Thomas Dupic

PhD

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Research Experience

2020-present	**Post-doctoral researcher**, *Desai Lab (Harvard, USA), with Michael Desai*, Antibodies Evolution, Experimental and computational study of the affinity maturation landscape.
2018-2020	**Post-doctoral researcher**, *LPENS (ENS, France), in the group of Aleksandra Walczak and Thierry Mora*, structure and generation of the immune repertoire, relationship and interactions between the two polymer chains composing the T-cell receptor.
2015-2018	**Doctoral student**, *LPTHE (UPMC, France) supervised by Yacine Ikhlef and Benoît Estienne*, loop models and conformal field theories, study of a particular class of two-dimensional polymer models at criticality, entanglement entropy in critical non-unitary systems.
2015	**Internship at the LPTHE (UPMC)**, *with B. Estienne and Y. Ikhlef.*
2014	**Internship at the LPS (ENS), ABCD group**, *with J-F. Allemand*, Optical microscopy, tracking of a magnetic bead through diffraction patterns, Building of an optical setup .
2013	**Internship at the disordered system group in King's College London**, *with I.P. Castillo*, Eigenvalues of product of random matrices ; behaviour of vicious brownian walkers.
2012	**Internship at the laboratory Kastler Brossel**, *non-destructive quantum measurement : photons and atoms in cavity with M.Brune and P. Rouchon.*

Education

2013	**Master ICFP, Theoretical Physics**.
2012	**Master ICFP**.
2011	**Bachelors of Science in Mathematics and in Physics**.
2010-2014	**École normale supérieure (ENS, Paris)**.
2009-2010	**Classe Préparatoire (Nantes)**.
2009	**A-levels with First Class Honors**.

Area of expertise

Scientific

Immunology	**Immune repertoire, transcriptomics, antibody and T-cell receptor specificity**.
Evolutionary biology	**Population genetics, fitness landscapes, viral evolution**.
Physics	**Statistical physics, mathematical physics**.

Methods

Molecular biology	**Flow-cytometry, Sequencing, single-cell methods incl. scRNA-seq, transformations, cloning**.
Protein fabrication	**Recombinant protein, Column chromatography, Western Blot**.
Cell culture	**Bacteria, Yeasts, Mammalian cell line**.
Programming	**Python, C++, Rust, R**, *Data analysis, statistics, optimization (LP, MIP), version control . . .*.

Teaching Experience

2015-2018	**UPMC**, *Teaching assistant (theoretical and practical), electromagnetism and optics* .
2013	**Lycée Henri IV**, *Oral examiner in classe préparatoire.*

Oral communications

July 2023	**EMBO Predicting evolution**, *The evolution of the Omicron SARS-CoV-2 variant*, Heidelberg, Germany.
April 2023	**Biological sequence variation**, *The evolution of the Omicron SARS-CoV-2 variant*, Cargèse, France.
September 2022	**ENS seminar**, *The evolution of the Omicron SARS-CoV-2 variant*, Paris, France.
April 2021	**CSHL virtual conference on Systems Immunology**, *Immune fingerprints*, Online.
September 2020	**Harvard Physics Research Scholar Retreat**, *Immune fingerprints*, Online.
March 2020	**Statistics of the T-cell repertoire**, *QBio Fellow at Harvard's NSF-Simons Center*, Online.
August 2019	**qBio**, *Genesis of the α-β T-cell receptor*, San Francisco, US.
April 2019	**Tumors and immune system, from theory to therapy**, *Genesis of the α-β T-cell receptor*, Cargèse, France.

August 2018	**International Physics of living systems**, *Genesis of the α-β T-cell receptor*, Houston, US.
June 2016	**ICFT 2016 (UK Meeting on Integrable and Conformal Field Theory)**, *Relation between fully packed loop models and $\mathcal{W}_3$*.
October 2016	**Workshop on exactly solvable models**, *The fully packed loop model on the honeycomb lattice*, Nancy, France.

Publications

2023 Moulana, Alief, Thomas Dupic, Angela Phillips, et al. (2023). "Genotype-Phenotype Landscapes for Immune-Pathogen Coevolution". In: *Trends in immunology* 44.5.

Moulana, Alief, Thomas Dupic, Angela M Phillips, et al. (2023). "The Landscape of Antibody Binding Affinity in SARS-CoV-2 Omicron BA.1 Evolution". In: *eLife* 12. Ed. by Jos W van der Meer, e83442.

Phillips, Angela M, Daniel P Maurer, et al. (2023). "Hierarchical Sequence-Affinity Landscapes Shape the Evolution of Breadth in an Anti-Influenza Receptor Binding Site Antibody". In: *eLife* 12. Ed. by Tomohiro Kurosaki and Betty Diamond, e83628.

2022 Moulana, Alief, Thomas Dupic, Angela M. Phillips, et al. (2022). "Compensatory Epistasis Maintains ACE2 Affinity in SARS-CoV-2 Omicron BA.1". In: *Nature Communications* 13.1, p. 7011.

Spisak, Natanael et al. (2022). *Combining Mutation and Recombination Statistics to Infer Clonal Families in Antibody Repertoires*.

2021 Dupic, Thomas, Meriem Bensouda Koraichi, et al. (2021). "Immune Fingerprinting through Repertoire Similarity". In: *PLoS genetics* 17.1, e1009301.

Phillips, Angela M, Katherine R Lawrence, et al. (2021). "Binding Affinity Landscapes Constrain the Evolution of Broadly Neutralizing Anti-Influenza Antibodies". In: *eLife* 10. Ed. by Sarel Jacob Fleishman et al., e71393.

2020 Sethna, Zachary et al. (2020). "Population Variability in the Generation and Selection of T-cell Repertoires". In: *PLoS computational biology* 16.12, e1008394.

2019 Dupic, T., B. Estienne, and Y. Ikhlef (2019a). "The Imaginary Toda Field Theory". In: *Journal of Physics A: Mathematical and Theoretical* 52.10, p. 105201.

Dupic, T., B. Estienne, and Y. Ikhlef (2019b). "Three-Point Functions in the Fully Packed Loop Model on the Honeycomb Lattice". In: *Journal of Physics A: Mathematical and Theoretical* 52.20, p. 205003.

Dupic, Thomas, Quentin Marcou, et al. (2019). "Genesis of the $\alpha\beta$ T-cell Receptor". In: *PLOS Computational Biology* 15.3, e1006874.

2018   Dupic, Thomas, Benoit Estienne, and Yacine Ikhlef (2018). "Entanglement Entropies of Minimal Models from Null-Vectors". In: *SciPost Physics* 4.6, p. 031.

2016   Dupic, Thomas, Benoît Estienne, and Yacine Ikhlef (2016). "The Fully Packed Loop Model as a Non-Rational W3 Conformal Field Theory". In: *Journal of Physics A: Mathematical and Theoretical* 49.

2014   Castillo, Isaac Pérez and Thomas Dupic (2014). "Reunion Probabilities of N One-Dimensional Random Walkers with Mixed Boundary Conditions". In: *Journal of Statistical Physics* 156.3, pp. 606–616.