Computer software for physiology education

The computer programs listed below are presented to help physiologists locate appropriate software for use in their curricula. These programs have not been reviewed by Advances in Physiology Education, and inclusion in the listing does not constitute endorsement of the software. If you use or are aware of software that may be useful in teaching physiology, please share this information with us, so that it can be included in future listings. Send pertinent information to Harold Modell, Editor, Advances in Physiology Education, National Resource for Computers in Life Science Education, PO Box 51187, Seattle, WA 98115-1187.

AneSoft Corporation
1005 SE 47th Place
Bellevue, WA 98006
(206) 644-7488

Artwave: the Radial Artery Pressure Waveform. Simulation dealing with factors influencing the shape of the radial arterial pressure waveform. Available for IBM-PC-compatible equipment.


Axon Instruments, Inc.
1101 Chess Drive
Foster City, CA 94404
(415) 571-9400

Axovacs. A simulation program that investigates the mechanisms underlying the action potential by graphically fitting the Hodgkin-Huxley equations for single or multiple channels. Available for IBM-PC-compatible equipment.

Barry, Dr. Peter II
School of Physiology and Pharmacology
University of New South Wales
P.O. Box 1, Kensington
NSW 2033
Australia
61-9-6987

Mempot. A graphical interactive program that simulates the measurement of membrane potentials in a number of excitable cells and allows the fitting of permeability parameters to the data. Available for IBM-PC-compatible equipment.

BIOSOFT
22 Hills Road
Cambridge CB2 1JP, UK; or
P.O. Box 10938
Auburn, AL 36849
(205) 844-5414


Ileum. Simulates laboratory experiments investigating effects of drugs on the in vitro guinea pig ileum. Program available for Apple II and IBM-PC-compatible equipment.


BioSource Software
2105 S. Franklin, Suite R
Kirkville, MO 65501
(816) 865-9678

Concepts in Thermography. Tutorial covering basic DC concepts, peripheral vascular physiology, detecting skin temperature, amplifiers, and processing DC signals. Program for Apple II equipment.


Skeletal Muscle Anatomy/Physiology. Tutorial covering three muscle categories, skeletal muscle microstructure, sliding filament theory, motor units, and lever systems. Program for Apple II equipment.

Still in Electromyography. Tutorial covering skin preparation, reducing EMG artifact, testing a myograph's operation, electrode location, and preventing shock hazards. Program for Apple II equipment.

Dietz, Dr. John R.
Department of Physiology and Biophysics
University of South Florida
College of Medicine, Box 8
Tampa, FL 33612
(813) 974-3723

Endolab. An endocrine physiology computer laboratory designed to provide some experience with the effects of a number of hormones as well as practice in problem-solving in endocrinology. Available for IBM-PC-compatible equipment.

Glomerular Filtration, Concentration-Dilution, Tm. A package of three renal physiology teaching programs. Available for IBM-PC-compatible equipment.

Educational Materials and Equipment Co.
P.O. Box 2805
Danbury, CT 06813-2805
(203) 798-2650

Arterial Blood Gas Analysis. A series of exercises designed to sharpen clinical skills in assessing blood gas levels. Available for IBM-PC-compatible and Macintosh equipment.

Interactive Videodisc Basic Science Labortories. Available for MS-DOS computers with either IBM Infowindows, Sony View II, or the Matrox VGO overlay system.

Decker Electronic Publishing, Inc.
P.O. Box 785
Lewiston, NY 14092-0785
(416) 639-6215

Arterial Blood Gas Analysis. A series of exercises designed to sharpen clinical skills in assessing blood gas levels. Available for IBM-PC-compatible and Macintosh equipment.

Educe Education Technologies
P.O. Box 192
Whitewood, SD 57793
(605) 269-2612

From the Heart Software
P.O. Box 2087 C.S.
Pullman, WA 99165

Cardiovascular Function Laboratory/Physiology Laboratory Tutor. Programs developed to provide problem-based learning in cardiovascular physiology. Available for IBM-PC-compatible and Macintosh equipment.

Gaar, Dr. Kermit A.
Department of Physiology and Biophysics
School of Medicine in Shreveport
Louisiana State University Medical Center
Shreveport, LA 71130-3852
(318) 674-6010

O2/CO2 Transport Model. Simulation for studying oxygen transport from the lungs to the tissues. Available for Apple II and IBM-PC-compatible equipment.

Gourke, Dr. Jon
CVRI
University of California, San Francisco
San Francisco, CA 94143-0130

The Cardiac Cycle. HyperCard stack providing students with three animations for viewing the cardiac cycle: a four-chamber echocardiographic sequence, a Wiggers' plot of physiological variables, and a pressure-volume diagram of the left ventricle. Available for Macintosh equipment.

The Cardiac Vector. HyperCard stack examining how myocardial electrical events generate the frontal vectorcardiogram and the standard limb leads of the electrocardiogram. Available for Macintosh equipment.

The Einthoven Triangle. HyperCard stack that allows students to explore how changes in the direction and magnitude of the cardiac dipole vector affect voltages in the standard electrocardiographic leads. Available for Macintosh equipment.

The Einthoven Triangle. HyperCard stack that allows students to explore how changes in the direction and magnitude of the cardiac dipole vector affect voltages in the standard electrocardiographic leads. Available for Macintosh equipment.

Hempling, Dr. Harold G.
Department of Physiology
Medical University of South Carolina
171 Ashley Avenue
Charleston, SC 29425-2238
(803) 792-2005


Self Exam. Questions, answers, and a discussion used for self-study or for student evaluation. Available for Apple II-compatible and Macintosh equipment.


HRM Software
Division of Queue, Inc.

TECHNOLOGY-BASED RESOURCES

338 Commerce Dr.
Fairfield, CT 06430
(800) 232-2224; (203) 335-0906

Biofeedback. Part of 10-program package "Experiments in Human Physiology." Experiments include biofeedback, conditioning, and perception measurements. Program available for Apple II equipment.

Biofeedback Microlab. Package includes a sensor that measures EMG, a galvanic skin response sensor, a thermistor probe to measure skin temperature, and an interface circuit that enables student to connect the sensors to the computer. Program available for Apple II equipment.

Calibration. Part of 10-program package "Experiments in Human Physiology." Temperature and timing functions are calibrated against standards. Program available for Apple II equipment.

Cardiovascular Fitness Lab. Provides students with everything they need to use the microcomputer to monitor cardiovascular activity. Program available for Apple II equipment.

Exercise Experiments. Part of 10-program package "Experiments in Human Physiology." The effect of exercise and physical condition on heart rate, breathing rate, and skin temperature is investigated. Program available for Apple II equipment.

Heart Rate. Part of 10-program package "Experiments in Human Physiology." Light and light sensor for measuring and recording heart rate. Program available for Apple II equipment.

Homeostasis-Thermoregulation. Part of 10-program package "Experiments in Human Physiology." Students investigate the body's ability to maintain a constant internal temperature by subjecting a volunteer to mild temperature excursion while recording and displaying skin and body temperature. Program available for Apple II equipment.

Psychological Stress-Lie Detector. Part of 10-program package "Experiments in Human Physiology." The physiological response to the stress of a frustrating and abusive quiz is measured. Program available for Apple II equipment.

Respiration Rate. Part of 10-program package "Experiments in Human Physiology." A napping subject is monitored for heart and breathing rate. Results are compared with the data acquired when the subject is awake. Program available for Apple II equipment.

Response-Time. Part of 10-program package "Experiments in Human Physiology." Users measure finger reaction times with a bright light stimulus (sensor included). Program available for Apple II equipment.

Response-Time Investigations. Part of 10-program package "Experiments in Human Physiology." The effects on reaction times of stimulus type and response location are studied. Program available for Apple II equipment.

Skin Temperature. Part of 10-program package "Experiments in Human Physiology." Temperature probe (included) senses body and skin temperatures. Program available for Apple II equipment.

Human Kinetics Publishers
1807 North Market Street
P.O. Box 5076
Champaign, IL 61825-5076

Simulated Exercise Physiology Laboratories. Simulations of 90 common equations used in exercise physiology. Available for Apple II and IBM-PC-compatible equipment.

Indiana University School of Medicine
Dept. of Physiology and Biophysics
635 Barnhill Drive
Indianapolis, IN 46223

Acid-Base Physiology Simulation. Simulation of acid-base disturbances based on Davensoort diagram. Program available for IBM-PC-compatible equipment.

Cardiovascular Interactions. Cardiovascular physiology simulation. Program available for IBM-PC-compatible equipment.

Gas Diffusion in the Lung. Simulation of oxygen and CO2 transfer between alveolar air and blood. Program available for IBM-PC-compatible equipment.

Renal Glomerular Dynamics. Simulation of human glomerulus and factors that affect glomerular filtration rate. Program available for IBM-PC-compatible equipment.

Intellimation Library for the Macintosh
P.O. Box 459
Batavia, IL 60510-0459
(708) 406-1041; (800) 227-3805

Cardiocomp. ECG/EMG data acquisition and analysis system. Available for IBM-PC-compatible equipment.

Flexcomp. Data acquisition and analysis system for studying the reflex arc. Available for Apple II and IBM-PC-compatible equipment.

Physiogrip. Data acquisition and analysis system for the muscle physiology lab. Available for Apple II and IBM-PC-compatible equipment.

Spirocomp. Data acquisition and analysis system for measuring lung volumes and capacities. Available for Apple II and IBM-PC-compatible equipment.

Intellimation Library for the Macintosh
P.O. Box 1922
Santa Barbara, CA 93116-1922
(800) 346-8305

Action Potential Tutorial. HyperText-based tutorial dealing with membrane potentials, the voltage clamp, the sodium action potential, refractory periods, and axon conduction. Available for Macintosh equipment.

Cells. Simulates experiments in tracking the movement of cells through the four state
mitotic cell cycle. Available for Macintosh equipment.

Cockroach Nerve Cord. HyperCard lab stack gives an extensive description of the classic cockroach nerve preparation and covers principles of extracellular recording, recording from giant axons in the nerve cord, and stimulation of single cercal hairs. Available for Macintosh equipment (requires HyperCard 1.2.2).

Crab Ion Balance. HyperCard stack describing the effects of blood sodium levels in crabs bathed in water with different salinities. Available for Macintosh equipment.

Crayfish Membrane Potential Lab. HyperCard program designed to guide students through the laboratory exercise of measuring resting membrane potentials in crayfish muscle fibers. Available for Macintosh equipment.

Effect of Size on Mouse Metabolism. HyperCard stack describing the effects of mouse size on the metabolic rate. With the use of simple metabolic chambers, experiments are performed on mice of different sizes. Available for Macintosh equipment (requires HyperCard 1.2.2).

Frog Gastrocnemius Muscle. HyperCard stack describing the classic frog gastrocnemius muscle preparation. Covers the muscle twitch, stimulus-response relationships, work done, summation, and tetanus. Available for Macintosh equipment (requires HyperCard 1.2.2).

Frog Heart. HyperCard stack describing the classic frog heart preparation. Covers heart contraction, temperature effects, adrenaline, and acetylcholine effects, and the refractory period of the ventricle. Available for Macintosh equipment (requires HyperCard 1.2.2).


Human Electrocardiogram. HyperCard stack describes the classic human ECG (response, artifacts, heart sounds, exercise effects) and finger pulse (dichrotic notch, exercise effects, temperature effects). Available for Macintosh equipment (requires HyperCard 1.2.2).

Human Lung. HyperCard stack allowing students to record breathing movements. The experiments include the effect of gravity on lung capacity and of rebreathing on ventilation. Available for Macintosh equipment (requires HyperCard 1.2.2).

Membrane Potential Tutorial. HyperCard stack tutorial that explores membrane structure and permeability, the Donnan equilibrium, the Na\(^+\)-K\(^+\)-ATPase pump, the Nernst equation, and the Goldman equation. Available for Macintosh equipment.

Model Neuron. Simulated experiments demonstrating the dynamic aspects of excitable cell behavior. Available for Macintosh equipment.

Mouse Thyroid Gland. HyperCard stack describes the effects of reversal thyroid destruction on growth rate and cold temperature on the metabolic rate. Available for Macintosh equipment (requires HyperCard 1.2.2).

Postsynaptic Potentials in Crab Stretching Muscle. Tutorial/simulation of neuromuscular preparations in a crab limb to illustrate the properties of chemical synapses. Available for Macintosh equipment.


The Chemical Synapse Tutorial. HyperCard-based tutorial that introduces students to the main concepts of chemical synapse. Available for Macintosh equipment.


The Rat Uterus Smooth Muscle Lab. HyperCard-based laboratory exercise that uses rat uterus smooth muscle to study the effect of muscle length and weight on the amount of contraction. Available for Macintosh equipment.

Think Tank. Allows experimental differentiation between chemical synapses, electrical synapses, and no synapses. Available for Macintosh equipment (requires HyperCard 1.2.2).

Water and Ion Movement Across Frog Skin. HyperCard stack describes the effects of ouabain and antidiuretic hormone on the movement of sodium and water across frog skin. Available for Macintosh equipment (requires HyperCard 1.2.2).

IRL Press
P.O. Box 1
Eynsham
Oxford OX8 1JJ, UK


Irvine Interactive Inc.
4521 Campus Drive, Suite 236
Irvine, CA 92715
(619) 431-8860

Autonomic System. Tutorial on neurophysiology, the parasympathetic system, and the sympathetic system. Available for Macintosh equipment.

The Cardiovascular System. Tutorial on hemodynamics, peripheral circulation, the heart, and integration. Available for Macintosh equipment.

J & S Software
135 Haven Ave.
Port Washington, NY 11050
(516) 767-0393

Digestion. Tutorial covering digestion in simple organisms and humans. Program available for Apple II equipment.

Endocrine System. Tutorial covering hormones, effects, and problems. Program available for Apple II equipment.


Nervous System. Tutorial covering nerves, reflexes, and chemical transfer of impulses. Program available for Apple II equipment.

Life Science Associates
1 Fenimore Road
Bayport, NY 11705
(516) 472-2111


Mad Scientist Software
13422 North Bayberry Circle
Alpine, UT 84004
(801) 756-6027


Mines, Dr. Allan H.
Department of Physiology
University of California, San Francisco
513 Parnassus Avenue
San Francisco, CA 94143
(415) 476-2882

Pimple. Twenty-five problem sets, each containing between 4 and 15 problems. Areas covered include cardiovascular, respiratory, and renal physiology. Available for Macintosh equipment.

NRC/SE
National Resource for Computers in Life Science Education
P.O. Box 51187
Seattle, WA 98115
(206) 522-6045

Common Themes in Physiology—Conservation of Mass. Simulations/problems applying conservation of mass principles to physiological situations. Included are indicator dilution experiments and mass balance experiments. Available for IBM-PC-compatible equipment.

Common Themes in Physiology—Osmotic Pressure Relationships. Tutorial format using simulated experiments covering determinants of osmotic pressure, cell reactions...
to osmotic environments, and fluid movement at the capillary. Available for IBM-PC-compatible equipment.


New Jersey Medical School
Joseph Boyle, MD
100 Bergen Street
Newark, NJ 07103
(201) 456-4464

Abgame. Tutorial and game providing practice in acid-base principles. Program available for IBM-PC-compatible equipment.

Capexch. Simulation dealing with exchange at the capillary level. Available for IBM-PC-compatible equipment.


ECG Tutor. Tutorial presenting basic cardiac electrophysiology. Available for IBM-PC-compatible equipment.


Oakleaf Systems
P.O. Box 47
Decorah, IA 52101
(319) 382-4320

Physiological Data Simulation. Twenty-five simulations covering aspects of physiology. Program available for Apple II and IBM-PC-compatible equipment.

Omega Ware
P.O. Box 8024
Ft. Collins, CO 80526
(303) 491-7858

Basic Biology Series. A series of 52 tutorial programs covering topics typically covered in freshman biology. Physiology topics include blood glucose, cells, countercurrent exchange, digestive enzymes, hormonal regulation, kidney function, neural transmission, and osmoregulation. Available for Macintosh equipment.

P11 Enterprises
P.O. Box 5186
Bridgeport, CT 06610
(203) 366-0258


 TECHNOLOGY-BASED RESOURCES

Queue, Inc.
338 Commerce Dr.
Fairfield, CT 06430
(800) 232-2224; (203) 335-0900

Cardiac Muscle Mechanics. Simulation of heart muscle behavior in response to changes in length, load, and contractility. Available for IBM-PC-compatible equipment.


Randall, Dr. James
609 S. Jordan
Blacksburg, VA 24060
(815) 335-1574


Rush Medical College
Drs. Joel Michael and Allen Rovick
Department of Physiology
1750 West Harrison Street
Chicago, IL 60612
(312) 442-6126; (312) 442-6567

Cardiovascular Physiology Part I: Pressure/Flow Relations. Tutorial dealing with a variety of calculations in the area of hemostasis/hemodynamics. Program available for IBM-PC-compatible equipment.

Cardiovascular Physiology Part II: Reflex. Tutorial dealing with carotid sinus regulation of blood pressure and reflex responses in hemorrhage and exercise. Program available for IBM-PC-compatible equipment.

Circsim: a Teaching Exercise on Blood Pressure Regulation. Simulated experiments based on a model of the baroreceptor reflex loop. Program available for IBM-PC-compatible equipment.

Gasp-PC: a Teaching Exercise on the Chemical Control of Ventilation. This is a simulated experiment based on a model of the chemical control of ventilation (Macpuf). Available for IBM-PC-compatible equipment.

Muscle Mechanics: a Computer-Simulated Experiment. Simulated experiment that permits the user to determine either the length-tension or the force-velocity relationship of a skeletal muscle. Program available for IBM-PC-compatible equipment.

Problems in Fluid Compartment Redistribution. Tutorial covering solution of simple problems of fluid compartment changes in the face of perturbations. Program available for IBM-PC-compatible equipment.

Scott, Foresman and Company
1900 East Lake Ave.
Glencoe, IL 60025
(312) 729-3000

Human Body—Structure and Function. Simulation covering joint movement, movement of food through digestive system, and enzyme activity. Program available for Apple II equipment.

Sheffield BioScience Programs
11 Robinson Dr.
Harrogate
North Yorkshire, HG2 9DJ
United Kingdom

Blood. Simulation to teach the principles of the laboratory determination of red blood cell indexes and blood group. Available for BBC/Master and IBM-PC-compatible equipment.

Colonial Peristalsis. Tutorial/simulation to teach the principles of peristalsis using isolated rat colon. Program describes the nervous control of intestinal longitudinal and circular muscle, the apparatus used to measure longitudinal muscle activity, and propulsion of fluid through the gut. Available for IBM-PC-compatible equipment.

Exercise Physiology. Simulation of some of the important physiological measurements that can be made to assess cardiorespiratory performance or "fitness" in the laboratory. Available for IBM-PC-compatible equipment.

Frog Heart. Simulation of experiments that can be performed on the in situ frog heart. Available for IBM-PC-compatible and Acorn (BBC) equipment.

Frog Skin—Membrane Transport. Simulation of experiments that can be performed on the frog skin preparation to teach the principles of the epithelial transport of ions. Available for IBM-PC-compatible equipment.

Guinea Pig Ileum. Simulation of the isolated, transmurally stimulated guinea pig ileum preparation to investigate the effects of drugs on neurotransmitter release in the enteric nervous system. Available for IBM-PC-compatible equipment.

Intestinal Absorption. Simulation experiments designed to demonstrate the important characteristics of the transport of hexoses and amino acids in the small intestine. Available for IBM-PC/PS2-compatible equipment.

The Langendorff Heart. Simulates experiments that can be performed on the isolated perfused mammalian heart (Langendorff preparation). Available for IBM PC-compatible equipment.

Muscle Physiology. Simulation of experiments that can be performed on the isolated frog sciatic nerve-gastrocnemius muscle to illustrate some of the physiological properties of skeletal muscle. Available for IBM-PC-compatible and Acorn (BBC) equipment.

Nerve Physiology. Simulation of experiments that can be performed on the isolated frog sciatic nerve to illustrate some of the physiological properties of mixed nerves. Available for IBM-PC-compatible, Macintosh, and Acorn (BBC) equipment.

The Electrocardiogram. Interactive, menu-driven program to teach the funda-
mentals of the electrocardiogram. Available for IBM-PC-compatible and BBC B/Master equipment.

Siegman, Dr. Marion J.
Department of Physiology
Jefferson Medical College
1020 Locust Street
Philadelphia, PA 19107


Trinity Software
P.O. Box 960
Campton, NH 03223
(603) 726-4641


Membrane Potential Problem Solver. Simulation to help students grasp the complexities of cell membrane potentials. Available for IBM-PC-compatible equipment.

Walker, Dr. J. R.
University of Texas Medical Branch
Galveston, TX 77550
(409) 761-2966