Research Highlight

A Measure of Morphodynamics

A researcher in the NSF-Simons Center for Mathematical and Statistical Analysis of Biology and colleagues have published a popular account of their recent work in the newsletter of the Society for Industrial & Applied Mathematics (SIAM News).

The work addresses one of the grand challenges of modern biology, understanding the way in which a complex, multicellular organism arises from a single cell via spatiotemporal patterns that are repeatable and reproducible across the tree of life. The SIAM News synopsis, which includes illustrations and videos, explains how four-dimensional microscopy (three spatial dimensions and time) is beginning to illuminate how genetic, chemical, and mechanical cues affect the fate of developing cells and the geometric form of tissues and organs. Even though individual cells might seem to move chaotically, the large-scale, collective cell movements within tissues resemble a choreographed ballet.

The research article on which the synopsis is based identifies model- and parameter-free, frame-invariant features of morphogenetic flows in animal embryos that capture the early footprint of known morphogenetic features, reveal new ones, and quantitatively distinguish between different phenotypes.

Mattia Serra, Sebastian Streichan, Manli Chuai, Cornelis J. Weijer, L. Mahadevan;
Dynamic morphoskeletons in development,
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