June 2020 Newsletter

FSU Biomed

Florida State University College of Medicine

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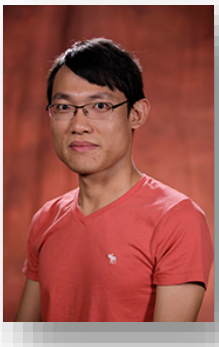
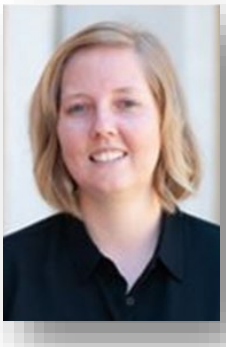
Student News



On May 26th, **Yiming Zheng**, formerly with the **Megraw Lab**, began his postdoc with Hugo Bellen at the Baylor College of Medicine as a Howard Hughes Fellow. We wish Yiming the best of luck with this next phase of his career!



Congratulations to **Caroline Strong** of the **Kabbaj Lab**! In August, Caroline will begin her postdoc at The National Center for Advancing Translational Sciences (NCATS), a branch of NIH.

Upcoming Events

June 10

Seminar Series: Jamie Johnston

June 17

Seminar Series: Jenny Warnock

June 24

Seminar Series: Yuan Wang

July 1

Seminar Series: Robert Tomko

NOTICE:

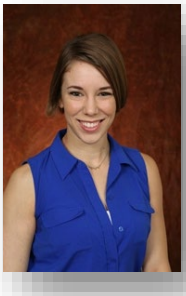
As FSU and the College of Medicine approach Phase 2 of the Governor's plan to reopen Florida, please check regularly for updated policies and procedures regarding access and usage of the facilities. As of now, Phase 1 is still in effect and established policies regarding facility usage should continue to be carried out.

Publications

Drs. Antonia Nemec and **Robert Tomko** recently had a paper published in *Yeast* titled "A suite of polymerase chain reaction-based peptide tagging plasmids for epitope-targeted enzymatic functionalization of yeast proteins." The link and abstract are below:

https://doi.org/10.1002/yea.3471

The budding yeast and model eukaryote *Saccharomyces cerevisiae* has been invaluable for purification and analysis of numerous evolutionarily conserved proteins and multisubunit complexes that cannot be readily reconstituted in *E. coli*. For many studies, it is desirable to functionalize a particular protein or subunit of a complex with a ligand, fluorophore, or other small molecule. Enzyme-catalyzed site-specific modification of proteins bearing short peptide tags is a powerful strategy to overcome the limitations associated with traditional nonselective labeling chemistries. Toward this end, we developed a suite of template plasmids for C-terminal tagging with short peptide sequences that can be site-specifically functionalized with high efficiency and selectivity. We have also combined these sequences with the FLAG tag as a handle for purification or immunological detection of the modified protein. We demonstrate the utility of these plasmids by site-specifically labeling the 28-subunit core particle subcomplex of the 26S proteasome with the small molecule fluorophore Cy5. The full set of plasmids has been deposited in the non-profit plasmid repository Addgene (http://www.addgene.org).

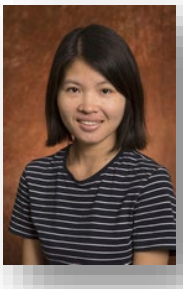


In May, **Kristin Schoepfer** of the **Kabbaj Lab**, along with Yiqi Xu, Aaron A. Wilber, Wei Wu, and **Dr. Mohamed Kabbaj** published a manuscript in bioRxiv titled "Sex differences and effects of estrous stage on hippocampal-prefrontal theta communications". The link and abstract are below:

https://www.biorxiv.org/content/10.1101/2020.05.16.099739v1

Effective communication between the mammalian hippocampus and neocortex is essential to certain cognitive-behavioral tasks critical to survival in a changing environment. Notably, functional synchrony between local field potentials (LFPs) of the ventral hippocampus (vHPC) and the medial prefrontal cortex (mPFC) within the theta band (4-12 Hz) underlies innate avoidance behavior during approach-avoidance conflict tasks in male rodents. However, the physiology of vHPC-mPFC communications in females remains unestablished. Furthermore, little is known about how mPFC subdivisions functionally interact in the theta band with hippocampal subdivisions in both sexes in the absence of task demands. Given the established roles of biological sex and gonadal hormone status on innate avoidance behaviors and neuronal excitability, here, we characterize the effects of biological sex and female estrous stage on hippocampal-prefrontal theta signaling in freely-moving female and

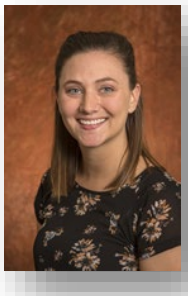
male rats. LFPs from vHPC, dorsal hippocampus (dHPC), mPFC-prelimbic (PrL), and mPFC-infralimbic (IL) were simultaneously recorded during spontaneous exploration of a familiar arena. Data suggest that theta phase and power in vHPC preferentially synchronize with PrL; conversely, dHPC and IL preferentially synchronize. Males displayed greater vHPC-PrL theta synchrony than females, despite similar regional frequency band power and inter-regional coherence. Additionally, several significant estrous-linked changes in hippocampal-prefrontal theta dynamics were observed. These findings support the hypothesis that biological sex and female estrous stage can both affect hippocampal-prefrontal theta signaling in a familiar environment. These findings establish novel research avenues concerning sexual dimorphisms and effects of gonadal hormone status in HPC-mPFC network activity pertaining to threat evaluation biomarkers.



Last month **Xiaoyan Yu** of the **Yuan Wang Lab**, along with Xiaoyu Wang, Hitomi Sakano, **Diego Zorio**, and **Yuan Wang** had their manuscript accepted for publication by the Journal of Comparative Neurology. More information regarding the manuscript entitled "Dynamics of the Fragile X Mental Retardation Protein Correlates with Cellular and Synaptic Properties in Primary Auditory Neurons following Afferent Deprivation" can be found through the link and abstract listed below:

https://doi.org/10.1002/cne.24959

Afferent activity dynamically regulates neuronal properties and connectivity in the central nervous system. The Fragile X mental retardation protein (FMRP) is an RNA-binding protein that regulates cellular and synaptic properties in an activity-dependent manner. Whether and how FMRP level and localization are regulated by afferent input remains sparsely examined and how such regulation is associated with neuronal response to changes in sensory input is unknown. We characterized changes in FMRP level and localization in the chicken nucleus magnocellularis (NM), a primary cochlear nucleus, following afferent deprivation by unilateral cochlea removal. We observed rapid (within 2 hours) aggregation of FMRP immunoreactivity into large granular structures in a subset of deafferented NM neurons. Neurons that exhibited persistent FMRP aggregation at 12–24 hours eventually lost cytoplasmic Nissl substance, indicating cell death. A week later, FMRP expression in surviving neurons regained its homeostasis, with a slightly reduced immunostaining intensity and enhanced heterogeneity. Correlation analyses under the homeostatic status (7–14 days) revealed that neurons expressing relatively more FMRP had a higher capability of maintaining cell body size and ribosomal activity, as well as a better ability to detach inactive presynaptic terminals. Additionally, the intensity of an inhibitory postsynaptic protein, gephyrin, was reduced following deafferentation and was positively correlated with FMRP intensity, implicating an involvement of FMRP in synaptic dynamics in response to reduced afferent inputs. Collectively, this study demonstrates that afferent input regulates FMRP expression and localization in ways associated with multiple types of neuronal responses and synaptic rearrangements.



Elise Wight, a graduate student in the **Megraw Lab**, along with Amber Ide, and Cynthia Damer, recently had work from her Master's degree titled "Copine A regulates the size and exocytosis of contractile vacuoles and postlysosomes in Dictyostelium" published in FEBS Open Bio. The link and abstract are below:

https://doi.org/10.1002/2211-5463.12874

Copines are a family of cytosolic proteins that associate with membranes in a calcium-dependent manner and are found in many eukaryotic organisms. Dictyostelium discoideum has six copine genes (cpnA -cpnF), and cells lacking cpnA (cpnA−) have defects in cytokinesis, chemotaxis, adhesion, and development. CpnA has also been shown to associate with the plasma membrane, contractile vacuoles (CV), and organelles of the endolysosomal pathway. Here, we use cpnA− cells to investigate the role of CpnA in CV function and endocytosis. When placed in water, cpnA− cells made abnormally large CVs that took longer to expel. Visualization of CVs with the marker protein GFP-dajumin indicated that cpnA− cells had fewer CVs that sometimes refilled before complete emptying. In endocytosis assays, cpnA− cells took up small fluorescent beads by macropinocytosis at rates similar to parental cells. However, cpnA− cells reached a plateau sooner than parental cells and had less fluorescence at later time points. p80 antibody labeling of postlysosomes (PL) indicated that there were fewer and smaller PLs in cpnA− cells. In dextran pulse-chase experiments, the number of PLs peaked earlier in cpnA− cells, and the PLs did not become as large and disappeared sooner as compared to parental cells. PLs in cpnA− cells were also shown to have more actin coats, suggesting CpnA may play a role in actin filament disassembly on PL membranes. Overall, these results indicate that CpnA is involved in the regulation of CV size and expulsion, and the maturation, size, and exocytosis of PLs.

Chunfeng Zheng, a research scientist with the **Megraw Lab**, recently co-authored a paper with Alain Debec, Benjamin Loppin, Xiuwen Liu, and **Timmothy L. Megraw**, titled "The Enigma of Centriole Loss in the 1182-4 Cell Line" which appeared in the publication, Cells. The link and abstract are below:

https://doi.org/10.3390/cells9051300

The *Drosophila melanogaster* cell line 1182-4, which constitutively lacks centrioles, was established many years ago from haploid embryos laid by females homozygous for the *maternal haploid (mh)* mutation. This was the first clear example of animal cells regularly dividing in the absence of this organelle. However, the cause of the acentriolar nature of the 1182-4 cell line remained unclear and could not be clearly assigned to a particular genetic event. Here, we detail historically the longstanding mystery of the lack of centrioles in this *Drosophila* cell line. Recent advances, such as the characterization of the *mh* gene and the genomic analysis of 1182-4 cells, allow now a better understanding of the physiology of these cells. By combining these new data, we propose three reasonable hypotheses of the genesis of this remarkable phenotype.

Save the Date

Wednesday, July 15th	Seminar Series: Gregg Stanwood
Wednesday, July 22nd	Seminar Series: Tim Megraw
Wednesday, July 29th	Seminar Series: Sanjay Kumar

Do you have news you wish to share in the May Biomed Newsletter? If so, please contact Ryan Teston at: ryan.teston@med.fsu.edu

The July Deadline for Submissions: Friday, June 26th at 12pm