

**Division of Integrative Organismal Systems  
Directorate for Biological Sciences  
National Science Foundation**

**Images depict some of IOS' research themes, spanning from  
small to large organisms and hot to cold environments**

**1. Learning & Memory: Neurons**

Studies of different types of brain cells (color-coded images) in the mouse hippocampus reveal mechanisms of learning, memory, and neurodegenerative diseases.

**2. Human Food Crops: Genome Map**

A “synteny” map illustrates how genes in different chromosomes of soybean (outer circle) are related to each other (colored line connects different genome locations).

**3. High-speed Metabolism: Hummingbirds**

Studies of hummingbirds are revealing how animals can rapidly convert food energy into fast motion.

**4. Developmental Biology**

Developing embryos of a frog display extensive external gills oriented to obtain maximum oxygen.

**5. Evolution of Life in Hot Environments: Bacteria**

Scientists study these single-celled microorganisms from deep-sea hydrothermal vents to understand how life may have first evolved on Planet Earth.

**6. Food and Pollination: Bee on Plant**

Research on honey bees provides insight into behavior and pollination, processes that have an essential role in food crop production and maintenance of diversity in native plant communities.

**7. Plant Behavior: Sunflowers**

Sunflowers, shown in this image as all facing the same direction in response to sunlight (phototropism), are valuable study systems for analysis of plant metabolism and genome evolution.

**8. Life in the Cold: Mammals**

Investigations of Antarctic seals yield new insights into the physiological mechanisms of reproductive success in extreme-cold environments.