

FOS: Bio-informatics; Computational Biology of Complex disease and Ageing 2013 BW 4/5

**Organized by LUMC Departments of Molecular Epidemiology, Medical Statistics
and Bio-informatics and Center for Human and Clinical Genetics**

Location and Participation

Location: LUMC, Building 1

Participation: Questions of participating students to mail to [I.C.M.ten Hoorn@lumc.nl](mailto:I.C.M.ten_Hoorn@lumc.nl) so we can have mail contact.

Focus of the course:

The student will be taken into a natural sequence of issues that are met in different disciplines of genetic/genomic research. Introduction into genomics of complex disease: which research questions are of importance in different disease fields, what common designs are applied in genetic and gene expression studies, how and why are large datasets of genetic, gene expression and phenotypic data collected, what do the datatypes look like, how are such datasets managed, which bioinformatic tools are used for pattern recognition in the data, to match results with existing biological information, to form new hypotheses.

Literature and documents for study assignments will be handed out during the course.

Coordinators

Ingrid Meulenbelt, Molecular Epidemiology; 071-526 9734, i.meulenbelt@lumc.nl

Peter Bram 't Hoen Department of Human Genetics 071-526 9421 p.a.c.hoen@lumc.nl

Location

Leiden University Medical Center, Albinusdreef 2, 2333 ZA Leiden: room J1-82 at the main building. For the practicals, computers in J1-82 will be used.

Storing valuables

Store valuables, especially during breaks, in one of the lockers available for library users, located on the left of the library entrance.

Evaluation

For individual evaluation of students, the module coordinators of the first 2 weeks will judge the following:

- participation in the (paper) discussions
- answers to the questions in the practicals

The module coordinators of the third week will judge the following

- Written project proposal
- Oral project defense

Overall the evaluation will be a score between 0-10 composed of a weighted average of the different modules.

WEEK 1**Monday June 3 (Location J1-82/building 1, LUMC)**

when	What Basic genetic tools linkage/association	who	where
9.00-10.00	Lecture: Short Introduction to Genetic studies designs	Eline Slagboom	J1-82
10.00-10.15	Coffee break		
10.15-11.00	Lecture: Linkage analysis	Ingrid Meulenbelt	
11.15-12.00	Hands on: pedigrees and inheritance patterns	Ingrid Meulenbelt	
12.00-13.00	Lunch		
13.00-13.30	Lecture: Association analyses	Ingrid Meulenbelt	
13.30-15.00	Practical: Association analyses candidate genes	Ingrid Meulenbelt	
15.00-15.15	Tea break		
15.15-15.30	Lecture: Linkage disequilibrium, Haplotypes, hapmap	Ingrid Meulenbelt	
15.30-17.00	Practical linkage disequilibrium, Haplotypes, hapmap	Ingrid Meulenbelt	

Tuesday June 4 (Location J1-82/building 1, LUMC)

when	What Genome wide association	who	where
9.00-10.00	Lecture and practical: Genome wide association	Joris Deelen Marian Beekman	J1-82
10.00-10.15	Coffee break		
10.15-12.00	Continue lecture & practical Genome wide association	Joris Deelen Marian Beekman	
12.00-13.00	Lunch		
13.00-15.00	Lecture and Practical; Genome wide association	Joris Deelen Marian Beekman	
15.00-15.15	Tea break		
15.30-17.00	Continue lecture and practical; Genome wide association	Joris Deelen Marian Beekman	

Wednesday June 5 (Location J1-82/building 1, LUMC)

when	What Epigenetics	who	where
9:00-10.00	Lecture Introduction to epigenetics	Bas Heijmans	J1-82
10:00-10.15	Coffee Break		
10:15-12:30	Lecture + practical 450 K array (techniques, probes, normalisation)	Roderick Sliker	
12:30-13.30	Lunch		
13:00-15.00	Lecture + practical Gene targeted methylation Epi typer	Wouter den Hollander	
15:30-15.45	Tea Break		
15:45-17:00	Guest lecture: Identifying differential methylation using next-generation sequencing: the Hunger Winter	Elmar Tobi	

Thursday June 6 (Location J1-82/building 1, LUMC)

when	What Expression	who	where
9.00-10.00	Lecture: Transcriptomics technologies: a comparison between microarrays and RNA-seq	Peter-Bram 't Hoen	J1-82
10.00-10.15	Coffee break		
10.15-12.30	Lecture: Statistical analysis of expression data: Normalization, differential expression and multiple testing	Jelle Goeman	
12.30-13.30	Lunch		
13.30-14.15	Lecture and practical introduction: RNA-seq data analysis	Peter-Bram 't Hoen	
14.15-17.00	Practical: RNA-seq analysis and visualization in UCSC / Galaxy	Eleonora de Klerk	
15:30-15.45	Tea Break		

Friday June 7 (Location J1-82/building 1, LUMC)

when	what	who	where
9.00-12.00	<i>Due to the BW symposium there will be no program in the morning</i>		
12.00-14.00	Lunch		
14.00-16.00	Paper discussion "Genetic Study design"	Eline Slagboom (TBC)	J1-82

WEEK 2**Day 1 Monday June 10**

when	What Next generation sequencing	who	where
9.00-10.00	Lecture: Next generation sequencing technology	Henk Buermans	J1-82
10.00-10.15	Coffee break		
10.15-11.15	Lecture: Medical sequencing (principles exome and WGA sequencing)	Yu Sun	
11.15-12.00	Practical: Whole genome sequencing	Mark Kroon Mathijs Moed	
12.00-13.00	Lunch		
13.00-14.00	Practical: Exome sequencing early onset OA	Yolande Ramos	
14.00-15.00	Lecture and practices burden test	Hae-Won Uh	
15.00-15.15	Tea break		
15.15-17.00	Practical Exome sequencing early onset OA	Yolande Ramos	

Day 2 Tuesday June 11

when	What Datamining and practices	who	where
9:00-10.15	Lecture and practices Datamining	Joost Kok	J1-82
10:00-10:15	Coffee Break		
10:15-12.30	Lecture and practices Datamining	Joost Kok	
12:30-13:30	Lunch		
13:30-15:00	Lecture	Jeroen de Ridder	
15:00-15:15	Tea Break		
15:15-17:00	Practical: Clustering using Spotfire (TBC)	Jeroen de Ridder plus someone else (TBC)	

Day 3 Wednesday June 12

when	What Pathway analysis	who	where
9:00-10.15	Lecture Finding functional relevant genes	Joris Deelen Wouter den Hollander	J1-82
10:00-10:15	Coffee Break		
10:15-12.00	Practical: Finding genes in practice	Joris Deelen Wouter den Hollander	
12:00-13:00	Lunch		
13:00-14:30	Lecture: Pathway analyses	Harish Dharuri	
14:30-17:00	Practical: Interpretation of gene lists Anni and DAVID	Kristina Hettne Herman van Haagen	
15:30-15:45	Tea Break		

Day 4 Thursday June 13

when	What Metabolomics and Meta-analyses	who	where
9:00-10:30	Metabolomic biomarker discovery	Anika Vaarhorst	J1-82
10:30-10:45	Coffee Break		
10:45-11:00	Introduction case study scientific publication	Peter-Bram 't Hoen	
11:00-12:00	Self study: Reading: literature-aided meta-analysis of microarray data		
12:00-13:00	Lunch		
13:00-14:00	Self study: Preparation of case study		
15:30-15:45	Tea Break		
14:00-17:00	Case study	Peter-Bram 't Hoen	

Day 5 Friday June 14

9:00-10:30	Lecture: microarray profiling of late onset disorders to reveal the normal ageing related pathways	Vered Raz	J1-82
10:30-10:45	Coffee Break		
10:45-12:00	Lecture: Micro expression analyses of with age	Erik van den Akker	
12:00-13:00	Lunch and self study		
13:00-15:00	Literature discussion: papers (paper to be announced)	Vered Raz	
15:00-17:00	Introduction to the third week	Eline Slagboom	

WEEK 3

This week students will work on an assignment from 9.00-17.00 hours.

In the assignment all knowledge and hands on experience that is acquired in the previous 2 weeks is applied to the topic of ageing. A project proposal should be written using all information accessible on the websites that were part of the course. It is important to determine the appropriate study design and power to establish and defend a “genomic” research proposal.

During the week there will be regular moments of interaction with the module coordinators and the possibility to contact other tutors of the course.

Program**Day 1 Monday June 17**

9:00 Introduction to the third module (J1-82, Eline Slagboom Ingrid Meulenbelt)
11:15 Work on the project proposal (J1-82)
12:00 [Break / Lunch](#)
12.30 Work on the project proposal (J1-82)
17.00 End of the day

Day 2 Tuesday June 18

9:00 Work on the project proposal (J1-82)
11:15 Work on the project proposal (J1-82)
12:00 [Break / Lunch](#)
12.30 Work on the project proposal (J1-82)
17.00 End of the day

Day 3 Wednesday June 19

9:00 Work on the project proposal (J1-82)
11:15 Work on the project proposal (J1-82)
12:00 [Break / Lunch](#)
12.30 Work on the project proposal (J1-82)
17.00 End of the day

Day 4 Thursday June 20

9:00 Work on the project proposal (J1-82)
11:15 Work on the project proposal (J1-82)
12:00 [Break / Lunch](#)
12.30 Work on the project proposal (J1-82)
17.00 **Hand in project proposals**

Day 5 Friday June 21

9:00 Work on project defence (J1-82)
11:15 Work on the project defence (J1-82)
12:00 [Break / Lunch](#)
13.00 **Project defences (Building 2, S5)**
17.00 End of the day