

## BIOINFORMATICS SEMINAR

### MATTHEW GOOD

*Assistant Professor, Cell and Developmental Biology*

UNIVERSITY OF PENNSYLVANIA

#### CONTROL OF EMBRYONIC GENOME ACTIVATION AND HIERARCHICAL ONSET OF GERM LAYER PATTERNING

A watershed event in early development is the transition from maternal to zygotic control of embryogenesis. This major transition requires widespread awakening of the embryonic genome and expression of thousands of nascent transcripts in a process termed zygotic genome activation (ZGA). How the embryo determines the timing of genome activation is a topic of active investigation. Recently, we demonstrated that ZGA onset occurs in a spatially graded fashion, contingent on embryonic blastomeres reaching a threshold cell size or DNA:cytoplasm ratio. Using a model vertebrate embryo and by imaging nascent transcripts we showed that the decision to initiate zygotic transcription occurs at a single-cell level and that changes to cell size are sufficient to alter the timing of genome activation. In unpublished work, we have sought to address how cell size controls large-scale transcription initiation, and how gradients of cell size contribute to proper regulation of embryonic development. We discovered that interphase elongation overcomes the repressive effect of rapid cell cycle in cleavage stage embryos, and that alteration of ZGA onset gradients leads to subsequent developmental defects. Additionally, by developing a new methodology to sequence the nascent transcriptome, we identified a temporal hierarchy of germ layer initiation, linked to cell size gradients in the embryo. This work provides new mechanistic insights on embryonic decision-making and paradigms for how loss of cell size control leads to transcriptional dysregulation, including in cancer and senescence.

#### BIOGRAPHY

Dr. Matthew Good received his PhD in Biochemistry from the University of California San Francisco, working in the laboratory of Wendell Lim. As a Miller Fellow at UC Berkeley, Dr. Good worked jointly with Rebecca Heald and Dan Fletcher to understand mechanisms of organelle size regulation in early embryogenesis. In 2015, Dr. Good joined the faculty at University of Pennsylvania with appointments in Cell and Developmental Biology and Bioengineering. His lab is interested in the unique cell biology of early development, including how cell size regulates genome activation and assembly of embryo-specific protein condensates.



CBCB SEMINAR

11/1/2021

3:30-4:30PM

AP BioPharma

Room 140

(590 Avenue 1743)

or via ZOOM:

[https://udel.zoom.us/j/  
93442313974](https://udel.zoom.us/j/93442313974)

(Passcode: BINF865)

[bioinformatics.udel.edu](http://bioinformatics.udel.edu)

