JoVE Science Education Catalog

JoVE Science Education is a powerful tool and a comprehensive database of science videos designed to teach laboratory fundamentals through simple, easy to understand demonstrations. Each collection includes 15 educational videos demonstrating an overview of a technique or instrument, and up to 75 peer-reviewed journal video articles conveying examples of real world applications.

Available collections include:

- General Laboratory Techniques
- Basic Methods in Cellular and Molecular Biology
- Essentials of Biology I: Yeast, Drosophila, and C. elegans
- Essentials of Biology II: Mouse, Zebrafish, and Chick
- Essentials of Neuroscience
- Essentials of Developmental Biology
- Essentials of Behavioral Science
- Essentials of Genetics
- Essentials of Cell Biology
- Essentials of Experimental Psychology
- Essentials of Cognitive Psychology

SE1: GENERAL LABORATORY TECHNIQUES

This premier collection illustrates how to use standard pieces of laboratory equipment essential to many experiments, as well as how to perform basic laboratory functions. Topics include:

- Introduction to Working in the Hood
- Measuring Mass in the Laboratory
- Making Solutions in the Laboratory
- Understanding Concentration and Measuring Volumes
- Introduction to the Spectrophotometer
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Histological Sample Preparation for Light Microscopy
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Regulating Temperature in the Lab: Applying Heat
- Introduction to the Centrifuge
- Introduction to the Microplate Reader
- Introduction to the Bunsen Burner
- Introduction to the Micropipettor
- Introduction to Serological Pipettes and Pipettors

SE2: BASIC METHODS IN CELLULAR AND MOLECULAR BIOLOGY

Demonstrated here are basic techniques commonly used in cellular and molecular biology. Topics include:

- Using a Hemacytometer to Count Cells
- Passaging Cells
- PCR: The Polymerase Chain Reaction
- DNA Gel Electrophoresis
- Separating Protein with SDS-PAGE
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- The ELISA Method
- Plasmid Purification
- Gel Purification
- The Western Blot
- Introduction to Transfection
- DNA Ligation Reactions
- Restriction Enzyme Digests
- Molecular Cloning

SE3: ESSENTIALS OF BIOLOGY I: YEAST, DROSOPHILA AND C. ELEGANS

Three model organisms commonly used in life sciences research are highlighted: S. cerevisiae (baker's yeast), D. melanogaster (the fruit fly), and C. elegans (nematode roundworm). In addition to discussing the current and historical significance of these organisms, this collection includes concepts and methodology relating to how they are maintained and reproduce in the laboratory. Topics include:

S. cerevisiae (Baker's Yeast)
- Introduction
- Maintenance
- Reproduction
- Isolating Nucleic Acids
- Transformation and Cloning

D. melanogaster (Fruit Fly)
- Introduction
- Maintenance and Care
- Development and Reproduction
- Larval Immunohistochemistry
- Embryo and Larva Harvesting and Preparation

C. elegans (Nematode Roundworm)
- Introduction
- Maintenance
- Development and Reproduction
- RNAi in C. elegans
- Chemotaxis Assay

SE4: ESSENTIALS OF BIOLOGY II: MOUSE, ZEBRAFISH AND CHICK

Three vertebrate species commonly used in life sciences research are featured: M. musculus (laboratory mouse), G. g. domesticus (chick), and D. rerio (zebrafish). In addition to discussing the current and historical significance of these organisms, this collection includes methodology relating to how they are maintained in the laboratory and reviews important concepts relating to their development. Topics include:

M. musculus (Laboratory Mouse)
- Introduction
- Care and Maintenance
- Reproduction and Development
- Mouse Genotyping
- Introducing Experimental Agents Into the Mouse

G. g. domesticus (Chick)
- Introduction
- Care and Maintenance
- Development
- In ovo Elewctroporation
- Ex ovo Culture

D. rerio (Zebrafish)
- Introduction
- Maintenance and Husbandry
- Reproduction and Development
- Breeding and Embryo Handling
- Microinjection Techniques

SE5: ESSENTIALS OF NEUROSCIENCE

An introduction to neuroscience at a professional level, this collection offers an exploration of five major branches of study: neurophysiology, neuroanatomy, cell and molecular neuroscience, behavioral neuroscience, and developmental neuroscience. In addition to presenting the key questions asked by scientists from these subfields, this collection describes prominent methods used today, while describing exciting discoveries regarding nervous system function. Topics include:

Neurophysiology
- Introduction to Neurophysiology
- Patch Clamp Electrophysiology
- Calcium Imaging in Neurons

Neuroanatomy
- Introduction to Neuroanatomy
- Rodent Stereotaxis Surgery
- Histological Staining of Neural Tissue

Developmental Neurobiology
- Introduction to Neurobiology
- Murine In utero Electroporation
- Explant Cultures of Neural Tissue

Behavioral Neuroscience
- Introduction to Behavioral Neuroscience
- Morris Water Maze
- fMRI: Functional Magnetic Resonance Imaging

Cellular and Molecular Neuroscience
- Introduction to Cellular and Molecular Neuroscience
- Primary Neuronal Cultures
- Neural Transfection Methods

SE6: ESSENTIALS OF DEVELOPMENTAL BIOLOGY

Developmental Biology researchers endeavor to understand the developmental processes that occur in organisms at every stage, starting from the single-celled embryo to the aging adult. The following videos provide a brief history of developmental biology research and discuss the common lab techniques used to answer key questions asked by experts in this field. Topics include:

Developmental Genetics
- An Introduction to Developmental Genetics
- Gene Silencing with Morpholinos
- Genetic Engineering of Model Organisms

Molecular Developmental Biology
- An Introduction to Molecular Developmental Biology
- Explant Culture for Developmental Studies
- Whole-mount In situ Hybridization

Stem Cell Biology
- An Introduction to Stem Cell Biology
- Embryonic Stem Cell Culture and Differentiation
- Induced Pluripotency

Organogenesis
- An Introduction to Organogenesis
- Fate Mapping
- Transplantation Studies

Aging and Regeneration
- An Introduction to Aging and Regeneration
- Invertebrate Lifespan Quantification
- Tissue Regeneration with Somatic Stem Cell

SE7: ESSENTIALS OF BEHAVIORAL SCIENCE

Behavior is a complex phenomenon and scientists are trying to decode the neural mechanisms that our systems produce, and that are affected by behavior. An overview of the neurobiology of behavior, concepts behind prominent techniques, important questions being asked by scientists, and protocols to run behavioral experiments are addressed. Topics include:

Learning and Memory
- An Introduction to Learning and Memory
- Fear Conditioning
- Spatial Memory Testing Using Mazes

Cognition
- An Introduction to Cognition
- Electroencephalography (EEG)
- Eye Tracking in Cognitive Experiments

Motor Control
- An Introduction to Motor Control
- Balance and Coordination Testing
- Assessing Dexterity with Reaching Tasks

Reward and Addiction
- An Introduction to Reward and Addiction
- Positive Reinforcement Studies
- Self-administration Studies

Modeling Behavioral Disorders and Stress
- An Introduction to Modeling Behavioral Disorders and Stress
- Modeling Social Stress
- Anxiety Testing

SE8: ESSENTIALS OF GENETICS

The physical and behavioral traits of all living organisms are shaped by the genetic information they inherit from their parents. This collection focuses on how genes build traits and how they are passed down from generation to generation. The videos highlight important discoveries and basic concepts of each field, introduce key questions being asked by geneticists today, and discuss common tools and experimental

Genetic Analysis

- An Overview of Genetic Analysis
- Genetic Crosses
- Genetic Screens

Genetics and Disease

- An Overview of Genetics and Disease
- SNP Genotyping
- Cytogenetics
  Developmental Studies
- Whole-mount In situ Hybridization

Gene Expression

- An Overview of Gene Expression
- Expression Profiling with Microarrays
- RNA-Seq

Epigenetics

- An Overview of Epigenetics
- DNA Methylation Analysis
- Chromatin Immunoprecipitation
- An Introduction to Aging

Genetic Engineering

- An Overview of Genetic Engineering
- Recombineering and Gene Targeting
- Genome Editing

SE9: ESSENTIALS OF CELL BIOLOGY

Despite the first observation of cells in the 1600s, scientists are still trying to decipher the questions related to the structure, growth, division, function, and dysfunction of cells. This collection profiles five important cellular phenomena: cell division, motility, endo- and exocytosis, metabolism, and cell death. The videos review some of the landmark discoveries associated with these phenomena, highlight a few Cell

Division

- An Introduction to Cell Division
- Cell Cycle Analysis
- Live Cell Imaging of Mitosis

Cell Motility and Migration

- An Introduction to Cell Motility and Migration
- The Transwell Migration Assay
- Invasion Assay Using 3D Matrices

Endocytosis and Exocytosis

- An Introduction to Endocytosis and Exocytosis
- Cell-surface Biotinylation Assay

Cell Death

- An Introduction to Cell Death
- Annexin V and Propidium Iodide Labeling
- The TUNEL Assay

Cell Metabolism

- An Introduction to Cell Metabolism
- The ATP Bioluminescence Assay
- Detecting Reactive Oxygen Species

SE10: ESSENTIALS OF EXPERIMENTAL PSYCHOLOGY

Providing an introduction to the application of experimental methods in the study of behavior, this collection presents how psychological experiments are embedded in the actual research process from initial design to formulating conclusions. The videos include independent and dependent variables, experimental designs, observational research, self-reporting measures, behavioral measures, and ethics in psychology research. Topics include:

- Perspectives on Experimental Psychology
- Creativity in Designing Experiments
- Ethics in Psychology Research
- Realism in Research
- Pilot Testing
- Observational Research
- The Two-group Experiment
- The Multi-group Experiment
- Within-subjects Repeated-measures Design
- The Factorial Experiment
- Self-report vs. Behavioral Measures
- Reliability in Psychology Experiments
- Placebos in Research
- Embodiment
- Confederates in Research

SE11: ESSENTIALS OF COGNITIVE PSYCHOLOGY

This collection describes a number of influential paradigms used to study complex mental processes underlying attention, perception, and learning and memory. The videos illustrate the chronology of experiments—how to design stimuli and obtain data for both simple, pen-and-paper approaches to more involved computer-based executions. Topics include:

- Perspectives on Cognitive Psychology
- Dichotic Listening
- Method of Subtraction
- Visual Search
- Binocular Rivalry
- Multiple Object Tracking
- Approximate Number Sense Test
- Mental Rotation
- Prospect Theory
- Verbal Working Memory Span
- Delayed Estimation
- Verbal Priming
- Incidental Encoding
- Visual Statistical Learning
- Mirror Drawing

About JoVE

JoVE is the leading creator and publisher of video solutions that increase productivity in scientific research and education. With over 16,000 authors, JoVE has produced nearly 4,000 videos demonstrating experiments from laboratories at top research institutions delivered online to millions of scientists, educators and students worldwide. JoVE institutional subscribers comprise nearly 850 universities, colleges, biotech and pharmaceutical companies, including such leaders as Harvard, MIT, Yale, Stanford, Princeton and Caltech. Headquartered in Cambridge, Massachusetts, JoVE maintains offices throughout the United States, Europe, Asia and Australia.
Please visit www.jove.com, or call 617.945.9051 to learn more.