

Machinist Laboratory

Eric Worthington, Machinist

VSRC-Machinist Lab Services

- 1) Design and fabrication of new research instruments, in collaboration with the Electronics and the Computer Modules;
- 2) Repair, modification, retooling, and replacement of parts of existing equipment;
- 3) Technical assistance for any kind of machine shop and mechanical needs;
- 4) Assistance in the selection and purchasing of tools, parts, and other mechanical equipment.

Machinist Lab Equipment and tools

The VSRC Machinist Laboratory is a fully-equipped shop which includes:

- A milling machine,
- A lathe,
- Horizontal and vertical band saws,
- A drill press, a planer,
- A belt sander,
- and a variety of hand tools.

Machinist Lab Example projects

Fig. A shows a detail of a custom designed and machined assembly for a head-coil that used for eye movements study in MRI/fMRI system. All mechanical parts are fabricated in VSRC-Machinist Lab according to client's CAD-drawing.

Next figure shows (Fig. B) the complete head coil which is fabricated in Machinist Laboratory of VSRC as well.

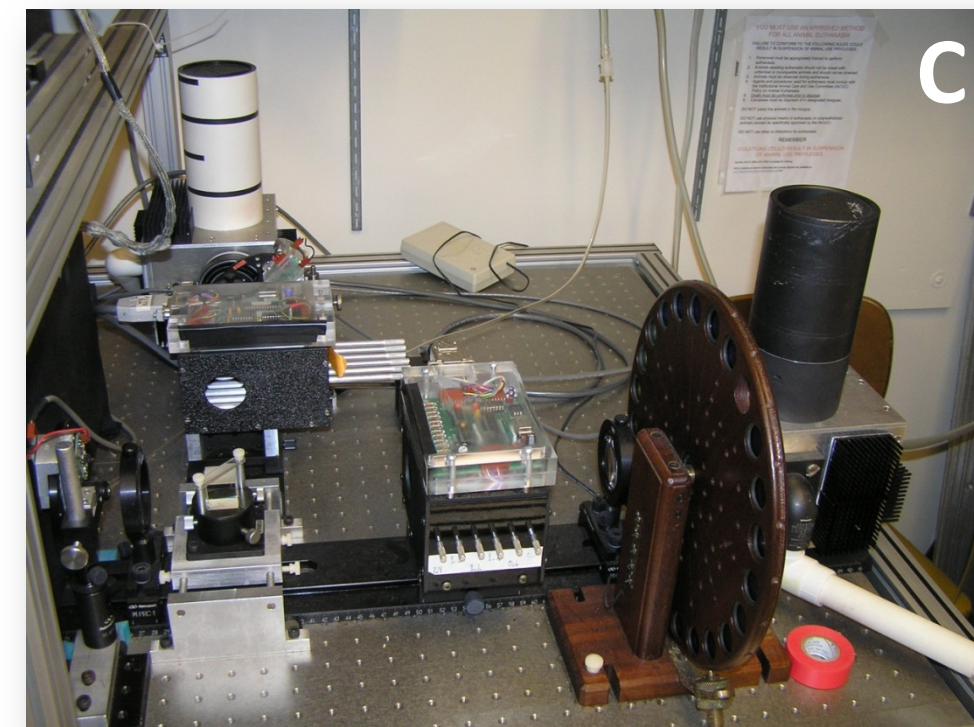
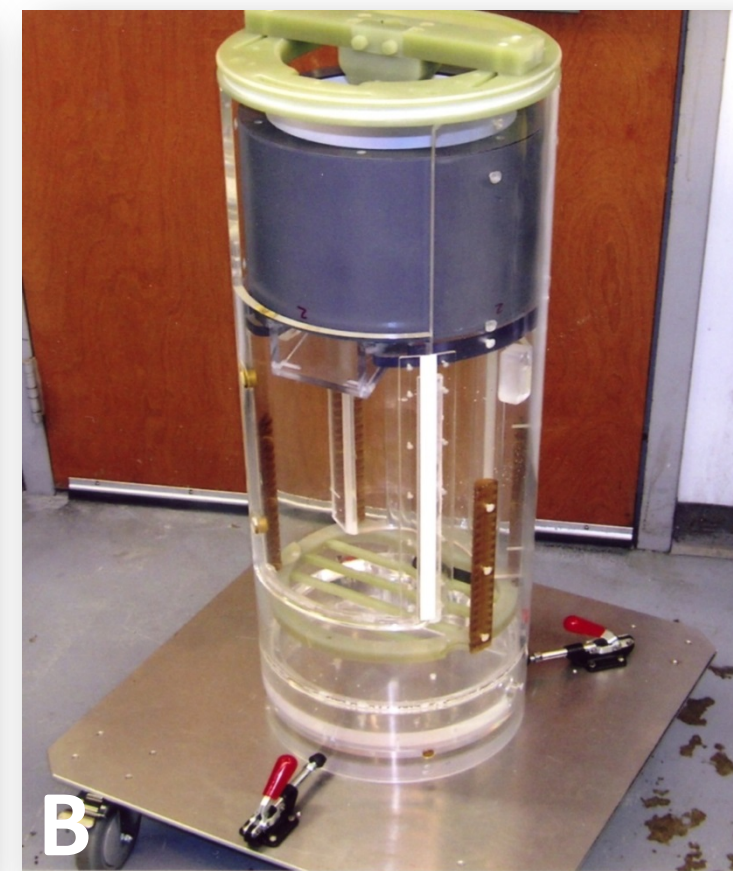


Fig C. Instrumentation developed for a computer-controlled ultra-rapid change of the spectrum characteristics of a beam of light delivered to in-vitro rabbit retinas during patch-clamp recordings. This is achieved by a fast, servo-controlled filter wheel. A LED-based coding of the wheel position – observe the LED array on the wheel support and the small holes on the wheel – provides a feedback to the computer of the filter presented at that moment.

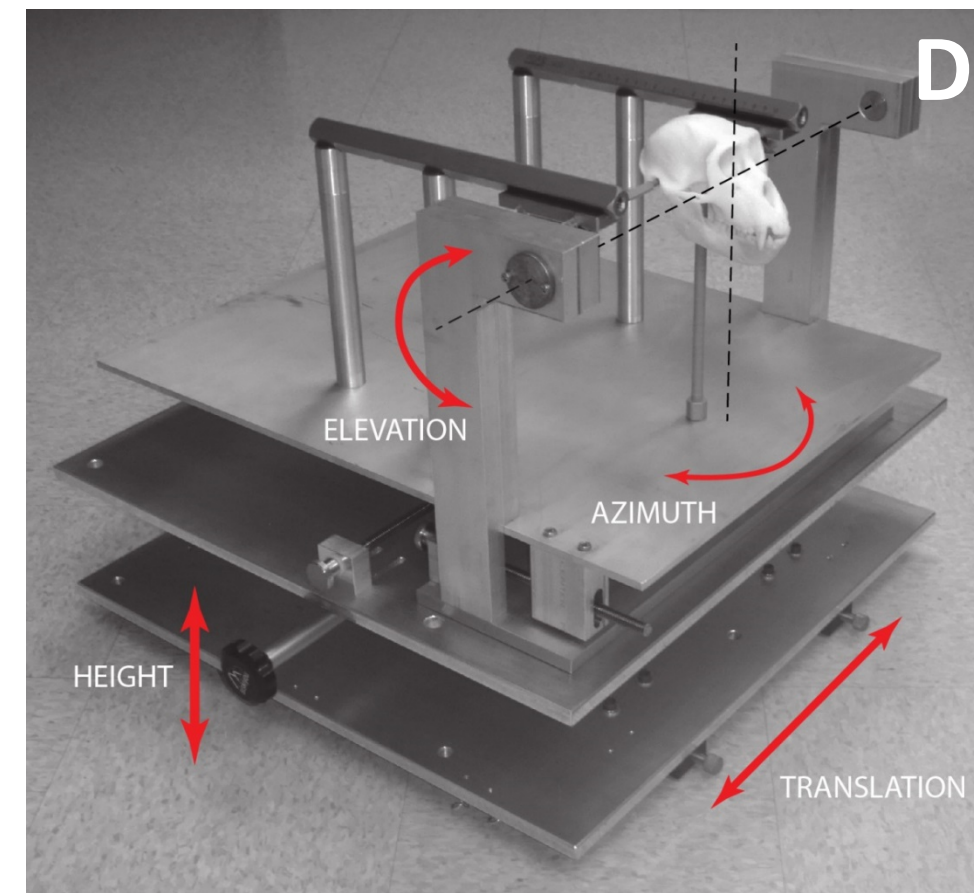


Fig D. A gimbaled stereotaxic frame with four degrees of translational and rotational freedom built for primate use. This frame positions the animal's pupil at the central axes of rotation to allow a fixed imaging beam to scan any region of the retina within ± 20 degrees of the fovea, while also allowing head-mounted electrodes to move with the animal.

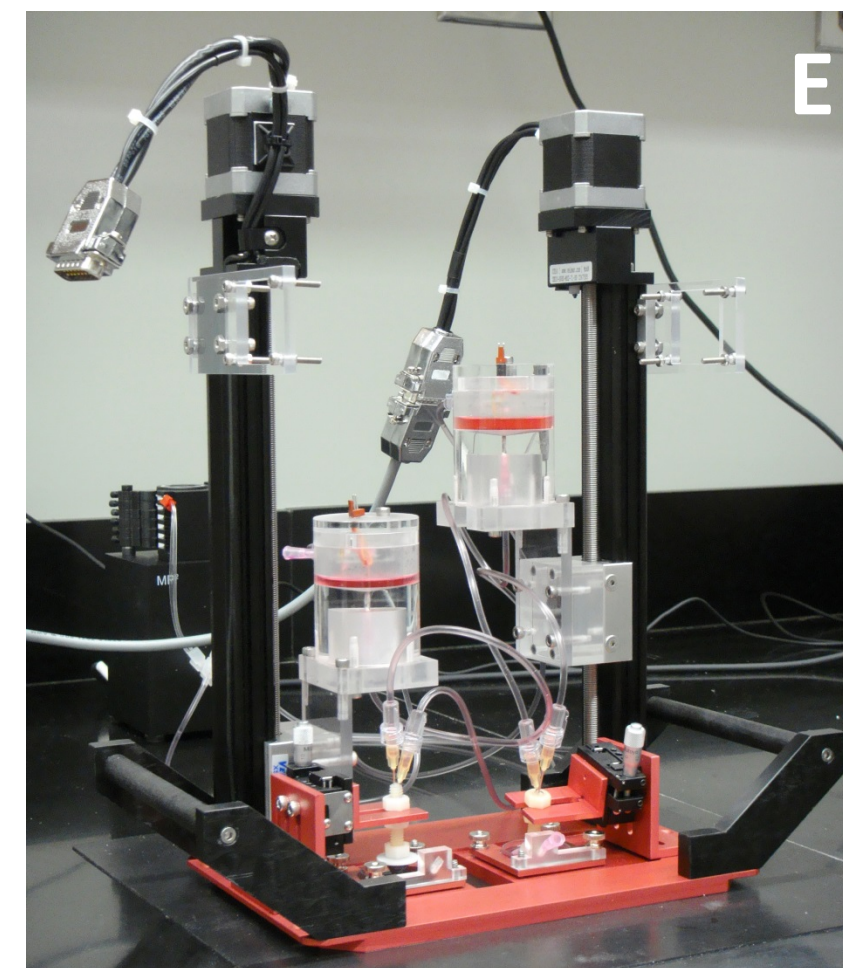


Fig E. A dual biomechanical chamber system built to deliver controlled fluid streams and pressures onto whole tree shrew eye explants. It will be used to study how ocular pressure reforms the organization of the sclera in a culture system that can be positioned in a confocal microscope for imaging of fibril organization.

Electronics Laboratory

Wes Moore, Electrical Engineer

VSRC-Electronics Lab Services

VSRC **Electronics Laboratory** support services are generally available for grant holders; however, services for collaborative projects with VSRC members are also available. Many materials required for fabrication and repair are stocked by the module. If it is necessary to order special materials and parts, as well as manufacturing bare electronics PCB's are covered by investigators grant budget. Overall, VSRC-Electronics Laboratory is one of the best-equipped and staffed electronics shops at UAB. As a result of the equipment, staffing and supplies available, the Electronics Module significantly enhances the research productivity of Core Grant participants through the following activities:

- 1) Designing and fabricating electronic instruments and devices that are not commercially available;
- 2) Repairing, with minimal delay, electronic or electromechanical equipment that is essential to the research of the participant, thus significantly minimizing experimental "down-time". If necessary, such as during a critical experiment or if the equipment is too large to move easily, the electronics specialist will make a "house-call" to troubleshoot the equipment and, if at all possible, make the repair on the spot;
- 3) Maintaining a stock of standard electronic components (e.g. fuses, resistors, capacitors, potentiometers, etc.) which are available for self-repair or modification of equipment outside of normal working hours;
- 4) Providing basic classes for staff, graduate students, and fellows on how to troubleshoot and do simple repairs on electronic devices (e.g. checking fuses, power supplies, LEDs, soldering, etc.);
- 5) Providing a knowledgeable electronics specialist for consultation about equipment purchase or modification, circuit design, and new types of electronics equipment.

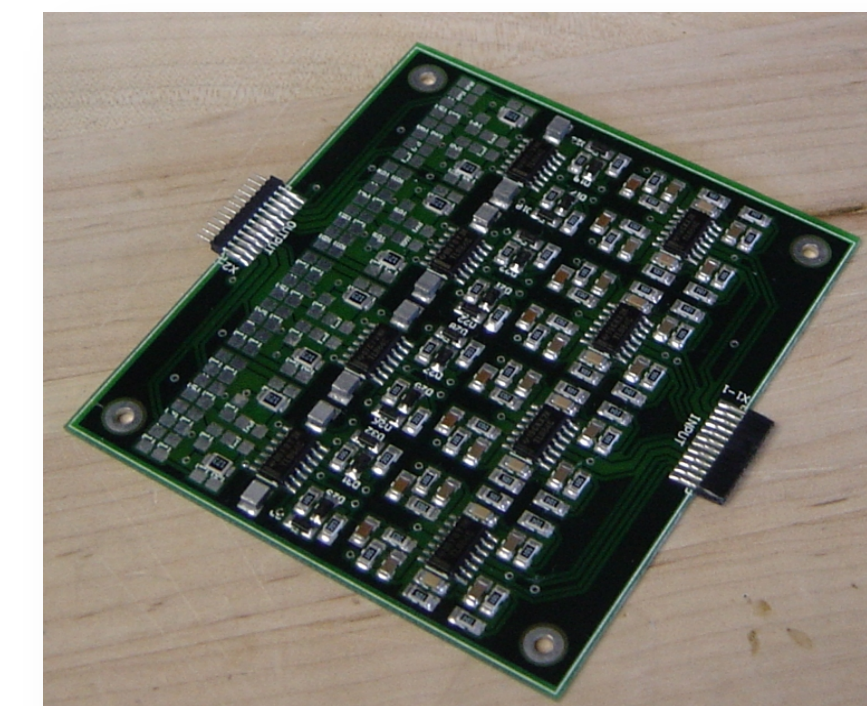
The **VSRC-Electronics Laboratory** is housed in the Worrell Building and consists of 453 ft² an electronics shop and an office area. The electronics shop is designed expressly for this use and is fully equipped for in-house electronics circuit design, fabricating, testing and repair. All core participants have keys to the shop for their convenience.

VSRC's Instrumentation module's Electronics shop is staffed by a full time electrical/electronics engineer who is available to VSRC members for system consultation, circuit design and equipment manufacturing, and computer interfacing tasks. From original idea to completion of each project, the shop engineer designs and fabricates various types of research equipment that are used in our vision research labs as well as in the classrooms. Additionally, shop engineer can modify and customize commercially obtained research equipment according to the research requirements. One other major benefit of the electronics lab is convenient on-site repair services for lab equipment and tools to save researchers time and money. In addition, consultation services for our core members are free.

Electronics Lab Equipment and tools

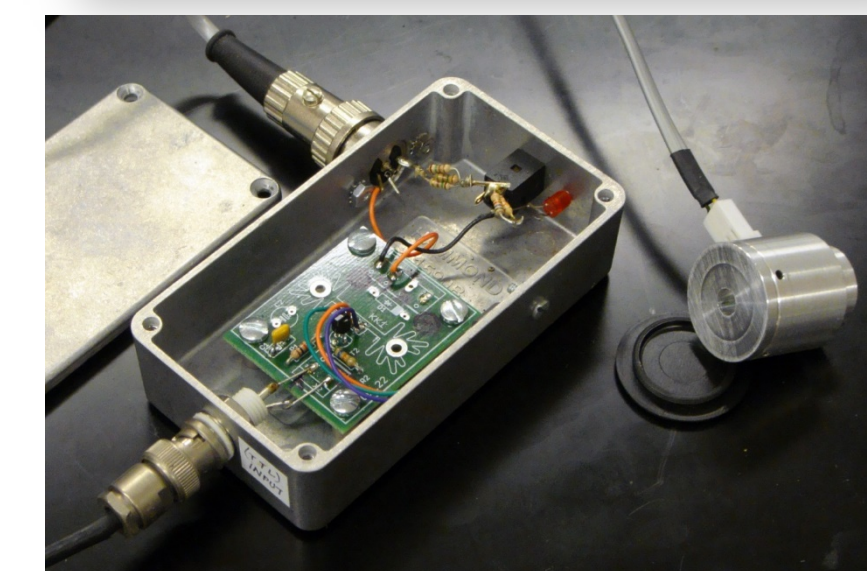
The VSRC Electronics lab is a fully-equipped shop which includes various Oscilloscopes, function generators AC/DC regulated power supplies, and a variety of electronics measurement tools and components assembly tools.

- 4-Ch. Oscilloscopes (LeCroy and YOKOGAWA)
- General purpose pulse/ function generator (YOKOGAWA)
- Electronics Circuit Design and Layout software
- Various Multimeters
- HP-Spectrum analyzers
- Variety of power supplies



8-Channel Head stage and Amplifier

This 8-Channel amplifier system is designed to record from retinal ganglion cells with a custom "Carbon Fiber Micro-electrode array". To the left is an 8-Channel sub-unit circuitry PCB with SMT (Surface mount Technology) assembly. Each electrode channel has a pre-amplifier (Gain 20) and end-amplifier (total gain of 5000x) a LPF with 60 Hz notch filter.



8-Channel SMD- Head stage

A microcontroller-based instrument to enable precise control of light levels for *in vitro* rod photoreceptor physiology. This was retrofitted into an existing microscope.