



## Neurosciences (MSc)

Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Neurosciences (research) - 2013-2014

## **General information**

Biological Psychology studies the biological and genetic basis of human behavior. Theoretical knowledge of (molecular) genetics, neurophysiology and neuroanatomy is coupled to empirical research in population samples and in neurological and psychiatric patient groups. This yields an understanding of normal as well as abnormal brain function and behavior.

A substantial part of your training is devoted to practical skills with the techniques of genetic and psychophysiological research. Our courses in behavioral genetics are unique in the Netherlands. During these courses you learn to examine the role of genetic and environmental factors on individual differences in personality, lifestyle, and mental and physical health.

In the fields of behavior genetics and psychophysiology our department has a strong track record in training highly qualified scientific researchers. Job opportunities in these fields have been, and remain, very good.

## **Master of Neurosciences**

The Neurosciences Master's program at the VU is a joint initiative by the Faculty of Earth and Life Sciences, the Faculty of Psychology and Education and the VU University Medical Center.

[Information on admission criteria, the application procedure, and deadlines](#)

The programme is embedded in the Neuroscience Campus Amsterdam and thereby offers you the chance to integrate the full range of neuroscience disciplines. The advantage of this Master's programme is that you always have access to experts within your chosen field, whichever specialization you opt for. These experts form part of national and international cooperative networks, so your studies need not be restricted to the VU.

[Schedule and program of the Master](#)

## Inhoudsopgave

Expired programme components Neurosc.	1
MSc Neurosciences, year 1	1
MSc Neurosciences, year 2	1
MSc Neurosciences, track Animal Behavior	1
MSc Neurosciences, Track Clinical Neurosciences	2
MSc Neurosciences, General optional modules	2
MSc Neurosciences, Track Medical and Behavioural Genomics	3
MSc Neurosciences, Track Neurogenomics	3
MSc Neurosciences, track Neurophysiology	3
MSc Neurosciences, Track Psychophysiology	4
Vak: Advanced Clinical Neurosciences (Periode 1)	4
Vak: Advanced Human Neurophysiology (Periode 2)	5
Vak: Advanced Neurogenomics (Periode 1)	7
Vak: Behavioral Genetics (Periode 2)	8
Vak: Clinical neurosciences (Periode 2)	10
Vak: Complex Trait Genetics (Periode 2)	10
Vak: Developmental Neurobiology of the Vertebrate Brain (Periode 2)	12
Vak: Experimental and clinical neuroendocrinology (Periode 2)	13
Vak: From Molecule to Mind (Periode 1)	14
Vak: Functional Brain Imaging (Periode 1)	15
Vak: Gene Hunting (Periode 1)	17
Vak: Genomic Data Analysis (Periode 2)	18
Vak: Internship Neurosciences I (Ac. Jaar (september))	19
Vak: Internship Neurosciences II (Ac. Jaar (september))	20
Vak: Literature Survey Neurosciences (Ac. Jaar (september))	20
Vak: Live Cell Imaging (Periode 1)	20
Vak: Methods in Behavioral Neurosciences (Periode 1)	21
Vak: Neuro- and Psychopharmacology (Periode 2)	22
Vak: Neurobiology of Animal Behaviour (Periode 1)	24
Vak: Neurogenomics (Periode 3)	25
Vak: Neuronal Networks in Vivo (Periode 2)	25
Vak: Neurophilosophy and Ethics (Periode 3)	26
Vak: Psychophysiology (Periode 1)	28
Vak: Scientific Writing in English (Ac. Jaar (september))	29
Vak: Statistical Genetics for Gene Finding ()	32
Vak: Statistical Genetics for Gene Finding (Periode 1)	33
Vak: Synaptic and Cellular Neurophysiology (Periode 1)	35
Vak: System Neurosciences (Periode 2)	35

## Expired programme components Neurosc.

Courses:

Name	Period	Credits	Code
<a href="#">Statistical Genetics for Gene Finding</a>		5.0	AM_470734

## MSc Neurosciences, year 1

Courses:

Name	Period	Credits	Code
<a href="#">Behavioral Genetics</a>	Period 2	6.0	AM_1006
<a href="#">Clinical Neurosciences</a>	Period 2	6.0	AM_1005
<a href="#">From Molecule to Mind</a>	Period 1	12.0	AM_1004
<a href="#">Internship Neurosciences I</a>	Ac. Year (September)	27.0	AM_471108
<a href="#">Neurogenomics</a>	Period 3	6.0	AM_1007
<a href="#">Scientific Writing in English</a>	Ac. Year (September)	3.0	AM_471023

## MSc Neurosciences, year 2

Programme components:

- [MSc Neurosciences, Track Animal Behavior and Systems Neurosciences](#)
- [MSc Neurosciences, Track Clinical Neurosciences](#)
- [MSc Neurosciences, general optional modules year 2](#)
- [MSc Neurosciences, Track Behavioral and Medical Genomics](#)
- [MSc Neurosciences, Track Neurogenomics](#)
- [MSc Neurosciences, Track Neurophysiology](#)
- [MSc Neurosciences, Track Psychophysiology](#)

Courses:

Name	Period	Credits	Code
<a href="#">Internship Neurosciences II</a>	Ac. Year (September)	25.0	AM_471109
<a href="#">Literature Survey Neurosciences</a>	Ac. Year (September)	8.0	AM_471110
<a href="#">Neurophilosophy and Ethics</a>	Period 3	3.0	AM_1018

## MSc Neurosciences, track Animal Behavior

Vakken:

Naam	Periode	Credits	Code
<a href="#">Methods in Behavioral Neurosciences</a>	Periode 1	6.0	AM_470728
<a href="#">Neurobiology of Animal Behaviour</a>	Periode 1	6.0	AM_471018
<a href="#">Neuronal Networks in Vivo</a>	Periode 2	6.0	AM_1001
<a href="#">System Neurosciences</a>	Periode 2	6.0	AM_470712

## MSc Neurosciences, Track Clinical Neurosciences

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Clinical Neurosciences</a>	Periode 1	6.0	AM_1014
<a href="#">Experimental and clinical neuroendocrinology</a>	Periode 2	6.0	AM_470700
<a href="#">Functional Brain Imaging</a>	Periode 1	6.0	AM_470715
<a href="#">Neuro- and Psychopharmacology</a>	Periode 2	6.0	AM_470718

## MSc Neurosciences, General optional modules

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Clinical Neurosciences</a>	Periode 1	6.0	AM_1014
<a href="#">Advanced Human Neurophysiology</a>	Periode 2	6.0	AM_1003
<a href="#">Advanced Neurogenomics</a>	Periode 1	6.0	AM_470717
<a href="#">Complex Trait Genetics</a>	Periode 2	6.0	AM_470733
<a href="#">Developmental Neurobiology of the Vertebrate Brain</a>	Periode 2	6.0	AM_470713
<a href="#">Experimental and clinical neuroendocrinology</a>	Periode 2	6.0	AM_470700
<a href="#">Functional Brain Imaging</a>	Periode 1	6.0	AM_470715
<a href="#">Gene Hunting</a>	Periode 1	6.0	AM_470729
<a href="#">Genomic Data Analysis</a>	Periode 2	6.0	AM_1008
<a href="#">Live Cell Imaging</a>	Periode 1	6.0	AM_470726
<a href="#">Methods in Behavioral Neurosciences</a>	Periode 1	6.0	AM_470728
<a href="#">Neuro- and Psychopharmacology</a>	Periode 2	6.0	AM_470718

<a href="#">Neurobiology of Animal Behaviour</a>	Periode 1	6.0	AM_471018
<a href="#">Neuronal Networks in Vivo</a>	Periode 2	6.0	AM_1001
<a href="#">Psychophysiology</a>	Periode 1	6.0	AM_470736
<a href="#">Statistical Genetics for Gene Finding</a>	Periode 1	6.0	AM_1040
<a href="#">Synaptic and Cellular Neurophysiology</a>	Periode 1	6.0	AM_1009
<a href="#">System Neurosciences</a>	Periode 2	6.0	AM_470712

## MSc Neurosciences, Track Medical and Behavioural Genomics

Vakken:

Naam	Periode	Credits	Code
<a href="#">Complex Trait Genetics</a>	Periode 2	6.0	AM_470733
<a href="#">Gene Hunting</a>	Periode 1	6.0	AM_470729
<a href="#">Genomic Data Analysis</a>	Periode 2	6.0	AM_1008
<a href="#">Statistical Genetics for Gene Finding</a>	Periode 1	6.0	AM_1040

## MSc Neurosciences, Track Neurogenomics

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Neurogenomics</a>	Periode 1	6.0	AM_470717
<a href="#">Developmental Neurobiology of the Vertebrate Brain</a>	Periode 2	6.0	AM_470713
<a href="#">Genomic Data Analysis</a>	Periode 2	6.0	AM_1008
<a href="#">Live Cell Imaging</a>	Periode 1	6.0	AM_470726

## MSc Neurosciences, track Neurophysiology

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Human Neurophysiology</a>	Periode 2	6.0	AM_1003
<a href="#">Live Cell Imaging</a>	Periode 1	6.0	AM_470726
<a href="#">Neuronal Networks in Vivo</a>	Periode 2	6.0	AM_1001
<a href="#">Synaptic and Cellular Neurophysiology</a>	Periode 1	6.0	AM_1009

# MSc Neurosciences, Track Psychophysiology

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Human Neurophysiology</a>	Periode 2	6.0	AM_1003
<a href="#">Experimental and clinical neuroendocrinology</a>	Periode 2	6.0	AM_470700
<a href="#">Functional Brain Imaging</a>	Periode 1	6.0	AM_470715
<a href="#">Psychophysiology</a>	Periode 1	6.0	AM_470736

## Advanced Clinical Neurosciences

<b>Vakcode</b>	AM_1014 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	W.D.J. van de Berg BSc
<b>Docent(en)</b>	W.D.J. van de Berg BSc
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Werkcollege
<b>Niveau</b>	600

### Doel vak

The aim of the Advanced Clinical Neuroscience course is to teach how to design, to perform and critically evaluate clinical neuroscience in which the following concepts play an important role: 1) (endo) phenotyping; 2) systems/circuits in aging and cognition; 3) translational neuroscience (from molecule to mind; and from bedside to bench). Major neurodegenerative diseases like Alzheimer's disease, Parkinson's disease and Multiple sclerosis will be discussed in depth with a focus on the current challenge of developing efficacious therapies.

### Inhoud vak

The Advanced Clinical Neuroscience Course will cover the following topics:

- 1) New strategies and innovative approaches to improve diagnosing and phenotyping of Alzheimer, Parkinson or Multiple Sclerosis patients.
- 2) Systems and circuits in aging and cognition.
- 3) Translation neuroscience: what does the rat brain can tell us about the human mind.
- 4) Clinical epidemiology and statistics
- 5) How to design and perform clinical research with specific attention to neurodegenerative disorders and developmental disorders.

### Onderwijsvorm

The basic principles of and challenges in clinical research will be presented in a series of 12 lectures. Small groups will write a research

proposal with focus on challenges in diagnosing and (endo)phenotyping patients with neurodegenerative or neurodevelopmental disorders. During the course all students will be able to do a rotation in the clinic to learn how neurophysiological testing, neuroimaging and other assessments contribute to diagnosis of neurodegenerative diseases. The students will have to study the papers and textbook chapters posted on the blackboard themselves. At the end of the course the students will present their research proposal.

Total number of contact hrs: approximately 24 hrs lectures, 6 hrs practicals, 16 hrs interns, 6 hrs presentations.

### Toetsvorm

General attitude during the course (10%). Research proposal on specific challenge related to phenotyping or diagnostic criteria for neurological disorders (50%). Presentation of research proposal at the end of the course (40%).

### Literatuur

A number of relevant reviews, peer-reviewed articles and information concerning phenotyping and diagnosis of patients with neurodegenerative diseases which will be posted on Blackboard.

### Vereiste voorkennis

Principles of Neuroscience (470701), Clinical Neuroscience (470757)

### Doelgroep

Msc Neuroscience students, 2nd year following Track Clinical Neurosciences.  
Other Msc Neuroscience students with interest in Clinical Neurosciences.

### Overige informatie

There is maximum of 24 students. For further information and application, please contact dr. W.D.J. van de Berg ([wdj.vandenberg@vumc.nl](mailto:wvj.vandenberg@vumc.nl))

## Advanced Human Neurophysiology

<b>Vakcode</b>	AM_1003 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. K. Linkenkaer Hansen
<b>Docent(en)</b>	dr. D.J.A. Smit, dr. K. Linkenkaer Hansen
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Computerpracticum
<b>Niveau</b>	600

### Doel vak

At the end of the course the student should be able to:

1. Prepare a subject for an EEG measurement and understand acquisition settings such as sampling frequency, filters, impedance, etc.
2. Explain how the human brain generates scalp electroencephalographic (EEG) signals, both ongoing oscillations and

- event-related potentials (ERPs).
3. Analyze both ongoing (spontaneous) and ERP data using MATLAB toolboxes.
  4. Understand the principles and give examples of these techniques as applied in various scientific and medical fields, including sleep research, brain-computer interfacing, and genetics.
  5. Explain the principle of inverse modeling and outline the possibilities and limitations based on own experiences.
  6. Apply state-of-the-art time-series techniques to M/EEG data and understand their interpretation as a biomarker and genetic marker for cognition and psychopathology,
  7. Perform quantitative and statistical analysis of own data and use the results to make conclusions about the relation between brain activity and cognition/behavior.
  8. Summarize the results of your research on a poster and present and defend the interpretation. Thus, you will acquire theoretical and practical experience with EEG.
  9. Make an informed decision as to continue a specialization in M/EEG as part of his/her PhD training.

### **Inhoud vak**

The course aims to provide you with the skills to perform an electrophysiological experiment from beginning to end. This requires highly practical skills in the preparation of subjects and use of highly sensitive/expense equipment, proficiency in the state-of-the-art signal analysis techniques, and a broad theoretical knowledge of how the human neurophysiology can be studied with the techniques of magneto- and electroencephalography. The generating mechanisms of EEG oscillations and ERPs are treated in detail, as well as the theory behind digital signal processing. This will include frequency decomposition of the EEG (Fourier analysis), time-frequency analysis (wavelet), filtering, and methods to quantify temporal and spatial correlations (i.e., Detrended Fluctuation Analysis and cross-channel synchrony, respectively). An important component of the course is to teach you how to perform high-density EEG recordings and to analyze these signals with classical as well as more recent non-linear methods. You will work in small groups to record, analyze and present both data on EEG its cognitive/behavioral correlates at the end of the course. The importance of non-stimulus driven brain activity and cognition for brain-related disorders such as depression, dementia, insomnia or attention deficit and hyperarousal disorder is discussed.

### **Onderwijsvorm**

The study credits amount to 168 hours of study, which are divided approximately as follows:

Activity Hours of study	
Lectures	20
Self study (literature and lecture sheets)	40
Lab experiments	8
Data analysis and computer practicals	32
Group discussions (journal club preparation)	4
Plenary discussions	6
Poster preparation	18
Preparation for exams (poster and written)	40
Total	168

### **Toetsvorm**

EEG/ERP data collection under supervision; analysis and presentation of data on research poster (40%). Written examination (60%).

### Literatuur

Steven J. Luck 'An introduction to the event-related potential technique'. (Boston: The MIT press). Chapters 1, 3 and 4.

Nikulin VV, Linkenkaer-Hansen K, Nolte G, Lemm S, Müller KR, Ilmoniemi RJ, Curio G. A novel mechanism for evoked responses in the human brain. Eur J Neurosci. 2007;25:3146–54.

Mazaheri A, Jensen O. Asymmetric amplitude modulations of brain oscillations generate slow evoked responses. J Neurosci 2008;28:7781–7.

Jensen O, van Dijk H, Mazaheri A. Amplitude asymmetry as a mechanism for the generation of slow evoked responses. Clin Neurophysiol 2010.

Nikulin VV, Linkenkaer-Hansen K, Nolte G, Curio G. Non-zero mean and asymmetry of neuronal oscillations have different implications for evoked responses. Clin Neurophysiol 2010;121:186–93.

Hardstone R, Poil S-S, Schiavone G, Jansen R, Nikulin VV, Mansvelder HD, Linkenkaer-Hansen K. Detrended fluctuation analysis: A scale-free view on neuronal oscillations. Frontiers in Physiology. 3:450. doi:10.3389/fphys.2012.00450. 2012.

De Geus EJC (2002) Introducing genetic psychophysiology. Biol Psychol 61:1–10.

De Geus E (2010) From genotype to EEG endophenotype: a route for post-genomic understanding of complex psychiatric disease? Genome Medicine 2:1–4.

### Aanbevolen voorkennis

Breïn en Medicijn and/or Humane Neurofysiologie.

### Doelgroep

Masters and PhD students with interest in human brain function in general and EEG methodology in particular.

## Advanced Neurogenomics

<b>Vakcode</b>	AM_470717 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. M. Verhage
<b>Niveau</b>	600

### Doel vak

This course aims to introduce modern techniques in the integrated Neurosciences via hands-on experience. The use of these techniques is embedded in short research projects and typically covers a number of steps: first clone a construct, than culture and tranfect a cell with this construct and finally analyze a functional consequences of this

modification using functional assays. Alternatively, research projects may also start with the intact brain and then work down to the molecular networks of proteins and genes, for instance using proteomics and mRNA expression profiling. Although centered around genomics, many functional assays are offered, from electronmicroscopy and protein chemistry to life cell imaging, electrophysiology and behavioural analyses. Various tools and technologies will be explained in supporting lectures and used in order to answer questions related to the function of genes in the nervous system and how they contribute to higher order processes important for functioning of circuitry or behavior.

End terms:

Profound insight and experience with neurogenomic techniques that are used during the course

Adequate design, execute, and interpret a neurogenomic experiment

Good oral presentation (2 oral presentations)

### **Inhoud vak**

This is a largely practical course. You will be executing a small research project aimed at illustrating today's research into gene-function relations. The experiments involve gene expression analysis (transcripts, proteins), and genotypic and phenotypic analysis (genotyping, cell biology, behavior). Theoretical underpinning of concepts and methods will be achieved by using examples from recent literature. The Neurogenomics course (MN 1st year) is obligatory for this course.

### **Onderwijsvorm**

Lectures, discussion of papers, demonstrations, practicals

16x8h practicals, presentations and discussion

4x8h self study

### **Toetsvorm**

Examination and presentations of the work performed. Evaluation on the basis of 2 oral presentations by the students and their performance during the practical work and during (plenary) discussions.

### **Literatuur**

Articles from journals that published in the last couple of months (2-4 per student)

Purves Neuroscience (5th edition) as reference book

Literature can be studied during the course and will be provided at the start of the course.

### **Vereiste voorkennis**

Neurogenomics

### **Overige informatie**

E-mail: [matthijs@cncr.vu.nl](mailto:matthijs@cncr.vu.nl)

## **Behavioral Genetics**

<b>Vakcode</b>	AM_1006 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels

<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	R.S.L. Ligthart
<b>Docent(en)</b>	dr. C.M. Middeldorp, R.S.L. Ligthart
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum
<b>Niveau</b>	400

### **Doel vak**

To provide the Master of Neuroscience students with a solid basis in human behavioral genetic research. This entails:

- A good understanding of the most commonly used methods in behavioral genetics (including twin studies, genetic linkage and genome-wide association studies)
- The ability to critically read and understand behavioral genetic research articles
- Familiarity with the most important research findings in the field
- Familiarity with the most common software programs used in this field of research.

### **Inhoud vak**

Behavior genetics focuses on the inheritance of individual differences in complex traits. Such traits are most likely influenced by multiple genetic and environmental factors. The effects of genetic and environmental factors may be additive or interactive and lead to individual differences in complex traits and diseases that are quantitative rather than qualitative. In this course theory and principles from population genetics and biometrical genetics will be introduced, including genetic and cultural inheritance of complex phenotypes. Designs of family, adoption and twin studies and their applications to variation in cognitive abilities, personality and psychiatric disease will be discussed. The advances in molecular genetics have generated substantial progress in identifying the genetic basis of heritable traits using linkage and genome-wide association approaches. Both approaches will be reviewed and illustrated using recent studies aiming to identify genes underlying the vulnerability for psychiatric disorders, such as schizophrenia and mood disorders. Practical exercises will guide the student through some of the available online tools that facilitate the interpretation of gene-finding studies.

### **Onderwijsvorm**

Lectures (6, 2 hours each) and computer practicals (6, 3 hours each).

### **Toetsvorm**

Written exam consisting of open-end questions (60%) + writing assignment (40%).

### **Literatuur**

Research articles, exact reading list to be announced on blackboard 2 weeks before the course.

### **Vereiste voorkennis**

BSc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

### **Doelgroep**

First year students of the master neuroscience and students interested in behavioral genetic research (e.g. twin studies or gene-finding)

methods, with a focus on behavioral phenotypes).

### Overige informatie

Attending the practicals is compulsory

## Clinical neurosciences

<b>Vakcode</b>	AM_1005 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Docent(en)</b>	dr. R.J. Vermeulen, dr. J.J.G. Geurts, M.M. Schoonheim
<b>Lesmethode(n)</b>	Hoorcollege, Practicum
<b>Niveau</b>	400

## Complex Trait Genetics

<b>Vakcode</b>	AM_470733 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. D.I. Boomsma
<b>Docent(en)</b>	prof. dr. D.I. Boomsma
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

Provide the theoretical background into population and biometrical genetics so that students gain an understanding of the way the genome contributes to human variation.

### Inhoud vak

Quantitative genetics is concerned with the inheritance of those differences between individuals that are of degree rather than of kind (quantitative rather than qualitative). Such differences are seen for most complex traits (e.g. depression, cognitive abilities or attention problems). This course aims to provide an understanding of the inheritance of such quantitative differences in behavior, behavioral disorders, endophenotypes (e.g. blood pressure or brain volumes) underlying disease traits (e.g. hypertension or schizophrenia). Quantitative differences, as far as they are inherited, depend on genes with on average small effects and are usually influenced by gene differences at many loci. Consequently these genes cannot be identified by Mendelian segregation ratios (though they are subject to the laws of Mendelian transmission). The methods of quantitative genetics differ in two aspects from those employed in Mendelian genetics: since single progenies are uninformative the unit of study is the population; and the nature of quantitative differences requires the measurement (and not just the classification) of individuals. The extension of Mendelian

genetics into quantitative genetics will be made in two stages: the genetic properties of populations (population genetics) and the inheritance of measurements (biometrical genetics). Quantitative genetics is now merging with molecular genetics and the last part of this course will be devoted to methods for the localization and characterization of genes causing quantitative variation, focusing on recent developments using genome wide association (GWA) analysis.

### **Onderwijsvorm**

Combined lectures and work groups, twice 4 hours per week

### **Toetsvorm**

Course grades will be based on 3 assignments; for ~40%, 20% and 40% of grades

- 1) Read papers (references provided) and write a short essay about current issues / state-of-the-art in human genetics (focus on genetic association studies). Select one empirical paper; (try to) read it. Indicate what is unclear to you. At the end of this course you will be asked to review your own essay and then indicate what you now understand better than before.
- 2) Problems from the book to be assigned after each lecture (about 4 or 5) as home work before the next class. Students will be asked to present the solutions to the problems in class and part of grading depends on how well solutions are presented.
- 3) Final assignment: oral presentations on a research topic; topics can be chosen from a list of papers or book chapters.

### **Literatuur**

Book: Falconer & Mackay: Introduction to Quantitative Genetics (1996)

NB final list of papers may change when new papers come out

4 papers / commentaries from the New England J of Medicine 23 april, 2009:

J. Hardy and A. Singleton: Current Concepts: Genomewide Association Studies and Human Disease

D. B. Goldstein: Common Genetic Variation and Human Traits

J. N. Hirschhorn: Genomewide Association Studies — Illuminating Biologic Pathways

P. Kraft and D. J. Hunter: Genetic Risk Prediction — Are We There Yet?

Recent review papers

Visscher PM, Brown MA, McCarthy MI, Yang J. Five years of GWAS discovery. *Am J Hum Genet.* 2012 ;90(1):7-24.

Hirschhorn JN, Gajdos ZK. Genome-wide association studies: results from the first few years and potential implications for clinical medicine.

*Annu Rev Med.* 2011 18;62:11-24.

Recent gene finding papers

\*Davies G, et al. Genome-wide association studies establish that human intelligence is highly heritable and polygenic. *Mol Psychiatry*, 16 (10):996-1005, 2011

\* Teslovich TM, et al. Biological, clinical and population relevance of 95 loci for blood lipids. *Nature.* 466(7307): 707-13, 2010

\* Lango Allen H, et al.. Hundreds of variants clustered in genomic loci and biological pathways affect human height. *Nature.* 467(7317):832-8, 2010

\* Scott RA,. Large-scale association analyses identify new loci influencing glycaemic traits and provide insight into the underlying

### Vereiste voorkennis

General knowledge of human and quantitative genetics. When in doubt, ask the course coordinator.

### Aanbevolen voorkennis

General knowledge of human and quantitative genetics. When in doubt, ask the course coordinator.

### Doelgroep

Students, phd-students, postdocs who are interested in the theoretical basis of research on the genetic origin of complex features of man.

### Overige informatie

There will be 2 guest lectures on actual fields like epegenetics. Furthermore, it is expected from students that they will join a couple of high-level meeting, such as from BBRMI-NL.

## Developmental Neurobiology of the Vertebrate Brain

<b>Vakcode</b>	AM_470713 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. R.F.G. Toonen
<b>Docent(en)</b>	dr. R.F.G. Toonen, prof. dr. R.E. Koes
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

This course will provide the student with in depth knowledge of general animal development and focus on brain development. The student will obtain hands-on experience in handling, manipulating and observing nerve cells.

### Onderwijsvorm

Week 1&2: Lectures and seminars. These first two weeks will be shared with the Master Developmental Biology and will consist of lectures on general developmental biology in week 1 and developmental neurobiology in week 2. These 2 weeks will be examined during a mid-term exam.

Week 3&4: Lectures,, master classes and hands-on practicals. Focus on early development of neuronal networks, Human iPS cells and neuro-glia interactions. In week 4, students will present on specific topics in developmental neurobiology.

Theory (30%)

A. Lectures

- 8 sessions of ± 3 hrs: 24 hrs

B. Masterclasses

- 3 classes of ± 3 hrs: 9 hrs

C. Individual Journal Club task

- 1 high-impact paper presentation 6 sessions of 2 hrs: 12 hrs

Hands-on lab work (30%)

- neuron development in vitro (polarization, neurite outgrowth, synapse

formation): 10 sessions of ± 4 hrs: 40 hrs  
 - Presentation of results lab work: 1 session of 5 hrs  
 Self study (40%)  
 - 60 hrs

### Toetsvorm

Written mid-term exam (40%). Oral presentation of seminar task (30%).  
 Presentation of labwork (30%)

### Literatuur

Handouts will be distributed at the beginning of the course

### Vereiste voorkennis

Neurobiology, Molecular Developmental Biology

### Overige informatie

Guest lecturers:  
 Dr. R. Meredith CNCR/FALW  
 Dr. M. Verheije CNCR/FALW  
 Dr. V. Heine VUmc

## Experimental and clinical neuroendocrinology

<b>Vakcode</b>	AM_470700 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. C.B. Lambalk
<b>Docent(en)</b>	dr. J.B. Deijen, B.P.C. Kreukels BSc, dr. J. Rotteveel, dr. C.B. Lambalk, dr. M.M. van Weissenbruch, prof. dr. M.A. Blankenstein, prof. dr. M. den Heijer
<b>Lesmethode(n)</b>	Hoorcollege, Practicum
<b>Niveau</b>	500

### Doel vak

The aim of the course is to provide the students not only with a solid basis in the fundamentals of neuroendocrinology, but also with knowledge of recent developments and current research in this field of clinical neurosciences.

### Inhoud vak

The course includes an understanding of structure and function of the hypothalamo- pituitary axis in relation to growth, stress, reproduction as well as to autonomic- endocrine and immune- endocrine interactions. Diseases of the hypothalamus and pituitary will be discussed, with special emphasis on central regulation of growth, puberty, reproduction, obesity and stress, sexual orientation and gender identity, taking both an experimental and clinical point of view. A VICI scholar will lecture on the role of pheromones in understanding how males and females respond differently to social odours - possibly the key to understanding the neural basis of sexual orientation and preference.

**Onderwijsvorm**

Lectures 24 hrs

Outpatient clinics 6 hrs

Research tutorials 10 hrs (appr)

**Toetsvorm**

Written examination; open questions.

**Literatuur**

Kandel ER, Schwartz JH, Jessell TM Principles of Neural Science, 2000, 4th edition, McGraw Hill, ISBN 0-07-112000-9. (Ch 49) Selected papers to be handed out during the course.

**Vereiste voorkennis**

BSc Biology, BSc Medical Biology, BA Biological Psychology, BA Neuropsychology

**Overige informatie**

For further information, please contact mw. M. Evers ([M.Evers@vumc.nl](mailto:M.Evers@vumc.nl))

**From Molecule to Mind**

<b>Vakcode</b>	AM_1004 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. W.J.A.J. Smeets
<b>Docent(en)</b>	prof. dr. M. Verhage, prof. dr. H.D. Mansvelder, prof. dr. A.B. Smit, dr. D.J.A. Smit, dr. G.J. Schenk
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum, Practicum
<b>Niveau</b>	400

**Doel vak**

Providing the master student, independently of your primary training, with a solid basis in cell biology, neurophysiology, functional neuroanatomy, genetics and statistics

**Inhoud vak**

The first two weeks will be used to brush up your knowledge of molecular and cellular neurobiology and statistics, in particular SPSS. Lectures and computer labs in this period are not compulsory, but if you have limited knowledge of these fields, you are strongly urged to attend these lectures and computer labs. The lectures are scheduled in such a way that you can attend all lectures in both fields. Weeks 3-6 will be used to deepen your knowledge in neurophysiology, genetics and functional neuroanatomy. As a guidance we will use the four research programs of the Neuroscience Campus Amsterdam, i.e. Attention and Cognition, Addictive Behavior, Anxiety and Depression, and Neurodegeneration. Keynote lectures related to these research programs, will be given on Monday, Wednesday and Friday during lunch break.

**Onderwijsvorm**

First two weeks: 40 lectures, 18 h computer lab

Week 3-6: 51 lectures, 12 h computer lab, 10 h brain dissection

Week 7: 8 h lab rotation

### Toetsvorm

Written progress exam (beginning week 3): 10% of final grade

Written final exam (covering week 3-8) open end questions: 90% of final grade

### Literatuur

B Alberts et al., Essential Cell Biology, 2009, 3rd edition, Garland Science, ISBN 978-0-8153-4130-7 (paperback)

A. Field, Discovering Statistics Using SPSS, 2009, 3rd edition, SAGE publications, ISBN 978-1847879073

D. Purves et al. Neuroscience, 2012, 5th edition, Sinauer associates INC, ISBN 9780878936953

Practical guide : Human Neuroanatomy. Macroscopic dissection of the brain

Recent papers/reviews to be handed out during the course.

### Vereiste voorkennis

Bachelor Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

### Overige informatie

Except for the first two weeks, all lectures, practicals, demonstrations and computer labs are compulsory. For further information, please contact Dr Wil JAJ Smeets ([wjaj.smeets@vumc.nl](mailto:wjaj.smeets@vumc.nl))

## Functional Brain Imaging

<b>Vakcode</b>	AM_470715 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. P.J.W. Pouwels
<b>Lesmethode(n)</b>	Computerpracticum, Hoorcollege
<b>Niveau</b>	500

### Doel vak

To learn about the most important brain imaging techniques, the physics principles on which they are based and practical applications in research and patient care. To develop a critical and scientific attitude towards imaging techniques.

Final attainment level:

- To understand the basic principles and to discuss possibilities and limitations, advantages and disadvantages of brain imaging techniques
- To obtain knowledge of use of techniques in neuroscientific and clinical research
- To be able to propose an imaging experiment (acquisition methods and analysis) for a neuroscientific question

## Inhoud vak

Three main approaches of brain imaging (to study structure and function) can be distinguished: neurophysiological techniques (EEG, MEG), neuroradiological techniques (MRI, fMRI, MRS) and techniques which involve the use of radio active ligands (SPECT, PET). Quite some emphasis on physics and mathematics will be given during the lectures. This is necessary to provide sufficient background knowledge, such that the students become aware of the advantages and disadvantages, the possibilities and limitations of the techniques. Applications of the techniques will be given in relation to ongoing research at the Neuroscience Campus Amsterdam.

## Onderwijsvorm

The basic principles and several applications of all techniques will be presented in a series of lectures mainly scheduled during the first 3 weeks almost full-time. Small groups will discuss particular aspects in more detail. During the course, visits to the departments involved in imaging will be arranged. Hands-on experience of analysis methods is provided in computer practicals.  
approx. 70 hours of contact time during the whole course.

## Toetsvorm

Individual written exam (50% of final mark)  
Team presentation about a functional brain imaging experiment concerning a neurological disorder / neuroscientific problem. (50% of final mark)

## Literatuur

- Bullmore E, Sporns O: Complex brain networks: graph theoretical analysis of structural and functional systems. *Nat Rev Neurosci.* 2009 Mar;10(3):186-98.
- Stam CJ: Characterization of anatomical and functional connectivity in the brain: a complex networks perspective. *Int J Psychophysiol.* 2010 Sep;77(3):186-94.
- Varela F et al: The brainweb: phase synchronization and large-scale integration. *Nat Rev Neurosci.* 2001 Apr;2(4):229-39.
- Devlin H et al: Introduction to fMRI.  
<http://www.fmrib.ox.ac.uk/education/fmri/fmri/introduction-to-fmri>
- Matthews PM et al: Applications of fMRI in translational medicine and clinical practice. *Nat Rev Neurosci.* 2006 Sep;7(9):732-44.
- Lazar M: Mapping brain anatomical connectivity using white matter tractography. *NMR Biomed.* 2010 Aug;23(7):821-35.
- Beaulieu C. The basis of anisotropic water diffusion in the nervous system - a technical review. *NMR Biomed.* 2002 Nov-Dec;15(7-8):435-55
- Blokland JA et al: Positron emission tomography: a technical introduction for clinicians. *Eur J Radiol.* 2002 Oct;44(1):70-5.
- Klunk WE et al: Imaging brain amyloid in Alzheimer's disease with Pittsburgh Compound-B. *Ann Neurol.* 2004 Mar;55(3):306-19.
- Lammertsma AA: Radioligand studies: imaging and quantitative analysis. *Eur Neuropsychopharmacol.* 2002 Dec;12(6):513-6.
- Phelps ME: Positron emission tomography provides molecular imaging of biological processes. *Proc Natl Acad Sci U S A.* 2000 Aug 1;97(16):9226-33.
- Baillet S et al: Electromagnetic brain mapping. *IEEE Signal Processing Magazine* 2001 Nov;18(6):14-30.
- Hari R, Salmelin R: Human cortical oscillations: a neuromagnetic view through the skull. *Trends Neurosci.* 1997 Jan;20(1):44-9.
- Hillebrand A et al: A new approach to neuroimaging with

magnetoencephalography. Hum Brain Mapp. 2005 Jun;25(2):199-211.

### Vereiste voorkennis

Finished 1st year Master of Neuroscience. Preference for students following 2nd year tracks Master of Neuroscience which contain this course. Students with other background, please first contact coordinator.

### Doelgroep

Students attending 2nd year Master of Neuroscience  
Students with other background, please first contact coordinator.

### Overige informatie

There is a maximum number of students – which means that students other than 2nd year Master of Neuroscience should first contact coordinator.

Taught in English. For further information, please contact dr. P.J.W.

Pouwels ([pjw.pouwels@vumc.nl](mailto:pjw.pouwels@vumc.nl))

## Gene Hunting

<b>Vakcode</b>	AM_470729 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. D. Posthuma
<b>Docent(en)</b>	dr. Z. Bochdanovits, P. Heutink
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum, Practicum
<b>Niveau</b>	500

### Doel vak

To provide students with a solid base of molecular genetic approaches to identify the responsible genes for human traits and disorders.

End terms:

- students can run a genome wide association by themselves
- students can critically read GWAS studies
- students have good insight into molecular approaches that can be used for functional genetic studies
- students are aware of the differences between Mendelian and complex traits and the consequences for statistical and functional analyses

### Inhoud vak

The course will address the various aspects of positional cloning approaches (gene hunting) and functional assays for identified mutations and will address the following topics:

- Genome variation
- Molecular finemapping (tools and methods) SNPs, STRs
- Copy number variation
- From statistics to biology
- Mutation analysis
- Genome browsers
- Epigenetics
- Biological effects of mutations
- Functional assays

**Onderwijsvorm**

Lectures and discussion (25 hrs) , computer practicals (20 hrs), and self study (24-40 hrs)

Lecture and computer practicals each represent 50% of the course.

**Toetsvorm**

Weekly reports (30%), presentation (30%) and assignments (40%)

**Literatuur**

Human Molecular Genetics 4, Strachan and Read + handouts for computer practical

**Vereiste voorkennis**

Master course Behavior Genetics

**Aanbevolen voorkennis**

Statistics, genetics

**Doelgroep**

Master students

**Overige informatie**

(Minimum # students: 25)

## Genomic Data Analysis

<b>Vakcode</b>	AM_1008 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. P. van Nierop
<b>Docent(en)</b>	dr. P. van Nierop, dr. Z. Bochdanovits
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum
<b>Niveau</b>	500

**Doel vak**

To provide students with basic knowledge and skills to independently design, execute and explain the results of data analysis in the context of a genomics/proteomics experiment.

**FINAL ATTAINMENT LEVELS :**

- (i) Graduated students have acquired the necessary research skills to plan, execute, and reflect on elementary steps in data processing, statistical evaluation, and representation of results of a genomics experiment;
- (ii) students have knowledge of the principles behind analysis of protein and DNA sequence information;
- (iii) students have basic programming skills in the R programming language

**Inhoud vak**

The course will address various aspects of bioinformatics analysis of the genome and will address the following topics:

- Gene expression analysis: this section of the course deals with stages in data analysis that are associated with large scale transcriptomics data (microarray experiment). Consecutive stages of data analysis, i.e., experimental design (as far as relevant for data analysis), data preprocessing, normalization, statistical evaluation, and the identification of relevant gene groups, are discussed. At each stage specific characteristics of large scale genomics experiments that impair a straightforward interpretation of results are highlighted and alternative analysis strategies are discussed. The lectures are accompanied by computer practicals where theory is put into practice and the basic practical skills are acquired for genomics data analysis and representation in the R programming language. The theoretical and practical skills are applicable to any 'omics' (genomics, proteomics, metabolomics) experiment.

- Analysis of biological sequences: this section of the course teaches the fundamentals of mining of information on DNA and protein sequences relevant for molecular biology research. Special attention is given to the principle of molecular evolution and the translation thereof into algorithms for sequence analysis. Topics of sequence alignment, sequence database searching, and phylogenetic analysis will be discussed, and are accompanied by computer practicals that provide insight into sequence analysis algorithms as well as familiarize students with popular sequence analysis tools such as BLAST and ClustalW.

#### **Onderwijsvorm**

Lectures (20 hr), practicals (15 hr)

#### **Toetsvorm**

Written exam(60%), microarray data analysis assignment (20%), sequence analysis assignment (20%)

#### **Literatuur**

Dov Stelkel, Microarray bioinformatics, 2003, Cambridge University Press, ISBN 052152587X

David W Mount, Bioinformatics: sequence and genome analysis, 2004, 2nd edition, Cold Spring Harbor Laboratory Press, ISBN 0879697121 (this book may be replaced by a book at a more suitable level; more known Q3 2013 )

#### **Vereiste voorkennis**

Bachelor Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology, Neurogenomics course.

#### **Doelgroep**

The course provides essential body of knowledge and skills to students that pursue a career in Life Sciences at the molecular level (genomics, proteomics, metabolomics).

#### **Overige informatie**

For further information, please contact dr. P. van Nierop ([p.van.nierop@vu.nl](mailto:p.van.nierop@vu.nl))

## **Internship Neurosciences I**

<b>Vakcode</b>	AM_471108 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	27.0

<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. W.J.A.J. Smeets
<b>Niveau</b>	600

## Internship Neurosciences II

<b>Vakcode</b>	AM_471109 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	25.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. W.J.A.J. Smeets
<b>Niveau</b>	600

## Literature Survey Neurosciences

<b>Vakcode</b>	AM_471110 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	8.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. W.J.A.J. Smeets

## Live Cell Imaging

<b>Vakcode</b>	AM_470726 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. R.F.G. Toonen
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

This course will provide the student with theoretical and practical knowledge to utilize emerging cellular and sub-cellular imaging technologies in neuroscience.

### Inhoud vak

Advances in light microscopy, digital image processing, and the development of a variety of powerful fluorescent probes present expanding opportunities for investigating the nervous system, from synaptic terminals to networks in the brain. This intensive theoretical and practical course will provide participants in-depth knowledge to utilize emerging imaging technologies. The primary emphasis of the

course will be on vital light microscopy. Students will learn the principles of light microscopy, as well as use of different types of electronic cameras, laser scanning systems, functional fluorophores, delivery techniques, and digital image-processing software. In addition to transmitted light microscopy for viewing cellular motility, the course will examine a variety of molecular probes of cell function, including calcium-sensitive dyes, voltage-sensitive dyes, photo-activated ("caged") compounds, and exocytosis tracers. Issues arising in the combination of imaging with electrophysiological methods will be covered. Particular weight will be given to single- and multi-photon laser scanning microscopy, photo-stimulation techniques and to newly available biological fluorophores, especially Green-Fluorescent Protein (GFP) and its variants.

### Onderwijsvorm

Masterclass meetings, 2 weeks hands-on experiments in the lab in small groups and lectures.

Theory: (20%)

A. Lectures: 10 x 2 hrs: 20h

B. Journal clubs/lab tour: 10h

Hands-on lab work (45%)

A. Practicals & data analysis: 8 x 7h: 56h

B. Presentations/data assessment/exam: 15h + 2h exam

Self-study (35%)

- 58h

Total: 160h

### Toetsvorm

Oral presentations (50%) and Exam (50%)

### Literatuur

- Selected chapters from Live Cell Imaging. A laboratory Manual.

Editors: Goldman and Spector.

- Selection of primary scientific papers

### Vereiste voorkennis

Neurobiology, Principles of Neuroscience (470701)

### Overige informatie

Guest lecturers:

Dr. C. Lohman NIN, KNAW

Dr. P Mangeol FEW

Drs B. v. Oort FEW

Drs. A. Negrean CNCR, FALW

## Methods in Behavioral Neurosciences

<b>Vakcode</b>	AM_470728 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. R.O. Stiedl
<b>Niveau</b>	500

## Doel vak

The course will give an overview of methods such as behavior tests and approaches used in a number of different research areas in behavioral neuroscience. It will provide a critical overview on behavioral phenotyping aspects of mice and rats used in biomedical research. Lecturers include Drs. Sabine Spijker, Maarten Loos and Tommy Pattij as experts in their scientific fields.

## Inhoud vak

In behavioral neuroscience we study how different brain areas are involved in the control and execution of behavior. Importantly, the methods used have to capture important aspects of the normal behavior of the animal. In order to obtain results that are both reproducible and reliable it is important to that the methods used are standardized and that there is a clear interpretation of what the measures actually mean. Questions that we will address are:

- 1) How can we record animal behavior in a reproducible fashion?
- 2) Which test assays and behavioral parameters are important and which brain areas are involved?
- 3) How do we analyze the data that we have obtained?

The following topics will be covered to better understand and judge the behavior test spectrum and its use in behavioral phenotyping:

- Standardization of behavior tests
- Classical and novel tests and measures of anxiety and fear
- Telemetry and optogenetics in behavioral neuroscience
- Experimental approaches to study addictive behavior
- Autonomic functions in behavior as index of emotion
- Studying executive functions in behavior
- Home cage-based phenotyping of mice
- Spatial learning tests in rodents: clues and pitfalls
- Neural aspects of spatial orientation

## Onderwijsvorm

Lectures/demonstrations with discussion

## Toetsvorm

Student presentation from a spectrum of related topics (15%) and written examination with open-ended questions (85%) determine the final grade.

## Literatuur

Primary literature (papers) generally provided through digital blackboard.

## Vereiste voorkennis

Basic knowledge of animal behavior.

## Neuro- and Psychopharmacology

<b>Vakcode</b>	AM_470718 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen

<b>Coördinator</b>	dr. M.M.M. Wilhelmus
<b>Niveau</b>	600

### **Doel vak**

Principal aim of the course is to provide the student with sufficient insight into the basic principles of Neuro- and Psychopharmacology, in order to enable the student to independently formulate ideas and concepts which may lead to the development of innovative drug therapies. The subjects of the course are largely drawn from research themes of the Neuroscience Campus Amsterdam of the Vrije Universiteit and VU University Medical Center.

Specific aims:

- A) Students are able to describe the pathology of the disease and know which biological mechanisms are the driving forces underlying the pathology.
- B) Students are capable of pinpointing possible therapeutic entries of the disease, and can argue whether and how the therapy will affect these therapeutic entries.
- C) Students are able to defend and motivate their therapeutic strategy in front of fellow students and teachers.

### **Inhoud vak**

Current pharmacotherapy of well known neurologic- and psychiatric disorders is based on the use of drugs of which the development has been guided by, often unproven, hypotheses concerning the pathophysiology of these diseases. As a result, despite a few "success stories", in most cases this has led to the introduction of suboptimally effective compounds. Moreover, these "therapeutics" do not cure the disease, but merely act to ameliorate the symptoms. However, in light of the increasing knowledge concerning the pathogenesis of brain disorders, it now seems highly feasible that in the near future drugs will be developed which will target the core of the disease process.

During the course, a small number of lectures will provide the student with detailed knowledge and insight into the hypotheses that have guided the development of the current generation of neuro- and psychopharmaceuticals. Subsequently, the student will be expected to 1) independently identify the strong points and weaknesses of these hypotheses, and 2) use the conclusions of this evaluation, in combination with recent developments in the field, to formulate a well-based proposal for the development of a new pharmacotherapy for a specific brain disease.

### **Onderwijsvorm**

Lectures (approximately 19h), progression meeting with supervisor (3h) and writing a thesis and preparing presentation (approximately 96h). In total, the students are expected to invest a workload of 40 hour each week during this course.

### **Toetsvorm**

Pharmacology exam (1/4 of mark, in writing), writing (1/2 of mark) and public presentation (1/4 of mark) of thesis

### **Literatuur**

- "Medical Pharmacology at a Glance"; M.J. Neal, Fifth Edition (Blackwell Science 2005), ISBN 0-632-05244-9; Chapters 1-4, 6-9, 22, 24-28 and 31.
- "Rang and Dale's Pharmacology"; H.P. Rang, M.M. Dale, J.M.

Ritter, R.J. Flower, Sixth Edition (Churchill Livingstone-Elsevier 2007), ISBN 0-443-06911-5; Chapters 1-3, 6 and 56.

- Additional texts provided during the course

### Vereiste voorkennis

Medical Pharmacology course or equivalent.

### Overige informatie

A maximum of 24 students can be accommodated in the course. Preference is given to students who participate in the Master of Neuroscience program of the VU University Amsterdam. Course is taught in English.

For further information please contact dr. M. Wilhelmus

([m.wilhelmus@vumc.nl](mailto:m.wilhelmus@vumc.nl)).

## Neurobiology of Animal Behaviour

<b>Vakcode</b>	AM_471018 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. R.O. Stiedl
<b>Niveau</b>	500

### Doel vak

The course will give an overview of research topics of the neural basis of animal behavior from sensory perception to specific behaviors. In this course we will study of a number of model systems from insects to mammals with partly human aspects for psychiatric disorders related to stress. I will do this by critically reviewing both recent literature and a number of classical papers. The course is designed for students who already have a basic knowledge of neurobiology and behavior.

### Inhoud vak

When we study the neural basis of behavior we investigate how, in a biological setting, nervous systems generate behavior in specific functional contexts. This is done by combining evolutionary and comparative approaches to the study of nervous system function on a systems level. Questions that we will address are:

- 1) How do neural circuits cause different species-specific behaviors?
- 2) How can we compare the nervous systems of different animals in this respect?

3) What exactly are the sensory worlds of the different animals and how do environmental factors contribute to the different behaviors?

The following topics will be studied from neurons via brain areas to behavior:

- Ultimate and proximate questions to study behavior
- Emotional learning and anxiety in rodents
- Echolocation in bats
- Locomotion and pattern generation principles
- Escape behavior in the cockroach and the crayfish
- Auditory communication in insects
- The tactile world of the star-nosed mole and the rat
- Olfactory systems and behavior
- Dominance, hormones and stress

**Onderwijsvorm**

Lectures with discussion

**Toetsvorm**

Student presentation from a spectrum of related topics (15%) and written examination with open-ended questions (85%) determine the final grade.

**Literatuur**

Primary literature (papers) generally provided through digital blackboard.

**Vereiste voorkennis**

Basic knowledge of animal behavior.

## Neurogenomics

<b>Vakcode</b>	AM_1007 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. A.B. Smit
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Computerpracticum
<b>Niveau</b>	500

## Neuronal Networks in Vivo

<b>Vakcode</b>	AM_1001 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. C.P.J. de Kock
<b>Docent(en)</b>	dr. C.P.J. de Kock
<b>Lesmethode(n)</b>	Werkgroep
<b>Niveau</b>	600

**Doel vak**

The aim is to provide insight into the most intricate neuronal network of the brain – the cortical micro-circuit. You will learn the basic floor plan of the cortex and find out the function of different layers and multiple cell types. As the course title suggests, all topics will be addressed from the in vivo perspective which aims to combine cortical function with animal behaviour. You will get hands-on experience in in vivo experiments, data analysis and how to identify different types of cortical neurons.

**Inhoud vak**

The course starts with plenary lectures on cortical circuitry and on recent advances to study the properties of cortical networks. These

advances involve in vivo imaging and electrophysiological techniques that are applied in anaesthetized and awake animals. The lectures will gradually merge into a master class setting where you will work on a mini-thesis. In the mini-thesis you will review two experimental papers (from a pre-selected set) and write a research proposal involving in vivo experiments. In addition, the course will feature demonstrations of in vivo experiments, practical (histological) work and will be concluded with a workshop where you learn how to discriminate and recognize different cortical cell types using real rat brain slices. At the end of the course, you will present your mini-thesis to your peer students.

### Onderwijsvorm

Lectures 11 hours 25% 1.5 ECTS

Demo's in vivo experiments 16 hours 38% 2.3 ECTS

Histology workshop 8 hours 19% 1.1 ECTS

Cell identific. workshop 2 hours 5% 0.3 ECTS

Final presentations 5 hours 12% 0.8 ECTS

Total 42 hours 100% 6.0 ECTS

### Toetsvorm

1) Written exam

2) Presentation on an in vivo methods.

3) Written thesis (5 pages) on an in vivo topic, accompanied by a presentation. The topic can fall into three categories: 1) a "hot" current topic in the field. 2) the topic covers a set of papers with conflicting outcomes or 3) the topic covers similar outcomes with different in vivo approaches.

Final grading depends on Exam (25%), Methods presentation (25%), Written topic thesis (25%), and Topic presentation (25%).

### Literatuur

Oberlaender et al, Cereb Ctx 2012

Egger et al, PLoS Comp Biol 2012

Markram et al, Nat.Neurosci 2006

Hill et al, PNAS 2012

### Vereiste voorkennis

To be announced

### Doelgroep

Master of Neuroscience students of VU University Amsterdam or other universities. The course is optional for all Master of Neuroscience tracks.

### Overige informatie

Guest Lecturers:

Hemanth Mohan, MSc, FALW

Roel de Haan, MSc, FALW

Anton Pieneman, FALW

## Neurophilosophy and Ethics

<b>Vakcode</b>	AM_1018 ()
<b>Periode</b>	Periode 3

<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. G. Glas
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

This course gives an introduction into philosophical and ethical issues that are part of neuroscientific research and of the application of neuroscientific insights in professional practices and in the communication with the general public.)

Final attainment level: at the end of the course the student is able

- To identify logical errors in scientific papers
- To understand and reproduce four positions in the debate about the relation between brain and mind
- Point out the differences between the concepts of cause, explanation, law, correlation
- To identify 'reification' and scientific reasoning
- To give an ethically informed account of the relation between scientific research and the industry
- To provide a summary statement about the role of the scientist in educating the general public.

### Inhoud vak

Part 1. Philosophy of science and methodology (6 hours)

This part of the course addresses questions like

- what is science?
- what do concepts like cause, explanation, and law mean?
- what is the difference between correlation and causation? different types of relation: lawlike relation, statistical relation; covariation.
- when do statistical relations say anything about reality?
- hypothesis-driven research versus bottom-up 'data-driven' research
- explanation of terms: inference to the best explanation, post hoc explanation, validation (different types of validation)

Part 2. Basic concepts(6 hours)

This part of the course addresses questions like

- what is mind?(including the notion of 'extended mind')
- what is relation between mind and brain? (with an introduction into the conceptual history of this relationship)
- what is embodiment?
- what is a gene (the gene as 'fuzzy' concept)?
- conceptualizations of complexity (system theory; neurophilosophy)

Part 3. Ethical issues (4 hours)

This part of the course gives an introduction to basic concepts and to current approaches of ethics. Special attention to issues like

- informed consent, especially in neurological and psychiatric patients
- intertwinement between science and industry
- neurosurgery (in OCD and Parkinson's disease)
- brain implants

Part 4. Educating the public (4 hours)

This part of the course is devoted to the position of the scientist who is asked to inform the general public. What can be said on the basis of neuroscience research and what not? Is it for example legitimate for a scientist to say

- that God does not exist

- that we have no free will
- that morality is nothing but a product brain wiring
- what is the status of evolutionary explanations in the public sphere?

### Onderwijsvorm

20 hours interactive Interactive lectures (in English), video, discussion of the literature, 'Lagerhuys debate', pitching

### Toetsvorm

Each student gives a brief presentation about his or her research project and discusses one or two philosophical issues with respect tot his project.(the grade for this presentation forms 1/3 of the final grade). The other 2/3 of the is based on a final paper, which provides a brief summary of the main issues that are discussed and a two page account of a particular philosophical or ethical problem (question, possible answers, discussion of philosophical/ethical resources to answer the question, conclusion).

### Literatuur

Will be provided two months before the beginning of the course.

## Psychophysiology

<b>Vakcode</b>	AM_470736 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. J.C.N. de Geus
<b>Docent(en)</b>	prof. dr. J.C.N. de Geus
<b>Lesmethode(n)</b>	Werkgroep, Practicum, Hoorcollege
<b>Niveau</b>	400

### Doel vak

1) Insight in the link between emotional state and peripheral nervous system activity and the most recent experimental approaches and research designs in the field of autonomic and cardiovascular psychophysiology.

2) Practical skills in the measurement of autonomic nervous system and cardiovascular stress-reactivity.

### Inhoud vak

In plenary lectures we will outline the organisation of the autonomic nervous system and the cardiovascular system and how their activity is reflected in peripheral physiological signals. The lectures are interspersed with a series of practicals, where the students apply a broad arsenal of instruments and techniques (ElectroCardioGram, ImpedanceCardioGram, Skin-conductance, Respiration, Finger Blood Pressure, Hormones) to record these signals and to extract parameters that can be used to index psychological processes (e.g. mental load, emotion and stress). This will be done in a standardized laboratory setting using the Biopac system as well as in naturalistic open-field settings using the Vrije Universiteit Ambulatory Monitoring System (VU-AMS). Amongst others, students will measure (on each other): skin-conductance responses to emotion, cardiorespiratory coupling, baroreflex

regulation, and sympathetic and parasympathetic reactivity to mental and physical stress. The main principles and strategies for data analysis will be covered in the lectures and applied in the practicals to the self-recorded data-sets.

### Onderwijsvorm

In plenary lectures we will outline the organisation of the autonomic nervous system and the cardiovascular system and how their activity is reflected in peripheral physiological signals. The lectures are interspersed with a series of practicals, where the students apply a broad arsenal of instruments and techniques (ElectroCardioGram, ImpedanceCardioGram, Skin-conductance, Respiration, Finger Blood Pressure, Accelerometry) to record these signals and to extract parameters that can be used to index psychological processes (e.g. mental load, emotion and stress). This will be done in a standardized laboratory setting using the Biopac system as well as in naturalistic open-field settings using the Vrije Universiteit Ambulatory Monitoring System (VU-AMS). Amongst others, students will measure (on each other): skin-conductance responses to emotion, cardiorespiratory coupling, baroreflex regulation, and sympathetic and parasympathetic reactivity to mental and physical stress. The main principles and strategies for data analysis will be covered in the lectures and applied in the practicals to the self-recorded data-sets.

Number of contact hours:

Lectures: 20h

practicals & practical preparation: 70h

Examination: 2h

self-study: 70h

### Toetsvorm

Written examination (50% of grade) and independent performance of a short experiment (20%) and analysis and presentation of the data collected (30%).

### Literatuur

1) Psychophysiology reader with selected articles

AND

2a) Vander, A., Sherman, J. & Luciano, D. Human physiology, the mechanisms of body function. Boston: WCB-McGraw-Hill: blz 373-463 (Circulation), blz 463-504( Respiration).

OR

2b) Stanfield J, Principles of Human Physiology (4th Ed). Pearson Education Inc: chapters 13,14 (Circulation), and 16 (Respiration)

AND

3) 6 short practical manuals

## Scientific Writing in English

<b>Vakcode</b>	AM_471023 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels

<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	M. van den Hoorn
<b>Lesmethode(n)</b>	Werkgroep
<b>Niveau</b>	400

### **Doel vak**

The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article in English that is well organized idiomatically and stylistically appropriate and grammatically correct.

At the end of the course students

- know how to structure a scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

Final texts may contain occasional spelling, grammatical or word choice errors, but these will not distract from the general effectiveness of the text.

### **Inhoud vak**

The course will start with a general introduction to scientific writing in English. Taking a top-down approach, we will then analyse the structure of a scientific article in more detail. As we examine each section of an article, we will peel back the layers and discover how paragraphs are structured, what tools are available to ensure coherence within and among paragraphs, how to write effective and grammatically correct sentences and how to choose words carefully and use them effectively.

Topics addressed during the course include the following:

- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?
- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism

- Vocabulary development: using appropriate vocabulary and collocations

### **Onderwijsvorm**

Scientific Writing in English is an eight-week course and consists of 4 contact hours during the first week and 2 contact hours a week for the rest of the course. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (Introduction, Methods or Results section, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

### **Toetsvorm**

Students will receive the three course credits when they meet the following requirements:

- Students hand in three writing assignments (Introduction, Methods or Results, Discussion) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend all sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students actively participate in class;
- Students do not plagiarise or self-plagiarise.

### **Literatuur**

Effective Scientific Writing: An Advanced Learner's guide to Better English (A. Bolt & W. Bruins, ISBN 978 90 8659 6171). VU bookstore: €27.95.

### **Doelgroep**

This course is only open to students of the Master's programmes of the Faculty of Earth and Life Sciences mentioned below. These students are only eligible to the course if they have already conducted scientific research (e.g. for their Bachelor's thesis) or if they will be working on a research project when taking Scientific Writing in English.

Faculty of Earth and Life Sciences - Master's programmes:

- Biology;
- Health Sciences;
- Ecology;
- Biomolecular Sciences;
- Biomedical Sciences;
- Neurosciences;
- Global Health;
- Management, Policy Analysis and Entrepreneurship in Health and Life Sciences.

### **Overige informatie**

- To do well, students are expected to attend all lessons. Group schedules are to be found at [rooster.vu.nl](http://rooster.vu.nl) and on Blackboard.
- A VUnet registration for this course is necessary in order to enroll or be enrolled in a Blackboard group. The VUnet registration automatically gives access to the corresponding Blackboard site.
- Group enrollment only takes place via Blackboard. For open/general groups: students have to enroll themselves following FALW programmes containing this course. For group assigned to specific studies, students are enrolled by the course coordinator).

- Make sure Scientific Writing in English does not overlap with another course.
- If you have registered for a group in Blackboard, you are expected to attend all sessions (eight). If you decide to withdraw from the course, do so in time, both on Blackboard and in VU.net. This will avoid a 'fail' on your grade list for not taking part in this course and allows other students to fill in a possible very wanted group spot.
- If you (expect to) miss a session, please inform the group trainer as soon as possible. If you miss a session without notification, you may not be able to finish the course.
- For any questions concerning this course, please contact the course coordinator Marieke Zantkuijl: [m.c.l.zantkuijl@vu.nl](mailto:m.c.l.zantkuijl@vu.nl)

## Statistical Genetics for Gene Finding

<b>Vakcode</b>	AM_470734 ()
<b>Credits</b>	5.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.J. Hottenga
<b>Docent(en)</b>	dr. J.J. Hottenga
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum
<b>Niveau</b>	500

### Doel vak

Provide practical skills for genetic linkage and association studies

### Inhoud vak

The first part of the course will focus on parametric and non-parametric linkage analysis in pedigrees, with special emphasis on mendelian inheritance of complex phenotypes. The second part of the course will concentrate on genome-wide association studies (GWAS). With the advent of SNP microarray-chips that can map the largest part of the common genetic variance, GWAS have been playing a significant role in the field of genetics for the last couple of years. With higher resolution than the classical linkage studies, GWAS have been able to uncover many variants with small effects on complex traits. Besides teaching the main theoretical concepts underlying GWAS and linkage analysis, this course also includes the hands on training needed to handle the large amounts of data and statistical tests. In the practical you will prepare your data, run GWAS and linkage analyses, learn how to visualize and interpret the output and distinguish real signal from noise. The practicals include the use of Merlin, PLINK, haploview, WGA-viewer, Galaxy, SPSS.

### Onderwijsvorm

Lectures, practical hands-on computer training

### Toetsvorm

Weekly assignments (25%) & exam (75%). Practical needs to be completed in order to obtain a final grade.

### Literatuur

To be announced on Blackboard

### Vereiste voorkennis

Behavioral Genetics (AM\_470732) & Complex Trait Genetics (AM\_470733)

## Statistical Genetics for Gene Finding

<b>Vakcode</b>	AM_1040 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.J. Hottenga
<b>Docent(en)</b>	dr. J.J. Hottenga
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum
<b>Niveau</b>	500

### Doel vak

Provide practical skills for genetic linkage and association studies

### Inhoud vak

The first part of the course will focus on parametric - and non-parametric linkage analysis in pedigrees, with special emphasis on Mendelian inheritance of complex phenotypes and the possible ways to analyze these data. In current and future genetics, linkage analysis remains an essential tool to analyse pedigrees for research as well as clinical genetics. The knowledge required is essential for any geneticist.

The second part of the course will concentrate on genome-wide association studies (GWAS). With the advent of SNP microarray-chips that can map an essential part of the common genetic variance, GWAS have been playing a significant role in the field of genetics for the last couple of years. With higher resolution than the classical linkage studies, GWAS have been able to uncover many variants with small effects on complex traits.

Besides teaching the main theoretical concepts underlying GWAS and linkage analysis, this course also includes the hands on training needed to handle the large amounts of data and statistical tests. In the practical you will prepare your data, run GWAS and linkage analyses, learn how to visualize and interpret the output and distinguish real signal from noise. The practicals include the use of Merlin, Qtdt, Plink, haploview, WGA-viewer, Galaxy, SPSS.

### Onderwijsvorm

Lectures, practical hands-on computer training.

Note that the lectures will be essential to answer most of the examined knowledge.

Contact hours: 4x2 hours lecture + 4x4 hours practicals.

First two weeks: Linkage

Second two weeks: GWAS

### Literatuur

Statistical Genetics: Gene Mapping Through Linkage and Association. Neale BM, Ferreira MAR, Medland SE, & Posthuma D (Eds.) Taylor and Francis, London (2007). (ISBN 9780415410403)

Abecasis GR, Cardon LR and Cookson WO. A General Test of Association for Quantitative Traits in Nuclear Families. *Am J Hum Genet* (2000) 66:279-292.

Abecasis GR, Cherny SS, Cookson WO and Cardon LR. Merlin-rapid analysis of dense genetic maps using sparse gene flow trees. *Nat Genet* (2002) 30:97-101.

Fulker DW, Cherny SS, Sham PC, Hewitt JK. Combined linkage and association sib-pair analysis for quantitative traits. *Am J Hum Genet*. 1999 Jan;64(1):259-67.

Purcell S, Neale B, Todd-Brown K, Thomas L, Ferreira MAR, Bender D, Maller J, Sklar P, de Bakker PIW, Daly MJ & Sham PC (2007) PLINK: a toolset for whole-genome association and population-based linkage analysis. *American Journal of Human Genetics*, 81.

David J. Balding. A tutorial on statistical methods for population association studies. *Nature Reviews Genetics*. (2006) 7:781-791

Thomas A. Pearson; Teri A. Manolio. How to Interpret a Genome-wide Association Study. *JAMA*. 2008;299(11):1335-1344

Joel N.Hirschhorn and Mark J.Daly. Genome-Wide Association Studies for Common Diseases and Complex Traits. *Nature Reviews Genetics*. (2005) 6:95-108.

Treva K. Rice, Nicholas J. Schork, and D. C. Rao. Methods for Handling Multiple Testing. *Advances in Genetics*, Vol. 60, chapter 12.

Robert Plomin, Claire M. A. Haworth and Oliver S. P. Davis. Common disorders are quantitative traits. *Nature Reviews Genetics*, published online 27 october 2009.

John P. A. Ioannidis, Gilles Thomas and Mark J. Daly. Validating, augmenting and refining genome-wide association signals. (2009). *Nature Reviews Genetics*. 10:318-329.

Peter M. Visscher, Matthew A. Brown, Mark I. McCarthy, and Jian Yang. Five Years of GWAS Discovery. *The American Journal of Human Genetics* 90, 7–24, January 13, 2012

Additional literature involving recent techniques will be announced on Blackboard two weeks in advance of the course.

### **Vereiste voorkennis**

Behavioral Genetics (AM\_470732) & Complex Trait Genetics (AM\_470733) & Basic Statistics.

### **Aanbevolen voorkennis**

Variance components analysis, regression analysis.

### **Doelgroep**

Any person interested in analyzing human DNA in relation to heritable (complex) traits: e.g., geneticists, molecular biologists.

### **Overige informatie**

Additional useful information can be obtained from the following website links:

<http://pngu.mgh.harvard.edu/~purcell/plink/download.shtml>

<http://www.sph.umich.edu/csg/abecasis/Merlin/index.html>

<http://www.sph.umich.edu/csg/abecasis/qtdt/index.html>

## Synaptic and Cellular Neurophysiology

<b>Vakcode</b>	AM_1009 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. L.N. Cornelisse
<b>Niveau</b>	500

### Doel vak

To provide a theoretical basis for the understanding and measurement of electrical activity and neuronal communication in the brain and to gain hands-on experience with electrophysiological techniques.

### Inhoud vak

A thorough introduction to electrophysiology and an understanding of the basic biophysics underlying (the study of) electrical activity in the brain at a cellular level. The first two weeks of the course will be dedicated to lecture classes with problem-solving exercises, and practicals to put theory into practice. Following this, students will acquire patch-clamping techniques and complete mini lab projects in the last two weeks, presenting their findings at the end of the course.

### Onderwijsvorm

Lectures: 20 hrs

Practicals: 28 hrs

Mini project: 100 hrs

### Toetsvorm

Theoretical exam 50%

Mini project 25%

Presentation 25%

### Aanbevolen voorkennis

Basic understanding of physics and mathematics

### Doelgroep

Students with an interest in electrophysiology and/or high-end methods for functional analysis of brain genes

### Overige informatie

Mini projects are performed in groups of 2-3 students with a supervisor and aimed at learning how to perform a successful electrophysiology experiment, and subsequent analysis, interpretation and presentation of the data.

## System Neurosciences

<b>Vakcode</b>	AM_470712 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. T.J. de Vries
<b>Niveau</b>	500

### Doel vak

- Understanding of approaches to study the central nervous system in an integrated and multidisciplinary way with a strong focus on how the complexity of the brain is required for complex behaviour.
- The ability to write a research proposal from a system neuroscience perspective

### Inhoud vak

Systems Neurosciences is a "way of life": approaching the study of the central nervous system in an integrated and multidisciplinary way. Once learned in an exemplar system, the systems approach can be applied to essentially any functional system in the CNS. In this course we will restudy the organization of essential systems, such as the sensory and motor systems, associational systems, autonomic nervous system and hypothalamus, etc. This will to a large extent consist of textbook-based homework assignments with short presentations and discussion. The core of the course will take examples of systems involved in learning and memory, in particular those involved in declarative learning and memory. Based on selected review- type papers/chapters we will a) follow the development of concepts over time; b) discuss the relationship between technology-development and experimental approaches c) study and discuss different approaches and d) integrate those into a concept of systems neurosciences.

### Onderwijsvorm

Lectures, homework assignments, presentations, and tutored discussions.

Contact hours: 24

Selfstudy 48

### Toetsvorm

Self-study with evaluations by way of presentations and discussions; final thesis on a self-selected topic.

### Literatuur

Kandel ER, Schwartz JH, Jessell TM Principles of Neural Science, 2000, 4th edition, McGraw Hill, ISBN 0-07-112000-9. All chapters

This book will be used in the course as background literature and for a large part of self study assignments. Other literature will be provided during the course or will be self-selected.

### Vereiste voorkennis

Principles of Neuroscience or similar advanced neuroscience course

### Aanbevolen voorkennis

Basic neuroscience

### Overige informatie

Guest lecturers: Prof dr Kees Stam, Prof dr Cyriel Pennartz, Prof dr Jeroen Geurts, dr Ysbrand van der Werf, dr Jamie Peters, dr Matthew Self