KANSAS STATE UNIVERSITY

Division of Biology Presents:

A Molecular Timer Couples Organism-Wide Temporal Identity to Developmental Checkpoints

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Coordinated development requires that growth and cell-fate transitions occur in a defined temporal order across tissues, yet how multicellular organisms generate and synchronize developmental timing information remains unclear. In *Caenorhabditis elegans*, stage-specific cell-fate transitions are driven by pulsatile transcription of heterochronic microRNAs, but the mechanism that produces these rhythms has been unknown. Here, we identify a developmental timer composed of the transcription factor MYRF-1 and the PERIOD-like repressor LIN-42 that operates synchronously across all somatic tissues. MYRF-1 binds conserved regulatory elements upstream of heterochronic microRNA genes and drives once-per-stage transcriptional pulses that are phase-locked across tissues, while simultaneously activating *lin-42* expression. Newly synthesized LIN-42 directly associates with MYRF-1, limiting its nuclear residence and transcriptional activity and thereby constraining the amplitude and duration of each pulse. Beyond regulating stage-specific gene expression, we show that MYRF-1 activity is also required to license a developmental checkpoint essential for growth and successful ecdysis. Together, these findings define a reciprocal transcriptional–translational feedback loop that generates organism-wide developmental timing information, coupling tissue-specific differentiation programs to coordinated organismal growth through a shared molecular timer.

If you would like to visit with Dr. Christopher Hammell, please contact Dr. Anna Zinovyeva at zinovyeva@ksu.edu.

Coffee & snacks served preceding the seminar in Ackert Hall, Room 225