NRSN
Norwegian Research School in Neuroscience

NRSN Summer School in Neuroscience 2017 at UiB

Circadian rhythms and sleep

their role in mental and physical health, safety and productivity

Faculty of Psychology, University of Bergen

6 - 12 of August 2017

Summary

Humans spend roughly one-third of their lives asleep. The aim of the course is to provide knowledge of the function that is served by circadian rhythms, sleep and the mechanisms by which circadian disruption and sleep insufficiency degrades mental and physical health, safety and productivity – and increases risk of errors and accidents.

The students will be given insight into clinical and preclinical aspects of circadian rhythms and sleep, into basic and applied research aiming to understand the neurobiology of normal sleep and circadian rhythmicity, and the effect of the consequences of their dysregulation on synaptic plasticity, metabolism, cognitive performance and health. Normal changes in sleep and circadian rhythms across the age span will be covered. In addition, factors that may impact sleep (such as habits, societal factors, shift work, stress, exercise, drug abuse and nutrition) and consequences of sleep loss on cognitive performance and health will be emphasized. The course will also provide an overview of sleep disorders (insomnia, hypersomnia, circadian sleep-wake disorders, sleep related breathing disorders, parasomnias, sleep related movement disorders), symptoms, causes and treatment. Circadian dysregulation and chronotherapy in psychiatric disorders and the interplay between mental and physical health and sleep will also be a central topic.

The students will be given hands on practice on how to assess sleep and circadian rhythms in humans and animals, and how to plan and conduct simple experiments on sleep and circadian rhythms. In the end of the course, the students will be challenged to identify and discuss future research perspectives within sleep and health.

The course includes lectures that are not only aimed at transferring knowledge but will also provide a platform for direct interaction and discussion between speakers and students. The students will be encouraged to discuss topics, between each other and in plenum. Handouts and problem sets will be given. Practical tests (monitoring their own sleep and circadian rhythms, and introduction to telemetric monitoring of sleep and circadian rhythms and how to perform and analyse behavioural tests in animals). The students present the results of their own sleep pattern and cognitive tests. There will be a quiz at the beginning of each day, and a final at the end of the course

UNIVERSITAS BERGENSIS

Target student profile

The summer school is intended for PhD candidates and MSc students in neuroscience in one of the Universities in Norway and the program is suitable for candidates with a variety of educational backgrounds and research specializations: neuroscience, engineering, life sciences, mathematics, computer sciences, and physics. Priority will be given to members of NRSN and PhD students.

Course duration:
One-week intensive course, 47 hours student commitment. Lectures (36hrs), laboratory practice and demonstrations (11hrs).

Organizers and lecturers

The summer school will be organized by the Faculty of Psychology at the University of Bergen (UiB), with support from the Norwegian Research School in Neuroscience (NRSN).

Scientific coordinators

Associate Professor Janne Grønli, PhD, Janne.Gronli@uib.no, mobile 92296559
Associate Professor Jelena Mrdalj, PhD, jelena.mrdalj@uib.no, mobile 95913594

Administrative/Program coordinator

Louise Haugen Bjerrum, M.Sc. candidate, Louise.Bjerrum@student.uib.no, mobile 99563398

Invited lecturers:

Assistant Professor Ilia Karatsoreos, Department of Integrative Physiology and Neuroscience, Washington State University, US employs the circadian and stress systems as models to probe how physiological dysregulation leads to long-term negative health consequences. His use of transgenic mouse models, behavioral and metabolic assays, and sleep electrophysiology, along with analyses of neural structure/function through gene expression, confocal microscopy, and 3-D cellular reconstructions are the basis to understand 1) how do normal circadian rhythms and sleep promote health, 2) how do disrupted rhythms increase vulnerability and 3) how does disruption of the brain-body stress axis alter long-term vulnerability and resilience. Dr. Karatsoreos was recently awarded a NSF CAREER grant.
http://ipn.vetmed.wsu.edu/people/faculty-ipn/karatsoreos-i

Associate Professor Jonathan Wisor, Elson S. Floyd College of Medicine, Washington State University, US is a leading scientist on sleep regulatory neuronal populations, cerebral metabolic changes with sleep, and drugs of abuse and sleep. His research program aims to identify functional consequences of sleep and sleep loss within the nervous system. Dr. Wisor develops data analysis algorithms that assure the efficiency and quality of the polysomnographic data to better generate new hypotheses on the effects of circadian disruption on sleep quality and circadian timing. Dr. Wisor was awarded with outstanding faculty member of the year, 2013-2014 with acknowledgment in teaching.
https://medicine.wsu.edu/directory-faculty/jonathan-wisor/

Professor Peter Meerlo from the University of Groningen in The Netherlands is an internationally acclaimed researcher in the field of sleep and circadian rhythms. He has an extensive publication list in the area of the role of sleep in neuronal plasticity and memory processes, neurobiological consequences of disrupted and restricted sleep, sleep across different species, and the effects of stress on sleep architecture, sleep EEG, biological clocks and circadian rhythmicity.
http://www.rug.nl/staff/p.meerlo/research

Associate professor Janne Grønli, Faculty of Psychology, UiB is an experienced experimental sleep researcher, and certified somnologist by the European Sleep Research Society as well as Registred Polysomnographic Technologist (American certification). She is head of the Research Group of Experimental and Clinical Stress and the animal sleep laboratory at UiB. Grønli has led several experimental sleep studies.

MD/PhD-student Tone Elise Gjøtterud Henriksen is a Chief Consultant Psychiatrist at Haukeland University Hospital and a PhD researcher at Section of Psychiatry, Clinical Institute 1, UiB. She has conducted an RCT that aimed to test the effect of blocking the energy-rich blue light (virtual darkness) used as an ad-on treatment in bipolar mania. Her work was awarded with Helse Vest Innovation Award in 2016.

Associate Professor Morten Engstrøm is a Chief Consultant Neurophysiologist at St. Olavs Hospital/NTNU. He is the president of Norwegian Society of Sleep Medicine and expert in clinical sleep disorders.

Professor Ståle Pallesen, Faculty of Psychology is a certified somnologist by the European Sleep Research Society and is head for the human sleep laboratory at UiB, which is expanding to a human centric lighting laboratory. He has extensive experience with sleep analyses; ranging from subjective, actigraphy and PSG.

Professor Clive Bramham, Faculty of Medicine and Dentistry, UiB, is a leading scientist on the molecular mechanisms, regulation, and functions of long-term synaptic plasticity in relation to specific neural circuits in the adult brain. His multidisciplinary approach combines electrophysiological studies in live rats and brain slices with molecular biological and imaging techniques including time-lapse multiphoton microscopy. Dr. Bramham was recently awarded with ‘Topforsk’ and is affiliated with KG Jebsen Centre for Research on Neuropsychiatric Disorders.

Associate Professor Jelena Mrdalj, Faculty of Psychology, UiB is expert in sleep and developmental psychology and in animal models in sleep research. She will also act as a local coordinator for the summer school.

Associate Professor Elisabeth Flo, Faculty of Psychology, UiB is psychologist with an expertise within sleep, shift work and sleep interventions in the elderly.

Practicalities

Arrival: Sunday August 6, 2017, by 18:00, **Departure:** Saturday August 12, 2017, after breakfast

Location:
BB-Building, Jonas Lies vei 91;
9th floor: room 110 and animal facility; 3rd floor: auditorium 4.
Christies gt 12; 1st floor: auditorium 129; 5th floor human centric light laboratory.

http://www.uib.no/en/ibmp

Number of students: Max. 25

Credits:
The Faculty of Psychology at UiB recommends that participation in the summer school is accredited with 3 ECTS credits. Participants must apply to their respective universities in order to have the course formally approved as part of their PhD education.

Language: The course is given in English and/or Norwegian

Examination:

- Presentation of their own sleep based on sleep questionnaire, polysomnographic or actigraphic measurements.
- Every student must log in to Inspera and answer 1 multiple choice test.
- The students are required to answer 1 out of 3 take-home essay assignments.
- Obligatory assignments must be approved before assessment.

Teaching material: Recommended literature will be available from 01.07 2017 on Dropbox.

Course fee: Participation is free for NRSN members. Participants who are **not NRSN members** must cover their own expenses for travel and accommodation (approx. 13 000 NOK).

Registration: Register here. Deadline: 3 April 2017

Accommodation for participants: Hotel Zander K, Bergen city center

Travel and accommodation:
Participants who are **not NRSN members** must cover their own expenses for travel and accommodation. Participants who are NRSN member will be covered for travel and accommodation. Accommodation will be arranged by the organization but participants must book their own travel. Reimbursement of travel expenses will take place after the meeting upon submission of receipts. Travel expense will be reimbursed up to a maximum of 2000 NOK for the round trip, including public transportation (not taxi or private car) to and from the airport. *Please do not book your travel until you have a confirmed place in the summer school.* The organizers have reserved rooms for the period of 6 - 12 August 2017 at Hotel Zander K, Bergen city center.

You need to **confirm your reservation for a room before 15 June 2017** to the NRSN coordinator tanja.i.doller@ntnu.no.

Meals:
Lunch will be served daily. The program includes *three* organized dinners and social events.

Course overview

Day	Topic	Lecturers/instructors
6 August	Arrival, welcome dinner with participants and lecturers	*all*
7 August	Biological rhythms and sleep physiology. How sleep and circadian rhythms can be measured. **Module 1**	*Karatsoreos, Wisor, Grønli, Pallesen, Meerlo, Mrdalj, Rød*
8 August	Molecular and genetic approaches to sleep. How does sleep loss affects cognitive performance and health**?** **Module 2**	*Wisor, Bramham, Grønli, Pallesen, Meerlo, Mrdalj*
9 August	Modelling circadian disruption: from neuron to organism. Circadian dysregulation and chronotherapy in psychiatric disorders. Shift work, stress and sleep. **Module 3**	*Karatsoreos, Meerlo, Pallesen, Henriksen, Grønli, Engstrøm, Wisor*
10 August	Sleep and developmental psychology. Sleep in the elderly and in neurodegenerative disorder. Sleep disorders; symptoms, causes and treatment **Module 4**	*Mrdalj, Flo, Engstrøm, Pallesen, Grønli, Karatsoreos*
11 August	Sleep and individual differences. Sleep and health – future perspectives. **Module 5**	*Grønli, Mrdalj, Pallesen, Karatsoreos, Engstrøm*
12 August	Departure	

Detailed programme

Sunday 6 August

Start: 18.30	Welcome dinner at **Kranen**: all students and lecturers All participants will be given an actigraph to wear for the week and sleep diary to fill out

Monday 7 August

Time/ Location	**Biological rhythms and sleep physiology. How sleep and circadian rhythms can be measured**
9:15 – 11:00 BB-bygget, Grupperom 9A110bP	**Lecture by Ilia Karatsoreos:** **Introduction to biological rhythms** • How light and darkness control bodily functions, circadian rhythms, our internal clock, genetics, chronophysiology Discussion with lecturer
11:00 - 11:15	Coffee Break & Sweets
11:15 – 13:00 BB-bygget, Grupperom 9A110bP	**Lecture by Jonathan Wisor:** **What is sleep?** • Sleep need and sleep regulation. • Physiological changes during sleep. Discussion with lecturer
13:00 - 14:00	Lunch Break
14:00 – 15:30 BB-bygget, Grupperom 9A110bP	**Lecture and practical work by Janne Grønli and Ståle Pallesen:** **How to measure sleep and circadian rhythmicity I** • Subjective sleep measurements, actigraphy, polysomnography (PSG), sleep EEG morphology Coffee break & Sweets Discussion about use of the sleep diaries and other subjective sleep parameters with lecturer
15:30 – 16:30 BB-bygget, Auditorium 4	**Lecture by Peter Meerlo**: **Beyond humans and laboratory rodents: physiological and behavioural studies of sleep across phylogeny** Discussion with lecturer
16:30 – 19:00 BB-bygget animal facility 9th floor	**Practical Rotations in the animal lab:** 16:30 – 16:45: Short introduction to the animal lab 16:45 – 19:00: 2 workstations • Work station 1: Telemetric recording of EEG, EMG and circadian rhythms (Jelena Mrdalj) • Work station 2 : Behavioral tests (Anne Marie Kinn Rød)

Tuesday 8 August

Time	Molecular and genetic approaches to sleep - how does sleep loss affects cognitive performance and health
9:00 – 9:15 9:15 – 10:00 10:15 – 11:00 BB-bygget, Grupperom 9A110bP	All participants will be given Karolinska Sleepiness Scale to fill out during the day and Student Morningness-Eveningness Questionnaire. **Lecture by Jonathan Wisor:** **Biochemical regulation of sleep and wakefulness. Modern hypotheses of why we sleep** - Arousal-inducing compounds, sleep-inducing compounds. The roles of genetic loci and discrete cell populations in regulating sleep and sleep-related electroencephalographic wave forms Discussion with lecturer
11:00 - 11:15	Coffee Break & Sweets
11:15-12:00 BB-bygget, Grupperom 9A110bP	**Lecture by Clive Bramham:** **Synaptic plasticity – what happens during sleep?** Discussion with lecturer
12:00-13:00	Lunch Break
13:00 – 14:00 14:15 – 15:00 BB-bygget, Grupperom 9A110bP	**Lecture by Ilia Karatsoreos and Jonathan Wisor:** **Don't skimp on sleep! Sleep loss, cognitive performance and health.** - Behavioral changes and physical performance, learning, memory, reaction time, accidents. CNS and metabolic consequences of sleep restriction. Are there any countermeasures? Discussion with lecturers
15:00 – 17:00 BB-bygget, Grupperom 9A110bP	**Lecture and practical work by Janne Grønli and Ståle Pallesen:** - Analyse subjective sleep measurements - How to analyse polysomnographically defines sleep states Coffee Break & Sweets Discussion with lecturers
17:00-18:00 BB-bygget, Auditorium 4	**Research talk by Peter Meerlo** **Sleep disturbance, neuronal plasticity and psychiatric disorders** Discussion with lecturer
18:15-19:00 BB-bygget, Grupperom 9A110bP	**Practical work by Janne Grønli and Jelena Mrdalj** PSG onsite: Hook up 2-4 students for one nights' sleep recording

Wednesday 9 August

Time	**Modelling circadian disruption: from neuron to organism** **Circadian dysregulation and chronotherapy in psychiatric disorders.** **Shift work, stress and sleep.**
9:15 – 10:00 Christies gt 12, Auditorium	**Lecture by Ilia Karatsoreos**: **Modelling circadian disruption: from neuron to organism** • Light/dark disruption, forced activity, timing of meals Discussion with lecturer
10:15 - 11:00 Christies gt 12, Auditorium	**Lecture by Peter Meerlo**: **The complex effects of stress on sleep and circadian rhythms** • Stress as an important cause of arousal and sleep disturbance. Discussion with lecturer
11:00 - 11:15	Coffee Break & Sweets
11:15 – 13:00 Christies gt 12, Auditorium	**Lecture by Ståle Pallesen**: **Shift work and jet lag** • Sleep quality and circadian rhythms in shift workers. Consequences on health and cognitive performance. Are there any countermeasures of shift work and jet lag? Discussion with lecturer
13:00-14:00	Lunch break
14:00 – 15:45 15:45-16:00 Christies gt 12, Auditorium	**Lecture by Tone Henriksen**: • **Circadian dysregulation and chronotherapy in psychiatric disorders** How light influences affective disorders, chronobiology and chronotherapy. Discussion with lecturer Short introduction to the human centric light laboratory by Ståle Pallesen
16:00 – 18:00 Christies gt 12, 5th floor Human laboratory	**Practical Rotations in human centric light laboratory:** **Janne Grønli, Ståle Pallesen, Erlend Sunde and Jelena Mrdalj** • Work station 1: Cognitive test in different light conditions • Work station 2: Analyses of sleep questionnaires Coffee Break & Sweets Discussion with lecturers
18:00-19:00 Christies gt 12, Auditorium	**Research talk by Jonathan Wisor** **The use of stimulants and sleep**
19:00 Christies gt 12, Grupperom xx	Seafood

Thursday 10 August

Time	**Sleep and developmental psychology.** **Sleep in the elderly and in neurodegenerative disorders.** **Sleep disorders; symptoms, causes and treatment**
9:15 – 10:00 10:15 – 11:00 BB-bygget, Grupperom 9A110bP	**Lecture by Jelena Mrdalj and Elisabeth Flo:** **Sleep and circadian rhythms across the lifespan** - Sleep and the developing brain. Normal sleep in older adults - Sleep and neurodegenerative disorders; Parkinson and Alzheimer patients Discussion with lecturer
11:00 – 11:15	Coffee Break & Sweets
11:15 - 13:00 BB-bygget, Grupperom 9A110bP	**Lecture by Morten Engstrøm** **Sleep disorders; symptoms, causes and treatment I** - Sleep related breathing disorders, parasomnia, sleep related movement, sleep and headache Discussion with lecturer
13:00 – 14:00	Lunch Break
14:00 – 15:00 BB-bygget, Grupperom 9A110bP	**Lecture by Ståle Pallesen:** **Sleep disorders; symptoms, causes and treatment II** - Insomnia, hypersomnia, circadian sleep-wake disorders Discussion with lecturer
15:00 – 15:15	Coffee Break & Sweets
15:15 - 17:00 BB-bygget, Grupperom 9A110bP	**Practical work by Janne Grønli, Jelena Mrdalj and Morten Engstrøm:** - Analyse PSG recordings, in groups Discussion with lecturers
17:00 – 18:00 BB-bygget, Auditorium 4	**Research talk by Ilia Karatsoreos**: **Timing is everything: The neurobehavioral costs of disrupted sleep and circadian rhythms.**

Friday 11 August

Time	**Sleep and individual differences.** **Sleep and health – future perspectives**
9:15 – 12:15 BB-bygget, Grupperom 9A110bP	**Practical work by Janne Grønli and Jelena Mrdalj**: - Results from the human centric laboratory. Actigraphy scoring of the students actogram. Analyses of the students sleep diaries - Students present their sleep during the summer school week Coffee Break & Sweets Discussion with lecturers
12:15 - 13:00	**Lecture by Ståle Pallesen:** **Statistical analyses of questionnaire data. Developing and testing self-report scales.** Discussion with lecturer
13:00 – 14:00	Lunch Break
14:00 – 16:00 BB-bygget, Grupperom 9A110bP	**Discussion session** (chair Ilia Karatsoreos): **Sleep and health – future perspectives** Identify 3-4 questions within teams (maximum 4-5 students) - On the new findings of the power of sleep and biological rhythms on health. - Research findings in animal models, clinical and epidemiological studies. Coffee Break & Sweets Discuss future research agendas
16:00 – 17:00 BB-bygget, Auditorium 4	**Research talk by Morten Engstrøm:** **TBA**
17:00-17:30 BB-bygget, Auditorium 4	Quiz & Course evaluation
17:30 - 19:00	Free
19:00	Dinner & Dance! at **Kalfaret Brygghus**

Restaurant Kranen : http://colonialen.no/kranen/.
Restaurant Kalfaret Brygghus: http://www.kalfaretbrygghus.no/