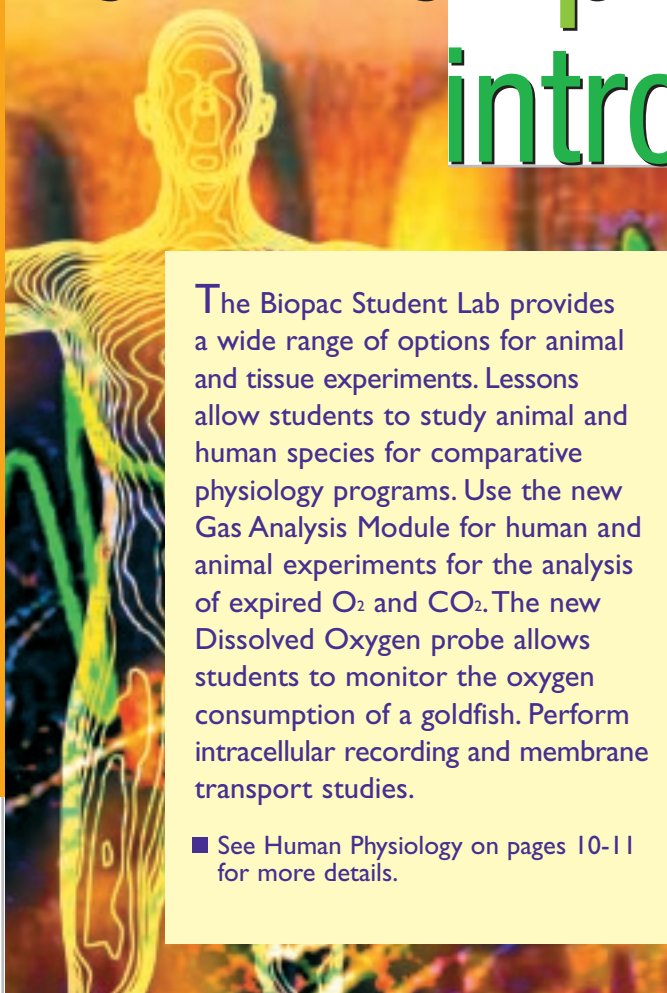


animal physiology & intro human phys

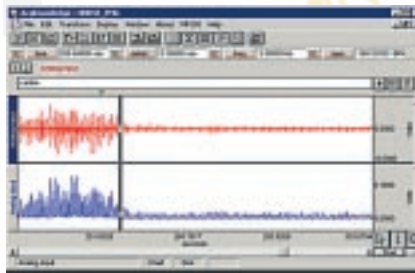


The Biopac Student Lab provides a wide range of options for animal and tissue experiments. Lessons allow students to study animal and human species for comparative physiology programs. Use the new Gas Analysis Module for human and animal experiments for the analysis of expired O_2 and CO_2 . The new Dissolved Oxygen probe allows students to monitor the oxygen consumption of a goldfish. Perform intracellular recording and membrane transport studies.

■ See Human Physiology on pages 10-11 for more details.

Cardiovascular Hemodynamics

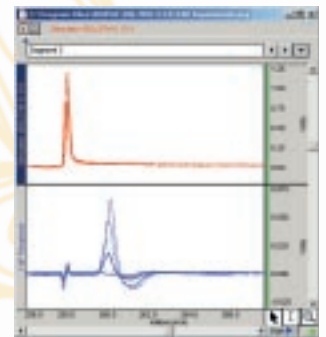
Lessons cover ECG (1-12 lead) and allow students to isolate components of the ECG complex and use the averaging features in the software for further ECG analysis. Use the electronic stethoscope to examine heart sounds and then overlap the data to correlate the sounds with the mechanical and electrical events of the cardiac cycle. Record arterial blood pressure and record systolic, diastolic, mean, dp/dt max and min, and use the noninvasive Cardiac Output Sensor to record stroke volume and cardiac output. If flow signals are available, record them simultaneously with pressure to examine vascular resistance and compliance. Plot pressure versus flow to obtain P/V Loops. See the Frog Heart and Turtle Heart lessons on page 45 for refractory heartblock and vagal escape.



EMG from a horse

Muscular

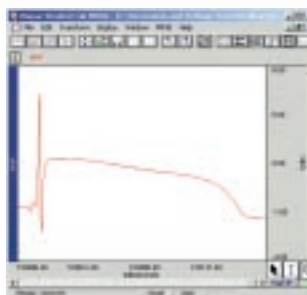
Record EMG to investigate the properties of skeletal muscle. Record and display raw and integrated EMG signals; overlap the signals for better correlation of the data. Measure strength and repeat trials for motor unit recruitment/summation and fatigue. Demonstrate the treppe (staircase) phenomenon. Study the contractility of skeletal muscle with the force transducer and stimulator. The Frog Gastrocnemius lesson records threshold, maximal response, summation, tetanus, and fatigue.



CAP in Overlap Mode

Compound Action Potential

Use the new Nerve Chamber (or an existing chamber) with the Low Voltage Stimulator (SS58L, page 25) to record the compound action potential and nerve conduction from the frog sciatic nerve. Record action potentials from



MAP—Guinea Pig

cockroaches, crawfish and earthworms. Add a range of drugs and determine the effect they have on the nerve. The new Nerve Chamber includes a drug delivery chamber (agent well) with lid to maximize the quality of the results and improve experimental repeatability.

features

- 32 lessons targeted for Animal & Intro. Human Phys.
- ECG, EEG, EMG, EOG & EGG
- Temperature
- Gas Analysis CO_2 & O_2
- pO_2
- pH
- Bioimpedance & Cardiac Output
- Force
- Neurophysiology
- Hemodynamics
- Respiratory & Pulmonary Function
- Reaction Time
- Nerve Recordings & Compound Action Potentials
- Membrane Transport (drug delivery)
- Tissue Baths
- Stimulation & Response
- Isolated Heart, Lung, Muscle
- Auditory, Somatosensory & Visual Evoked Response
- Compatible with Crawdad Lab Manual

Suitable for inquiry-based, active learning in 2-yr. & 4-yr. programs, medical schools, and nursing programs

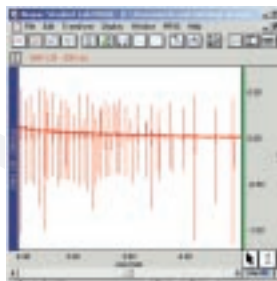
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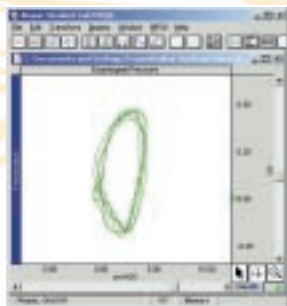
www.biopac.com

Neurophysiology

Study EEG under a variety of conditions to explore relaxation and brain rhythms—the software can filter and display each rhythm separately: Alpha, Beta, Delta and Theta. Select from a variety of *PRO* Lessons to study Alpha rhythms in the occipital lobe, reaction times, and hemispheric asymmetry. Add the EOG (ocular signal) to study eye movement, saccades, tracking, angular displacement, or ocular fixations. Use the stimulator to study evoked response — auditory, visual, or somatosensory. The new high-speed MP35 hardware allows the recording of spontaneous nerve activity, continuously, at speeds of 100,000 samples a second. Add the SuperLab stimulus presentation package to perform stimulus response studies investigating higher order neuronal function in humans. Conduct intracellular and extracellular recordings with glass microelectrodes and Ag-AgCl wire electrodes to study action potentials from a variety of subjects.



Cockroach nerve



Flow vs. pressure in X/Y mode

Respiratory & Pulmonary Function

The BSL System provides an excellent introduction to respiratory system and pulmonary function volumes and capacities, respiratory rates, breathing, and ventilation. Display and/or print a clinical grid on the data for effective interpretation and training. A complete range of airflow and pressure transducers is suitable for small, medium and large animals as well as humans.

Gas Analysis

Use the new gas analysis system for detailed metabolic studies in small and medium sized animals. Chambers, couplers, facemasks, and tubing options provide setup options for any protocol. The system can provide online measures of O₂ and CO₂ for RER, VO₂ and BMR/RMR. Use the Dissolved O₂ probe and lesson to measure the oxygen consumption of a goldfish.

Intracellular & Membrane Transport

Use the Voltage Drive & Current Monitor Cable (BSLCBL10, page 38) to perform ion transport studies. The cable uses the output from the BSL hardware to drive a set of stimulation electrodes and also monitors stimulation current. Use the new High-Impedance Cable (BSLCBL8/9, page 36) to record from the cockroach ventral nerve and for a variety of intracellular and extracellular recordings.

In vitro Applications

The new Tissue Bath Stations provide students with research-quality equipment in a modular, flexible configuration. The Visceral Smooth Muscle lesson guides students through the entire recording and analysis process. Students can also electrically stimulate tissue preparations, including field stimulation, with the BSL Stimulator. Interface with Ussing chambers for ion transport studies. Record and analyze data from isolated heart and lung experiments.

The following hardware suggestions will enable you to perform a wide variety of applications targeted for **animal physiology**. Use *BIOPAC* lessons or easily create your own experiments with the BSL *PRO* software included with each system. Order the core package or select items à la carte.

See **BSL Hardware** (page 23) for all available transducers, electrodes and accessories.

Animal Physiology Core

BSLAPH-W (Win) or BSLAPH-M (Mac)

Basic BSL System (with BSLCBL8 substituted for SS2L)	BSLBSC, p. 8
Dissolved O ₂ Probe Interface	BSL-TCI16, p. 39
Force Transducer (200 g)	SS65L, p. 31
Lead (unshielded) x 2	LEAD110, p. 36
Leads (shielded) x 2	LEAD110S-W/R, p. 36
Low Voltage Stimulator	SS58L, p. 25
Needle Electrodes x 3	EL452, p. 38
Nerve Chamber	NERVE2, p. 38
Recording Nerve Cable	BSLCBL4B, p. 39
Stim. Electrodes for animals	ELSTM2, p. 38
Stimulator Nerve Cable	BSLCBL2A, p. 39

Perform 32 or more lessons with this core package:

Muscular

A02	Frog Gastrocnemius
A05	Visceral Smooth Muscle
A11	Resting Potential from Crawdad Manual
A12	Membrane Potential (muscle)
A15	Earthworm Smooth Muscle
BSL1	Standard & Integrated EMG
H07	EMG Contractions - Active Learning
H27	Facial EMG
H34	EKG Electrogastrogram

Cardiovascular

A04	Frog Heart
A09	Turtle Heart
BSL5	Components of the ECG (Lead II)
BSL6	Leads I, II, III & Einthoven's Law
H08	Dive Reflex - Active Learning
H23	Signal Averaged ECG
H32	Heart Rate Variability

Pulmonary Function

A07	Dissolved O ₂ (goldfish)—with your probe
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Neurophysiology

A01	Frog Pith & Prep
A03	Frog Nerve
A06	Cockroach Nerve
A08	Action Potential
A14	CPG Hornworm
BSL3	EEG Relaxation & Brain Rhythms
BSL4	Alpha Rhythms in the Occipital Lobe
BSL10	Eye Movement, Saccades & Fixation
H10	EEG & Hemispheric Asymmetry
H12	EOG Saccades & Displacement
H13	EOG Visual Tracking vs. Imagination
H14	Ocular Fixation while reading
H15	Ocular Fixation while viewing an image

Biomedical Engineering

H20	BME Filtering
H33	FFT Fast Fourier Transform

See page 43-45 for a description of all available lessons.

Increase your lab options with...

Cardiac Output Sensor	SS31L, p. 29
Dissolved O ₂ Probe	RXPROBE02, p. 31
pH Probe	RXPROBE01, p. 31
O ₂ & CO ₂ Analysis Module	GASSYS2-EA, p. 34
Tissue Bath Station	ITBS100, p. 33
Temperature Transducer	SS6L, p. 26
Transducer Accessory Pack	BSLAPH-TA, p. 42