LASER DOPPLER FLOW SYSTEM IN MICROVASCULAR RESEARCH

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Laser doppler anemometry can be employed to monitor particle velocity and concentration and the technique has been used for a wide spectrum of applications from the measurement of particle velocities in gas solid suspension flow to the measurement of blood flow in arteries. In particular laser light scattering from blood flow in tissue and the resulting Doppler broadening of the optical spectrum has been used as the basis of the development of blood flowmeters (1,2). These flowmeters use low power helium–neon red lasers and optical fibres to transmit light to the skin and to collect some of the scattered light. Work at Oxford Polytechnic over a four year period has concentrated on improving Laser doppler systems (4,5,6) so that they could offer advantages to vascular researchers.

Traditionally, microsphere distribution and hydrogen or xenon clearance have been the commonest techniques used for measuring microvascular flow, but they have limitations which restrict their use as research tools. Major amongst these is that they only allow flow measurements at selected time points during the course of the experiment. In contrast, the laser doppler system permits continuous measurement of microvascular blood flow and is easy to use.

Collaborative work between Oxford Polytechnic and ICI Pharmaceuticals Division has led to the development and testing, in–vitro and in–vivo, of a traditional helium–neon red Laser. In addition work is being carried out on alternative laser systems namely: infra–red lasers, helium–neon green lasers and argon–ion lasers. It is predicted that work on these systems will lead to the development of laser systems capable looking at tissue blood flow at differing depths from the face of the probe. Infra–red lasers may be able to measure flow deeper into the tissue than helium–neon red whilst helium–neon green and argon–ion will measure more superficial flows.

Demonstrations of these differing laser systems will be given along with data from in vitro and in vivo validation experiments in anaesthetised rats.

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INTERACTIVE TEACHING PROGRAMS IN PHYSIOLOGY AND PHARMACOLOGY FOR THE BBC MICROCOMPUTER

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Recently a number of interactive, computer-simulation programs have been reported as possible alternatives to using animals in the teaching of neurophysiology (eg Clarke, 1986; Clarke et al,1986; Dewhurst & Meehan,1986). These programs make use of the ability of the BBC microcomputer to function as a storage oscilloscope, using stored physiological data to generate simulated compound nerve action potentials and display these on a monitor. Here we present details of two further programs which simulate simple class experments normally performed on frog gastrocnemius muscle and frog heart.

Both programs are written in a combination of BASIC and assembly language and assume the availability of only the minimum hardware: BBC B or Master microcomputer, single 40-track disk drive and monitor.

The muscle program uses experimental data to generate high-resolution graphic simulations of isometric contractions, and displays them on a graticuled screen. Students then work through a series of experiments, selected from a menu, at their own pace taking measurements directly from the monitor screen. Experiments include the demonstration of summation, tetanus, length-tension relationship and the action of curare. Hard-copy printouts of screen displays can easily be obtained, providing a suitable printer is connected.

The frog heart program differs from the muscle program in that simulated heart contractions are presented on a continuously scrolling screen display to simulate a chart recorder. The moving screen can be "frozen" allowing measurements of heart rate and force of contraction to be made, and hard copies are available. Experiments include the effect of temperature, the action of certain drugs, investigation of refractory period and spread of conduction through the heart (Stannius ligatures).

Both programs contain concise textual information about the preparation, experimental set-up and each experiment, and include student assignments.

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MOLECULAR GRAPHICS WITH A MICROCOMPUTER AND A MOUSE

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This demonstration is a sequel to "A Poor Man's Molecular Graphics" shown at the Society's Edinburgh meeting two years ago (Barlow, 1985). Subsequent improvements in microcomputers have speeded up the calculations and reduced the stress to the impatient. More importantly, the introduction of the mouse has greatly simplified running the programs. Once new data has been added to the collection you can obtain rapid and easy access to the structures of hundreds of compounds.

The demonstration offers "hands-on" experience using a Commodore Amiga.

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