Open Ph.D. projects

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Title of the research topic: The molecular mechanisms of myofibrillogenesis

Description of the research topic: Myofibrils are composed of sarcomeres, serially repeated structural and functional units. The emergence of these highly ordered structures is evident already in the premyofibrils where the developing sarcomeres are bordered by Z-disks. Once formed in the premyofibrils, the sarcomeres must undergo a substantial growth process to reach their final length and width, typical for the given muscle. In case of our major model system, the Drosophila indirect flight muscle (IFM), the sarcomeres lengthen by 1,7 fold and their width increases by nearly 5 fold. Although, beyond the major muscle proteins (i.e. actin, myosin and titin), few additional proteins have also been linked to myofibrillogenesis, the major mechanisms of thin filament growth and peripheral addition of the myofilaments remained largely unknown. Over the past years our research group identified a set of actin regulatory proteins which clearly contribute to at least one aspect of sarcomere growth. The initial characterization of these proteins revealed a role for CapZ, V1/Myotrophin, Flightless-I, LRRFIP2, SALS, and two formins (DAAM and Fhos) in the regulation of myofibril width, whereas SALS, DAAM and Fhos also play a role in sarcomere/thin filament elongation. The goal of our future studies is to use a combination of genetic, biochemical, cell biological and superresolution imaging techniques to shed light on the mechanisms of these proteins. Given that all these proteins are linked myopathies or cardiomyopathies, we expect that our findings may contribute to a better understanding of the pathomechanisms of these devastating diseases.