EMBO Molecular Medicine

Excellence in biomedical research: ubiquitin family proteins and grid cells

The Louis-Jeantet Prize for Medicine is awarded yearly to recognize European biomedical researchers who have distinguished themselves with scientific excellence. The prize was established 1986 to celebrate scientists whose accomplishments had and still have a major impact on biomedical research. As such, the prize above all is dedicated to fostering ongoing and future research projects of major impact in the biomedical field. Therefore, the vast majority of the prize money is intended to fund the ongoing research in the recipients' laboratory. Honouring fundamental insights and innovative applications as well as promoting the outstanding work of the winners are the major aims of the prize.

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This year, the Louis-Jeantet Prize for Medicine is awarded to Stefan Jentsch (Max-Planck-Institute of Biochemistry, Munich, Germany) as well as May-Britt and Edvard Moser (Norwegian University of Science and Technology, Trondheim, Norway). In collaboration with the Louis-Jeantet-Foundation, EMBO Molecular Medicine is delighted to publish inspirational features by the recipients in this issue (Jentsch, 2011; Moser and Moser, 2011). The articles are an inspirational read in that they delineate personal voyages and convey the enthusiasm of the awardees for their respective field while explaining their breakthrough work and its implications.

Stefan Jentsch, a molecular cell biologist, made numerous milestone discoveries studying the function of ubiquitin and ubiquitin-like proteins. A key concept that emerged from his work was that modification of proteins with small modifiers like ubiquitin not only leads to degradation of the modified protein through the proteasome, but also serves important regulatory functions independent of proteolytic degradation. One striking example is the so-called proliferating-cell nuclear antigen (PCNA) switch, which implicated ubiquitin as well as SUMO in the regulation of DNA damage tolerance and repair (Hoege et al, 2002). Thus, the work of Stefan Jentsch and his colleagues challenged the common belief that ubiquitin functioned exclusively in protein degradation pathways and opened a new, exciting field that studies the relationship between ubiquitin family proteins and DNA repair pathways. Given its essential functions in various essential cellular pathways, it is not surprising that defects in the ubiquitin system have been linked to numerous diseases such as cancer, inflammation, central nervous system disorders and metabolic dysfunctions. In addition, proteasome inhibitors are successfully used in the therapy of cancers and both industry and academia focus efforts on the identification of novel drug targets in the ubiquitin pathways with the hope that new, active compounds can be identified. This perfectly illustrates the synergy between basic research and applied science in the development of therapeutic approaches.

Edvard and May-Britt Moser, the remarkable neuroscientist couple leading research at the Kavli Institute for Systems Neuroscience and the Centre of the Biology of Memory, are the well-known discoverers of grid cells (Hafting et al, 2005). The Mosers devote their professional life to the investigation of the neural basis of behaviour. Their pioneering work characterized the spatial representation system of the mammalian brain, which allows the organism to generate a map of the local space. Together with their students, they showed that grid cells, which are situated in the entorhinal cortex of the brain, fire at regularly spaced positions in the environment, in contrast to place cells that fire at a single location. Grid cells are now thought to provide an internal metric navigation system, mainly instructed by self-motion information rather than by external clues. But importantly the team did not stop at investigating the isolated cell type but started to characterize the network in which the cells are embedded. Consequently, they made seminal discoveries, for example showing that grid cells and the outputs of the respective circuits are connected to memory networks in the hippocampus and determine how memory is deposited in this region. Their breakthrough discoveries opened the field to new arenas of research and proved the existence of a place and memory network in conjunction with the hippocampus. In their Perspective, the couple emphasizes the need for integrated understanding of the neuronal circuits in the brain and that the wider network of interactions and connections should be analysed to further understand the individual components. This integration also promises to enable the understanding of the most complex biological functions, not only in neuroscience, but also in other areas of biomedical research.

We wish to express our congratulations to the winners for their remarkable achievements and continued excellence and look forward to exciting times in molecular medicine.

The authors declare that they have no conflict of interest.

References

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