

Pasteur course

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY



PROGRAM
2019-2020

PASTEUR COURSE

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY

September 30-October 11, 2019

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
- DNA methylation
- Computer laboratory work in population genetics
- Lectures from keynote speakers

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY 2019-2020

Co-directors

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INSTITUT PASTEUR

Education Center

28 rue du Docteur Roux 75 015 Paris

Room 4 – September 30 to October 10, 2019
Amphithéâtre F. JACOB – Keynote lectures October 11, 2019

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FIRST WEEK

MONDAY, SEPTEMBER 30

HUMAN GENOME DIVERSITY

9:00-10:30	Welcome	Register office
	General Introduction	Aurélié COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes) and Lluís QUINTANA-MURCI (Institut Pasteur, Paris)
10:45-12:00	Human genome diversity and public databases	Lluís QUINTANA-MURCI (Institut Pasteur)
12:00	Group picture	
13:30-15:15	A survival kit to Genetic Epidemiology	Aurélié COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
15:30-17:00	A survival kit to bioinformatics	Guillaume LAVAL (Institut Pasteur)

TUESDAY, OCTOBER 1

GENOTYPE-BASED ANALYSES: LINKAGE ANALYSIS

9:00-10:30	Research in Genetic Epidemiology: Why, When, Who, How	Alexandre ALCAIS (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
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: hands-on computer	Sophie GARNIER (Sorbonne Université, Paris)

WEDNESDAY, OCTOBER 2

GENOTYPE-BASED ANALYSES: ASSOCIATION STUDIES

9:00-10:30	Linkage disequilibrium: principles and methods	Etienne PATIN (Institut Pasteur)
10:45-12:15	Linkage disequilibrium: hands-on computer	Jeremy MANRY (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
13:30-15:00	Association studies: principles and methods	Sophie GARNIER (Sorbonne Université, Paris)
15:30-17:00	Association studies: hands-on computer	Sophie GARNIER (Sorbonne Université, Paris)

THURSDAY, OCTOBER 3**GENOTYPE-BASED ANALYSES: ASSOCIATION STUDIES II**

9:00-10:30	Genome-wide association studies: principles and methods	Etienne PATIN (Institut Pasteur)
10:45-12:15	Genome-wide association studies: hands-on computer	Aurélie COBAT and Jeremy MANRY (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
13:30-15:00	Genome-wide association studies: hands-on computer II	Aurélie COBAT and Jeremy MANRY (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
15:30-17:00	Genome-wide association studies: hands-on computer III	Aurélie COBAT and Jeremy MANRY (Institut IMAGINE, INSERM-Univ. Paris-Descartes)

FRIDAY, OCTOBER 4**SEQUENCE-BASED ANALYSIS: WHOLE EXOME/GENOME STUDIES**

9:30-10:45	A survival kit to Whole exome/genome sequencing	Aurélie COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
11:00-12:30	Rare variants association studies : principles and methods	Aurélien COBAT (Institut IMAGINE, INSERM-Univ. Paris-Descartes)
13:45-15:15	Research example: the case of tuberculosis	Laurent ABEL (Institut IMAGINE, INSERM-Univ. Paris-Descartes)

HUMAN POPULATION GENOMICS AND GENETIC EPIDEMIOLOGY 2019-2020

SECOND WEEK

MONDAY, OCTOBER 7

POPULATION GENETICS, EVOLUTION AND HUMAN DEMOGRAPHY

9:00-9:30	Population genetics, evolution and demography: an overview	Lluís QUINTANA-MURCI (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, OCTOBER 8

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) and Jeremy MANRY (Institut IMAGINE, INSERM-Univ. Paris-Descartes)

WEDNESDAY, OCTOBER 9

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 and Etienne PATIN (Institut Pasteur)
13:30-15:45	Genome-wide scans for selection: principles and hands-on computer I	Guillaume LAVAL and Etienne PATIN (Institut Pasteur)
16:00-17:00	The adaptive nature of admixture: research example	Sebastian CUADROS (Institut Pasteur)

THURSDAY, OCTOBER 10**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 and Mary O'NEILL (Institut Pasteur)
13:30-15:45	Genetics of gene expression: hand-on computer I	Maxime ROTIVAL and Mary O'NEILL (Institut Pasteur)
16:00-17:00	Genetics of gene expression: hand-on computer II	Maxime ROTIVAL and Mary O'NEILL (Institut Pasteur)

FRIDAY, OCTOBER 11**KEYNOTE LECTURES**

9:00-10:00	VISIT OF PASTEUR MUSEUM	
<i>Both lectures will take place at amphitheatre François Jacob (ground floor)</i>		
10:00-11:00	Ancient genomes inform on early human history	Mattias JAKOBSSON (Uppsala University, Uppsala, Sweden)
11:00-12:00	Genetic overlap between leprosy reactions and immune mediated diseases	Vinicius MEDEIROS FAVA (McGill University, Montreal, Canada)
14:30-17:30	Written examination (<i>Room 4 of the Teaching Centre</i>) Duration 3 hours - Grade out of 20	

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