

# Ioanna Garefalaki

## Curriculum Vitae

Evolutionary Biology Division  
Ludwig-Maximilians-Universität München  
☎ (+49) 1771386419, (+30) 6931735782  
✉ igarefalaki1390@gmail.com  
🌐 Webpage  
🐙 GitHub   in LinkedIn   🎵 Bluesky

## Research Interests

Studied biology and learned how to code to make sense of it. I investigate how (epi)genetic variation arises, is regulated, and shapes the phenotypic traits that make life forms so remarkable.

## Education

- 2023–present **PhD, Avian Epigenetics & Quantitative Genetics**, *Evolutionary Biology Division*, Ludwig-Maximilians-Universität Munich, Germany, International Max Planck Research School for Biological Intelligence.
- 2017 – 2019 **MSc, Molecular Biology & Plant Biotechnology**, *Faculty of Biology*, University of Crete, Heraklion, Greece.
- 2013 – 2017 **BSc, Biology**, *Biology Department*, University of Patras, Patra, Greece.
- 2009 – 2013 **BSc, Biomedical Science (Technological Education)**, *Biomedical Laboratories department*, University of West Attica, Athens, Greece.

## Publications

### Peer-Reviewed Journal Articles

- 2026 **Garefalaki, I.**, Mueller, S., Metzler, D., et al. "Technical Considerations in DNA Methylation Studies in Natural Populations." *In preparation for submission*.
- 2026 **Garefalaki, I.**, Wolf, J. B. W., et al. "Investigating the Impact of Epigenetic Variation on Evolution in Wild *Cyanistes caeruleus* Pedigrees." *In preparation*.
- 2026 Trougakos, I., ... **Garefalaki, I.**, ... Terpos, E. "Integrated Transcriptomic and Proteomic Signatures of the BNT162b2 mRNA Vaccine in Human Blood." *Manuscript in resubmission*.
- 2021 Vasilariou, M., Alachiotis, N., **Garefalaki, I.**, Beloukas, A., & Pavlidis, P. "Population Genomics Insights into the First Wave of COVID-19." *Life*, 11(2), 129. doi: 10.3390/life11020129.

### In Conference Proceedings

- 2026 **Garefalaki, I.**, Mueller, S., et al. "A statistical framework for DNA methylation repeatability in natural populations." *Annual Meeting of the Society for Molecular Biology & Evolution (SMBE)*, Copenhagen, Denmark. (Oral Presentation)
- 2026 **Garefalaki, I.**, Mueller, S., et al. "Technical repeatability of DNA methylation in two wild avian species." *Evolutionary Genetics Community Conference (EvoGenMunich)*, Munich, Germany. (Oral Presentation)
- 2025 **Garefalaki, I.**, Mueller, S., et al. "Investigating the Impact of Epigenetic Variation on Evolution in Wild *Cyanistes caeruleus* Pedigrees." *16th Int. Congress on the Zoogeography and Ecology of Greece and Adjacent Regions (ICZEGAR)*, Athens, Greece. (Poster)
- 2019 **Garefalaki, I.** & Pavlidis, P. "Evolutionary Forces in the Genomic Neighborhoods of Polymorphic Transposable Elements in Plant Populations." *12th FORTH Scientific Retreat*, Patras, Greece. (Poster)

- 2018 **Garefalaki, I.**, Chorba, K., & Mitsainas, G. P. "The Traits of Contact Zones between Different Chromosomal Races of *Mus musculus domesticus* in Two Robertsonian Systems of Greece." *6th Int. Conference of Rodent Biology and Management*, Potsdam, Germany. (Poster)

## Research Experience

Ludwig Maximilian University Munich (LMU), Germany

Advisor **Prof. Jochen B. W. Wolf**, Chair of Evolutionary Biology; Max Planck Fellow, MPI for Biological Intelligence

2026 – Present **Quantitative Genetic Modeling of Epigenetic Heritability.**

Implementing Linear Mixed Models (LMMs) to estimate 5mC heritability within a large-scale natural pedigree of 1200+ individuals. Validating model performance against morphological benchmarks and investigating heritable variation within CpG islands.

2023 – 2026 **Methodological Optimization for Wild Population Epigenomics.**

Developed a robust statistical framework to assess CpG site repeatability and technical noise in RRBS/EM-seq datasets from natural populations using 372 technical replicates.

2023 – 2025 **Strategic Coordination & Bioinformatic Optimization of EM-seq Data.**

Led the technical and financial strategy for a **€130k+ sequencing project** involving 1,288 libraries.

- **Project Management:** Performed independent read-depth modeling to achieve 30x target coverage; evaluated cost-coverage trade-offs across NovaSeq 6000 and NovaSeq X platforms to optimize DFG-funded resource allocation.

University of Thessaly, Greece

Advisor **Prof. Artemis G. Hatzigeorgiou**, Department of Informatics and Telecommunication

2022 **Deep Learning Evaluation for microRNA Target Prediction.**

Developed standardized bioinformatics pipelines for comparison of *microT-CNN* against state-of-the-art target prediction tools to evaluate MRE counts and miRNA interactions accuracy.

BSRC "Alexander Fleming", Greece

Advisor **Dr. Christoforos Nikolaou**, Computational Genomics Group

2021 – 2022 **Multi-omic Profiling of Post-Vaccination Immune Responses.**

Executed differential expression and multivariate analysis on high-dimensional whole-blood proteomic and transcriptomic datasets. Investigated protein correlation structures and pathway enrichment across healthy, elderly, and Multiple Myeloma cohorts to identify cohort-specific immune signatures.

Foundation for Research and Technology Hellas (FORTH), Greece

2018 – 2019 **Evolutionary Dynamics of Transposable Elements (TEs) in Plants.**

Developed an open-source pipeline to detect putative adaptive signals and selective sweeps in genomic regions flanking polymorphic TE insertions in *Oryza sativa*.

**Advisor:** Prof. Pavlos Pavlidis, Bioinformatics and Population Genomics Group

2018 **Functional Characterization of Xylella Virulence Factors.**

Utilized molecular cloning and transient expression assays to investigate pathogenic effectors within plant–pathogen interaction systems.

**Advisor:** Prof. Panagiotis Sarris, IMBB, Microbial Pathogenicity Laboratory

2018 **Phylogenetic Analysis of Plant NLR Proteins.**

Comparative evolutionary analysis of nucleotide-binding leucine-rich repeat immune receptors in plants.

**Advisor:** Prof. Pavlos Pavlidis, Bioinformatics and Population Genomics Group

2018 **CRISPR/Cas9 Screening.**

Performed molecular validation of DCL knock-out lines in *N. benthamiana* and conducted comparative evolutionary analysis of plant immune receptors.

**Advisor:** Prof. K. Kalantidis, Molecular Plant Biology Laboratory

University of Patras, Greece

Advisor **Dr. George P. Mitsainas**, Laboratory of Cytogenetics

2016 – 2017 **Chromosomal Diversity in *Mus musculus domesticus*.**

Analyzed hybrid zones between Robertsonian races and acrocentric populations; documented complex chromosomal variation through karyotype analysis.

## Fellowships & Awards

2020 **2nd Award** for best presentation at the 8Th Panhellenic Meeting of AIDS and Hepatitis 2020 “Population Genomics Insights into the First Wave of COVID-19”.

## Academic Achievements & Recognitions

2023 Selected for the **International Max Planck Research School – Biological Intelligence (IMPRS-BI)**, a competitive doctoral program of Max Planck Institute.

2013 Admitted to the Department of Biology, University of Patras, through national competitive transfer examinations (*Katataktiries Exetaseis*) with an **Excellent** grade.

## Computational & Bioinformatics Skills

Programming R (*tidyverse*, *data.table*), Python, Bash/Shell,  $\LaTeX$ ; Git-based version control and automated reporting.

NGS & Epigenomics End-to-end processing for RRBS, EM-seq and WGS; methylation calling, CpG filtering, and DMR detection; coverage/missingness evaluation and batch effect mitigation.

Advanced Statistics Linear Mixed Models (LMM/GLMM), quantitative genetics, and heritability estimation; high-dimensional data analysis and variance partitioning.

Workflow & HPC Pipeline orchestration using **Nextflow** (nf-core/methylseq); large-scale job scheduling via **SLURM** (job arrays) in HPC environments (LRZ, DSS).

Evolutionary Genomics Scalable variant/SNP calling pipelines; reference-guided scaffolding; phylogenetics; population genomics workflows and genome-wide data management.

Experimental Design Power analysis for sequencing depth; cost-effective resequencing strategies; budget-constrained experimental planning and parameter benchmarking.

Method Development Custom repeatability metrics; locus reliability modeling; integration of genomic predictors; cross-platform data harmonization.

Data Management NCBI/SRA archival workflows; Aspera-based high-speed uploads; metadata curation and public repository management.

## Molecular & Laboratory Skills

Molecular Techniques PCR, gel electrophoresis, nucleic acid extraction and cloning, bacterial transformation, agroinfiltration, CRISPR screening, cytogenetic karyotyping (G/C banding).

## Teaching & Mentoring

2023–2025 **Graduate Teaching Assistant**, *Ludwig Maximilian University (LMU)*, Munich.

Assisted the “*Computational Biology with Python*” course. Led practical sessions on Python-based data analysis and managed course logistics via Moodle.

2020 **Guest Lecturer**, *University of West Attica*, Athens.

Delivered an invited lecture on *SARS-CoV-2 Genomics and Pathogenesis* for the undergraduate Virology curriculum.

2019 **Graduate Teaching Assistant**, *University of Crete*, Heraklion.

Instructional support for *BIO251: Functional Analysis of Biological Macromolecules* and *BIO208: Cellular and Genetic Analysis*. Demonstrated laboratory techniques and evaluated student performance in molecular assays.

- 2022–2023 **Lead Biology Instructor**, “*Thalis*” Tutoring Center, Athens.  
Developed and delivered comprehensive biology curricula for senior secondary students; focused on preparing candidates for national-level examinations.
- 2014–2015 **Volunteer Science Tutor**, *Municipality of Patras*, Patras.  
Provided biology and general science instruction at the Community Evening School, supporting adult learners and students from underprivileged backgrounds.
- Languages Greek (native), English (C2), Spanish (B2), German (B1).

---

## Referees

### **Prof. Jochen B. W. Wolf**

*Chair of Evolutionary Biology*

Division of Evolutionary Biology

Ludwig Maximilian University Munich (LMU)

✉ jochen.wolf@biologie.uni-muenchen.de

Personal webpage

### **Dr. Sarah Mueller**

*Postdoctoral Researcher*

Division of Evolutionary Biology

Ludwig Maximilian University Munich (LMU)

☎ +49 89 2180 74106

✉ s.mueller@biologie.uni-muenchen.de

### **Prof. Pavlos Pavlidis**

*Professor of Bioinformatics and Population Genomics*

University of Crete

✉ pavlidis@ics.forth.gr

Personal webpage