

# Elia Mascolo

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## Research interests

Evolution of biological information, transcriptional regulatory systems, gene networks, mobile genetic elements.

## Academic position

### Postdoctoral researcher

ISTA, Austria Nov 2025 - present  
Mentor: Gašper Tkačik  
Topic: Evolution of transcriptional regulatory codes.

## Education

### PhD in Computational and Theoretical Biology

UMBC, Baltimore, USA 2025

### MS in Molecular Biology of the Cell

UniMi, Milan, Italy 2020

### BS in Biological Sciences

UniMi, Milan, Italy 2018

## Research experience

- **PhD research** in the Erill Lab (UMBC) Jun 2021 – Jul 2025  
Topic: Evolution of transcriptional regulatory systems
- Internship in the Lobo Lab (UMBC) Mar 2021 – May 2021  
Topic: Prediction of phenotype-specific gene networks
- Internship in the Kann Lab (UMBC) Jan 2021 – Mar 2021  
Topic: Characterization of cancer mutations based on changes in protein stability
- Internship in the Erill Lab (UMBC) Aug 2020 – Dec 2021  
Topic: Development of a composite motif discovery algorithm
- **MS thesis research** in the Brilli Lab (UniMi) Sep 2018 – Apr 2020  
Topic: Prediction of global gene regulatory networks in Bacteria

## Skills

<b>Mathematical skills</b>	Information theory, Bayesian statistics, statistical mechanics, dynamical systems
<b>Computational skills</b>	Algorithm design, evolutionary computation, parallel computing (MPI), evolutionary simulations, version control (Git, GitHub)
<b>Programming languages</b>	Python, Bash, R, C, Matlab, L <sup>A</sup> T <sub>E</sub> X
<b>Spoken languages</b>	English (fluent), Italian (native)

## Publications

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\*co-first authors

### Pre-prints or in preparation

- Emmael Mekasha\*, **Elia Mascolo\***, Ivan Erill. "Mutational Robustness and Evolvability of Encoding Strategies for Transcription Factor Binding Motifs." [*manuscript in preparation*] (Emmanuel Mekasha is an undergraduate student I co-supervised)
- **Elia Mascolo**, and Ivan Erill. "Information Theory of Composite Sequence Motifs: Mutational and Biophysical Determinants of Complex Molecular Recognition." *bioRxiv*, (November 15, 2024). <https://doi.org/10.1101/2024.11.11.623117>. [pre-print]

### Peer-reviewed journal articles

- Tagide deCarvalho\*, **Elia Mascolo\***, Steven M Caruso, Júlia López-Pérez, Kathleen Weston-Hafer, Christopher Shaffer, and Ivan Erill. "Simultaneous Entry as an Adaptation to Virulence in a Novel Satellite-Helper System Infecting *Streptomyces* Species." *The ISME Journal* 17, no. 12 (December 1, 2023): 2381–88. <https://doi.org/10.1038/s41396-023-01548-0>.
- **Elia Mascolo\***, Satish Adhikari\*, Steven M. Caruso, Tagide deCarvalho, Anna Folch Salvador, Joan Serra-Sagristà, Ry Young, Ivan Erill, and Patrick D. Curtis. "The Transcriptional Regulator CtrA Controls Gene Expression in Alphaproteobacteria Phages: Evidence for a Lytic Deferment Pathway." *Frontiers in Microbiology* 13 (August 19, 2022): 918015. <https://doi.org/10.3389/fmicb.2022.918015>.

### Book chapter

- Antonio Frandi, Francesco Pini, Wanassa Beroual, Andrea Bianchetti, Alice Chiodi, **Elia Mascolo**, Lorenzo Miano, Greta Petazzoni, Emanuele G. Biondi, and Matteo Brilli. "Toward a Comparative Systems Biology of the Alphaproteobacterial Cell Cycle." In *Cell Cycle Regulation and Development in Alphaproteobacteria*, edited by Emanuele Biondi, 1–27. Cham: Springer International Publishing, 2022. [https://doi.org/10.1007/978-3-030-90621-4\\_1](https://doi.org/10.1007/978-3-030-90621-4_1).

## Teaching experience

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### General and Molecular Genetics (BIOL302 - UMBC)

*Spring 2022, Fall 2023, Spring 2024*

> 200 students. Designed weekly homework, held weekly office hours, proctored exams.

### Ecology and Evolution (BIOL142 - UMBC)

*Fall 2021*

> 100 students. Prepared and led weekly discussions sections, held weekly office hours, graded and reviewed exams.

### Advanced Genomics and Epigenomics (PoliMi-UniMi)

*Fall 2022*

Designed, together with Dr. Matteo Brilli, a workshop in R for the class "Advanced Genomics and Epigenomics", delivered by the joint PoliMi-UniMi Master's degree "Bioinformatics for Computational Genomics".

### Guest lectures

Guest lecture "Motif matching and motif discovery" for the course Introduction to Bioinformatics and Computational Biology (BIOL 313 - UMBC) *Spring 2022, Spring 2023, Spring 2024*

Guest lectures for **high school** students: "Introduction to biology", "The logic of transcription and translation", "Cells and viruses", "Introduction to Genetics" *2022 - 2023*

## Mentoring and supervising

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### Mentoring and supervising research (UMBC)

*May 2022 – 2025*

Mentored 4 undergraduate researchers and 2 graduate (MS thesis) students conducting research in the Erill Lab.

## Conference presentations

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- Talk at EvoKE 2025: Elia Mascolo and Yseult Héjja-Brichard.  
"Replicards: teaching evolution with a card game". Nov 6-8, 2025 - Athens, Greece
- Poster presentation at ISMB 2024 (Intelligent Systems for Molecular Biology)  
Elia Mascolo and Ivan Erill. "Molecular Information Theory of Composite Sequence Motifs". *F1000Research* (2024). <https://doi.org/10.7490/f1000research.1120047.1> Jul 12-16, 2024 – Montréal, Canada
- Talk in the main track of the 2022 Molecular Genetics of Bacteria and Phages Meeting  
"Phage Gene Regulation by CtrA: Evidence for a Lytic Deferment Pathway in Alphaproteobacteria phages". Aug 1-5, 2022 - Madison, Wisconsin

## Other academic presentations

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- Seminar at the Institute of Science and Technology (ISTA)  
"Evolution of Information in Transcriptional Regulatory Systems" Feb 12, 2025
- Seminar for the course "Advanced genomics and epigenomics" (PoliMi-UniMi)  
"Evolution of Information in Transcriptional Regulatory Systems" Dec 11, 2024
- Seminar at the Department of Biological Sciences (UMBC)  
"Evolution of Transcriptional Regulatory Systems in Prokaryotes" Oct 16, 2024
- Presentation at the Research Seminar in Molecular Biology (BIOL770 - UMBC)  
"Overlapping Codes on Nucleotide Sequences" May 6, 2022
- Presentation at the Follenzi Lab (UPO)  
"Designing a synthetic enhancer specific for LSEC cells" Jul 2, 2021

## Grants and fellowships

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### Research funding

- 2025-2029: "Apart-USA" fellowship awarded by AAS and ISTA
- 2024-2025: Merck-CNMS academic fellowship program at UMBC
- 2022-2023: Merck-CNMS academic fellowship program at UMBC

### Grants and awards

- 2024: Travel grant from UMBC Graduate Student Association to attend the *Intelligent Systems for Molecular Biology* conference in Montréal, Canada.
- 2024: *Best poster award* at the Graduate Association of Biological Sciences (GABS) Symposium 2024
- 2023: *Best poster award* at the Graduate Association of Biological Sciences (GABS) Symposium 2023
- 2022: Travel grant from UMBC Graduate Student Association to attend the *Molecular Genetics of Bacteria and Phages Meeting* in Madison, Wisconsin.

## Professional memberships

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EvoKE (Evolutionary Knowledge for Everyone)  
ISCB (International Society for Computational Biology)

## Science communication

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- Invited talk for high school students at *Melzo Incontra la Scienza* (Melzo meets Science) "Evolution of Mutation Rates" *Melzo, Italy*  
*Jan 22, 2025*
- Invited talk for Euresis association "*Good at evolving – The Evolution of Mutation Rates*" *Rimini, Italy*  
*Aug 20, 2024*
- Invited talk at Balticon "Stranger Things of the Microcosmos" *Baltimore, USA*  
*May 26, 2024*
- Invited talk "Viruses may have eyes and ears on us" at QuantumPhotonics Club podcast *Oct 29, 2022*
- Online presentations for the general public (local cultural associations) during the lockdown in Italy to explain how COVID-19 vaccines work and how they are developed (> 100 attendees). *Jan 2021*

## Other classes attended

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- At the Mathematics Department at UniMi: *Algebra 1, Geometry 1, Methods and Models for the applications (an introduction to dynamical systems), Biomathematics*.
- At the Computer Science Department at UniMi: *Bioinformatics, Principles and Models of Perception*.

## Other education

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I worked as a jazz piano player in small groups as well as in an orchestra. I participated in the summer workshops of the *Siena Jazz Academy*, earning a scholarship in 2013 as "Best piano student".