Csenge Petak

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LinkedIn Profile

Education

- **University of Vermont** — **Burlington, VT, USA**
  Ph.D. in Biology, Current GPA: 4.0 — *Aug 2019 -*

  My research explores adaptation to variable environments using a wide range of approaches including population genomics, in vivo functional validation of mutations, and computational modeling.

- **Vermont Complex Systems Center** — **Burlington, VT, USA**
  Complex Systems and Data Science Certificate, GPA: 4.0 — *Aug 2020 - Dec 2021*

  This program focuses on computational and theoretical techniques for describing and understanding complex natural and sociotechnical systems.

- **University of Southampton** — **Southampton, UK**
  B.Sc. in Biology, First-Class Honours, Dean's List — *Sept 2016 - July 2019*

  Undergraduate degree with special focus on evolutionary, molecular and microbiology. Dissertation topic: the effect of antibiotics on aquatic microbial community structure.

Research experience

- **The Sainsbury Laboratory Cambridge University (SLCU)** — **Cambridge, UK**
  Modeling the evolution of phyllotaxis — *May 2023 - July 2023*

  Investigated the effect of environmental variability on the ability to evolve patterns in a computational model of phyllotaxis. This internship was funded by the Quantitative Evolutionary STEM Training program at the University of Vermont.

- **Wellcome Trust Biomedical Vacation Scholarship** — **Southampton, UK**
  Comparing biofilm formation-defective mutant strains — *June 2018 - Sept 2018*

  This scholarship allowed me to examine the role of alginate in the attachment of *Pseudomonas aeruginosa*, and subsequent biofilm formation, on urinary catheters.

- **Centre for Biological Sciences, University of Southampton** — **Southampton, UK**
  Speciation through hybridisation — *June 2017 - July 2017*

  Investigated homoploid hybrid speciation in *Argyranthemum* as a volunteer research assistant in an Evolutionary Genomics and Transcriptomics lab.

Notable Projects

- **Identifying loci involved heat and drought adaptation in UTRs of Red spruce**

  Utilised various bioinformatic tools to find SNPs under putative selection in 3' and 5' untranslated regions of *Picea rubens* transcriptomics data.

  Collaborators: Baxter Worthing, Kerria Burns

- **Computational simulation of balanced polymorphism**

  R simulation of a population of individuals with diploid chromosomes experiencing seasonally fluctuating selection.

  Collaborators: Thomas O'Leary, Alison Hall

- **Programming artificial agents to explore mutation rate dynamics**
  Python simulation of a population of food-seeking agents on a toroidal lattice. Mutation rate is under selection in an randomly changing environment.
  Collaborators: Lapo Frati, Dr. Richard A. Watson

Peer–Reviewed Journal Articles

- Petak, C., Frati, L., Brennan, R. S., and Pespeni, M. H. (2023). Whole-Genome Sequencing Reveals That Regulatory and Low Pleiotropy Variants Underlie Local Adaptation to Environmental Variability in Purple Sea Urchins. The American Naturalist, 202(4), 571–586.
- Petak, C., Frati, L., Pespeni, M. H., and Cheney, N. (2023). Coping with seasons: evolutionary dynamics of gene networks in a changing environment. Proceedings of the Companion Conference on Genetic and Evolutionary Computation, 163–166.
- Bunford, N., Csibra, B., Peták, C., Ferdinandy, B., Miklósi, Á., and Gácsi, M. (2019). Associations among behavioral inhibition and owner-rated attention, hyperactivity/impulsivity, and personality in the domestic dog (*Canis familiaris*). *Journal of comparative psychology*, 133(2), 233.

In prep publications

- Petak, C., Sgouros, T., Frati, L., Raynes, Y., Bravo, I., Weinreich, D. (2024). Modifier Theory: A unified population genetic framework for the evolution of developmental and reproductive noise.
- Petak, C., Frati, L., Vroomans, R., Pespeni, M., Cheney, N. (2024). Patterns of GRN Evolution: Exploring Evolvability in the Space of Developmental Trajectories Generated by 1-D Cellular Automata Rules.

Reports and Other Publications

- Petak, C. (2021). Comparing different implementations of the classical gene regulatory network evolutionary model: the start of an exploration. *Evolutionary Computation 2021, University of Vermont*. PDF
- Petak, C. (2021). The evolution of gene regulatory networks in variable environments. *Principles of Complex Systems 2020, University of Vermont*. PDF
- Petak, C. (2020). Signatures of adaptation to environmental variability in the protein-protein interaction network. *Data Science 2020, University of Vermont*. PDF

Fellowships and Awards

- University of Vermont Graduate College Conference Grant Program and Biology Department Chair's Award (2024) $900
- CS Fair 3rd place (2023)
- Dr. Roberto Fabri Fialho Research Award (2022) $1,850
- Graduate Student Senate Most Innovative Research Award (2021)
- John Wheeler Graduate Student Research and Development Award (2021) $1,600
- National Science Foundation (NSF) Research Traineeship Fellow, Quantitative and Evolutionary STEM Training (QuEST) Program (2019 -)

- University of Southampton Faculty Merit Award (2018)

Technical skills

- **Microbiology techniques**: preparation of laboratory media and equipment, inoculation of agar plates and broths, serial dilution, heat-shock transformation
- **Microscopy**: familiar with fluorescent staining, usage of episcopic differential interference contrast and laser scanning confocal microscope
- **Molecular biology techniques**: DNA extraction, primer design, PCR amplification and purification of product, gel electrophoresis, creation of specific gene mutant strains, molecular cloning, microinjection of live egg cells
- **Computational**: Python, R, C++, Jupyter, LaTeX, Bash

Conferences

- **The Allied Genetics Conference (TAGC)**
  Poster, Presenter *2024*
  Title: Non-heritable yet evolvable: increased developmental noise can be selected for despite average negative effect
- **Society for Molecular Biology and Evolution (SMBE)**
  Poster *2023*
  Title: The evolution of biological noise
- **The Genetic and Evolutionary Computation Conference (GECCO)**
  Poster, Presenter *2023*
  Title: Coping with seasons: evolutionary dynamics of gene networks in a changing environment
- **Developmental Biology of Sea Urchins and other Marine Invertebrates XXVI**
  Virtual Poster, Presenter *2022*
  Title: Whole-genome sequencing shows the role of gene regulation in local adaptation to environmental variability in purple sea urchins
- **SSE, SSB, ASN joint Evolution Conference**
  Virtual talk, Presenter *2021*
  Title: Local adaptation to environmental variability through the evolution of gene regulation in a heterogeneous seascape
- **University of Vermont Student Research Conference**
  Poster, Presenter *2021, 2022, 2023, 2024*
- **Evolutionary Systems Biology**
  Attended *2020, 2022*
- **University of Southampton Natural History Society Symposium**
  Invited speaker *2018*
  Title: Programming artificial agents to explore the evolution of evolvability

Teaching experience

- **Teaching Assistant for Data Science I** **Burlington, VT**
  Course code level: Graduate *Spring 2023 and 2024*
- **Teaching Assistant for Introduction to Programming** **Burlington, VT**
  Course code level: Graduate *Spring 2023 and 2024*
- **Teaching Assistant for Ecological Genomics** **Burlington, VT**
  Course code level: Graduate *Fall 2023*

- **Teaching Assistant for Evolutionary Computation** — **Burlington, VT**
  Course code level: Graduate — *Fall 2022*
- **Teaching Assistant for Modeling Complex Systems** — **Burlington, VT**
  Course code level: Graduate — *Fall 2022*
- **Program support advisor** — **Burlington, VT**
  Thermofly 2022 Summer Undergraduate Research Experience — *Summer 2022*
- **Teaching Assistant for Genetics** — **Burlington, VT**
  Course code level: 100 — *Spring 2020 and 2022*
- **Teaching Assistant for Ecology and Evolution** — **Burlington, VT**
  Course code level: 100 — *Fall 2019 and 2021*

Extra-curricular activities

- **Active member** QuEST Evolutionary Genomics Interest Group Network
- **Demonstrator** at the Southampton Science and Engineering Day - evolutionary biology/fossils booth
- **Member** of the following societies: Society for the Study of Evolution (SSE), Society for Molecular Biology and Evolution (SMBE), EchinoClub, Genetics Society of America
- **Co-Graduate Student Representative** of the Biology Department at the University of Vermont 2021-22 AY
- Rock climbing, hiking, geocaching

References

Name: Dr. Melissa Pespeni
Position: Associate Professor
Institution: University of Vermont
Email Address: Melissa.Pespeni@uvm.edu
Reference Description: PhD advisor since 2019

Name: Dr. Daniel Weinreich
Position: Professor
Institution: Brown University
Email Address: Daniel_Weinreich@brown.edu
Reference Description: PhD committee member and collaborator since 2019