

# BDR SEMINAR via Zoom

## Heath E. Johnson

Department of Molecular Biology, Princeton University

**Wednesday, September 23, 2020**

9:30-10:30

Meeting URL will be announced on the event day by e-mail.

✂This seminar is open only to BDR members.

## Optogenetic dissection Erk-dependent cell fates during embryogenesis

### Summary

Animal embryos are partitioned into spatial domains by successive patterns of intracellular signaling and gene expression. Yet in most cases it is unknown which pattern features are required to support normal development. To address this question, we developed a light-inducible system activate Erk in early *Drosophila* embryo. Here, RTK activity leads to an evolving gradient of Erk activity, patterns of gene expression, and the specification of tissues / morphogenic movements. Using this optogenetic tool, we systematically test the requirements of early embryo Erk signaling for cell fates, gene expression, and the formation of a viable embryo. We discovered that the cumulative load of Erk activity is used to program cell fates at least three different thresholds, including a choice between endoderm and ectoderm which is governed by these dynamics. Surprisingly, we find that the embryo is quite robust to spatial perturbations in the signal, as simple all-or-none light inputs were able to completely rescue normal embryogenesis, generating viable larvae and fertile adults from an otherwise-lethal genetic mutant. These results open the door to the targeted design of complex morphogenetic outcomes or to correcting the patterning errors that underlie developmental defects.



RIKEN Center for Biosystems Dynamics Research (BDR)

**Host: Yasushi Okada**  
Laboratory for Cell Polarity Regulation, BDR  
Contact: BDR Meeting Office  
bdr-mtg@ml.riken.jp