



Tim Hinterberger, Ph.D.
Vertebrate Development, Gene Regulation

Dr. Hinterberger's research focuses on the genetic mechanisms that control the development of skeletal muscle cells and some of many the physiological changes that affect muscle. Most of this work is being done in the frog *Xenopus laevis*, a widely used model vertebrate organism. Skeletal muscle embryonic development is regulated by many genes, including one called MRF4. In adult human muscles, MRF4 expression levels also respond to exercise. We have used transgenic techniques to identify some of the upstream genomic sequences responsible for activation of MRF4 expression in *Xenopus* embryos and found substantial differences from the activating sequence regions in mammalian MRF4 genes. A number of potential REU student projects are available in Hinterberger's laboratory. (1) Students can use gene cloning and engineering techniques to help construct new *Xenopus* MRF4 test sequences and create transgenic frogs with them. In situ hybridization and tissue sectioning will be used to localize the cells that normally express MRF4 in frog embryos and compare them to those that express the inserted test genes. (2) Students can assist in a new project to determine whether certain amino acids, that are essential for muscle growth in response to exercise, affect MRF4 expression in a mouse cell culture model. (3) Another research interest involves neuroscience as well as muscle biology—determining the *Xenopus* MRF4 gene sequence regions that cause MRF4 expression levels to change when the motor nerves to a muscle are severed. Students can learn to perform surgical denervation of frog muscles and later harvest those muscles for analysis of MRF4 mRNA levels.

Dr. Hinterberger received his BS in Biology from the University of Illinois, Urbana, in 1976, a MS in Biology from the Department of Anatomical Sciences at the University of Illinois, Urbana, in 1981, and a Ph.D. in Biology from the Department of Cell and Structural Biology at the University of Illinois, Urbana, in 1987. He was a postdoctoral fellow in the Department of Anatomy and Cell Biology at the University of Michigan from 1987-89 and in the Department of Biological Sciences at Purdue University from 1989-92. In 1992 he joined the Biomedical Program and the Department of Biological Sciences at the University of Alaska Anchorage where he is currently an Associate Professor. Dr. Hinterberger has taught neuroanatomy to medical students, graduate students, and undergraduate students and he has been the recipient of research awards from the National Institute of Health, the American Heart Association, and Alaska EPSCoR.