ICFO Colloquium LESZEK KACZMAREK 'Shedding light on molecular mind'

LESZEK KACZMAREK

October 02, 2015

Friday, October 2nd, 12:00, ICFO's Auditorium

LESZEK KACZMAREK

Professor of neurobiology and head of the Laboratory of Neurobiology at the Nencki Institute of Experimental Biology, the Polish Academy of Sciences (PAS)$$ Leszek Kaczmarek is a professor and Chair of the Department of Molecular & Cellular Neurobiology at the Nencki Institute, Warsaw; Poland, a leading independent laboratory since 1988. His major research achievements include: (i) discovery of c-Myc protein role in regulation of the cell cycle; (ii) discovery of the learning-related gene (c-fos) expression in the mammalian brain; (iii) revealing apoptotic component of excitotoxicity in the adult brain; (iv) discovery of specific role of cyclin D2 in the adult brain neurogenesis; (v) discovery of involvement of matrix metalloproteinases in neuronal plasticity, epileptogenesis, learning and memory; (vi) defining the role of the central amygdala in appetitive learning and memory. At present he chairs the Division of Biological and Agriculture Sciences of the Polish Academy of Sciences (PAN); Life

Sciences Committee of the Council of the National Science Center (NCN, the Polish basic research grant awarding body); Polish-Swiss Joint Selection Committee (grant system). He is also a member of the Council of the European Molecular Biology Organization (EMBO) and Physiology & Medicine Section Committee of the Academia Europaea. He has received several awards for his research achievements, including a prize from the Foundation for Polish Science (2000), the most prestigious science award in Poland.

The Merriam-Webster Dictionary derives the term "Mind" from Old English gemynd; akin to Old High German gimunt meaning memory. Over the last quarter of century we have followed molecular roots of the memory in a hope to identify also building blocks of the mind. Initially, we have identified increased c-fos mRNA levels in memory formation, thus discovering phenomenon of gene expression in learning. Following c-Fos protein function as a gene activity regulator, we have focused on its targets: TIMP-1 and MMP-9 (tissue inhibitor of matrix metalloproteinases-1 and matrix metalloproteinase-9), composing extracellular proteolytic system that we and others have implicated as a major player in the synaptic plasticity, learning and memory. At the subcellular level, MMP-9 localization and activity helps to explain this role, since the enzyme, its protein and mRNA are all available at the or near excitatory synapses located at the dendritic spines to allow for a rapid, local unleash of the enzymatic activity in response to synaptic stimulation. Furthermore, MMP-9 was shown to control morphological and physiological synaptic plasticity that underlies reorganization of neuronal circuitry in the brain. The present research challenge is to explain possible contribution of the enzyme to such human neuropsychiatric conditions as epilepsy, drug addiction, schizophrenia, and autism spectrum disorders, to name just those for which such a link has been implied. c-Fos and MMP-9 indeed emerge as pivotal components of the molecular underpinnings of the mind, and at the same time they can be followed as markers of the neuronal plasticity. Shedding light on these proteins means both elucidating the mechanisms supporting mind function and dysfunction, as well as literally visualizing mind at work.

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