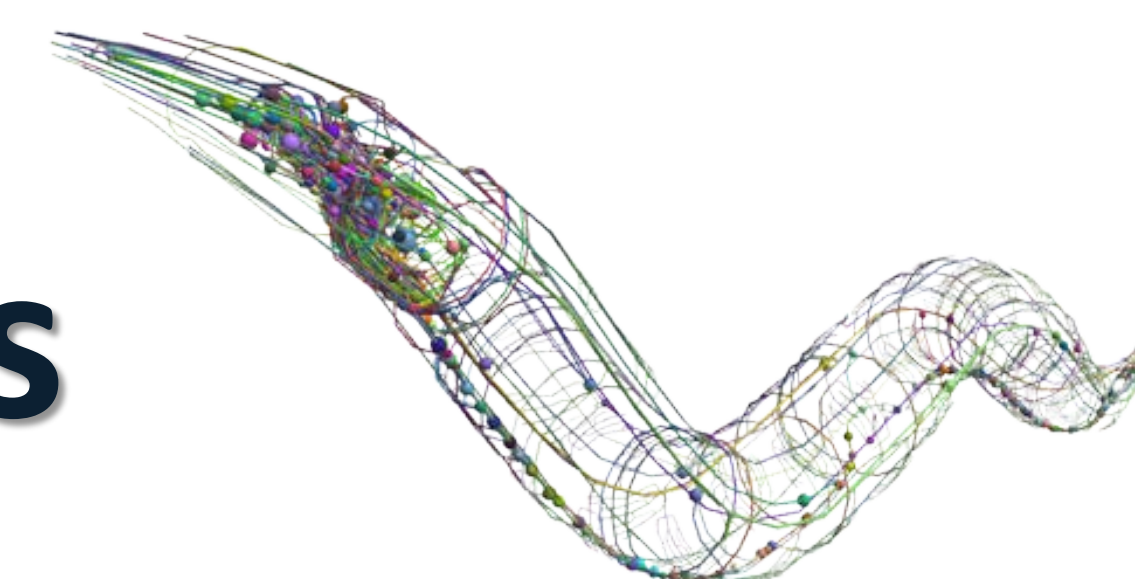




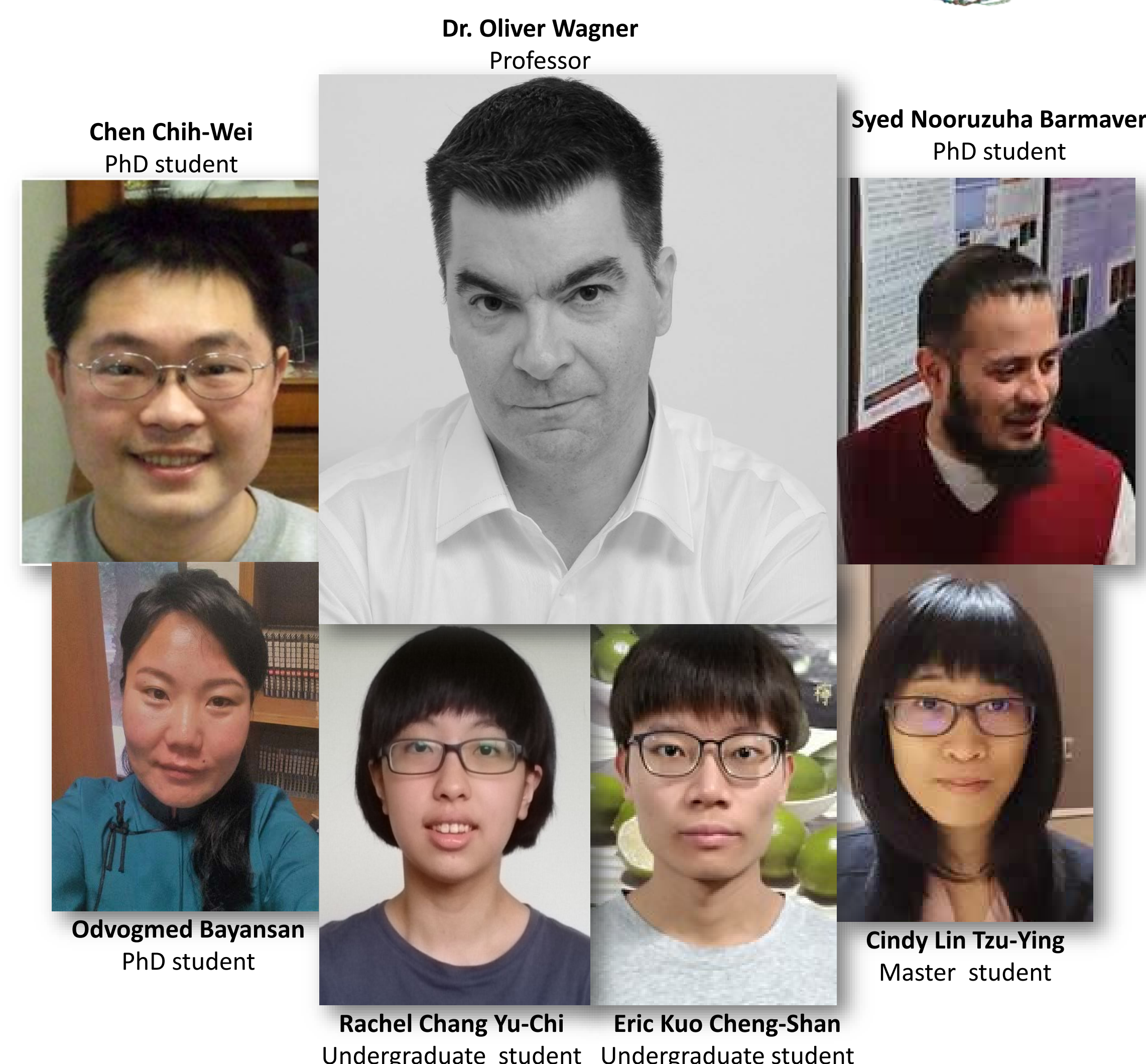
Wagner-Lab

Regulation of molecular motors in the nervous system of *C. elegans*



Research Areas

Our lab is interested in the regulation of organelle trafficking and molecular motors in the nervous system using *C. elegans* with a fully sequenced genome. We seek for answers how molecular motors recognize their cargo and how their motility is controlled. Our oriented basic-research on ALS, tubulinopathies, ciliopathies, and synaptopathies will provide important knowledge for future drug design to prevent or cure such diseases.



Ongoing Research Projects

Regulation of axonal transport in the nervous system of *C. elegans*

- Various neuropathological diseases are linked to dysfunctional molecular motors and axonal transport. We identified a protein liprin- α (SYD-2) that regulates directionality and speed of kinesin-3. Another active zone protein MAGUK (LIN-2) significantly boost run lengths of this motor. We recently identified a new receptor of kinesin-3 to bind to RAB-3 containing vesicles, the UNC-10/SYD-2 complex.

Cilia development and intraflagellar transport

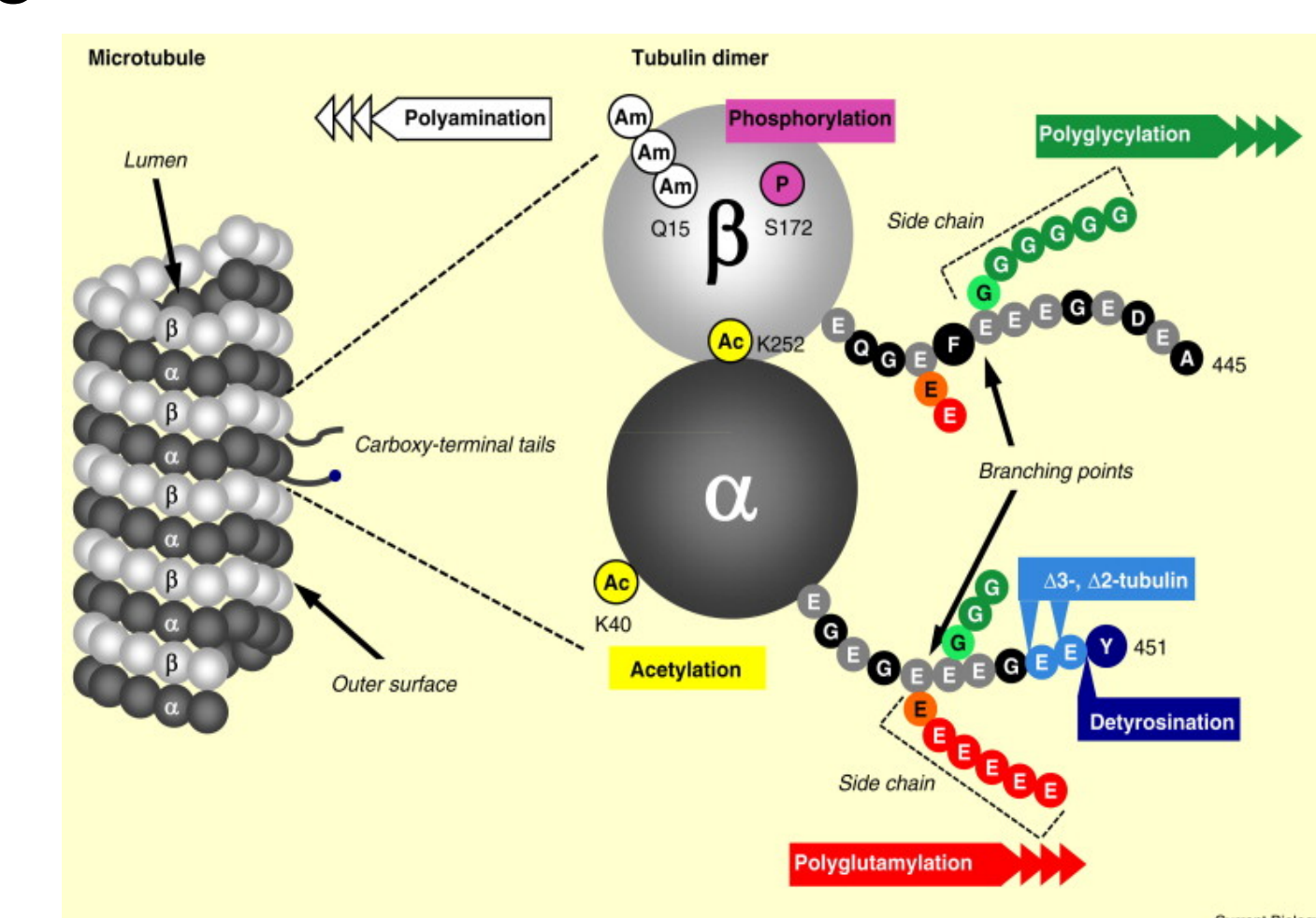
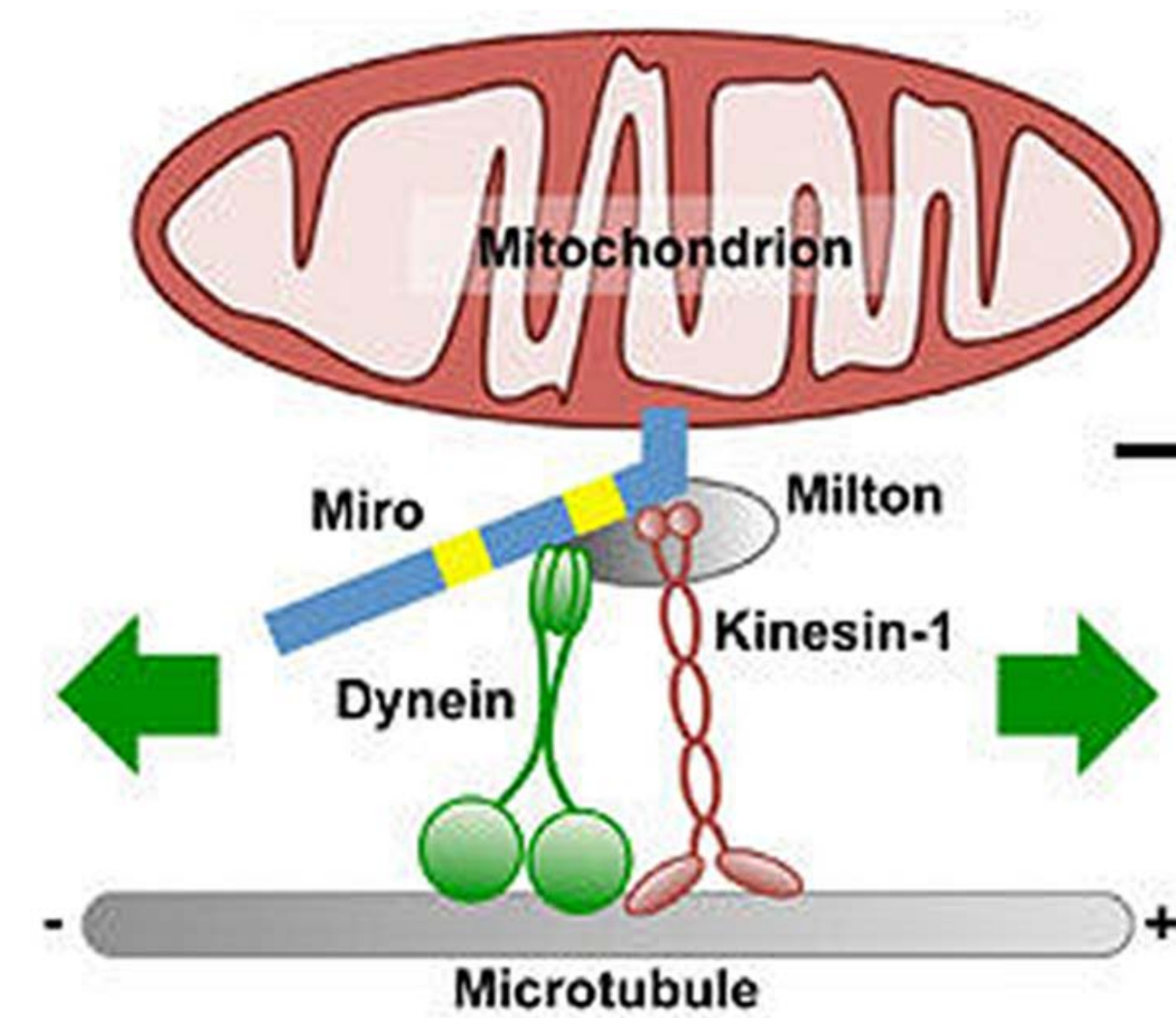
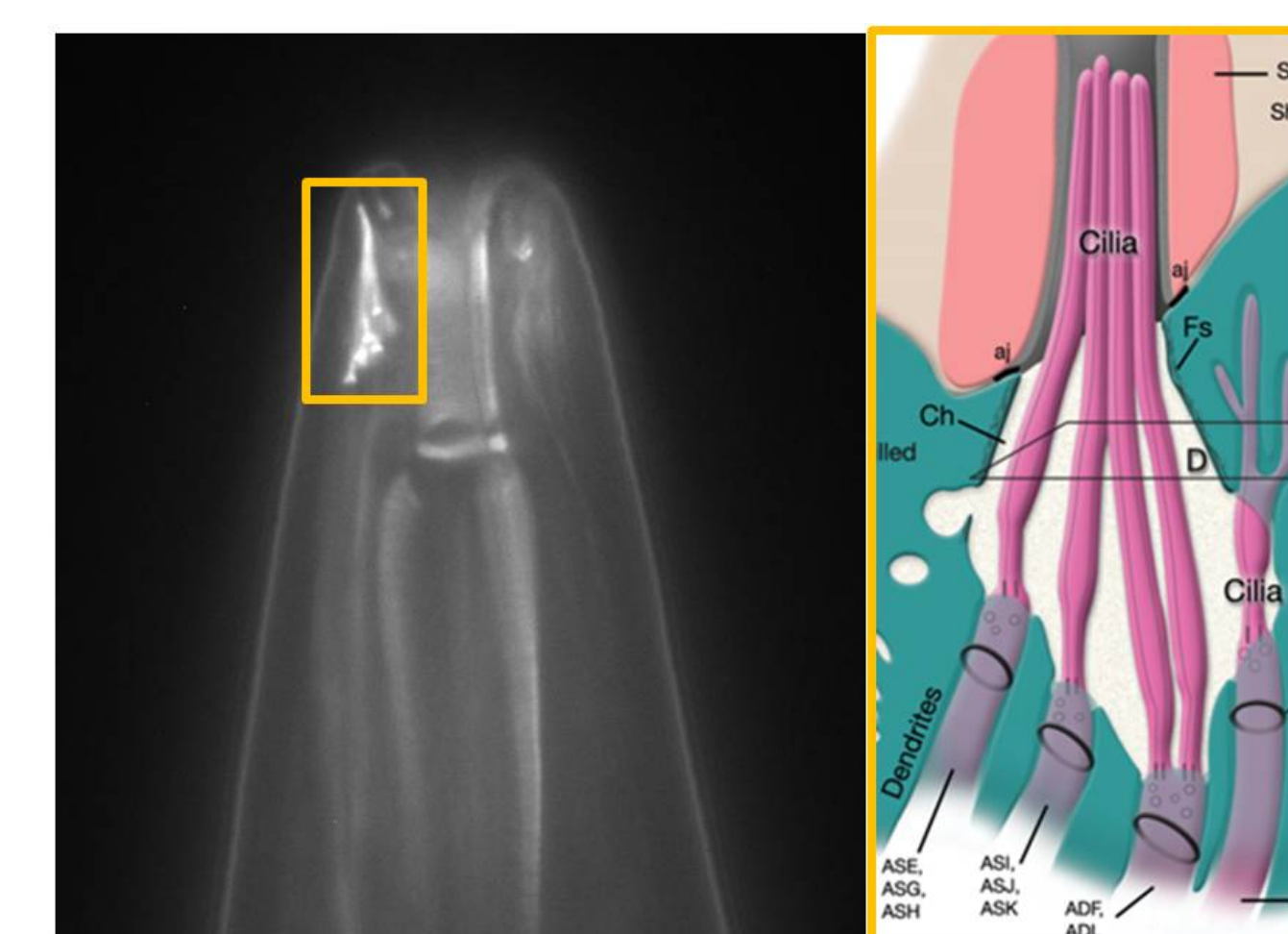
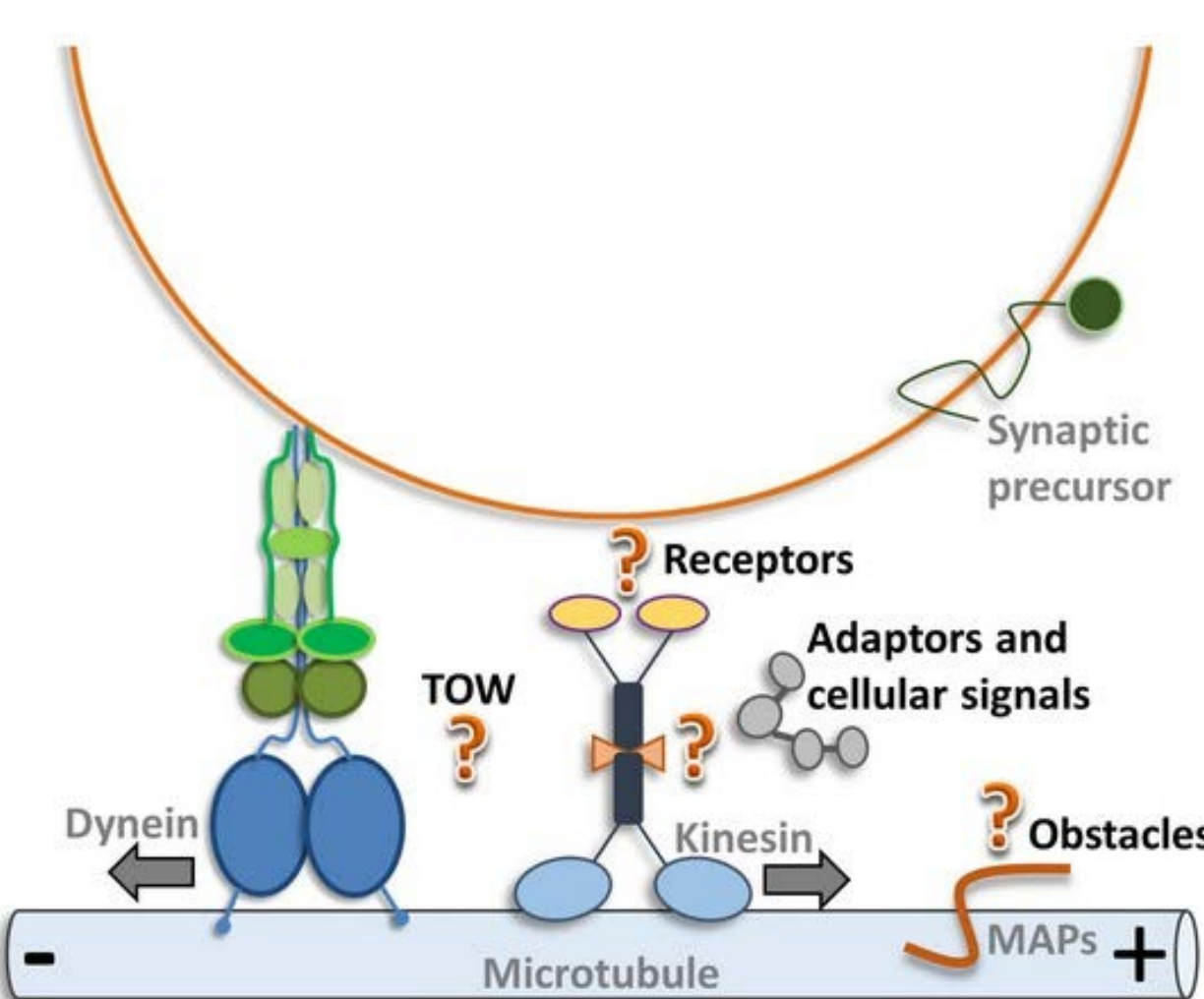
- Adult polycystic kidney disease (APKD) is one of the most common diseases in Taiwan and is linked to defects in the highly conserved components of the intraflagellar transport machinery in cilia. We have identified two novel kinases PGK-1 and GCK-2 that largely affect cilia growth and IFT. We also discovered that ciliary post-translation modifications (acetylation and deacetylation) affect cilium length and transport.

Identification of novel regulators of mitochondrial transport via forward and reverse genetics

- Mitochondrial transport and distribution in neurons is effectively regulated in response to changes in neuronal activity and various physiological functions. Dysfunctional mitochondria transport leads to various neurological diseases. In a forward genetic screen we have screened 1000 genomes and identified unique mitochondrial distribution phenotypes. In a reverse screen (92 genes) we identified 3 critical genes affecting mitochondria.

Role of post-translation modification of tubulin on axonal transport in *C. elegans*

- Post-translational modifications (PTM) of tubulin are regulated by a unique set of enzymes expressed in neurons and linked to various neurological diseases. Such tubulin modifications regulate microtubule stability and organization as well as motor attachment rates to the microtubules. Heritable mutations in PTM enzymes often lead to dysfunctional axonal transport and has impacts on synaptic transmission affecting memory and synaptic plasticity. We identified PTM enzyme TTLL-12 as a critical novel regulator of tyrosination in *C. elegans*.



Awards and Honors

- 2019 National Tsing Hua University "Excellent research Award"
- 2018 MOE Naturalization Award for High Professionals
- 2014 National Tsing Hua University "Best Lecturer Award"
- 2013 College of Life Science "Outstanding Teaching Award"

Alumni

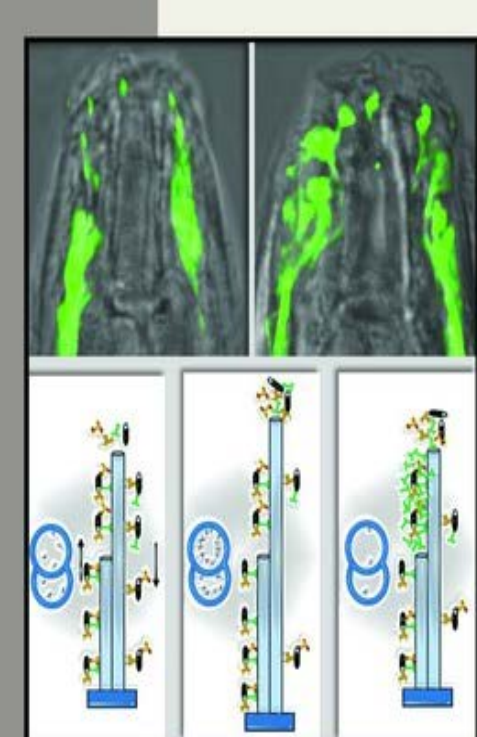
- 4 PhD students
- 13 Master students
- 12 Undergraduates
- 8 Summer exchange students from Germany
- 5 exchange students from Mainland China

Publications

2018

2019

Cover feature



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IF 3.951 /Rank 77/193 (Q2)



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