



The Burden of Wake and the Reasons of Sleep

Lecture by Dr. Chiara Cirelli

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hosted by Prof. Silvestro Micera and Prof. Calogero Oddo

BioRobotics PhD

Seminars Cycle on Neuroscience Robotics

Tuesday March 30, 2021 - 9.30 pm

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ABSTRACT: Sleep is universal, tightly regulated, and many cognitive functions are impaired if we do not sleep. But why? Any hypothesis about the essential function of sleep must take into account that when asleep we are essentially offline: sensory disconnection must be crucial for whatever function sleep serves. If not, natural selection would likely have found a way to perform the same function while awake, avoiding the danger of being unable to monitor the environment. Over the past 20 years, Dr. Cirelli has developed and tested a comprehensive hypothesis about the core function of sleep: **The Synaptic Homeostasis Hypothesis (SHY).**

In this seminar, Dr. Cirelli will discuss the rationale underlying this hypothesis and will summarize electrophysiological, molecular and ultrastructural studies in flies, rodents and humans that confirmed SHY's main predictions, including the recent observation, obtained in mice using serial block face scanning electron microscopy, that most cortical synapses grow after wake and shrink after sleep.

BIOSKETCH: Chiara Cirelli received her medical degree and Ph.D. in Neuroscience from the University of Pisa. She continued this work as Fellow in experimental neuroscience at the Neuroscience Institute in San Diego, and since 2001 at the University of Wisconsin – Madison, where she is currently Professor at the Department of Psychiatry. Her lab aims at understanding the function of sleep and clarifying the functional consequences of sleep loss. Dr. Cirelli has developed the synaptic homeostasis hypothesis, according to which sleep is needed for synaptic renormalization, to counterbalance the net increase of synaptic strength due to wake plasticity. She recently used this technique to show how cortical synapses grow during waking and shrink during sleep. Dr. Cirelli has published over 150 papers on sleep and is Associate Editor of *SLEEP*. With Dr. Giulio Tononi, she received the 2017 Farrell Prize in Sleep Medicine from Harvard Medical School. In 2018, she was awarded the Outstanding Scientific Achievement Award from the Sleep Research Society.

Figures, source: Bellesi M, de Vivo L, Koebe S, Tononi G and Cirelli C (2018) Sleep and Wake Affect Glycogen Content and Turnover at Perisynaptic Astrocytic Processes. *Front. Cell. Neurosci.* 12:308. doi: 10.3389/fncel.2018.00308