Simple Physics in Diseases and Embryonic Development of the Eye\textsuperscript{1}

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While molecular-level regulation within cells during embryonic development is highly complex, the physical mechanisms which translate this intracellular information into multicellular physical structure at the tissue level are often surprisingly simple. I will discuss an example where regulation of cell-cell contact energies is primarily responsible for robust and evolvable regular patterns, the organization of the ommatidia and supporting cells into the regular tiling characteristic of the Drosophila eye and another example where adhesion failures in the human retina result in choroidal neovascularization leading to blindness. In both cases, simulations based on materials-science techniques can help us understand the patterning mechanisms and the reasons for their robustness and failures. Such simulations are easy to extend to other developmental phenomena and to development-related diseases like cancer.

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