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Synchrony in embryogenesis via an active medium R. SCOTT MCISAAC, Princeton University, ANIRVAN SENGUPTA, Rutgers University, NED WINGREEN, Princeton University — In developing embryos of the frog *Xenopus*, mitotic divisions occur at 8-minute intervals. After the initial rounds of division, nuclei divide in near-perfect synchrony throughout the embryo. Given a typical protein diffusion constant of $10\frac{\mu m^2}{sec}$, and an embryo length of $\approx 1mm$, it would take diffusion many hours to propagate a signal across the embryo. Therefore, synchrony cannot be attained by diffusion alone. We hypothesize that known autocatalytic reactions of cell-cycle components make the embryo an "active medium" in which waves propagate much faster than diffusion, enforcing synchrony. Furthermore, developing embryos are found to be very robust, meaning that their spatial and temporal patterns are highly repeatable over a broad range of environmental conditions and despite biochemical noise. We report on robust synchronization of oscillations for a coupled two-species system consisting of diffusing activator and repressor molecules.

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