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BASIC SCIENCE SLEEP TRACK

FULL TRACK RUNS SUNDAY - WEDNESDAY

The Basic Science Track at World Sleep 2019 will include some of the biggest names in the field offering cutting-edge science and information.

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BASIC SCIENCE TRACK OVERVIEW

TYPE	DAY	TITLE	HOURS
AFFILIATED MEETING	Sunday	Trainee research day	8:00am - 4:00pm
SYMPOSIUM	Monday	Sleep and bidirectional changes in synaptic plasticity: The untold story	9:00am - 10:30am
SYMPOSIUM	Monday	Effects of sleep and sleep loss on synaptic function	9:00am - 10:30am
SYMPOSIUM	Monday	Large-scale genomic studies advancing understanding of sleep and circadian biology and disorders in humans	10:45am - 12:15pm
SYMPOSIUM	Monday	The molecular and physiological mechanisms of sleep	3:00pm - 4:30pm
SYMPOSIUM	Monday	Pathophysiological insights from animal models of restless legs syndrome	3:00pm - 4:30pm
SYMPOSIUM	Tuesday	New insights into light's non-visual impact on sleep and circadian physiology	9:00am - 10:30am
SYMPOSIUM	Tuesday	New sleep circuits and their role in disorders	9:00am - 10:30am
SYMPOSIUM	Tuesday	What else can we learn from sleep oscillations?	10:45am - 12:15pm
SYMPOSIUM	Tuesday	Genetic and epidemiological triggers of sleepiness: From natural variation to severe sleep disorders	3:00pm - 4:30pm
AFFILIATED MEETING	Tuesday	SRS-CSS Frontiers: Sleeping well and staying in rhythm	9:00am - 10:00am
AFFILIATED MEETING	Tuesday	SRS-CSS Frontiers: Sleep: Impact on physiology and public health	10:15am - 12:00pm

BASIC SCIENCE TRACK OVERVIEW (continued)

TYPE	DAY	TITLE	HOURS
AFFILIATED MEETING	Tuesday	SRS-CSS Frontiers: Obstructive sleep apnea and the risk of cognitive decline in older adults	3:00pm - 4:00pm
AFFILIATED MEETING	Tuesday	SRS-CSS Frontiers: Sleep: Impact on neurological function	4:15pm - 6:00pm
KEYNOTE	Wednesday	K09: Biomarkers and determinants of drowsy driving: Advances in reducing crash risk	8:00am - 8:45am
SYMPOSIUM	Wednesday	What is slow-wave activity? And, can we manipulate it to our benefit?	9:00am - 10:30am
SYMPOSIUM	Wednesday	Effects of perinatal sleep modulation in the mother and offspring: Evidences from preclinical research	9:00am - 10:30am
SYMPOSIUM	Wednesday	The relationship between sleep and torpor: Circuits and mechanisms linking thermoregulation and sleep switch	10:45am - 12:15pm
SYMPOSIUM	Wednesday	The impact of short and disturbed sleep on pain: New mechanistic insights, sex differences, and clinical implications	3:00pm - 4:30pm
SYMPOSIUM	Wednesday	Functional networks of the sleepy and sleeping brain	3:00pm - 4:30pm
SYMPOSIUM	Wednesday	Genetics of sleep and its disorders: An update	4:30pm - 6:00pm

BASIC SCIENCE AFFILIATED MEETING
SUNDAY, SEPTEMBER 22, 2019

Trainee research day
8:00am – 4:00pm | Room 222

No Additional Cost

Summary
This daylong event, sponsored by Canadian Sleep Society, Institute of Circulatory and Respiratory Health (ICRH) and the Canadian Sleep and Circadian Rhythms Network, has been designed by trainees for trainees in sleep research. The program will be relevant to a wide range of trainees. Participation is encouraged from trainees at all levels, from graduate students to fellows, working in basic and clinical research fields.

The format of the program will include a mixture of data presentations by trainees and senior investigators, in addition to professional development sessions where attendees will get advice from experts on improving scientific communication skills. The trainee day will conclude with a social event and data blitz aimed at getting attendees to interact and have fun.

BASIC SCIENCE SLEEP TRACK

FULL TRACK RUNS SUNDAY - WEDNESDAY

BASIC SCIENCE SYMPOSIUM | MONDAY, SEPTEMBER 23, 2019

Sleep and bidirectional changes in synaptic plasticity: The untold story

9:00am – 10:30am I Room 212

Chair
Marcos G. Frank (United States)

Summary
Sleep disorders are common among adolescents around the world, including insomnia, delayed sleep-wake phase disorder, and insufficient sleep syndrome. In order to improve sleep among adolescents, it is essential to understand the biological and environmental factors that contribute to sleep disorders, and there is a critical need to develop and validate novel interventions to improve sleep duration and sleep quality in this age group. This symposium brings together international experts on adolescent sleep disorders, examining both contributing factors and interventions for adolescents from multiple perspectives.

9:00am – 9:02am
Introduction

9:02am – 9:18am
Sleep-dependent thalamocortical activity is crucial for visual system plasticity
Sara Aton (United States)

9:18am – 9:34am
Slow-wave sleep potentiates thalamocortical responsiveness and facilitates memory formation in mice
Igor Timofeev (Canada)

9:34am – 9:50am
Learning and sleep-dependent synaptic plasticity in the cortex
Wen Biao Gan (United States)

9:50am – 10:06am
Homeostatic regulation by GABA and glutamate receptors of cortical neurons in response to sleep deprivation
Barbara Jones (Canada)

10:06am – 10:22am
The tired hippocampus; elucidating the molecular underpinnings of sleep loss-induced memory impairments
Robbert Havekes (The Netherlands)

10:22am – 10:30am
Conclusion

Effects of sleep and sleep loss on synaptic function

9:00am – 10:30am I Room 212

Chair
Chiara Cirelli (United States)

Summary
Sleep promotes the acquisition and consolidation of memory traces, the integration of new information within the prior body of knowledge, and the forgetting of irrelevant information. The underlying mechanisms remain poorly characterized and a matter of intense debate. Does sleep promote learning and memory mainly by strengthening or weakening synapses, or both? Are these mechanisms conserved throughout brain development, and are they shared across brain regions? Are plastic changes mainly due to behavioral state, or do they strongly depend on the circadian clock? Do they critically depend on specific oscillations such as Up and Down states? This symposium will address each of these questions using animal models and multiple in vivo and in vitro approaches, with an emphasis on new, currently unpublished results. The five speakers have complementary expertise and different scientific background. Drs. Diering, Gisabella and Olsen are recent “newcomers” to our field.

9:00am – 09:02am
Introduction

9:02am – 9:18am
Sleep-dependent synaptic weakening across brain regions and during development
Chiara Cirelli (United States)

9:18am – 9:34am
A cortical neuron’s view of sleep and wake
Steven Brown (Switzerland)

9:34am – 9:50am
Cortical synaptic plasticity during slow wave sleep-related activity
Ole Paulsen (United Kingdom)

9:50am – 10:06am
Regulation of hippocampal dendritic spines following sleep deprivation
Barbara Gisabella (United States)

10:06am – 10:14am
Conclusion

Large-scale genomic studies advancing understanding of sleep and circadian biology and disorders in humans

10:45am – 12:15pm I Room 211

Chair
Susan Redline (United States)

Summary
Despite marked advances in sleep and circadian sciences, there remain fundamental questions regarding the molecular bases for sleep and sleep and circadian disorders. Large-scale genomic studies in humans have provided novel insights. Recent international initiatives have produced large data resources of genomic data combined with a broad variety of phenotypes, including self-reported sleep phenotypes, polysomnography, and actigraphy. These remarkable data resources have catalyzed a large number of international collaborations, leading to the discovery of multiple variants for a wide range of sleep traits, identifying novel pathways and clarifying inter-relationships and causal associations with neuro-psychiatric and cardiometabolic diseases.

In particular, the UK Biobank has performed whole genome genotyping on 500,000 individuals who have undergone a variety of phenotyping and links to electronic health data, providing scale and power. This proposal will highlight the unique and complementary features of the UK Biobank, TOPMed, and CHARGE, identifying newly emergent opportunities for sleep and circadian researchers to access and analyze large genomic data sets; to understand approaches for maximizing information from collected sleep and circadian phenotypes within public repositories; to identify statistical tools for optimizing statistical power and identify the influence of rare or functional variants on sleep and circadian traits; and to understand methods for dissecting mediating, causal and common genetic mechanisms that link sleep and neuropsychiatric and cardiometabolic diseases and their associated genes and molecular phenotypes.

An over-riding aim of the symposium also will be to foster discussion across the sleep and circadian community on strong collaborative models to enhance multi-disciplinary team science, cross-cohort and international collaboration, and attracting and supporting new investigators working in this rapidly evolving area.

10:45am – 10:47am
Introduction

10:47am – 11:03am
Emerging challenges and opportunities in human genomic studies of sleep and circadian biology
Susan Redline

11:03am – 11:19am
Accelerating gene discovery using diverse international resources: UK Biobank, TOPMed, and CHARGE
Richard Saxena (United States)

11:19am – 11:35am
Genetic variants influencing sleep and chronotype: Clinical and biological insights from the UK biobank
Martin Rutter (United Kingdom)

11:35am – 11:51am
Genetic variants and genomic profiles for sleep disordered breathing related traits in the NHLBI TOPMed consortium
Brian Cade (United States)

11:51am – 12:07pm
Investigating the biology of sleep-associated cardiometabolic traits using gene-sleep interactions: CHARGE
Raymond Noordam (The Netherlands)

12:07pm – 12:15pm
Conclusion

The molecular and physiological mechanisms of sleep

3:00pm – 4:30pm I Room 211

Chairs
Shoi Shi (Japan); Hiroaki Norimoto (Germany)

Summary
Sleep, including behavior sleep, is a widely conserved and an indispensable physiological phenomenon in almost all living organisms. The success of electroencephalogram (EEG) and electromyogram (EMG) recording in 1929 by Hans Berger enables us to define physiological sleep stages quantitatively: slow-wave sleep (SWS), rapid eye movement

(REM) sleep, and wakefulness. The knowledge about functions and underlying mechanisms of each state has been accumulated for several decades; however, we are still not able to answer many fundamental questions: What drives sleep oscillation? How are they shaped? Which genes are essential for maintaining/switching the states?

To address these questions, in this symposium, we will focus on the molecular and cellular mechanisms of sleep with unpublished simulation studies, tens of transgenic mice lines, and unique animal models. All the speakers have expertise in the area of the molecular or circuit mechanism of sleep.

3:00pm – 3:02pm
Introduction

3:02pm – 3:18pm
Genetic identification of cholinergic mechanisms controlling sleep and wakefulness
Yasutaka Niwa (Japan)

3:18pm – 3:34pm
Spatio-temporal structure of sleep oscillations in reptilian brain
Hiroaki Norimoto (Germany)

3:34pm – 3:50pm
Synaptic AMPA receptor plasticity by learning and sleep
Daisuke Miyamoto (United States)

3:50pm – 4:06pm
Newly-identified sleep genes: The role of calcium dependent hyperpolarization pathway in sleep regulation
Shoi Shi (Japan)

4:06pm – 4:22pm
Genetic dissection of sleep in fruit flies
Hirofumi Toda (United States)

4:22pm – 4:30pm
Conclusion

Pathophysiological insights from animal models of restless legs syndrome

3:00pm – 4:30pm I Room 219

Chair
Yuqing Li (United States)

Summary
Restless legs syndrome (RLS), is a common neurological disorder that has motor, sensory, and circadian components. RLS affects up to 10% of the general population. The symptoms of RLS often lead to sleep disturbances and can severely affect the patient's daytime function and quality of life. This therefore suggests importance of studying the pathophysiology of RLS.

Iron deficiency, which produces changes in dopaminergic neurons and receptors in the substantia nigra and putamen, has been reported to correlate with RLS. Iron Deficient rats have insomnia and severe PLM in wake and in Slow Wave Sleep. The sleep pattern and symptoms of putamen-lesioned rats and ID rats resemble human RLS patients. Using neurotoxic lesion, in vivo microdialysis HPLC analysis, microinfusion of GABAA receptor agonists and antagonists, systemic injection of histamine receptor agonist and antagonist, Western blotting, and EEG spectral analysis techniques, a comprehensive understanding of RLS pathophysiology has emerged. Recently, genome-wide association studies were performed, and 19 genetic loci were found to impart varying increased risk of developing RLS. Among these loci, genetic regions containing the genes MEIS1 and BTBD9 represent the top two hits and have been replicated in multiple independent genetic studies. The identification of these RLS candidate genes paved the way for making genetic animal model of RLS that could potentially be more relevant in elucidating the pathophysiology of RLS and developing therapeutic treatments.

The speakers are established scientists in the RLS pathophysiology and published extensively in this and related topics.

3:00pm – 3:02pm
Introduction

3:02pm – 3:22pm
Pathophysiological insights from the iron deficient rats
Yuan-Yang Lai (United States)

3:22pm – 3:42pm
Pathophysiological studies of RLS using BTBD9 mutant animal models
Yuqing Li (United States)

3:42pm – 4:02pm
MEIS1-based animal models and the pathophysiology of RLS
Aaro Salminen (Germany)

4:02pm – 4:22pm
Use of animal models for the pathophysiological study of RLS
Mauro Manconi (Switzerland)

4:22pm – 4:30pm
Conclusion

BASIC SCIENCE SYMPOSIUM | TUESDAY, SEPTEMBER 24, 2019

New insights into light's non-visual impact on sleep and circadian physiology

9:00am - 10:30am I Room 118

Chair
Christian Cajochen (Switzerland)

Summary
Light exerts profound effects on circadian physiology and sleep-wake behavior. This symposium will shed new insights into: 1.) how classical and non-classical retinal photoreceptors mediate non-visual responses to light, 2.) how light is implicated in direct non-circadian effects and sleep homeostasis, 3.) how daylight affects the human circadian timing system, 4.) how new LED solutions replicating daylight affect mood, circadian rhythms and sleep and 5.) how the daytime lighting situation affects nighttime sleep quality in a clinical setting.

Since this symposium gives an integrative view on light's non-visual repercussions on sleep and circadian physiology ranging from mechanisms and concepts in animal research to human basic and clinical studies, it is attractive for a broad audience working in the sleep field. Furthermore, the current development in LED technology along with the increasing amount of daily "screen time" makes light an important environmental factor to consider in sleep medicine and in our society in general.

9:00am – 9:02am
Introduction

9:02am – 9:18am
More than just blue light? The effects of light on circadian rhythms, sleep and performance in mice
Stuart Peirson (United Kingdom)

9:18am – 9:34am
Light and sleep homeostasis: A proof of concept study from mice to humans
Patrice Bourgin (France)

9:34am – 9:50am
Daylight replications with LEDs: Effects on sleep, circadian physiology and mood
Oliver Stefani (Switzerland)

9:50am – 10:06am
Natural light, sleep and the circadian clocks in humans
John Axelsson (Sweden)

10:06am – 10:22am
The effect of daytime lighting on the quality of sleep in human - from healthy people to caregivers
Tomoko Wakamura (Japan)

10:22am – 10:30am
Conclusion

New sleep circuits and their role in disorders

9:00am – 10:30am I Room 211

Chairs
Jimmy Fraigne (Canada); Carolina Gutierrez-Herrera (Switzerland)

Summary
The recent development of tools for remote control and recording of phenotypically defined population of neurons and circuits like optogenetics, chemogenetics, virally-mediated ablation, fiber photometry and calcium imaging has revolutionized our understanding of the circuits that regulate sleep-wake behaviors. Careful characterization of these circuits will undoubtedly provide a mechanistic explanation of disorders where these circuits have been altered, and may offer novel therapeutic avenues. For this symposium, we propose to cover recent discoveries in neural circuits and behavior research, and what role these circuits play in sleep disorders and related co-morbid diseases.

In this symposium, we will present four recently described sleep-wake circuits relevant to sleep medicine. 1) The ventral tegmental area (VTA) circuit induces arousal, and when inhibited engages robust sleep behavior even in the context of strong arousing stimulus. 2) The ventral midbrain/pons (VMP) circuit control the daily amount of sleep and wakefulness through control of the dopaminergic system. Understanding how these circuits interact is of critical importance for patients suffering from insomnia and may provide potential therapeutic targets for this sleep disorder that affects 30% of the population. 3) The sublaterodorsal nucleus (SLD) and the ventral medulla (vM) form the brainstem circuit controlling rapid eye movement (REM) sleep. Neurodegeneration of this circuit has been hypothesized to underlie REM sleep behavior disorder (RBD), offering new avenues for treating RBD as well as neurodegenerative synucleinopathies like Parkinson's disease. 4) The thalamic reticular nucleus (TRN) has been shown to be a strong modulator of arousal and sleep. Disruption of this circuit triggers symptoms mimicking schizophrenia; hence, understanding its regulation will provide therapeutic insights for this severe mental disorder.

There are no doubts that novel molecular and genetic tools (e.g., optogenetics and chemogenetics) have helped dissect the critical neural circuits involved in sleep-wake regulation, and will not only provide insight on the pathobiology of sleep disorders but also offer potential therapeutic strategies that are more focused and with fewer side effects for a variety of diseases.

9:00am – 9:02am
Introduction

9:02am – 9:22am
Pathological alterations in VTA-dopaminergic regulation of arousal
Ada Eban-Rotschild (United States)

9:22am – 9:42am
Sleep-regulating midbrain GABAergic circuitry
Yo Oishi (Japan)

BASIC SCIENCE SYMPOSIUM | TUESDAY, SEPTEMBER 24, 2019

9:42am – 10:02am
REM sleep circuit underlying REM sleep behavior disorder
Jimmy Fraigne (Canada)

10:02am – 10:22am
Thalamic contribution to sleep wake and schizophrenia
Carolina Gutierrez-Herrera (Switzerland)

10:22am – 10:30am
Conclusion

What else can we learn from sleep oscillations?
10:45am - 12:15pm I Room 211

Chairs *Antoine Adamantidis (Switzerland); Vladyslav Vyazovskiy (United Kingdom)*
Summary

Brain activity during sleep is characterized by a wide spectrum of oscillatory activities. The use of high-density scalp EEG and intracranial recordings in human and rodents during sleep have revealed a complex landscape of region-specific oscillations in what was previously assumed to be a 'uniform' pattern of brain activity. These oscillations include slow waves, spindles and theta rhythms and reflect patterned activities of anatomically distinct neuronal circuits located in, or encompassing, the cortex, thalamus or hippocampus structures. A major challenge in sleep research and sleep medicine is to better understand the neurobiological mechanisms orchestrating sleep oscillation in time and space to shine light on the structure and the functions of sleep in animal models and humans, as well as make important advances in prevention and treatment of brain disorders.

This symposium will focus on the oscillatory nature of neural circuits in the sleeping brain at different levels of organization studied using a variety of experimental models and approaches. The main goal of the symposium will be to provide the audience with recent results and novel concepts on the basic mechanisms and function of sleep oscillations. In agreement with the title of the symposium 'What else can we learn from sleep oscillations about..." each speaker will offer their perspective on the origin and the role of brain activity during sleep.

10:45am – 10:47am
Introduction

10:47am – 11:03am
Cellular dynamics of thalamo-cortical circuits across sleep states
Antoine Adamantidis (Switzerland)

11:03am – 11:19am
Local and global aspects of sleep homeostasis
Vladyslav Vyazovskiy (United Kingdom)

11:19am – 11:35am
Harnessing olfactory bulb oscillations to perform fully brain-based sleep-scoring
Karim Benchenane (France)

11:35am – 11:51am
Brain oscillations, sleep states and consciousness
Melanie Boly (United States)

11:51am – 12:07am
High-density EEG in sleep and mental disorders
Ruth M. Benca (United States)

12:07pm – 12:15pm
Conclusion

Genetic and epidemiological triggers of sleepiness: From natural variation to severe sleep disorders
3:00pm - 4:30pm I Room 211

Chair *Hanna M. Ollila (United States)*

Summary
This symposium will summarize the latest findings in sleepiness, the effect of sleepiness on diseases and the severe sleep disorders with core disease component of sleepiness (narcolepsy, excessive daytime sleepiness and Kleine-Levin Syndrome). In addition, we will present the triggering factors for natural and pathological sleepiness disorders and their recentle discovered underlying biological mechanisms as well as unpublished work.

This symposium comprises five talks that specifically address the following topics. 1) What affects normal variation in sleepiness in population level 2) What are the genetic and environmental triggers behind hypersomnia disorders 3) How is sleepiness connected with disease predisposition. Finally, this symposium shows the known triggers and mechanisms in severe sleepiness, most notably in narcolepsy and Kleine-Levin Syndrome. Data presented comprises clinical cohorts, large scale population cohorts, electronic health records and functional biological assays where the exact disease mechanisms have been measured both in humans and in model organisms.

3:00pm – 3:02pm
Introduction

3:02pm – 3:18pm
Genetic association analyses for excessive daytime sleepiness
Heming Wang (United States)

3:18pm – 3:34pm
USF1 ties metabolism to chronotype and sleepiness
Nasa Sinnott-Armstrong (United States)

3:34pm – 3:50pm
Kleine Levin Syndrome is strongly associated with variants at TRANK1 locus and genes involved in the regulation of rhythmic behaviours
Aditya Ambati (United States)

3:50pm – 4:06pm
Electronic health records define novel genetic and environmental triggers for sleepiness and narcolepsy
Hanna M. Ollila (United States)

4:06pm – 4:22pm
CD8 T-cell autoreactivity in type 1 narcolepsy
Birgitte Kornum (Denmark)

4:22pm – 4:30pm
Conclusion

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TUESDAY, SEPTEMBER 24 | 9:00AM – 6:00PM | ROOM 220

Sleep Research Society®
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SRS-CSS FRONTIERS SCIENTIFIC WORKSHOP

The Sleep Research Society (SRS) & Canadian Sleep Society (CSS) Frontiers Scientific Meeting is a 1-day workshop contained within the World Sleep scientific program. Register to attend this comprehensive and state-of-the-art update of the linking sleep to brain function and physiology in both experimental and population-based studies.

Summary
Sleep is important for the brain as well as the body. The workshop will include an exciting range of speakers that will present data linking sleep to brain function and physiology in both experimental and population-based studies. Our key speakers are renowned experts in the field of sleep and health (Dr. Phyllis Zee) and in the associations between sleep and cognitive function (Dr. Nadia Gosselin). Each featured presentation is followed by an oral symposium on a related theme with a broad range of speakers and topics.

Chairs
John Peever (Canada) | Kristen Knutson (United States)

ATTEND THIS WORKSHOP AS PART OF THE WORLD SLEEP 2019 PROGRAM
worldsleepcongress.com/register

INVITED SPEAKER: PHYLLIS ZEE

9:00am – 10:00am
Sleeping Well and Staying in Rhythm: Implications for brain and metabolic health
Phyllis Zee (United States)

INVITED SPEAKER: NADIA GOSSELIN

3:00pm – 4:00pm
Obstructive sleep apnea and the risk of cognitive decline in older adults
Nadia Gosselin (Canada)

SLEEP: IMPACT ON PHYSIOLOGY AND PUBLIC HEALTH

10:15am – 10:40am
Inflammatory and counter-inflammatory responses to chronic sleep disruption in humans
Monika Haack (United States)

10:40am – 11:05am
Sleep, recovery and human performance in elite athletes
Charles Samuels (Canada)

11:05am – 11:30am
The epidemiology of sleep and population health implications
Chandra L. Jackson (United States)

11:30am – 11:55am
Human sleep in comparative context: Exploring the link between our evolutionary history, health and well-being
David Samson (Canada)

SLEEP: IMPACT ON NEUROLOGICAL FUNCTION

4:15pm – 4:40pm
Chronic sleep loss neural injury: Play early, pay later
Sigrid Veasey (United States)

4:40pm – 5:05pm
Links between global and local sleep disruption and Alzheimer's disease pathophysiology
Bryce Mander (United States)

5:05pm – 5:30pm
REM sleep behavior disorder: Animal models and the neuronal network involved
Pierre-Hervé Luppi (France)

5:30pm – 5:55pm
Obstructive sleep apnea and Alzheimer's disease: Is amyloid the link between breathing and dementia?
Yo-El Ju (United States)

BASIC SCIENCE SYMPOSIUM | WEDNESDAY, SEPTEMBER 25, 2019

KEYNOTE SPEAKER

K09: Biomarkers and determinants of drowsy driving: Advances in reducing crash risk
8:00am – 8:45am | Ballroom A

Keynote
Clare Anderson, PhD (Australia)

Summary
Drowsiness remains a significant cause of motor vehicle crash, responsible for approximately 20% of all crashes. This talk will examine current approaches to reducing the impact of drowsy driving, including (i) understanding of the characteristics of drowsiness-related motor vehicle crashes, beyond falling asleep (e.g., gaze allocation and distractibility); (ii) an evaluation of the available technologies that map onto these different signatures of impairment; (iii) a look into the future of roadside testing, including the development of novel biomarkers of the drowsy state that yield promise for implementation into road side tests; and (iv) revisiting the associations between subjective awareness of drowsiness and adverse driving events.

8:00am – 8:02am
Introduction

8:02am – 8:45am
Associations between subjective awareness of drowsiness and adverse driving events

What is slow-wave activity? And, can we manipulate it to our benefit?
9:00am - 10:30am | Room 211

Chairs
Jennifer Goldschmied (United States)

Summary
Slow-wave Activity (SWA) has historically been associated with the homeostatic regulation of sleep. In 1982, Borbely proposed the Two-Process Model of Sleep Regulation which postulated that two biological mechanisms regulate the sleep-wake cycle, with Process S increasing throughout the day and decreasing across the sleep period, representing the homeostatic drive to sleep. Borbely posited that SWA could be considered a putative marker of Process S, as peak SWA in the first NREM period increases with wakefulness, representative of an accumulation of sleep pressure, and subsequently decreases exponentially during sleep, representing dissipation of the sleep drive. Emerging research, however, has begun to suggest that SWA may be more than a marker of sleep homeostasis.

The Synaptic Homeostasis Hypothesis, for example, has theorized that EEG slow oscillations, characteristic of SWA, may play a role in regulating neuroplasticity via the homeostatic downscaling of synaptic strength. Additionally, ample evidence from the memory literature has demonstrated a relationship between slow-wave sleep (SWS) and the consolidation of declarative memories, with data from neuroimaging studies suggesting that it is the reactivation of memory traces during slow-wave sleep that is essential to memory consolidation. Moreover, an exciting and developing body of literature has also implicated SWA in a bidirectional relationship with amyloid-β.

This SWA enhancement has been shown to improve memory function and increase immune function. In the proposed session, we seek to discuss the most current theories about the nature and function of SWA, and examine whether SWA manipulation through various means can serve to elucidate its function or be used to yield positive outcomes.

This symposium aims to integrate the most recent SWA findings cutting across multiple levels of analysis, and demonstrate the importance of SWA to ultimately propose that the study of SWA is essential to the investigation of the role of sleep, more broadly.

9:00am – 9:02am
Introduction

9:02am – 9:18am
Experience and sleep-dependent synaptic plasticity
Guang Yang (United States)

9:18am – 9:34am
Bidirectional links between slow wave activity and β-amyloid pathology and their functional significance
Bryce Mander (United States)

9:34am – 9:50am
I want to sleep deeper! How does cognition affect slow-wave sleep?
Björn Rasch (Switzerland)

9:50am – 10:06am
Selective slow-wave disruption in healthy and depressed samples
Jennifer Goldschmied (United States)

10:06am – 10:22am
Slow wave activity: From basic knowledge to manipulation
Eden Debellemaniere (France)

10:22am – 10:30am
Conclusion

BASIC SCIENCE SYMPOSIUM | WEDNESDAY, SEPTEMBER 25, 2019

Effects of perinatal sleep modulation in the mother and offspring: Evidences from preclinical research

9:00am - 10:30am I Room 219

Chairs
Monica Levy Andersen (Brazil); Gabriel Natan Pires (Brazil)

Summary
The sleep pattern presented by women during pregnancy and postpartum is substantially different than what is observed in other periods of life. In general, women complain of reduced sleep quality and quantity, as well as present an increased prevalence of sleep disorders such as obstructive sleep apnea, restless legs syndrome and insomnia. Among the possible reasons are the anatomo-physiological alterations during the gestation, the increased demands by the newborn, and social and cultural factors that might impact sleep.

Preclinical animal research plays an important role in increasing the knowledge about the consequences of disturbed sleep during pregnancy. In a general sense, both physiological aspects of pregnancy and postpartum and sleep-related variables are comparable between human beings and rodents models, which assure a translational potential for these studies. Additionally, preclinical studies assure ethical and methodological conditions that are not possible in clinical research.

By the course of these lectures, the audience should have learned about the most recent advances in the field, understanding how alterations in perinatal sleep might lead into deleterious outcomes to both mother and offspring. Additionally, the audience should be able to understand the applicability of animal models on the research about sleep during pregnancy and postpartum, being capable to translate these data into potential clinical findings.

9:00am – 9:02am
Introduction

9:02am – 9:18am
Sleep during pregnancy and postpartum and its relationship with maternal behavior
Gabriel Natan Pires (Brazil)

9:18am – 9:34am
Functional impact of sleep apnea during pregnancy in mother and offspring: Epigenetic modifications associated with metabolic disorders
Rene Cortese (United States)

9:34am – 9:50am
Preoptic sleep regulation during the postpartum period
Luciana Benedetto (Uruguay)

9:50am – 10:06am
Sleep deprivation during pregnancy: Neurophysiological and cognitive effects in the offspring
Yu Tian Wang (Canada)

10:06am – 10:22am
Prenatal sleep deprivation and immature neuronal network in full term rat newborn
Kamalesh K. Gulia (India)

10:22am – 10:30am
Conclusion

The relationship between sleep and torpor: Circuits and mechanisms linking thermoregulation and sleep switch

10:45am – 12:15pm I Room 211

Chairs
Giovanna Zoccoli (Italy); Vladyslav Vyazovskiy (United Kingdom)

Summary
The primary aims of this symposium are to address the regulation of torpor, its relationship with sleep and to discuss the common neural mechanisms underlying thermoregulation, sleep and energy homeostasis. Torpor is a unique adaptation to harsh environmental conditions, characterised by a controlled reduction in metabolic rate to levels well below basal metabolic rate, and profound attenuation of physiological functions, wherein body temperature can drop to within a few degrees of ambient temperature.

Torpor is a strictly regulated process, yet the mechanisms that regulate this dramatic physiological state remain poorly understood. In mammals, sleep and energy metabolism are intimately linked, as evidenced by the numerous bidirectional connections between the neural circuits that govern these processes. The maintenance of waking and sleep is regulated by several subcortical structures, which provide neuromodulatory action on the forebrain.

Critically, all of these homeostatic centres are also implicated in the expression of torpor. Wakefulness and sleep are also shaped by the interaction of two processes: the homeostatic process, and the circadian process, which provides a temporal framework for specific waking behaviours, sleep and metabolism. Behaviourally, torpor resembles sleep, but the relationship between these two fundamental states of the organism remains controversial. While it appears that torpor is a state neurophysiologically distinct from both waking and sleep, evidence suggests that torpor and sleep are closely related. For example, while torpor bouts are often initiated from deep sleep, daily torpor in Djungarian hamsters is followed by deep sleep with high EEG slow-wave activity. In this symposium the speakers will review the knowledge about regulatory mechanisms of sleep, thermoregulation and torpor, and will discuss the effects of torpor on the brain and sleep regulation. In perspective, elucidating neural mechanisms of torpor and clarifying the relationship between torpor and sleep will benefit numerous clinical applications and open novel perspectives for inducing hypometabolic states in humans.

10:45am – 10:47am
Introduction

10:47am – 11:03am
Sleep and thermoregulatory control by the preoptic area
Clifford B. Saper (United States)

11:03am – 11:19am
Neural circuitry binding sleep and temperature regulation
William Wisden (United Kingdom)

11:19am – 11:35am
Orexins as a link between thermoregulation, sleep and torpor
Giovanna Zoccoli (Italy)

11:35am – 11:51am
The relationship between torpor and sleep: focus on cortical network activity and sleep homeostasis
Vladyslav Vyazovskiy (United Kingdom)

11:51am – 12:07pm
Neurochemical mechanisms driving sleep and thermoregulation in the circannual rhythm of hibernation
Kelly Drew (United States)

12:07pm – 12:15pm
Conclusion

The impact of short and disturbed sleep on pain: New mechanistic insights, sex differences, and clinical implications

3:00pm – 4:30pm I Room 119

Chair
Monika Haack (United States)

Summary
Short or disturbed sleep has been well established as a behavior that increases hyperalgesia and the risk of developing chronic pain. Chronic pain conditions are one of the primary health problems worldwide, and together with the high prevalence of individuals cutting back on sleep duration or suffer from disturbed sleep, advancing our mechanistic understanding is crucial in the development of strategies aiming to prevent pain augmentation secondary to sleep loss.

This symposium will focus on new findings that contribute to our mechanistic understanding of the sleep-to-pain directionality. Emphasis will be placed on the effects of pharmacological agents (i.e., caffeine, ibuprofen, morphine) in modulating the impact of disturbed sleep on pain, the role of disturbed sleep in postsurgical pain and opioid analgesia, and on the question of whether women and men differ in their pain, fatigue, and inflammatory responses to disturbed sleep.

The purpose of this scientific symposium is to highlight recent advances in the sleep-pain field and their clinical implications with respect to the management of chronic pain, postsurgical pain, and the opioid crisis. The symposium will feature a renowned group of experts in the sleep-pain field.

3:00pm – 3:02pm
Introduction

3:02pm – 3:22pm
Do women and men respond differently to short or disrupted sleep? Inflammation, pain, and fatigue
Monika Haack (United States)

3:22pm – 3:42pm
Preoperative sleep disruption worsens surgical pain in the rat: Role of preoptic adenosine signaling in sleep-pain interactions
Giancarlo Vanini (United States)

3:42pm – 4:02pm
Effects of acute and chronic sleep disturbance on pain sensitivity and analgesic treatments in mice
Chloe Alexandre (United States)

4:02pm – 4:22pm
The effects of sleep disruption and loss on endogenous analgesia and opioidergic pain control
Michael Smith (United States)

4:22pm – 4:30pm
Conclusion

Functional networks of the sleepy and sleeping brain

3:00PM – 4:30PM I Room 211

Chairs
Jean-Marc Lina (Canada); Julie Carrier (Canada)

Summary
Over the last decades, a particular attention has been paid on the functional brain networks associated with brain states and their dynamics across changes of sates of vigilance. This global perspective of the brain activity, which accounts for the brain mechanisms underlying the

functional integration of the segregated activities, has been ecently extended to the sleep state. For instance, studies demonstrated a significant increase in local cortical functional connectivity (FC) during NREM sleep whereas long-range cortico-cortical FC decreases with the descent from wakefulness to slow-wave sleep. Cognitive impairments and sleep disorders can be also associated with abnormal FC and altered interactions between functional brain networks.

The aim of this symposium is to discuss new advancements in our understanding of how cerebral networks, from micro to macro scales, are modulated the transitions between sleep stages, in various conditions of aging and sleep disorders.

3:00pm – 3:02pm
Introduction

3:02pm – 3:18pm
Introduction: An overview in functional connectivity in recent sleep studies
Jean-Marc Lina (Canada)

3:18pm – 3:34pm
From action potentials to neural oscillations: how brain regions exchange information across wakefulness and sleep
Umberto Olcese (The Netherlands)

3:34pm – 3:50pm
The neural correlates of sleep inertia
Raphael Vallat (United States)

3:50pm – 4:06pm
Abnormal brain connectivity and cognitive performance in OSA
Luigi Ferini-Strambi (Italy)

4:06pm – 4:22pm
NREM sleep functional connectivity: A window on the aging brain
Julie Carrier (Canada)

4:22pm – 4:30pm
Conclusion

Genetics of sleep and its disorders: An update

4:30pm - 6:00pm I Ballroom A

Chairs
Allan Pack (United States)

Summary
Over the last two years, there has been substantial advances in knowledge of common genetic variants associated with different aspects of sleep (e.g., sleep duration) and with specific sleep disorders, in particular, insomnia. Moreover, new approaches are being implemented based on institutions with large biobanks.

This symposium will discuss the following: recent findings published in high impact journals such as Nature Genetics (these are based on GWAS analyses from data from the UK Biobank) (Saxena); what these findings mean in terms of causative genes and how to go from gene variants so identified to identifying the causative genes (Gehrman); identifying extreme phenotypes that facilitate a novel approach to elucidating rare gene variants. This will be illustrated for obstructive sleep apnea (Magalang).

How to use large biorepositories to identify gene variants in patients in whom there are existing genetic data for both common and rare variants (Pack). This is currently being applied to obstructive sleep apnea.

Introduction
4:30pm – 4:32pm

4:32pm – 4:52pm
Recent advances in elucidating common genetic variants associated with sleep and sleep disorders
Richard Saxena (United States)

4:52pm – 5:12pm
Going from GWAS to identifying causative genes
Philip R. Gehrman (United States)

5:12pm – 5:32pm
Identifying extreme phenotypes: Using obstructive sleep apnea as an example
Ulysses J. Magalang (United States)

5:32pm – 5:52pm
Utilizing large biobanks for studies of the genetics of sleep disorders
Allan Pack (United States)

5:52pm – 6:00pm
Conclusion