Section V.

What is the current status of genetics and molecular genetic analysis in vertebrate cells, including human cells?

In the absence of direct genetic approaches that are available for various microorganisms and for certain higher organisms, such as *Drosophila* and *C. elegans*, studies with vertebrate cells have relied on the use of DNA transfection to reintroduce cloned gene sequences after suitable genetic engineering in vitro. In his review, Cleveland focuses on this approach to examine the tubulin multigene family in cultured vertebrate cells. He discusses the differences between stable and transient DNA transfection, describes the dissection of the tubulin multigene family, and illustrates how DNA transfection and site directed mutagenesis has been used to understand the mechanism of autoregulation of tubulin synthesis in animal cells.

The transgenic mouse system and germ line transformation approaches have been exciting developments for cell and developmental biologists. Shani describes three main routes to transgenesis. He then focuses on the control of expression of muscle-specific genes introduced into multipotent embryonic stem cells and the mouse germ line. His review illustrates some of the manipulations one can use to dissect complex biological systems and to elucidate the structure-function relationship of multiple protein isoforms.

Hoffman completes this compilation with a review on human molecular genetics and the elucidation of the primary biochemical defect in Duchenne muscular dystrophy. The basic biochemical defect responsible for Duchenne muscular dystrophy had eluded muscle biochemists for decades. Hoffman describes the genetic approach used to reveal the gene responsible for the defective protein, named dystrophin. The identification of this protein represents one of the best examples of the power of human molecular genetics.