Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Physical Mechanisms of Pattern Formation in the Early Chick Embryo[1] ARIEL BALTER, JAMES GLAZIER, BENJI ZAITLEN, Indiana University, MARK CHAPLAIN, CORNELIS WEIJER, University of Dundee, BIOCOMPLEXITY INSITTUTE COLLABORATION, UNIVERSITY OF DUNDEE COLLABORATION, UNIVERSITY OF DUNDEE COLLABORATION — Gastrulation marks a critical step in early embryogenesis when the first recognizable patterns are laid down. Although the genome maintains ultimate responsibility for this pattern formation, it cannot actually control the organization of individual cells. The robustness of embryogenic pattern formation suggests that a few simple, physical mechanisms are unleashed and that self-organization results. We perform numerical simulations of early chick gastrulation using an agent based method in which individual cells interact via a handful of behaviors including adhesivity, secretion and chemotaxis. Through these simulations we have identified certain behaviors as being important for various stages and morphological events. For instance, experimental results on primitive streak formation are best reproduced by a model in which the Kohler's Sickle secretes a chemo repellant for streak tip cells, and cell polarization appears to be important for initiating *polonaise* motion during streak elongation.

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Date submitted: 22 Nov 2006 Electronic form version 1.4