# Thomas Dupic

*PhD*

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## Research Experience

**2020-present**   **Post-doctoral student**, *Desai Lab (Harvard, USA), with Michael Desai*, Antibodies Evolution, Experimental and computational study of the affinity maturation landscape.

**2018-2020**   **Post-doctoral student**, *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

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

### Methods

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| 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

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

## Oral communications

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| 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 $\alpha$-$\beta$ T-cell receptor*, San Francisco, US. |
| April 2019 | **Tumors and immune system, from theory to therapy**, *Genesis of the $\alpha$-$\beta$ T-cell receptor*, Cargèse, France. |

| August 2018 | **International Physics of living systems**, *Genesis of the $\alpha$-$\beta$ 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.