

ONWAR ZOOM-Course Molecular Neurobiology

Organizers: Frank Jacobs, Guus Smit, Joost Verhaagen, Iris Jansen

Themes:

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| I. | Human genome structure and evolution | Frank Jacobs |
| II. | Single cell RNAseq, proteomics and cellomics | Guus Smit |
| III. | Viral vectors, gene therapy and CRISPR-CAS | Joost Verhaagen |
| IV. | Genetics of complex neurological and psychiatric disorders | Iris Jansen |

Sessions:

Thursday June 3: Round Table “get to know each other” session

Monday June 7: Theme I

Tuesday June 8: Theme II

Monday June 14: Theme III

Tuesday June 15: Theme IV

Active student participation: students are divided in 4 groups: one group per Theme. Two papers per Theme will be provided in advance (before June 3) to each of the groups. Each group will chair the general discussion session of their Theme. They will discuss the two papers and prepare discussion points.

Thursday June 3 – get to know each other session

16.00 – 17.30 Round Table: Get to know each other

Organizers present the goals of the themes of the Course – 25 minutes

Frank Jacobs – Theme I – 5 minutes

Guus Smit – Theme II – 5 minutes

Joost Verhaagen – Theme III – 5 minutes

Iris Jansen – Theme IV – 5 minutes

Each participant presents his/her Ph.D. project in 2 slides – 50 minutes

1. Aim and approach of their OIO project
2. Why have you chosen to follow this course?
3. Do you use molecular techniques?
4. Do you have plans to use molecular/genetic techniques?

Monday June 7

Theme I: Human genome structure and evolution

Organizer: Frank Jacobs

13.30 – 14.00 *Genomics of human brain evolution*

Frank Jacobs, University of Amsterdam, Swammerdam Institute for Life Science,
Evolutionary Neurogenomics: www.frankjacobslab.com ; sils.uva.nl/evn

14.00 – 14.30 *Genes unique to humans: What is their role in the healthy or disordered brain?*

Colette Moses, University of Amsterdam, Swammerdam Institute for Life Science,
Evolutionary Neurogenomics

14.30 – 15.15 *Synaptic basis of network dysfunction in neurodevelopmental disorders*

Nael Kasri, Radboud University, Donders Institute Nijmegen. <http://www.nadifikasri-lab.com/Home.html>

15.15-15.30 coffee break

15.30 – 16.00 *The hidden part of our genome and its role in human disease susceptibility*

Frank Jacobs, University of Amsterdam, Swammerdam Institute for Life Science,
Evolutionary Neurogenomics

16.00 – 17.00 Journal club and discussion session organized by students

Two papers to discuss:

Fiddes, Lodewijk et al., 2018. Human-Specific NOTCH2NL Genes Affect Notch Signaling and Cortical Neurogenesis. *Cell* ([https://www.cell.com/fulltext/S0092-8674\(18\)30383-0](https://www.cell.com/fulltext/S0092-8674(18)30383-0))

Trujillo, et al. 2021 Reintroduction of the archaic variant of NOVA1 in cortical organoids alters neurodevelopment. *Science* (<https://science.sciencemag.org/content/371/6530/eaax2537>)

Tuesday June 8

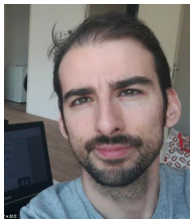
Theme II: High throughput molecular analysis: single cell RNAseq, proteomics and cellomics

Organizer: Guus Smit



13.30 – 14.30 Ahmed Mahfouz, Leiden University Medical Center & Delft Bioinformatics lab, TU-Delft

- Single cell RNA sequencing technology and its Neuroscience applications



14.30 - 15.00 Miguel Gonzalez Lozano, Center for Neurogenomics and Cognitive Research

- Interaction proteomics: stitching the synapse using crosslinking mass spectrometry



15.00 – 15.30u: Titia Gebuis, Center for Neurogenomics and Cognitive Research

- Cellomics: high content microscopy screening of neuronal cells



15.30-16.00u Guus Smit, Center for Neurogenomics and Cognitive Research

- Integrating -omics analyses

16.00 - 17.00: Journal club and discussion session organized by students

Papers to discuss:

Hodge et al (2019) Conserved cell types with divergent features in human versus mouse cortex. Nature 573: 61-68

La Manno et al (2018) RNA velocity of single cells. Nature [dio.org/10.1038](https://doi.org/10.1038)

Monday June 14

Theme III: Viral vectors, Gene therapy and CRISPR-CAS

Organizer: Joost Verhaagen

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| 13.30 – 14.00 | Viral vectors: basic science and gene therapy | Joost Verhaagen |
| 14.00 – 14.25 | Technical intermezzo: inducible viral vectors | Fred de Winter |
| 14.30 – 15.10 | Shifting the paradigm of gene therapy for neuromuscular diseases | Pavlina Konstantinova |
| 15.15 – 16.00 | ORANGE: a CRISPR/Cas9-mediated genome editing toolbox to interrogate the dynamic distribution of proteins in neurons | Harold MacGillavry |
| 16.00 – 17.00 | Journal club and discussion session organized by students | |

Two papers to discuss:

[Chan et al. Engineered AAVs for efficient *noninvasive* gene delivery to the central and peripheral nervous system. Nature Neuroscience 20: 1172 \(2017\)](#)

[Flytzanis et al. Broad gene expression throughout the mouse and marmoset brain after *intravenous delivery* of engineered AAV capsids. BioX \(2020\)](#)

Guest speakers:

Pavlina Konstantinova PhD, MBA
Chief Scientific Officer, VectorY
Matrix Innovation Center, Science Park 408
1098 XH Amsterdam

Harold MacGillavry PhD
Division of Cell Biology,
Neurobiology and Biophysics,
Department of Biology, Utrecht University.

Tuesday June 15

Theme IV: Genetics of complex neurological and psychiatric disorders

Organizer: Iris Jansen/Danielle Postuma

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| 13.30 – 14.00 | Basics of GWAS | Mats Nagel |
| 14.00 – 14.30 | Genetic heterogeneity of alcohol-related phenotypes | Jeanne Savage |
| 14.45 – 15.15 | Functional interpretation of GWAS results via RNAseq analysis | Rachel Brouwer |
| 15.15 – 15.45 | Understanding biological implications from Schizophrenia GWAS using iPSCs | Karen Laupman |
| 16.00 – 17.00: Journal club and discussion session organized by students | | |

Two papers to discuss:

[Jansen et al. Genome-wide meta-analysis identifies new loci and functional pathways influencing Alzheimer's disease risk. Nature Genetics 51, 404-13 \(2019\).](#)

[Uffelmann E, Posthuma D. Emerging methods and resources for biological interrogation of neuropsychiatric polygenic signal. Biological Psychiatry, 89, 41-53 \(2020\).](#)