

Mechanisms of Morphogenesis: the creation of biological form

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How is biological form created? How does an embryo use its genetic developmental program to cause its tissues to change shape? How do molecular machines cooperate to make structures that are much larger than themselves? How do embryos cope with random noise and unpredictability when making an accurate body plan? These are amongst the great questions that still lie at the heart of biology. A recent focus of effort in this area, from a loose coalition of advanced cell biologists, theoretical biologists, bioinformaticians and complex-system physicists, is beginning to yield answers.

This book presents an exciting and up to the minute account of the very latest research into the mechanisms that create biological form. Drawing on a combination of theory and experimental results, it illustrates how embryos use a combination of self-assembly, feedback and adaptive self-organization to drive the morphogenesis of structures ranging from the sub-cellular through cells to large tissues. Taking the general genetic programme of the embryo for granted, the book focuses on the ways in which this programme can be translated to generate cell shape, to direct cell migration, and finally to produce the shape and form of solid tissues and dictate their rates of tissue growth. Each topic is illustrated with experimental data from real systems, with particular reference to gaps in current knowledge and pointers to future research.

Suitable for researchers and for advanced students, this clear and well-illustrated book provides a solid foundation in the new science of morphogenesis and self-organization; a science that is emerging, right now, in the opening decade of the twenty-first century.

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