Nansen Neuroscience Lecture 2019

The Nansen Neuroscience Lectures (NNL) honour Nansen's ground-breaking contribution to neuroscience and since 10.10.2010 is part of the Academy's Nansen-celebration. This year, Morten Scheibye-Knudsen, University of Copenhagen, will speak on "***Discovering interventions for healthier, happier and more productive ageing***".

Morten Scheibye-Knudsen

Impaired health at old age is a major societal concern. Dr Morten Scheibye-Knudsen, uses in silico analyses, artificial intelligence, in vitro biochemistry and molecular biology as well as in vivo work on mouse disease models to provide new understanding and novel approaches to prevention and therapy.

Associate Professor Morten Scheibye-Knudsen, Center for Healthy Aging (CEHA), University of Copenhagen, will give this year's lecture on

"***Discovering interventions for healthier, happier and more productive ageing***".

***When*: Thursday 10th October 2019 at 11:30 – 13:30**

***Where*: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo**

***Why*: The Nansen Neuroscience Lectures (NNLs) are organized in conjunction with Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience. The NNLs are given by speakers selected from the top tier of science research.**

***Admission*: Open to public, no charge.**

Organizers: Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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Programme:

11:30 – 12:00 Coffee and refreshments – Mingling

12:00 – 12:03 Opening by Hans Petter Graver, President of The Norwegian Academy of Science and Letters

12:03 – 12:06 Introduction by Linda H Bergersen, University of Oslo

12:06 – 12:46 Lecture by **Morten Scheibye-Knudsen**, University of Copenhagen, Denmark

12:46 – 13:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen, University of Oslo

13:00 – 13:30 Coffee and refreshments – Informal discussions

Abstract

The process of aging is characterized by an accumulation of DNA damage, likely contributing to the many pathologies observed in the elderly population. Indeed, recent findings suggest that we can intervene in the DNA damage response and thereby alleviate features of aging. In this lecture, I will describe our *in silico*, *in vitro* and *in vivo* methodologies aimed at understanding the physiological consequence of DNA damage, and how we can use this knowledge to develop interventions. This will be illustrated by our discovery of a new premature aging disease characterized by defects in DNA metabolism, and by our efforts to develop small molecule DNA repair stimulators. Our goal, is to allow everyone to live healthier and longer lives.

Biography

Morten Scheibye-Knudsen is an Associate Professor at the Department of Cellular and Molecular Medicine and at the Center for Healthy Aging (CEHA), University of Copenhagen. He did his MD at the University of Copenhagen and worked briefly as a physician in Denmark and Greenland before turning to science. He did his post-doctoral fellowship at Vilhelm Bohr's lab at the National Institute on Aging, National Institutes of Health, where he utilized state-of-the art approaches to understand how DNA damage contributes to aging. He discovered that neurodegeneration in several premature aging diseases is partly caused by hyperactivation of a DNA damage responsive enzyme called poly-ADP-ribose polymerase 1 (PARP1). This activation leads to loss of vital metabolites such as NAD^+ and acetyl-CoA. Importantly, this discovery facilitated the realization that we can intervene in the aging process by inhibiting PARP1, augmenting NAD^+ levels and increasing acetyl-CoA. In his own lab he continues to focus on understanding aging by combining machine learning based approaches with wet-lab analyses with the goal of developing interventions for age-associated diseases and perhaps aging itself.

For information on NNL and previous lecturers, please click here.

Nansen Neuroscience Lecture 2018

http://english.dnva.no/
http://www.dnva.no/

Cognitive decline is a major societal concern, increasing with population longevity. Basic mechanisms can be revealed by studies in worms, providing new understanding and novel approaches to prevention and therapy.

When: Wednesday 10th October 2018 at 10:30 – 12:30
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNLs) are organized in conjunction with Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience*. The NNLs are given by speakers selected from the top tier of science research.
Admission: Open to public, no charge

10:30 – 11:00 Coffee and refreshments – Mingling
11:00 – 11:03 Opening by Ole M Sejersted, President of The Norwegian Academy of Science and Letters
11:03 – 11:06 Introduction by Linda H Bergersen, University of Oslo
11:06 – 11:46 Lecture by **Coleen T. Murphy**, Princeton University, Princeton, New Jersey, USA
11:46 – 12:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen
12:00 – 12:30 Coffee and refreshments – Informal discussions

Coleen T. Murphy: "**Regulation of Cognition and Longevity: What worms can teach us**"

"Longevity pathways" couple the timing of reproduction with somatic health, based on information the organism perceives about its environment and nutrient status. Because my lab and I are interested in reproductive and cognitive decline with age, and how they are regulated both cell autonomously and non-autonomously, the work in my lab incorporates several lines of research that are unified by this reasoning. For example, understanding how the long-lived and very healthy daf-2 insulin receptor mutant (Kaletsky et al. 2016 Nature) maintains its cognitive function and other health markers with age has been instructive in identifying potential pathways to slow aging and maintain important functions with age. CREB, a transcription factor which is required for long-term memory from worms to humans, is upregulated in insulin signaling mutants (Lakhina et al. 2015 Neuron), and its activity is maintained longer in a hyperactive Gaq mutant (Arey et al. 2018 Neuron). We have identified the set of genes that function downstream of the CREB transcription factor to regulate long-term memory, revealing conserved genes that may function to regulate and maintain memory in humans, as well.

Affiliations: Coleen T. Murphy, Ph.D.
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Professor, LSI Genomics and Molecular Biology
Director, Paul F. Glenn Center for Biology of Aging Research at Princeton
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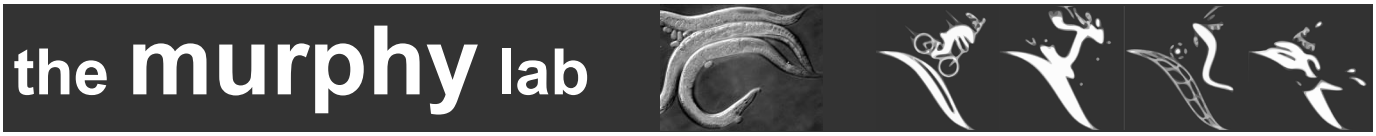
Princeton, NJ 08544, USA
Telephone +1-609-258-9396, E-mail: ctmurphy@princeton.edu
http://www.molbio1.princeton.edu/labs/murphy/

Minibiography: Coleen T. Murphy is a Professor of Genomics and Molecular Biology at Princeton University. She graduated from the University of Houston with a B.S. in Biochemistry and Biophysics, then earned her doctorate in Biochemistry at Stanford University, studying the structure-function determinants of the motor protein myosin. Dr. Murphy became interested in applying new quantitative technologies to approach the question of aging during her postdoctoral work in Dr. Cynthia Kenyon's lab (UCSF), developing microarray approaches to identify the set of genes downstream of the insulin signaling/FOXO longevity pathway, revealing a vast array of downstream cellular processes, including stress response, proteostasis, metabolism, immunity, autophagy, and intercellular signaling, to extend cellular and organismal maintenance with age.

In her own lab, Dr. Murphy's team has developed *C. elegans* models of human "quality of life" aging phenotypes, including cognitive aging and reproductive aging; these processes are remarkably well-conserved at the molecular level, and her group has identified genetic pathways that can extend these processes with age through the development of quantitative assays and genomic approaches to study these aging phenomena. Her lab's work has shown that *C. elegans* uses highly conserved mechanisms to learn and remember associative memories, and has revealed possible candidates for future therapeutics.



What governs how fast we age? Why do some biological processes stop working earlier than others? And what is happening at the molecular and cellular level as some organisms age while others continue to thrive?

Organizers: Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

* Nansen as neuroscientist: see notes at the end and at http://www.dnva.no/kalender/vis.html?tid=48780

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Nansen Neuroscience Lectures 2017

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Cognitive testing and brain imaging in the general population helps us understand how to best keep the brain in shape (Asta Håberg)

How viruses can be harnessed to map and repair the brain (Tomas Björklund)

When: Tuesday 10th October 2017 at 11:30 – 14:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNL) are organized in conjunction with Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience*. The NNLs are given by speakers selected from the top tier of neuroscience research.
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12:00 – 12:03 Opening by Ole M Sejersted, President of The Norwegian Academy of Science and Letters
12:03 – 12:06 Introduction by Linda H Bergersen, University of Oslo
12:06 – 12:46 Lecture by **Asta Håberg**, Norwegian University of Science and Technology (NTNU), Trondheim
12:46 – 13:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen
13:03 – 13:06 Introduction by Linda H Bergersen, University of Oslo
13:06 – 13:46 Lecture by **Tomas Björklund**, Lund University, Lund, Sweden
13:46 – 14:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen

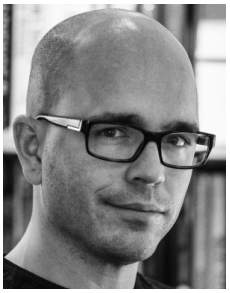
Asta Håberg: "An epidemiological approach to neuroscience"

The lecture focuses on the power of large-scale web-based cognitive testing and brain MRI (magnetic resonance imaging) in combination with prospectively collected demographic, lifestyle, somatic and psychiatric health data and clinical measures from the general population, i.e., the large-scale Nord-Trøndelag Health Survey (HUNT), as a means to understand how to optimize brain function and structure across the lifespan. I will present the development of Memoro, our web-based cognitive testing tool building on a combination of traditional neuropsychological tests and functional MRI based tests, as well as particularities related to web-based cognitive testing. Subsequently, impact of selected demographic and somatic factors on cognition, and the potential for intervention to preserve or optimize function will be illustrated. Lastly, I will present how an epidemiological approach to brain MRI can elucidate new relationships of disease risk and possibility of delaying brain atrophy.

Affiliations: Director of SFI Center for Innovative Ultrasound Solutions (CIUS); Professor, Dep of Neuroscience, NTNU; Head, Norwegian National Advisory Unit for fMRI, Dep Radiology and Nuclear Medicine, St. Olav's University Hospital; Medical Technical Research Center, Faculty of Medicine and Health Sciences, Trondheim, Norway; asta.haberg@ntnu.no; https://www.ntnu.no/ansatte/asta.haberg

Minibiography: Asta Håberg received her MD from the University of Oslo and her PhD (dr. med.) from the NTNU in Trondheim. She has worked with animal models of human neurological disease, in healthy volunteers and patients (mainly traumatic brain injury, preterm birth, and ischemia) MRI and MRS to elucidate brain structural, metabolic and functional correlates and plasticity. The neuronal basis of memory and attention, and how best to maintain these abilities throughout life, is a particular focus area. This interest has led to development of methodology for large-scaled epidemiological studies on cognition in HUNT (Nord-Trøndelag health study) in order to understand the somatic, psychological, social and genetic basis of individual differences in cognition and their brain structural and functional underpinnings.

Tomas Björklund: "Taming viruses to map and repair the brain"



During development, our brain goes through an amazing process of making and destroying connections between nerve cells. What connections remain in adulthood determine how we function. When those connections falter, disease ensues, revealing their importance. To date, the studies on brain connectivity have been limited to either crude assessment on the multi-millimeter scale of the entire human brain using brain imaging techniques or using labor intensive electron-microscopy techniques mapping each connection one by one. The goal of our research is to develop a novel technology that could fill the gap, so that we can understand how complete circuits in the brain function and connect before we have the entire map of the brain completed. To reach this goal we have chosen to develop synthetic viruses and utilize the genetic code as address labels. These viruses can infect nerve cells at their connectivity points (the synapses) and transport the information in their genome to the connected nerve cell bodies, where we then can map this information using modern sequencing techniques. In the end, this technology would help us to understand what goes wrong in the brain in complex disorders such as Parkinson's disease and Schizophrenia. The newly developed viruses could also help us to develop new treatments as they could target specific connections in the brain, leaving the rest untouched.

Affiliation: Group leader, Associate Professor of Neuroscience, Molecular Neuromodulation, Wallenberg Neuroscience Center, Lund University, Lund, Sweden; tomas.bjorklund@med.lu.se; http://www.med.lu.se/expmed/molecular_neuromodulation

Minibiography: Tomas Björklund obtained his training at Lund University, Sweden, where he completed his PhD in neuroscience in 2009. After a post-doctoral fellowship, he received an Assistant Professor position in 2011, when he established his research group, Molecular Neuromodulation. His research is at the union of neuroscience, molecular biology and bioinformatics, where a major goal is to develop and utilize frontline technologies to answer long-standing questions in brain function and connectivity, including in Parkinson's disease. He has founded a biotech company, Genepod Therapeutics, which is furthering his gene-based therapy for Parkinson's disease towards clinical trials.

Organizers: Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

* Nansen as neuroscientist: see notes at http://www.dnva.no/kalender/vis.html?tid=48780

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Nansen Neuroscience Lectures 2016

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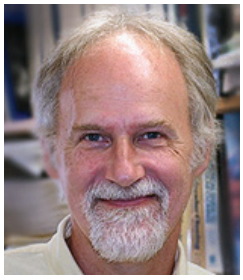
Viruses can destroy the brain, but can also be harnessed to fight brain cancer (Anthony N van den Pol)
Context dependent neuronal network oscillation in the brain underlies thinking (Rodolfo R Llinás)

When: Monday 10th October 2016 at 11:30 – 14:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNL) are organized in conjunction with Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience*. The NNL are given by speakers selected from the top tier of neuroscience research.
Admission: Open to public, no charge

11:30 – 12:00 Coffee and refreshments, mingling
12:00 – 12:03 Opening by Øivind Andersen, Secretary General of The Norwegian Academy of Science and Letters
12:03 – 12:06 Introduction by Linda H Bergersen, University of Oslo
12:06 – 12:46 Lecture by **Anthony N van den Pol**, Yale University
12:46 – 13:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen
13:03 – 13:06 Introduction by Linda H Bergersen, University of Oslo
13:06 – 13:46 Lecture by **Rodolfo R Llinás**, New York University
13:46 – 14:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen

Anthony N van den Pol: "**Virus in the brain - generating neurological dysfunction or destroying tumors**"

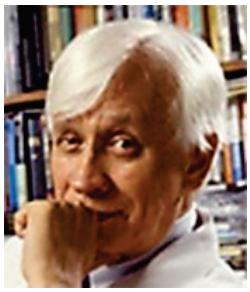


Many RNA and DNA viruses can enter the brain. Some exert minimal damage, whereas others can generate subtle or dramatic neuronal dysfunction. The lecture will first examine some neurological problems that viruses can generate within the brain, either directly or indirectly, including Zika virus and cytomegalovirus that are particularly problematic in the developing brain. The talk will then focus on the utilization of chimeric viruses that contain genes from otherwise dangerous viruses including Ebola or Lassa fever virus, coupled with genes from vesicular stomatitis virus. These chimeric viruses appear safe and can target and selectively destroy brain tumors, including glioma, melanoma, and other cancers that may metastasize into the brain, thereby prolonging the lives of individuals with brain cancer.

Affiliation: Anthony N van den Pol, PhD, Prof of Neurosurgery and of Psychiatry, Yale Univ Sch Med, 333 Cedar St, New Haven, CT, USA; anthony.vandenpol@yale.edu; http://medicine.yale.edu/news/anthony_vandenpol-4.profile

Minibiography: Dr van den Pol graduated from Yale University and did postdoctoral work at Oxford, Semmelweis, and Stanford Universities in the areas of neuropharmacology, neuroanatomy, and neurophysiology. He has two overlapping research interests. One focus is on regulatory mechanisms of the hypothalamus. The other is on viruses as pathogens and experimental and therapeutic tools in the brain.

Rodolfo R Llinás: "**Content and Context in Cognition: Intrinsic Neuronal Oscillation and Brain Function**"



The talk will address the basic hypothesis that large scale temporal coincidence activity, based on intrinsic neuronal oscillation properties, generates the functional states that underlie cognition.

[Additional talk by Dr Llinás: "**Art, the Other Face of the Brain**" IMB Distinguished Seminar October 11, 2016, at 12:00, Runde auditorium, Domus Medica, Sognsvannsv 9, University of Oslo.]

The visit by Dr Llinás is sponsored by the Embassy of Colombia in Norway.

Affiliation: Rodolfo R Llinás, PhD, MD, T and S Murphy Professor of Neuroscience, Dept of Neuroscience and Physiology, New York University School of Medicine, New York, NY, USA; rodolfo.llinas@med.nyu.edu; http://www.med.nyu.edu/neuro-physio/faculty/faculty/rodolfo-llinas

Minibiography: Dr Llinás graduated and received his MD at the Pontifical Xavierian University in Bogotá, Colombia, and did his PhD with Sir John C Eccles at the Australian National University. He has made a wide range of contributions ranging from basic properties of nerve cells to brain network function, such as cerebellar control of movements and thalamo-cortical interaction in cognition.

Organizers: Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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* Nansen as neuroscientist: see notes at *last page* below and at http://www.dnva.no/kalender/vis.html?tid=48780
Previous NNLs: see below

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Nansen Neuroscience Lecture 2015

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In the center of your brain are the 'basal ganglia'. You use them all the time to select which actions to take. How can the basal ganglia learn to string together a sequence of motor actions to accomplish a goal, and how does this process get awry in disease?

When: Monday 12th October 2015 at 11:30 – 13:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNL) are organized in conjunction with Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience*. The NNL are given by speakers selected from the top tier of neuroscience research.
Admission: Open to public, no charge

11:30 – 12:00 Coffee and refreshments, mingling
12:00 – 12:03 Opening by Kirsti Strøm Bull, President of The Norwegian Academy of Science and Letters
12:03 – 12:06 Introduction by Linda H. Bergersen, University of Oslo
12:06 – 12:46 Lecture by **Bernardo L. Sabatini**, Harvard University
12:46 – 13:00 Discussion and questions from the audience, moderator Jon Storm-Mathisen

Bernardo Luis Sabatini

Strange synapses – implications for biology, disease, and therapy

Affiliation:
Sabatini Lab
Howard Hughes Medical Institute
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Warren Alpert 347-354
200 Longwood Ave, Boston, MA 02115, USA
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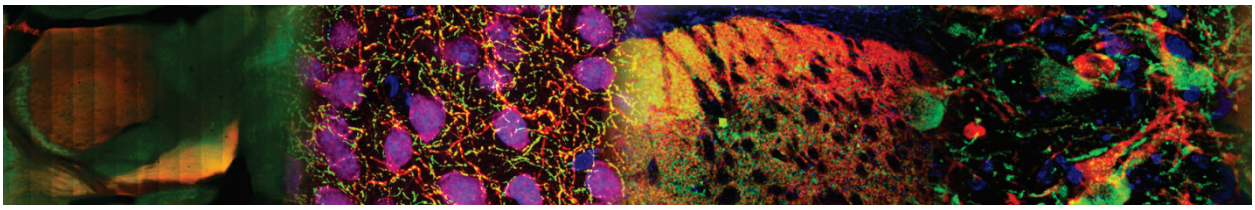
Abstract
Neurons communicate via specialized contact points called synapses at which neurotransmitters are released and activate specific receptor proteins. Synaptic activity is responsible for transmitting information throughout the brain and regulation of synapses is thought to be the biological substrate underlying learning and memory formation. Here we present recent data from our laboratory on the nature of neurotransmission in the basal ganglia, a phylogenetically old and evolutionarily conserved brain area that mediates coordinated and goal-oriented motor action. In humans, dysfunction of the basal ganglia underlies many neuropsychiatric disorders such as Parkinson[1]s, Tourette[1]s, drug addiction, and Huntington's. We find that synapses within this region have unique cell biological and signaling properties such that they target distinct neuronal populations with different neurotransmitters. Our findings reveal an additional level of complexity in neuronal cell biology and network organization with crucial implications for the treatment of human disease.



Biography
Professor Bernardo Sabatini is based at Harvard Medical School, and is also a Howard Hughes Medical Institute (HHMI) Investigator. His laboratory seeks to uncover the mechanisms of synapse and circuit plasticity that permit new behaviors to be learned and refined. They are interested in the developmental changes that occur after birth that make learning possible as well as in the circuit changes that are triggered by the process of learning. Lastly, they examine how perturbations of these processes contribute to human neuropsychiatric disorders such as Tuberous Sclerosis Complex and Parkinson's disease.

Organizers
Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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* Nansen as neuroscientist: see notes at http://www.dnva.no/kalender/vis.html?tid=48780
Previous NNL: see below

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Nansen Neuroscience Lectures 2014

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When: Friday 10th October 2014 at 13:00 – 14:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNL) are organized on Fridtjof Nansen's birthday to commemorate his fundamental contribution to neuroscience*. The NNL are given by speakers selected from the top tier of international neuroscience research.
Admission: Open to public, no charge

Amy FT Arnsten

Molecular events in Nansen's "Dotted Substance": Intracellular mechanisms governing higher cognitive network connections

Affiliation:
Amy FT Arnsten, PhD
Professor of Neurobiology and of Psychology
Founding Member, Kavli Institute of Neuroscience
Yale University, New Haven, CT, USA.
amy.arnsten@yale.edu
http://medicine.yale.edu/lab/arnsten/

Abstract
The highly evolved, primate dorsolateral prefrontal association cortex (PFC) generates the mental representations that are the foundation of abstract thought. The PFC can maintain information in the absence of sensory stimulation using networks of pyramidal cells that excite each other through NMDA type glutamate receptors at synapses on dendritic spines, constituents of the "dotted substance" first noted by Nansen. The numbers and complexity of layer III pyramidal cells expand greatly in primate evolution, and these neurons are gravely afflicted in both schizophrenia and Alzheimer's Disease. We have discovered that the strength of these PFC network connections is dynamically altered by the arousal systems, likely contributing to changes in conscious state and in higher mental abilities. For example, cholinergic stimulation of nicotinic alpha7 receptors in the synapse is needed for NMDA receptors to open and networks to connect when we are awake. The catecholamines control feedforward calcium-cAMP signaling events in the spine that can open or close potassium channels, rapidly weakening or strengthening connections, respectively. These molecular events help to shape the contents of working memory, and determine the strength of our higher cognitive abilities. We hypothesize that other association cortices, e.g. the entorhinal cortex, may also have mechanisms for dynamic regulation of network inputs. In contrast, the neuropil in the primary visual cortex reveals a fundamentally different landscape. In these more faithful connections, cAMP appears to have opposite effects compared to those in the PFC, e.g. strengthening connections by increasing glutamate release instead of weakening network inputs. Thus, the arousal systems can orchestrate brain circuits, e.g. enhancing sensory processing and weakening higher cognition during stress exposure. Importantly, many of the molecules that rein in the stress response, such as the phosphodiesterase PDE4A and its anchoring protein DISC1 (Disrupted In SChizophrenia), are genetically linked to schizophrenia. We have also found that PDE4A expression is reduced with advancing age, leading to the hyperphosphorylation of tau in the higher cortical circuits that degenerate in Alzheimer's disease. Thus, understanding the unique molecular regulation of the association cortices may help us understand the fragility of our higher cognitive abilities, and give rational strategies for the treatment of cognitive disorders.

Biography
Dr. Amy F.T. Arnsten is Professor of Neurobiology at the Yale University School of Medicine and a founding member of the Kavli Institute of Neuroscience at Yale. She received her B.A. with Honors in Neuroscience from Brown University in 1976, and her Ph.D. in Neuroscience from the University of California, San Diego in 1981. Following her doctoral studies, Dr. Arnsten performed post-doctoral research with Dr. Susan Iversen at the University of Cambridge in England and then with Dr. Patricia Goldman-Rakic at Yale University. Dr. Arnsten's research focuses on the highly evolved primate prefrontal cortex, elucidating the unique molecular mechanisms that dynamically alter the strength of network connections, shaping the contents of thought and coordinating state of arousal with cognitive abilities. Her lab has uncovered molecular events that take the prefrontal cortex "off-line" during uncontrollable stress, and has found that genetic and/or environmental insults in this process may contribute to cognitive impairment in mental illness and in aging. Arnsten's research has led to new treatments for prefrontal deficits in patients: 1) guanfacine (IntunivTM), for the treatment of Attention Deficit Hyperactivity Disorder and a variety of prefrontal cortical disorders; and 2) prazosin, for the treatment of Post-Traumatic Stress Disorder.

Organizers
Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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* Nansen as neuroscientist: see notes at http://www.dnva.no/kalender/vis.html?tid=48780
Previous NNL: see below

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The Nansen Neuroscience Lecture 2013

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When: Thursday 10 October 2013, 11:15 – 12:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
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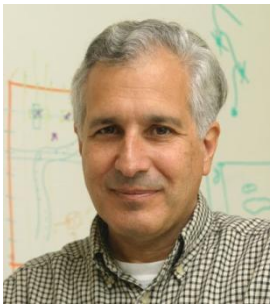

Jeff W. Lichtman

"Connectomics: What, How, and Why?"

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Harvard University
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Email: jeff@mcb.harvard.edu
http://www.hms.harvard.edu/dms/neuroscience/fac/lichtman.php

Abstract:
Connectional maps of the brain may have value in developing models of both how the brain works and how it fails when subsets of neurons or synapses are missing or misconnected. Such maps might also provide detailed information about how brain circuits develop and age. I am eager to obtain such maps in neonatal animals because of a longstanding interest in the ways neuromuscular circuitry is modified during early postnatal life as axonal input to muscle fibers is pruned. Work in my laboratory has focused on obtaining complete wiring diagrams ("connectomes") of the projections of motor neuron axons in young and adult muscles. Each data set is large and typically made up of hundreds of confocal microscopy stacks of images which tile the 3dimensional volume of a muscle. As a first step to analyze these data sets we developed computer assisted segmentation approaches and to make this task easier, have developed second generation "Brainbow" transgenic mice that in essence segment each axon by a unique fluorescent spectral hue. Once the axons are segmented, we have been able to graph the connectivity matrices that result. This effort has led to new insights into the developmental processes that help the mammalian nervous system mold itself based on experience. Analysis of these complete muscle connectomes show a striking single axis gradient of connectivity that we think is related to the ordered ranking of neural activity in axons (the "size principle" of Henneman). In brain however, as opposed to muscle, the high density of neuropil is overwhelming, which has precluded using the confocal optical approaches that have worked in the peripheral nervous system because there are too many neural processes in each optical section. We have thus developed a lossless automated physical sectioning strategy that generates thousands of ultra thin (~25 nm) sections on a firm plastic tape. We have developed a thin-section scanning electron microscopy approach to visualize these sections at 3 nm lateral resolution. This method makes large scale serial microscopic analysis of brain volumes more routine. We are now focused on developing an automated pipeline to trace out neural circuits in brains using this technique.

Biography:
Jeff Lichtman is Jeremy R. Knowles Professor of Molecular and Cellular Biology and Santiago Ramón y Cajal Professor of Arts and Sciences at Harvard University. He received an AB from Bowdoin (1973), and an M.D. and Ph.D. from Washington University (1980) where he worked for 30 years before moving to Cambridge in 2004. He is a member of the newly established Center for Brain Science. Lichtman's research interest revolves around the question of how mammalian brain circuits are physically altered by experiences, especially in early life. He has focused on the dramatic re-wiring of neural connections that takes place in early postnatal development when animals are doing most of their learning. This work has required development of techniques such as "Brainbow" transgenic mice to visualize neural connections and monitor how they are altered over time. Recently his efforts have focused on developing new electron microscopy methods to map the entire wiring diagram of the developing and adult brain. This "connectomics" approach has as one of its aims uncovering the ways information is stored in neural networks.

Organizers:
Linda H Bergersen and Jon Storm-Mathisen in cooperation with the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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* Nansen as neuroscientist: see notes at http://www.dnva.no/kalender/vis.html?tid=48780
Previous NNL: see below

UiO : University of Oslo

NANSEN NEUROSCIENCE NETWORK
connecting brain science and industry

The Nansen Neuroscience Lectures 2012

http://english.dnva.no/
http://www.dnva.no/

When: Wednesday 10 October 2012, 12:15 – 14:00
Where: The Norwegian Academy of Science and Letters – DNVA, Drammensv 78, 0271 Oslo
Why: The Nansen Neuroscience Lectures (NNL) are organized on Fridtjof Nansen's birthday to commemorate Nansen's fundamental contribution to neuroscience*. The NNL are given by speakers selected from the top tier of international neuroscience research.
Admission: Open to public, no charge

A. David Smith
Slowing progression in Alzheimer's disease by lowering homocysteine – evidence from neuroimaging

Semir Zeki
The neurobiology of beauty

Affiliations of speakers:

A. David Smith, FMedSci
Professor emeritus of Pharmacology
University of Oxford
Founding Director of Oxford Project to Investigate Memory and Ageing (OPTIMA)
http://www.medsci.ox.ac.uk/optima
Hon. Assoc. Director MRC Anatomical Neuropharmacology Unit
http://www.mrc.ox.ac.uk/

Semir Zeki, FRS, FMedSci
Professor of Neuroesthetics
(having previously held the Chair of Neurobiology)
University College London
http://www.vislab.ucl.ac.uk/
http://profzeki.blogspot.com/

Abstracts:

A. David Smith
Slowing progression in Alzheimer's disease by lowering homocysteine – evidence from neuroimaging
Alzheimer's disease (AD) progresses from an asymptomatic stage, through mild cognitive impairment (MCI), to eventual dementia. One therapeutic approach is to modify risk factors in the early stages. Raised plasma total homocysteine is a risk factor for AD and can be lowered by B vitamins (folate, vitamins B12 and B6). In the 2-year VITACOG trial we found that B vitamins slowed cognitive and clinical decline in those with MCI who had high baseline homocysteine. The B vitamins also markedly slowed atrophy in those regions of the brain that show loss of tissue in AD.

Semir Zeki
The Neurobiology of Beauty
The lecture will be a neurobiological dissection of one of the most famous definitions of beauty, given by Edmund Burke in *A Philosophical Enquiry into the Origin of our Ideas of the Sublime and Beautiful* (1757): "Beauty is, for the greater part, some quality in bodies acting mechanically upon the human mind by the intervention of the senses". I will examine, in light of experimental evidence, the four pillars of this definition: the *abstract nature* of beauty (as is implied in the definition), *the human mind* in the experience of beauty, *the quality in bodies* (that arouse the sense of beauty) and the neural nature of the *intervention by the senses*.

Organizers:
Linda H Bergersen and Jon Storm-Mathisen in cooperation with the Centre for Molecular Biology and Neuroscience (CMBN) at the University of Oslo, the Nansen Neuroscience Network (NNN), and the Norwegian Academy of Science and Letters (DNVA).

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* Nansen as neuroscientist: see notes at http://www.dnva.no/kalender/vis.html?tid=48780
Previous NNL: see below

CENTRE FOR MOLECULAR BIOLOGY AND NEUROSCIENCE

UiO : University of Oslo

NANSEN NEUROSCIENCE NETWORK
connecting brain science and industry

DET NORSKE VIDENSKAPS-AKADEMI

The Nansen Neuroscience Lectures

The Nansen Neuroscience Lectures (NNL) were organized for the first time on 11 October **2010** (in conjunction with Fridtjof Nansen's birthday 10 October) by the Centre for Molecular Biology and Neuroscience (CMBN) in cooperation with the Nansen Neuroscience Network (NNN) and the Norwegian Academy of Science and Letters (DNVA).

The program of the 'NNL101010' is shown below.

In the Nansen jubilee year **2011**, the NNL were replaced by the **Fridtjof Nansen Science Symposium**, neuroscience part, 28 April 2011 http://www.dnva.no/kalender/vis.html?tid=48780

"Nansen Neuroscience Lectures 101010"

Where: Nye auditorium 13, Domus medica, Sognsvannsv 9, University of Oslo
When: Monday 11th October 2010, at 11:00-13:45
http://www.cmbn.no/events-2010.html

11:00-11:15
Jon Storm-Mathisen, Professor, Centre for Molecular Biology and Neuroscience, University of Oslo, and Stein Lorentzen-Lund, Project Director, Nansen Neuroscience Network:
"**Nansen Neuroscience Network - innovation 123 years after the nascence of Norwegian neuroscience**"
(Nansen's thesis published 1887)

11:15-12:00
Albert Gjedde, Professor, Department of Neuroscience and Pharmacology, University of Copenhagen:
"**PET studies of oxygen delivery to brain tissue in humans in vivo: effects of aging, exertion and disease**"
Short introduction by Johanne Egge Rinholm, PhD, UiO

12:00-12:15 Coffee, fruits, refreshments

12:15-13:00
Kenneth Hugdahl, Professor, Department of Biological and Medical Psychology, University of Bergen:
"**Functional neuroimaging: promises and challenges -- unravelling the neuroscience of auditory hallucinations in schizophrenia**"
Short introduction by Cecilie Morland, PhD student, UiO

12:00-13:45
May-Britt Moser, Professor, The Kavli Institute for Systems Neuroscience & Centre for the Biology of Memory, NTNU, Trondheim:
"**How does the brain navigate in space**"
Short introduction by Lasse Ormel, PhD student, UiO

13:45 End of lectures

The Nansen Neuroscience Lectures 101010 are organized in conjunction with Fridtjof Nansen's birthday by the Centre for Molecular Biology and Neuroscience (CMBN) of the University of Oslo in cooperation with the Nansen Neuroscience Network (NNN) and the Norwegian Academy of Science and Letters (DNVA).
Organizing committee: Linda H Bergersen, Jon Storm-Mathisen



The inaugural Nansen Neuroscience Lectures speakers: Albert Gjedde, Kenneth Hugdahl, May-Britt Moser

Nansen Neuroscience Lectures 101010

Nye auditorium 13 (map), Domus medica, Sognsvannsv 9, University of Oslo
Monday 11th October 2010, at 11:00-13:45

The brain has myriads of separate units, the nerve cells, which transmit signals to each other. Fridtjof Nansen (1861-1930) was the first to state this principle. Today scientists unravel how the brain's networks of nerve cells make us who we are. The three speakers are world top experts using advanced methods to study in living subjects how the brain works when we think, feel, sense, navigate, or exercise - and how impaired function in aging and disease may be fought.

Chairperson: Linda H Bergersen

11:00-11:15 **"Nansen Neuroscience Network - innovation 123 years after the nascence of Norwegian neuroscience“** (Nansen's thesis published 1887)
Jon Storm-Mathisen, Professor, Centre for Molecular Biology and Neuroscience, and Anatomy, Inst of Basic Medical Sciences, University of Oslo;
Stein Lorentzen-Lund, Project Director, Nansen Neuroscience Network

11:15-12:00 **"PET studies of oxygen delivery to brain tissue in humans in vivo: effects of aging, exertion and disease"**
Albert Gjedde, Professor, Department of Neuroscience and Pharmacology, University of Copenhagen
Short introduction by Johanne Egge Rinholm, PhD, UiO

12:00-12:15 **Coffee, fruits, refreshments**

12:15-13:00 **"Functional neuroimaging: promises and challenges -- unravelling the neuroscience of auditory hallucinations in schizophrenia"**
Kenneth Hugdahl, Professor, Department of Biological and Medical Psychology, University of Bergen
Short introduction by Cecilie Morland, PhD student, UiO

12:00-13:45 **"How does the brain navigate in space"**
May-Britt Moser, Professor, The Kavli Instituet for Systems Neuroscience & Centre for the Biology of Memory, NTNU, Trondheim
Short introduction by Lasse Ormel, PhD student, UiO

Fridtjof Nansen was the first Norwegian neuroscientist of international standing. Next year we celebrate the 150th anniversary of his birth. The recently established Norwegian knowledge transfer network in neuroscience is named "Nansen Neuroscience Network“ in recognition of Nansen's contribution.

The Nansen Neuroscience Lectures 101010 are organized in conjunction with Fridtjof Nansen's birthday (10th October 1861) by the Center for Molecular Biology and Neuroscience (CMBN) in cooperation with the Nansen Neuroscience Network (NNN) and the Norwegian Academy of Science and Letters (DNVA).

Organizing committee : Linda H Bergersen, Jon Storm-Mathisen

On Fridtjof Nansen's contribution to neuroscience:

Nansen is to be credited as father of the Neuron Doctrine (the idea that the nervous system consists of separate nerve cells rather than a continuum of tubes, published in two papers in 1886) and for realizing the significance of the neuropil (the 'dotted substance' between the nerve cell bodies) as the site of communication between the cells (Edwards JS & Huntford R 1998 *Fridtjof Nansen: from the neuron to the North Polar Sea*. Endeavour 22(2):76-80; Huntford R 1997 *Nansen - The Explorer as Hero*. Reprinted 2009 Abacus, London).

Some salient statements in the thesis paper by Fridtjof Nansen (1887) *The structure and combination of the histological elements of the central nervous system*. Bergen Museums Aarsberetning for 1886, pp 25 - 214, Plates I - XI:
p144: "The tubes and fibrillæ forming the dotted substance do not anastomose with each other, but form, only, a more or less intricate web or plaiting."
p167: "The dotted substance (the interlacing of nervous fibrillæ) must be a principal seat of the nervous activity, through this substance or interlacing is the reflex-actions etc. communicated to the consciousness, which even possibly has its seat in this substance itself."
"..we can state, as a fact, that a plaiting or interlacing (not reticulation) of nervous fibrillæ extends through the whole central nervous system of all animals.."
p171: "..the dotted substance must be a principal seat of the nervous activity".."an extremely intricate web of nerve-tubes ... and this web is probably the principal seat of intelligence." (the last words of the thesis paper)

(From The Fridtjof Nansen Science Symposium 2011
http://www.dnva.no/kalender/vis.html?tid=48780)

See also

Linda H Bergersen & Jon Storm-Mathisen 'Kavliprisen i nevrovitenskap: 120 år etter Nansen'
KRONIKK forskning.no 28.04.2008
https://forskning.no/meninger/kronikk/2008/04/kavliprisen-i-nevrovitenskap-120-ar-etter-nansen

ÅRBOK FOR Universitetsmuseet i Bergen 2011
http://www.uib.no/universitetsmuseet/64551/%C3%A5rbok-2011
Karen B Helle '*Fridtjof Nansen som konservator ved Bergens Museum*' pp 8-18
Ortwin Bock: '*Fridtjof Nansen and the Nobel Prize in Physiology or Medicine of 1906'* pp 26-36

Nansen's Doctorate and the Neuron Doctrine - FENS 130th Anniversary Symposium 2018
http://folk.uio.no/jonsm/open/Nansen130/NansenSymp.pdf
https://www.med.uio.no/imb/english/research/news-and-events/events/conferences/2018/nansen-symposium.html
http://www.dnva.no/kalender/vis.html?tid=73062

Book
Ortwin Bock & Karen B Helle *'Fridtjof Nansen and the Neuron'* Bodoni, Bergen 2016
(ISBN 978-82-7128-855-6)
http://bodoniforlag.no/butikk/fagboker/fridtjof-nansen-and-the-neuron/