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**Embryo as an active granular fluid: stress-coordinated cellular constriction chains** MICHAEL HOLCOMB, Department of Physics, Texas Tech University , GUO-JIE GAO, Department of Mathematical and Systems Engineering, Shizuoka University, JEFFREY THOMAS, Department of Cell Biology and Biochemistry, Texas Tech University Health Sciences Center, JERZY BLAWZDZIEWICZ, Department of Mechanical Engineering, Texas Tech University — Mechanical stress plays an intricate role in gene expression in individual cells and sculpting of developing tissues. Motivated by our observation of the cellular constriction chains (CCCs) during the initial phase of ventral furrow formation in the *Drosophila melanogaster* embryo, we propose an active granular fluid (AGF) model that provides valuable insights into cellular coordination in the apical constriction process. In our model, cells are treated as circular particles connected by a predefined force network, and they undergo a random constriction process in which the particle constriction probability $P$ is a function of the stress exerted on the particle by its neighbors. We find that when $P$ favors tensile stress, constricted particles tend to form chain-like structures. In contrast, constricted particles tend to form compact clusters when $P$ favors compression. A remarkable similarity of constricted-particle chains and CCCs observed *in vivo* provides indirect evidence that tensile-stress feedback coordinates the apical constriction activity.

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