From cells to whole organisms, there is a time to grow and a time to proliferate; a time to keep silent and a time to express; a time to change and a time to refrain from transformation. But where are the cellular and organismal timepieces and how do they mark off time and keep the myriad physiological events in sync?

Understanding the temporal events that guide development is the focus of this special issue on developmental timing. One area of study that has made great strides recently examines the workings of the circadian clock. As described by Schultz and Kay (p. 326), plants and animals use molecular oscillators to sense changes in the light environment by day and season. They then accordingly adjust their developmental program (such as stem growth in seedlings or melatonin release in fish) and life cycle (such as plant flowering and fly eclosion). Another mechanism that shows temporal oscillations, termed somitogenesis, is found in vertebrates. In this process, blocks of mesoderm cells are laid down in a synchronous fashion on both sides of the body axis. Pourquié (p. 328) describes the various molecules and signaling pathways that run this segmentation clock.

Although the embryonic somites show a repeated pattern, the resultant vertebrae that form from them display distinct morphological identities, depending on their position along the anterior-posterior axis. The variations of this pattern and of other patterned structures such as the limb are in part due to the Hox family of genes. There is an intriguing facet of Hox gene expression: The clustered Hox genes are activated in a temporal and spatial manner that corresponds to their order on the chromosomes. Kmita and Duboule (p. 331) describe what is currently known about this observed colinearity and the Hox, or patterning, clock.

Space and time are also crucial parameters for establishing the great variation of patterns in the plant world. Varied structures such as leaves, internodes, and flowers form at different times and places and at different rates during development. Poethig (p. 334) describes how these developmental transitions are regulated and synchronized by interacting signal transduction pathways. And in the final Review, Carrington and Ambros (p. 336) discuss the role that small RNAs play in development. Since the first report that microRNAs can control the timing of cell fate, many more plant and animal microRNAs have been shown to display temporal- and tissue-specific patterns of gene expression during development.

The topics above represent only a fraction of the internal clocks that are in place to ensure a coordinated developmental program. By better understanding the temporal aspects of development, as well as the underlying genomics (see the Editorial by Duboule, p. 277), we should be in a better position to address events associated with the time to be born, the time to die, the time to plant, and the time to pluck up that which is planted. The time to learn is now.

—BEVERLY PURNELL

To Every Thing There Is a Season

The contents of the special section on developmental timing include:

- Circadian Clocks in Daily and Seasonal Control of Development
  T. F. Schultz and S. A. Kay

- The Segmentation Clock: Converting Embryonic Time into Spatial Pattern
  O. Pourquié

- Organizing Axes in Time and Space; 25 Years of Colinear Tinkering
  M. Kmita and D. Duboule

- Phase Change and the Regulation of Developmental Timing in Plants
  R. S. Poethig

- Role of MicroRNAs in Plant and Animal Development
  J. C. Carrington and V. Ambros

See also Science’s STKE material on p. 271 and the Editorial on p. 277.