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RESEARCH AREA

Coordinated regulation of the actin and microtubule cytoskeleton is known to play a pivotal role in the growth and proper navigation of neuronal axons and dendrites that are necessary to the formation of a functional nervous system. One of our major scientific interests is to gain a better understanding of the molecular mechanisms of axonal growth and guidance by uncovering the role of the growth cone cytoskeleton regulatory proteins. In addition, we are interested in the mechanisms of myofibrillogenesis. Myofibrils are composed of repeated sarcomeres that are extremely highly ordered macromolecular assemblies where structural organization is intimately linked to their functionality as contractile units. Recently, we developed a powerful nanoscopic approach that allowed us to determine the position of 27 muscle proteins with a quasi-molecular localization precision, and by means of template based protein structure modelling, we assembled a refined I-band and H-zone model with an unparalleled scope and resolution. We aim to combine this method with genetic approaches to investigate the molecular mechanisms of sarcomere assembly during muscle development. Our studies are of potential biomedical relevance as they may help to develop more efficient neuronal regeneration methods, and to understand sarcomere assembly and function in healthy and disease conditions.

TECHNIQUES AVAILABLE IN THE LAB

Classical and molecular Drosophila genetics, molecular biology, cell biology, cytoskeleton analysis, immunohistochemistry, the basic methods of biochemistry, confocal and super-resolution microscopy, behavioral tests, live imaging, digital image analysis.

SELECTED PUBLICATIONS

Szikora, S., Gajdos, T., Novák, T., Farkas, D., Földi, I., Lenart, P., Erdélyi, M., **Mihály, J.** (2020) Nanoscopy reveals the layered organization of the sarcomeric H-zone and I-band complexes. **J Cell Biol 219:** e201907026

Szikora, S., Földi, I., Tóth, K., Migh, E., Vig, A., Bugyi, B., Maléth, J., Hegyi, P., Kaltenecker, P., Sanchez-Soriano, N., **Mihály, J.** (2017) The formin DAAM is required for coordination of the actin and microtubule cytoskeleton in axonal growth cones. **J Cell Sci 130:** 2506-2519.

Nelson, K.S., Khan, Z., Molnár, I., **Mihály, J.,** Kaschube, M., Beitel, GJ. (2012) Drosophila Src regulates anisotropic apical surface growth to control epithelial tube size. **Nat Cell Biol 14:** 518-525.

Matusek, T., Gombos, R., Szécsényi, A., Sánchez-Soriano, N., Czibula, A., Pataki, C., Gedai, A., Prokop, A., Raskó, I., **Mihály, J.** (2008) Formin proteins of the DAAM subfamily play a role during axon growth. **J. Neurosci 28:** 13310-13319.

Boutros, M., **Mihaly, J.**, Bouwmeester, T., Mlodzik, M. (2000) Signaling specificity by Frizzled receptors in Drosophila. **Science 288:** 1825-1828.