

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY
2025-2026

INSTITUT PASTEUR COURSE - EDUCATION CENTER

Program 2025-2026
Human population genomics
and genetic epidemiology

Institut Pasteur, Paris, September 22 - October 3, 2025
Aurélie Cobat & Lluis Quintana - Murci

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This two-week presents theoretical lectures, research examples and hands-on computer training on concepts and tools used in population genomics and genetic epidemiology.

First week - topics include

- Principles in genetic epidemiology and statistical genetics
- Public databases in human genomics (1,000 Genomes, ExAC, gnomAD)
- Genetic epidemiology: linkage analyses and association studies
- Genome-wide association studies (GWAS)
- Whole exome and whole genome sequencing
- Computer laboratory work in genetic epidemiology
- Research examples

Second week - topics include:

- Principles in population genetics
- Population structure and human demography
- Methods to detect natural selection
- Genome-wide analyses of natural selection and research examples
- Quantitative genetics and expression quantitative trait loci (eQTL) mapping
- Computer laboratory work in population genetics
- Lectures from keynote speakers

Co-directors

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FIRST WEEK

WEDNESDAY, SEPTEMBER 17		PRE-START OF THE COURSE
11:30 – 12:15	Pre start meeting	Administrative department
MONDAY, SEPTEMBER 22		HUMAN GENOME DIVERSITY
9:00 – 9:30	Welcome	Administrative Department
9:30 – 10:30	General Introduction	Aurélié COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes) Lluís QUINTANA-MURCI (Institut Pasteur)
10:45 – 12:00	A survival kit to Genetic Epidemiology	Aurélié COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
12:10 – 12:15	PHOTO	
13:30 – 15:15	Human genome diversity and public databases	Maxime ROTIVAL (Institut Pasteur)
15:30 – 17:00	A survival kit to bioinformatics	Guillaume LAVAL (Institut Pasteur)
TUESDAY, SEPTEMBER 23		GENOTYPE-BASED ANALYSES: LINKAGE ANALYSIS
9:00 – 10:30	Linkage analyses: principles and methods	Sophie GARNIER (Sorbonne Université, Paris)
10:45 – 12:15	Linkage analyses: principles and methods	Sophie GARNIER (Sorbonne Université, Paris)
13:30 – 15:00	Linkage analyses: examples	Sophie GARNIER (Sorbonne Université, Paris)
15:30 – 17:00	Linkage analyses: examples	Sophie GARNIER (Sorbonne Université, Paris)
WEDNESDAY, SEPTEMBER 24		GENOTYPE-BASED ANALYSES: ASSOCIATION STUDIES
9:15 – 10:45	Linkage disequilibrium: principles and methods	Jérémy MANRY (IRD, Servier, Paris-Saclay)
11:00 – 12:30	Linkage disequilibrium: hands-on computer	Jérémy MANRY (IRD, Servier, Paris-Saclay)
13:30 – 15:00	Association studies: principles and methods	Sophie GARNIER (Sorbonne Université, Paris)
15:30 – 17:00	Association studies: examples	Sophie GARNIER

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY

2025-2026

THURSDAY, SEPTEMBER 25

GENOTYPE-BASED ANALYSES: ASSOCIATION STUDIES II

9:00 – 10:30	Genome-wide association studies: principles and methods (Paris Centre de Recherche Cardiovasculaire (PARCC) - INSERM - Université Paris Cité)	Takiy BERRANDOU
10:45 – 12:15	Genome-wide association studies: main steps and procedures (Paris Centre de Recherche Cardiovasculaire (PARCC) - INSERM - Université Paris Cité)	Takiy BERRANDOU
13:30 – 15:00	Genome-wide association studies: hands-on computer I (Paris Centre de Recherche Cardiovasculaire (PARCC) - INSERM - Université Paris Cité)	Takiy BERRANDOU
15:30 – 17:00	Genome-wide association studies: hands-on computer II (Paris Centre de Recherche Cardiovasculaire (PARCC) - INSERM - Université Paris Cité)	Takiy BERRANDOU

FRIDAY, SEPTEMBER 26

SEQUENCE-BASED ANALYSIS: WHOLE EXOME/GENOME STUDIES

9:00 – 10:30	Genetic risk predictions	Hugues ASCHARD (Institut Pasteur)
10:45 – 12:15	Rare variants association studies : principles and methods (Institut IMAGINE, INSERM-Univ. Paris-Descartes)	Clément CONIL
13:30 – 15:00	Rare variants association studies : hands-on computer (Institut IMAGINE, INSERM-Univ. Paris-Descartes)	Clément CONIL
15:30 – 17:00	Incomplete penetrance	Aris MOURELATOS (Rockefeller University)

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY 2025-2026

SECOND WEEK

MONDAY, SEPTEMBER 29 POPULATION GENETICS, EVOLUTION AND HUMAN DEMOGRAPHY

9:00 – 9:30	Population genetics, evolution and demography: an overview	Etienne PATIN (Institut Pasteur)
9:45 – 12:15	Principles in population genetics	Paul VERDU (MNHN, Paris)
13:30 – 15:00	Population structure and human demography I	Guillaume LAVAL (Institut Pasteur)
15:30 – 17:00	Population structure and human demography II	Guillaume LAVAL (Institut Pasteur)

TUESDAY, SEPTEMBER 30 NATURAL SELECTION AND GENETIC ADAPTATION

9:00 – 10:00	Research examples of natural selection: why and how	Lluís QUINTANA-MURCI (Institut Pasteur)
10:15 – 12:15	Natural selection: principles and methods	Etienne PATIN (Institut Pasteur)
13:30 – 17:00	Natural selection: hands-on computer	Etienne PATIN (Institut Pasteur)

WEDNESDAY, OCTOBER 1 GENOME-WIDE SCANS FOR SELECTION (GSS)

9:00 – 10:30	Basics in genome-wide statistics for selection detection	Guillaume LAVAL (Institut Pasteur)
10:45 – 12:15	Genome-wide scans for selection: principles and hands-on computer I	Guillaume LAVAL Etienne PATIN (Institut Pasteur)
13:30 – 15:45	Genome-wide scans for selection: principles and hands-on computer II	Guillaume LAVAL Etienne PATIN (Institut Pasteur)
16:00 – 17:00	Genomic insights into population history and selection: the paleogenetics approach	Oguzhan PARASAYAN (Institut Pasteur)

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY

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THURSDAY, OCTOBER 2

THE GENETICS OF GENE EXPRESSION AND BEYOND

9:00 – 10:30	Genetics of gene expression: principles, methods and eQTLs	Maxime ROTIVAL (Institut Pasteur)
10:45 – 12:15	Gene expression and immune response: research examples	Maxime ROTIVAL Yann AQUINO (Institut Pasteur)
13:30 – 15:45	Genetics of gene expression: hand-on computer I	Maxime ROTIVAL Yann AQUINO (Institut Pasteur)
16:00 – 17:00	Genetics of gene expression: hand-on computer II	Maxime ROTIVAL Yann AQUINO (Institut Pasteur)

FRIDAY, OCTOBER 3

KEYNOTE LECTURES

Both lectures will take place at Auditorium François Jacob

10:00 – 11:00	Modelling haplotype mosaics in French cohorts for imputing missing genotypes and association analyses (Génétique, Génomique fonctionnelle et Biotechnologies, INSERM UMR 1078, Univ. Bretagne Occidentale)	Anthony HERZIG
11:00 – 12:00	Paleogenomic insights into human demography (Archaeo- and Palaeogenetics group, Institute for Archaeological Sciences, Tübingen University, Germany)	Cosimo POSTH
14:00 – 17:00	Written examination (<i>Room 5 of the Teaching Centre</i>) Duration 3 hours - Grade out of 20	
17:00 – 17:15	Evaluation of the course	Administrative department