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Department of Marine Sciences
Presents a Seminar by

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Challenging the "rules of life" through analyses of genome evolution in microeukaryotes

Phylogenomic data from diverse lineages (i.e. microbes, plants, animals, fungi) have yielded considerable insight into the evolution of eukaryotes, including the structure of the eukaryotic tree of life and the nature of LECA (last eukaryotic common ancestor). At the same time, analyses of diverse life cycles and genome-scale data from numerous lineages have yielded insights into the dynamic nature of eukaryotic genomes that challenge the so-called "rules of life". These include complex patterns of chromosomal rearrangements, varying levels of ploidy within life cycles, and generation of extrachromosomal DNA. Based on the distribution of these dynamic genome features, we have previously hypothesized that the last common ancestor of eukaryotes had the ability to distinguish germline from somatic DNA even in the context of a single nucleus (e.g. Maurer-Alcalá X. X. and Katz 2015, Maurer-Alcalá Xyrus X et al. 2018, Parfrey and Katz 2010, Parfrey et al. 2008, Zufall et al. 2005), and we have speculated on the possibility of such distinctions in bacteria and archaea (Oliverio and Katz 2014) and at the origin of eukaryotes (Collens and Katz 2021). As part of this hypothesis, we argue that epigenetic processes play key roles in distinguishing germline (i.e. heritable) genome from more malleable somatic DNA. Ongoing work in the lab focuses on analyses of genome features in uncultivable microeukaryotic lineages to assess further these hypotheses.

- Collens A, Katz LA. 2021. OPINION: Genetic conflict with mobile elements drives eukaryotic genome evolution, and perhaps also eukaryogenesis. *J. Heredity* 112:140-144.
- Maurer-Alcala XX, Katz LA. 2015. An epigenetic toolkit allows for diverse genome architectures in eukaryotes. *Current Opinion in Genetics & Development* 35:93-99.
- Maurer-Alcalá XX, Yan Y, Pilling OA, Knight R, Katz LA. 2018. Twisted Tales: Insights into Genome Diversity of Ciliates Using Single-Cell 'Omics. *Genome biology evolution* 10:1927-1939.
- Oliverio AM, Katz LA. 2014. The dynamic nature of genomes across the tree of life. *Genome Biology and Evolution* 6:482-488.
- Parfrey LW, Katz LA. 2010. Dynamic genomes of eukaryotes and the maintenance of genomic integrity. *Microbe* 5:156-164.
- Parfrey LW, Lahr DJG, Katz LA. 2008. The dynamic nature of eukaryotic genomes. *Molecular Biology and Evolution* 25:787-794.
- Zufall RA, Robinson T, Katz LA. 2005. Evolution of developmentally regulated genome rearrangements in eukaryotes. *Journal of Experimental Zoology Part B-Molecular and Developmental Evolution* 304B:448-455.

Host: George McManus

Time & Date: 11:00 am, Friday, December 3, 2021

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