

Florence BANSEPT

ECOLOGY & EVOLUTION OF HOST-ASSOCIATED MICROBIOTA

Laboratoire de Chimie Bactérienne
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Place and date of birth: Mulhouse (France), 18/03/1993

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ACADEMIC PATH

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|-------------|--|
| 2023 - ... | 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) |
| 2019 - 2022 | 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> |
| 2015 - 2018 | 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, <i>LPTENS Paris</i> – president
Bahram HOUCMANDZADEH, DR, <i>LIPHY Grenoble</i> – reporter
Agnese SEMINARA, CR, <i>LPMC Nice</i> – reporter
Silvia DE MONTE, CR, <i>IBENS Paris</i> – examiner
Andrea PARMEGGIANI, PR, <i>L2C Montpellier</i> – examiner
Raphaël VOITURIEZ, DR, <i>LJP Paris</i> – supervisor
Claude LOVERDO, CR, <i>LJP Paris</i> – invited member
Emma WETTER-SLACK, Ass. Prof., <i>ETH Zurich</i> – invited member |
| 2012 - 2015 | ENS DIPLOMA - <i>École Normale Supérieure, Paris, France</i>
Major Physics - minor Musicology |
| 2013 - 2015 | 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> |
| 2012 - 2013 | 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> |
| 2010 - 2012 | CLASSES PRÉPARATOIRES aux Grandes Écoles – <i>Lycée Kléber, Strasbourg, France</i>
Intensive undergraduate training in mathematics and physics to join top engineering schools |
| 2010 | BACCALAURÉAT Série S - with first class honors – <i>Lycée Lambert, Mulhouse, France</i>
A-Levels in mathematics and physics |

SCIENTIFIC OUTPUT

Peer reviewed publications in international scientific journals <i>Nature, PLOS Comp Bio, Evolution, Trends in Microbio, ISME-J, BMC EcoEvo, eLife</i>	9
Preprints and manuscripts in preparation	4
Oral presentation at an international conference <i>Circle Meeting, IUPAB & EBSA, BIFI, MMEE, PLM, SFE2...</i>	15
Poster presentation at an international conference <i>StatPhys, PhysBio, AMR 2017, AMR 2018</i> – including 2 abroad	5
Seminars – including 10 invited seminars	15
Presentation at a local conference	12
Summer schools and thematic schools	3

GRANTS, AWARDS & PRIZES

- 2024 - 2029 **Max Planck Partner Group** – Collaborating grant of the MPG – 100 000 €
- 2023 - 2028 **CENTURI fellowship** – Group starting package – 150 000 € + 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 thetaiotaomicron* 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 enchainning growing bacteria, [Nature](#), 2017

PREPRINTS AND SUBMITTED MANUSCRIPTS

- 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 *Gal-leria mellonella* larvae, *in revision*

MANUSCRIPTS IN PREPARATION

- [F. Bansept](#), L. Espinosa, C. Carrère, Evolution of microbial biphasic life cycles, *in preparation*
- Y. W. Ngan, [F. Bansept](#), M. Pedraza, A. Traulsen, J. Gallie, The effect of plastic mutations on evolutionary trajectories, *in preparation*
- V. Marquioni Monteiro, J. Villavicencio Villavicencio, A-C. Hofacker, [F. Bansept](#), How does intermittent feeding shape the gut microbiome?, *in preparation*

SUPERVISION & MENTORING

POSTDOC

- 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 HOC1 stress response & resulting population dynamics

INTERNS

- 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 inferring 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*

SEMINARS

- 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 (Sammaba) 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

CONFERENCES & WORKSHOPS

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

ACADEMIC SERVICES

- 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**

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

FURTHER QUALIFICATIONS & CAREER DEVELOPMENT

- 2020 - 2022 **Mentee at Mentoring program via:mento** - *Selected by Kiel University, Germany*
- 2020 - 2022 **Coaching on Professional Positioning by Ute Jülly**
- 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*