

# Brief Contents

## **I Patterns and Processes of Becoming:** A Framework for Understanding Animal Development

CHAPTER 1 ■ **Making New Bodies:** Mechanisms of Developmental Organization 1

CHAPTER 2 ■ **Specifying Identity:** Mechanisms of Developmental Patterning 29

CHAPTER 3 ■ **Differential Gene Expression:** Mechanisms of Cell Differentiation 45

CHAPTER 4 ■ **Cell-to-Cell Communication:** Mechanisms of Morphogenesis 95

CHAPTER 5 ■ **Stem Cells:** Their Potential and Their Niches 143

## **II Gametogenesis and Fertilization:** The Circle of Sex

CHAPTER 6 ■ **Sex Determination and Gametogenesis** 181

CHAPTER 7 ■ **Fertilization:** Beginning a New Organism 217

## **III Early Development:** Cleavage, Gastrulation, and Axis Formation

CHAPTER 8 ■ **Rapid Specification in Snails and Nematodes** 251

CHAPTER 9 ■ **The Genetics of Axis Specification in *Drosophila*** 277

CHAPTER 10 ■ **Sea Urchins and Tunicates:** Deuterostome Invertebrates 311

CHAPTER 11 ■ **Amphibians and Fish** 333

CHAPTER 12 ■ **Birds and Mammals** 379

## **IV Building with Ectoderm:** The Vertebrate Nervous System and Epidermis

CHAPTER 13 ■ **Neural Tube Formation and Patterning** 413

CHAPTER 14 ■ **Brain Growth** 439

CHAPTER 15 ■ **Neural Crest Cells and Axonal Specificity** 463

CHAPTER 16 ■ **Ectodermal Placodes and the Epidermis** 517

## **V Building with Mesoderm and Endoderm:** Organogenesis

CHAPTER 17 ■ **Paraxial Mesoderm:** The Somites and Their Derivatives 539

CHAPTER 18 ■ **Intermediate and Lateral Plate Mesoderm:** Heart, Blood, and Kidneys 581

CHAPTER 19 ■ **Development of the Tetrapod Limb** 613

CHAPTER 20 ■ **The Endoderm:** Tubes and Organs for Digestion and Respiration 653

## **VI Postembryonic Development**

CHAPTER 21 ■ **Metamorphosis:** The Hormonal Reactivation of Development 671

CHAPTER 22 ■ **Regeneration** 693

CHAPTER 23 ■ **Aging and Senescence** 723

## **VII Development in Wider Contexts**

CHAPTER 24 ■ **Development in Health and Disease:** Birth Defects, Endocrine Disruptors, and Cancer 735

CHAPTER 25 ■ **Development and the Environment:** Biotic, Abiotic, and Symbiotic Regulation of Development 763

CHAPTER 26 ■ **Development and Evolution:** Developmental Mechanisms of Evolutionary Change 785