Florian E. C. Blanc, PhD

CNRS Research Scientist in computational molecular biophysics

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Research interests

Protein dynamics, molecular machines & motors, integrative MD simulations, free energy calculations, machine learning, statistical mechanics

Current position

CNRS Research Scientist — *Villeurbanne (Lyon), France*

Biophysics of Complex Systems team - Institut des Sciences Analytiques — Since October 2024

Permanent independent position.

Research experience

Post-doctoral researcher — *Villeurbanne (Lyon), France*

Biophysics of Complex Systems team - Institut des Sciences Analytiques — September 2023 - September 2024

Integrative molecular modelling of bacterial silver-resistance proteins
Advisors: Olivier Walker, Maggy Hologne

Post-doctoral researcher — *Frankfurt am Main, Germany*

Department of Theoretical Biophysics - Max-Planck Institute of Biophysics — May 2019 - August 2023

Computational study of ATPase molecular machines
Advisor: Gerhard Hummer

Post-doctoral researcher — *Strasbourg, France*

Molecular Function and Design team - Université de Strasbourg — October 2018 - March 2019

Computational investigations of functional transitions in biological and artificial molecular machines
Advisor: Marco Cecchini

PhD candidate — *Strasbourg and Paris, France*

Molecular Function and Design team - Université de Strasbourg; Structural Motility team - Institut Curie — September 2014 - September 2018

Exploring chemo-mechanical transduction in the myosin molecular motor through computer simulations
Advisors: Marco Cecchini, Anne Houdusse

Collective responsabilities

Elected Post-doc representative — *Frankfurt-am-Main, Germany*
Max Planck Institute of Biophysics — November 2020 - August 2023

Education

PhD in Theoretical and Computational Chemistry — *Strasbourg and Paris, France*
Institut de Sciences et d'Ingénierie Supramoléculaires / Université de Strasbourg / Institut Curie — September 2014 - September 2018
Highest rating ("exceptional") on all evaluation criteria.

MSc in Bioinformatics — *Paris, France*
Université Paris-Diderot — September 2013 - June 2014
With high honours.

École Normale Supérieure Diploma in Biology (major) and Physics (minor) — *Paris, France*
École Normale Supérieure (ENS) — September 2010 - June 2014

Admission to ENS - Biology Department
Nationwide competitive entrance evaluation - rank: 1. Admitted to ENS with the status of paid civil servant (élève-normalien). — July 2010

Classes Préparatoires BCPST — *Marseille, France*
Preparatory classes for nationwide competitive admission exams to French "Grandes Écoles" - 2-year intensive training in biology, chemistry, physics, Earth sciences and mathematics — September 2008 - June 2010

Baccalauréat Scientifique — *Toulon, France*
French High-School diploma, scientific specialization — June 2008
With highest honours.

Skills

Communication	Oral and written scientific communication
Languages	French (native), English (fluent), German (A1.2)
Programming	Python/SciPy, bash, Fortran 90 (basic knowledge), Tcl (basic knowledge)
Molecular Simulations	Molecular Dynamics, free energy calculations, enhanced sampling, quantum chemistry
Machine Learning	Generative deep learning, dimensionality reduction, clustering

Teaching duties

Qualification Universitaire (2020-2028) in Sections 31 (Theoretical, Physical, Analytical Chemistry) and 64 (Biochemistry, Molecular Biology)

Computational Drug Design

Frankfurt-am-Main, Germany

Frankfurt University

2020-2021 Winter semester

Prepared and gave a 12 hour lecture series on **Advanced Simulation Methods for Drug Design**
Invited a guest lecturer from the private sector
Supervised and graded practicals and student presentations

Temporary teacher (physical and computational chemistry)

Strasbourg, France

Université de Strasbourg

September & November 2017

Taught a 1-week tutorial class on **Mathematical Methods for Chemistry** to first-year physical chemistry undergraduates
Gave a 2-hour **Statistical Mechanics** lecture in the Chemoinformatics Master program
Supervised a 4-hour lab session on **Normal Mode Analysis** in the Chemoinformatics Master program

Temporary teacher (bioinformatics)

Noisy le Grand, France

Institut Supérieur des Biosciences

December 2014 & December 2015

Supervised a 8-hour lab session on **Biomedical Signal Acquisition and Processing**

Volunteer mentor for high-school students

Paris, France

TalENS (ENS student association for high-school student mentoring)

September 2010 - June 2014

Mentored and taught scientific concepts to high-school students
Designed transdisciplinary scientific classes

Publications

Mechanism of Ag^+-Induced Folding of a Bacterial Peptide from Replica-Exchange Molecular Simulations.
Blanc, F. E. C.*; Hologne, M.; Demontrond, M.; Chermette, H.; Walker, O.* (* corresponding authors)
ChemRxiv April 18, 2025.
https://doi.org/10.26434/chemrxiv-2025-pfwmz-v2

Metadynamics Simulations for Rational Ligand Design in the Reversible Inhibition of Human Peroxiredoxin 5.
Troussicot, L.; Blanc, F. E. C.; Pascal, Y.; Vidal, S.; Lancelin, J.-M.; Guillière, F.
bioRxiv April 27, 2025, p 2025.04.25.650576.
https://doi.org/10.1101/2025.04.25.650576

A weak coupling mechanism for the early steps of the recovery stroke of myosin VI: A free energy simulation and string method analysis
Florian E.C. Blanc*, Anne Houdusse, Marco Cecchini* (* corresponding authors)
PLOS Computational Biology, 2024
https://dx.plos.org/10.1371/journal.pcbi.1012005

Mechanism of proton-powered c-ring rotation in a mitochondrial ATP synthase
Florian E.C. Blanc, Gerhard Hummer
PNAS, 2024
https://www.pnas.org/doi/10.1073/pnas.2314199121

Molecular mechanisms of inorganic-phosphate release from the core and barbed end of actin filaments
W. Oosterheert*, F. E. C. Blanc*, A. Roy, A. Belyy, M. Boiero Sanders, O. Hofnagel, G. Hummer, P. Bieling, and S. Raunser. (* equal contribution)
Nature Structural and Molecular Biology, 2023
https://doi.org/10.1038/s41594-023-01101-9

Antibody accessibility determines location of spike surface mutations in SARS-CoV-2 variants
von Bülow, S., Sikora, M., Blanc, F.E.C., Covino, R., Hummer, G.
PLOS Computational Biology, 2023.
https://doi.org/10.1371/journal.pcbi.1010822

Computational epitope map of SARS-CoV-2 spike protein
Sikora, M.*, von Bülow, S.*, Blanc, F.E.C.*, Gecht, M.*, Covino, R.*, Hummer, G. (* equal contribution)
PLOS Computational Biology, 2021
https://doi.org/10.1371/journal.pcbi.1008790

An Asymmetric Mechanism in a Symmetric Molecular Machine
Florian Blanc, Marco Cecchini
***Journal of Physical Chemistry Letters*, 2021**
https://doi.org/10.1021/acs.jpclett.1c00404

***In situ* structural analysis of SARS-CoV-2 spike reveals flexibility mediated by three hinges**
Turoňová, B., Sikora, M., Schürmann, C., Hagen, W.J.H., Welsch, S., Blanc, F.E.C., von Bülow, S., Gecht, M., Bagola, K., Hörner, C., van Zandbergen, G., Landry, J., Trevisan Doimo de Azevedo N., Mosalaganti, S., Schwarz, A., Covino, R., Mühlebach, M.D., Hummer, G., Locker, J.K., Beck, M.
***Science*, 2020**
https://doi.org/10.1126/science.abd5223

An intermediate along the recovery stroke of Myosin VI revealed by X-ray crystallography and molecular dynamics
Florian Blanc, Tatiana Isabet, Hannah Benisty, H. Lee Sweeney, Marco Cecchini, Anne Houdusse
PNAS, 2018
https://doi.org/10.1073/pnas.1711512115

The myosin X motor is optimized for movement on actin bundles
Virginie Ropars*, Zhaohui Yang*, Tatiana Isabet*, Florian Blanc, Kaifeng Zhou, Tianming Lin, Xiaoyan Liu, Pascale Hissier, Frédéric Samazan, Béatrice Amigues, Eric D. Yang, Hyokeun Park, Olena Pylypenko, Marco Cecchini, Charles Sindelar, H. Lee Sweeney and Anne Houdusse
Nature Communications, 2016
https://doi.org/10.1038/ncomms12456

Myosin MyTH4-FERM structures highlight important principles of convergent evolution

Vicente José Planelles-Herrero, Florian Blanc, Serena Sirigu, Helena Sirkia, Jeffrey Clause, Yannick Sourigues, Daniel O. Johnsrud, Béatrice Amigues, Marco Cecchini, Susan P. Gilbert, Anne Houdusse, and Margaret A. Titus

PNAS, 2016

https://doi.org/10.1073/pnas.1600736113

Communications

Invited seminars

Revealing complex biomolecular processes with enhanced sampling Molecular Dynamics simulations
Laboratoire de Chimie de l'ENS Lyon, invited by Natacha Gillet, July 1st, 2025

Exploring the functional mechanisms of biomolecular machines with atomically-detailed simulations
École Normale Supérieure de Lyon, invited by Riccardo Pellarin, November 2023

Exploring the function of molecular machines with simulations
Institut des Sciences Analytiques, invited by Olivier Walker, November 2021

Oral communications

Mechanism of Ag^+-induced folding of a bacterial peptide from molecular dynamics simulations and deep dimensionality reduction
Machine Learning in Chemistry and Physics (MLCP2025) meeting, Lyon, France, June 2025

Mechanism and energetics of proton-powered c-ring rotation in mitochondrial ATP synthase
Congrès du Groupe de Graphisme et Modélisation Moléculaires (GGMM), Lille, France, September 2021

Poster presentations

Mechanism of Ag^+-induced folding of a bacterial peptide from molecular dynamics simulations
Blanc, F. E. C.; Hologne, M.; Demontrond, M.; Chermette, H.; Walker, O.
Congrès du GGMM, Forges-les-Eaux, France, 2025

Mechanism of Ag^+-induced folding of a bacterial peptide from molecular dynamics simulations
Blanc, F. E. C.; Hologne, M.; Demontrond, M.; Chermette, H.; Walker, O.
ML4NGP (Machine Learning for Non Globular Proteins) meeting, Vilnius, Lithuania, 2025

A novel intermediate along the recovery stroke of Myosin VI revealed by X-ray crystallography and molecular dynamics
Florian Blanc, Tatiana Isabet, Hannah Benisty, H. Lee Sweeney, Marco Cecchini, Anne Houdusse
Congrès du Groupe de Graphisme et Modélisation Moléculaires (GGMM), Reims, France, 2017

A novel intermediate along the recovery stroke of Myosin VI revealed by X-ray crystallography and molecular dynamics
Florian Blanc, Tatiana Isabet, Hannah Benisty, H. Lee Sweeney, Marco Cecchini, Anne Houdusse
EMBO Meeting, Mannheim, Germany, 2016