



# CERN Colloquium

SPEAKER: Prof. JOLIVET, R. (CERN)

TITLE: **Neuroenergetics: How energy constraints shape brain function**

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## ABSTRACT

The nervous system consumes a disproportionate fraction of the resting body's energy production. In humans, the brain represents 2% of the body's mass, yet it accounts for ~20% of the total oxygen consumption. Expansion in the size of the brain relative to the body and an increase in the number of connections between neurons during evolution underpin our cognitive powers and are responsible for our brains' high metabolic rate. The molecules at the center of cellular energy metabolism also act as intercellular signals and constitute an important communication pathway, coordinating for instance the immune surveillance of the brain. Despite the significance of energy consumption in the nervous system, how energy constrains and shapes brain function is often under appreciated.

I will illustrate the importance of brain energetics and metabolism with two examples from my recent work. First, I will show how the brain trades information for energy savings in the visual pathway. Indeed, a significant fraction of the information those neurons could transmit in theory is not passed on to the next step in the visual processing hierarchy. I will discuss how this can be explained by considerations of energetic optimality. Second, I will show how adenosine triphosphate, the energy currency of cells, is critical in regulating surveillance of the brain by a specialised population of immune cells. I will also discuss a new mechanism that we recently identified, which plays a key role in regulating the patrolling of brain tissue by these cells. Finally, I will conclude by discussing future research directions in the field and opportunities for CERN at the neuroscience interface.