulis, France**
Supervisors: Jean-François ARNOLDI & Michel LOREAU
Rôle de la diversité et des interactions biotiques dans la stabilité des écosystèmes
- SINCE 2024 **Equal Opportunity Officer & Communication Team**
Laboratoire de Chimie Bactérienne, Marseille, France
- SEPTEMBER 2024 **Co-organizer of the international conference Physics of Living Matter 18**
Palais du Pharo, Marseille, France
- SEPTEMBER 2022 **Co-organizer of the workshop Mathematical Modelling of Microbiomes**
Max Planck Institute for Evolutionary Biology, Plön, Germany
- JULY 2022 **Co-organizer of a minisymposium within the MMEE conference**
“Cancer vs microbial community modeling: divides and bridges”, Reading, UK
- 2020 **Outreach project on the Corona crisis** - with the MPI Plön theory department
Collaborative creation of an educational website for the general public: writing and translation of scientific articles about the pandemic, creation of simulation activities for highschool students.
One of them has been funded by the Robert Bosch Stiftung and produced as a real board game & distributed in over 10 000 copies over more than 5 countries
- SINCE 2019 **Reviewer for Nature Com., Com. Bio, PCI Ecology, ISF grants,...**
- 2019 - 2022 **Member of the local Max Planck Sustainability Network**
Organizer of a Climate Emergency Journal Club and of related seminars
- Nov 10, 2017 **Principal organizer of the Paris Biological Physics Community Day 2017**
A conference bringing into contact young scientists from the Paris region with invited external speakers
- OCT 21, 2016 **Co-organizer of the Paris Biological Physics Community Day 2016**

FURTHER QUALIFICATIONS & CAREER DEVELOPMENT

- 2025 **Musical Studies Certificate (CEM)** - Major Opera Singing - CRR of Marseille, France
- 2020 - 2022 **Mentee at Mentoring program via:mento** - Selected by Kiel University, Germany
- 2020 - 2022 **Coaching on Professional Positioning by Ute Jüilly**
- 2019 - 2026 **Qualified for assistant professorship applications in France** (Sections 28, 29, 30, 67)
- 2018 **Musical Studies Diploma (DEM)** - Major piano - Conservatoire of Cachan, France
- 2017 **Basic first aid skills certificate (PSC1)**
- 2011 **Driving Licence (Permis B)**
- 2010 **Musical Studies Certificate (CEM)** - Major piano - Conservatoire of Mulhouse, France