

A TOP-END COURSE IN HUMAN GENETICS IN HELSINKI SOON! APPLICATIONS OPEN!

LOGICAL REASONING IN HUMAN GENETICS 2019

WHEN: August 12-16, 2019.

WHERE: University of Helsinki, Biomedicum 1, Helsinki, Finland.

WHY: This course is designed to examine the conceptual, empirical, and theoretical approaches to understanding the complex cause and effect relationships underlying human variation. Despite a century of quantitative research on evolutionary biology and genetics, our hypotheses about the phenogenetic (genotype + environment + culture -> phenotype) relationships underlying human variation seem poorly focused and often based on unnecessarily naïve models. In this course we will review the basics of evolutionary biology, genetic epidemiology, gene mapping, and how to integrate these three disciplines to address questions of causality in human genetics.

It is hoped that through this course, students will develop critical thinking and logical reasoning skills to try and learn from what negative experimental results tell us about the architecture of disease and to question the assumptions underlying their experimental approaches to develop better study designs based on better hypotheses for future studies. The reason experiments are said to "fail" is usually because the question was poorly posed or the hypotheses being tested were incompletely thought out and justified, not because of technical or analytical errors. In fact, the results have been a major success in showing that the causal landscape is more complex than had been widely expected, but is in fact consistent with biological and evolutionary theory.

TO WHOM: The course is meant primarily for graduate students and post-docs interested and/or working in human genetics, but applies also to evolutionary and experimental genetics of wild or model species as well. More senior scientists are welcome, however, in the case there are too many applicants, the priority will be given to below-PI level people.

FACULTY:



Joseph D. Terwilliger, PhD, Professor of Neurobiology (in Psychiatry, in Genetics and Development, and in the in the Sergievsky Center), Columbia University, New York, USA and National Institute for Health and Welfare, Finland. <https://www.genetics.cumc.columbia.edu/profile/joseph-terwilliger-phd>



Kenneth Weiss, PhD, Evan Pugh Professor Emeritus of Anthropology and Genetics, Department of Anthropology, Penn State University, USA. <https://bio.psu.edu/directory/kmw4> (**NOTE: LECTURES VIA VIDEOLINK**)



Ryan Hernandez, PhD, Associate Professor in the Department of Human Genetics at McGill University, Montreal, Canada. <https://www.mcgill.ca/qls/researchers/ryan-hernandez>



Markus Perola, MD, PhD, Research Professor, Genomics and Biomarkers Unit, National Institute for Health and Welfare (THL)



Tero Hiekkalinna, PhD, Research Scientist, Genomics and Biomarkers Unit, National Institute for Health and Welfare (THL)

HOW: Registration is open through HERE: <https://courses.helsinki.fi/en/klto-137/129236470> **HOW MUCH:** The course is FREE. However participants have to cover their own travel and accommodation costs and meals. **QUESTIONS:** Prof Markus Perola, e-mail markus.perola at thl.fi, phone +358408612557 (applications accepted only via the website above).

AGENDA

Monday 12th of August: Philosophical and Evolutionary Background

- Introductions
 - Welcome
 - Faculty Introductions
 - Student introductions
- What is 'logical' about this course or about science?
- Big science, Omics
- Introductions to basic concepts
- Discussion: how do today's topics apply to *your* interests?

Tuesday 13th of August: Population Genetics and Evolution

- How reliable are our criteria for determining causation?
- Doubt: Scientific inference in a probabilistic world
- Evolution and the Darwinian method: Why should traits be 'genetic'?
- Genetic epidemiology of simple traits?
- Phenogenetics and the consequences of evolution by phenotype
- Human variation and evolution
- Discussion: how do today's topics apply to *your* interests?

Wednesday 14th of August: Simulations

- Computing environment
- Population genetics and evolution computer exercises
- Discussion: how do today's topics apply to *your* interests?

Thursday 15th of August: Epidemiology, Phenogenetics and Mapping

- Evolution revisited – phenogenetic traits and how they got here
- Detectance, mapping, study design, linkage and LD analysis of complex traits
- Dichotomous traits – linkage analysis
- Quantitative traits – linkage analysis
- Dichotomous traits – LD analysis and joint linkage/LD analysis
- Quantitative traits – LD analysis and joint linkage/LD analysis
- Discussion: how do today's topics apply to *your* interests?

Friday 16th of August: Examples and discussion – study design and analysis issues

- Sample applications of these programs to research problems and questions

- Controlled experiments and what they tell us
- Natural Experiments in human genetics – a better alternative to GWAS
- Real-world results from different approaches with an eye to the future
- Some thoughts on approaching complex problems
- Strange issues, violating ‘common sense’, and what they may mean
- Summary overview: our understanding of ‘truth’
- Questions and Discussion

We end course around 2-3pm.