

The source of plants' spiral symmetry

The quest to create systems that can be tailored to spontaneously adopt desired shapes and patterns draws inspiration and hints from the biological world—from the subcellular level, where proteins self-assemble into functional folded configurations, to the macroscopic, as limbs and organs emerge from an initially undifferentiated single cell. In plants, the periodic production of organs on a growing shoot apex generates spirals of seeds in a sunflower, spines on a pinecone, and leaves along a stem. The growth of an organ at a particular location is caused by the local accumulation of a plant hormone, auxin, which gets distributed via a cell-to-cell transport system. But how do the cells know where to transport auxin?

Although the details of the mechanism aren't yet fully understood, Marcus Heisler of the European Molecular Biology Laboratory and colleagues have demonstrated that, in a positive feedback loop, cells with high levels of auxin influence neighboring cells to transport more auxin toward them. Simulations show that such a feedback loop, combined with auxin diffusion, generates auxin maxima at regularly spaced intervals. Surprisingly, the researchers also found that if auxin signaling is restricted to just the outermost layer of cells, the auxin maxima shift laterally over time, and the plant forms two continuously spiraling ridges as seen in this photo of a thale cress plant. (N. Bhatia et al., *Curr. Biol.*, in press; H. Jönsson et al., *Proc. Natl. Acad. Sci. USA* **103**, 1633, 2006. Photo by Neha Bhatia/EMBL.)

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