

Vision Science Research Center Core Modules

Dr. Kent Keyser - VSRC Director

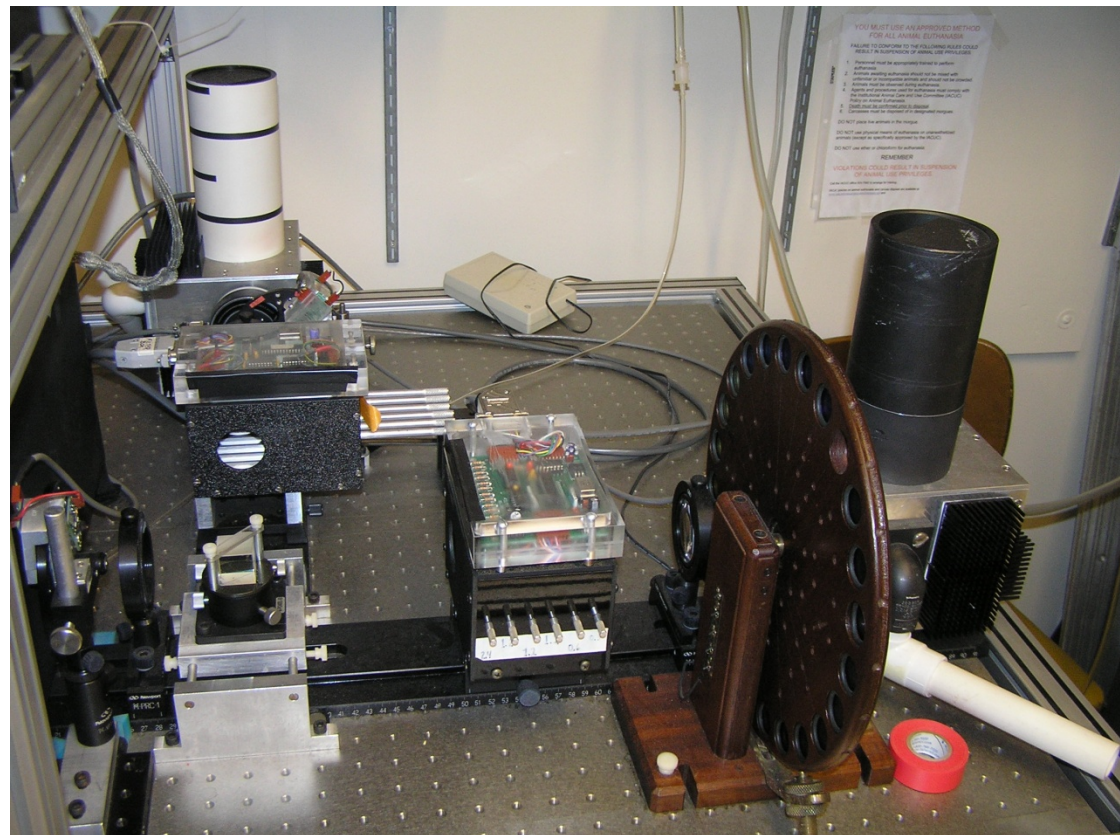
Dr. Steven Pittler - VSRC Core Grant PI

Dr. Christine Curcio - VSRC Core Grant co-PI

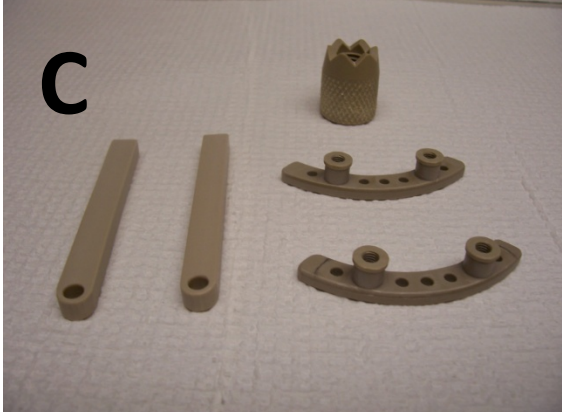
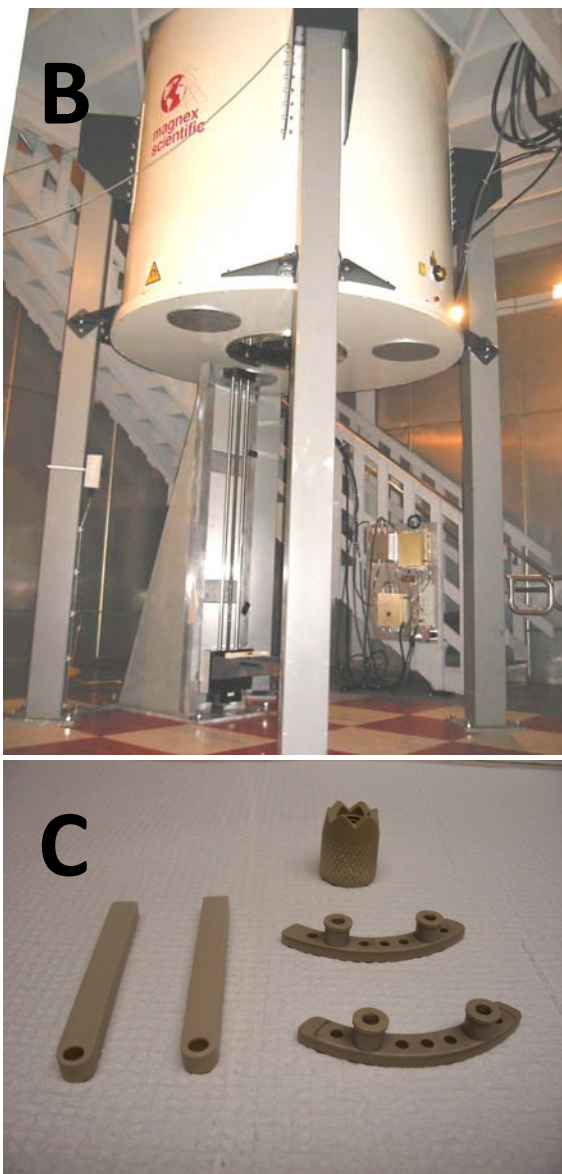
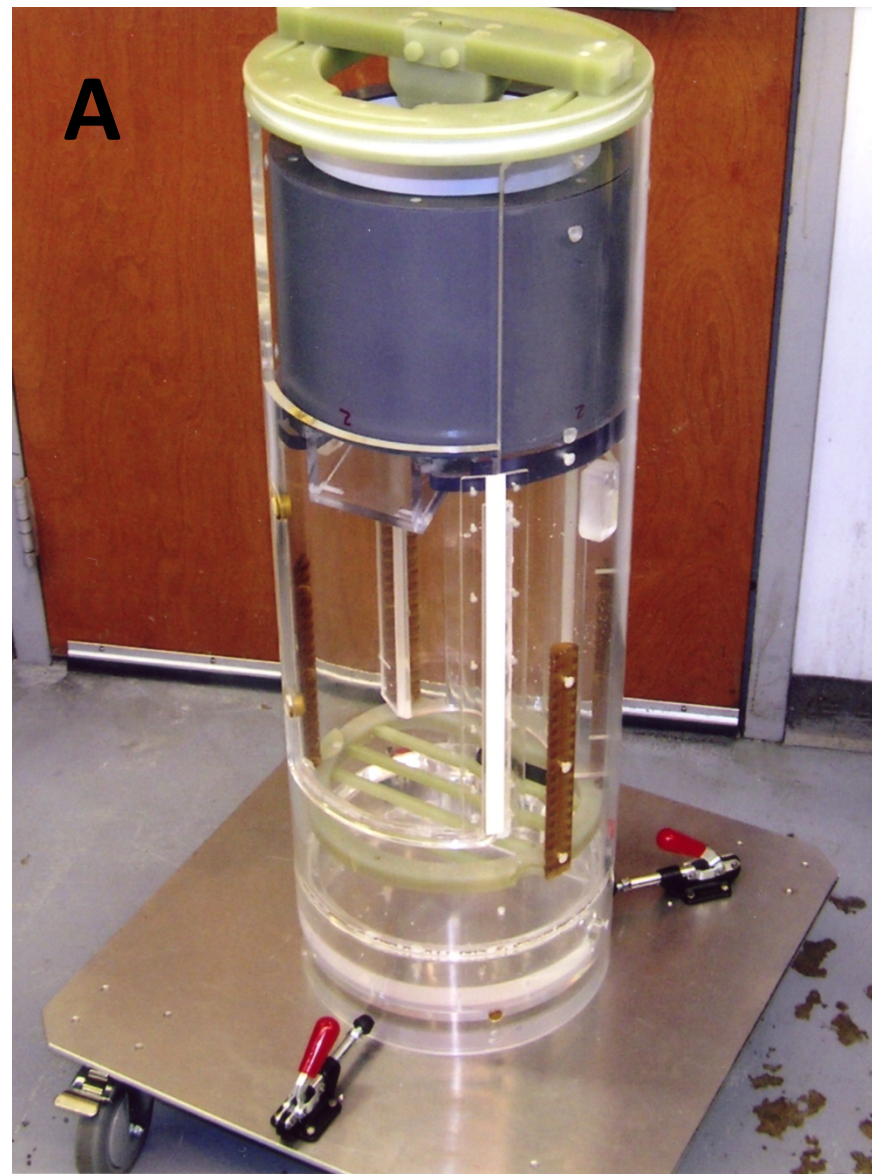
VSRC Machine Shop Module

Dr. Paul Gamlin– Director

Jerry Millican– Module Manager (jmillican@uab.edu)



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.



The VSRC machine shop plays a critical role in the development and fabrication of equipment and parts for vision and oculomotor research on trained behaving non-human primates (NHP). Panel A shows a NHP chair, including the head holder and the RF head coil, used in the 4.7 Tesla NHP MRI/fMRI system of the Center for the Development of Functional Imaging (panel B). The shop can also fabricate high-precision small parts, like the NHP head holder parts shown in panel C, recording chambers, chamber caps, etc. Many of these parts are made from blocks of extra-hard thermoplastic PEEK, which can then be precisely shaped using heat during the surgery. They are also fully MRI compatible when used with bone-compatible ceramic screws.

VSRC Machine Shop Module

The VSRC Computer Module 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.

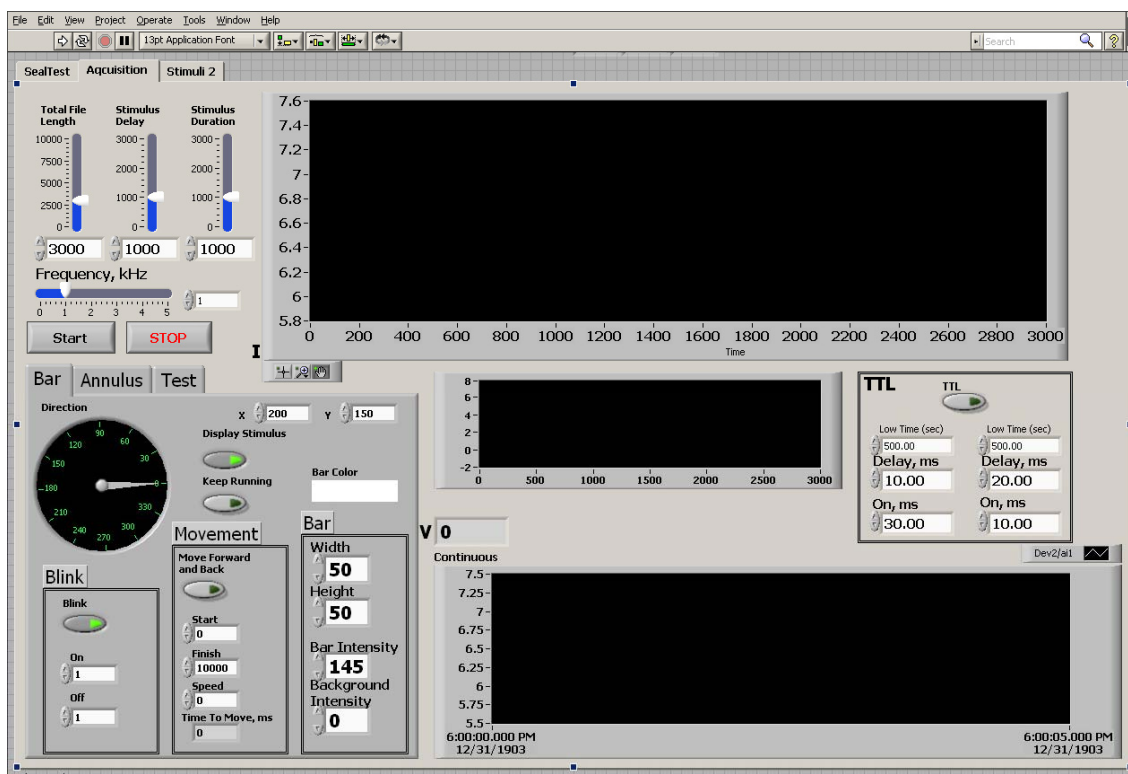
Services include:

- design and fabrication of new research instruments, in collaboration with the Electronics and the Computer module
- repair, modification, retooling, and replacement of parts of existing equipments
- technical assistance for any kind of machine shop and mechanical needs
- assistance in the selection and purchasing of tools, parts, and other mechanical equipment

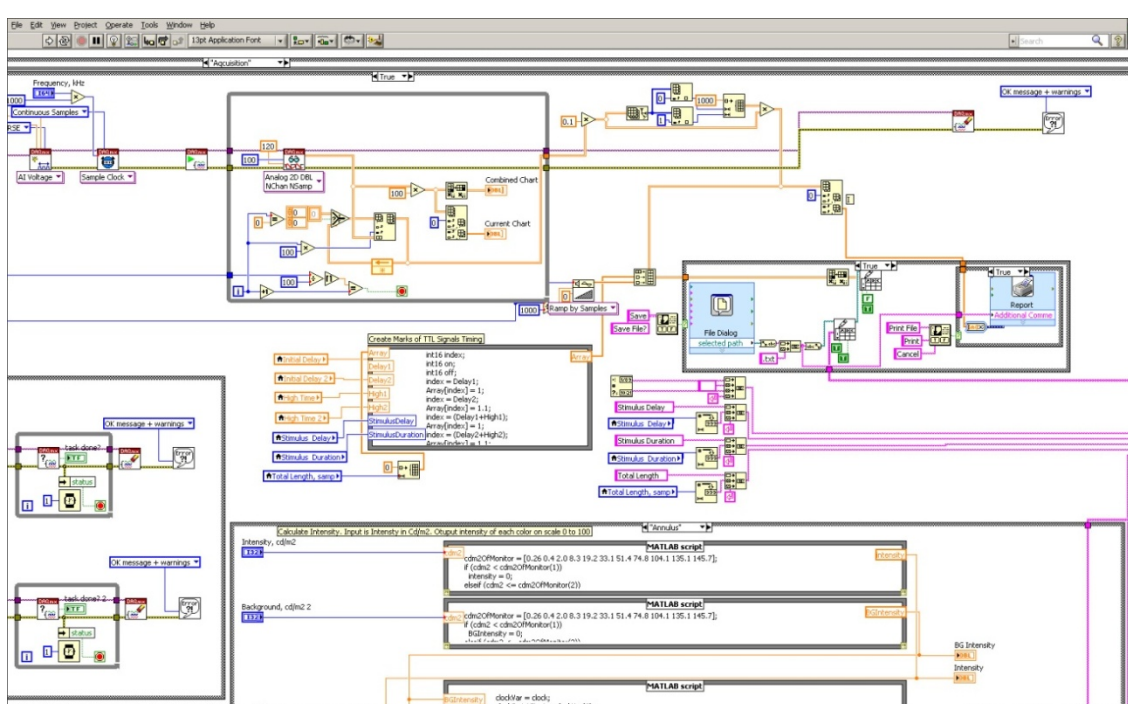
VSRC Computer Module

Dr. Claudio Busetтини – Director

Alex Zotov – Module Manager (azotov@uab.edu)



A: The customized graphical user interface allows the investigator to specify type, dimensions, color, intensity, parameters of movement, and other settings of the static and dynamic visual stimuli that are displayed during the experiment. The frequency of the data acquisition, and the analog and TTL outputs controlling a picoinjector can be specified through the user interface as well.



B: Block diagram of the LabView code that controls all the electronic devices involved in the experiment, the timing of the events, and the recording of the analog input data that is received from a microelectrode into a file. A graph of recorded data can be immediately printed using the virtual instrument.

Front Panel (A) of the graphical user interface and Block Diagram (B) of the LabView code of the fully-integrated software system that was developed for whole-cell patch-clamp recordings experiments performed on rabbit retina in vitro. The software, developed in LabView and Matlab, provides an efficient graphical user interface to the investigator to control in real-time all the key parameters of the experiment, the delivery of drugs by a picoinjector, and the acquisition of the electrical signals from a microelectrode. Some of the electronic interfaces were developed by the VSRC Electronic Module and some of the mechanical servo-mechanisms by the VSRC Machine Shop. The project is completed and it is actively supported and periodically improved as needed. Similar projects were developed or are in development for other VSRC laboratories.

VSRC Computer Module

The VSRC Computer Module provides VSRC members with technical support and assistance with computer hardware and software, including design and development of custom software, and provision of technical support in installing, configuring, and maintenance of computer systems. Computer Module administers VSRC network and hosts and maintains VSRC web site and online scheduling services.

The main goal of Computer Module is to provide assistance in configuring software and hardware to ensure that computer equipment meet all requirements for proper execution of vision science experiments and other research related activities. The Computer Module works closely with investigators and collaborates with other modules to design and develop custom commercially unavailable software required to manage experimental equipment and to process experiment data.

Services include:

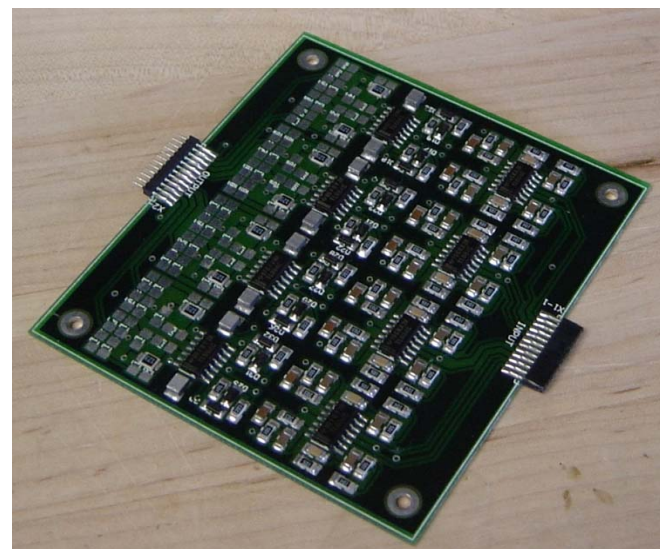
- computer assistance, maintenance and upgrades
- development of specialized real-time and off-line laboratory software
- development of customized hardware/software interfaces
- website authoring, hosting and development of web applications
- network administration for the Worrell building
- development and maintenance of online scheduling services for shared instrumentation
- scientific poster printing and poster design

VSRC Electronic Module

Dr. Christopher Girkin – Director

Abidin Yildirim– Module Manager (yildirim@uab.edu)

Custom Research Devices



8-Channel SMD- Headstage



2-Channel Photo Detector

8-Channel Headstage and Amplifier

This 8-Channel amplifier system is designed to record from retinal ganglion cells with a custom in-house “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. **Investigator:** Frank Amthor, Ph.D. **Publications:** “A new transparent multi-unit recording array system fabricated by in-house laboratory technology”, F. Amthor, J. Tootle, A.Yildirim.

2-Channel Photo Detector

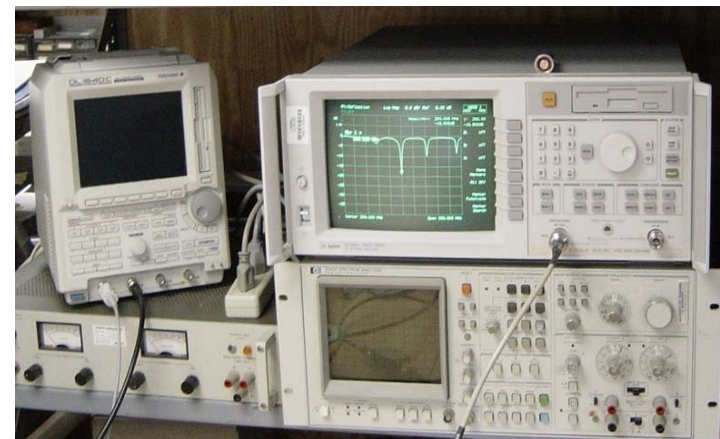
PHD 0202 is a custom universal photo detector unit that provides an adjustable gain, DC offset control, and TTL-synchronizing capability to trigger an external device. It has 2 photo detector channels that can be deployed together for detecting correlation of 2 signals resulting from a single stimulus or independently. A unique, suction type of detector design (optional) enables attachment of the detector to flat surfaces such as a PC monitor or TV screen for convenient detection of optic stimuli. **Investigators:** Tim Kraft, Ph.D. **Publications:** “A new transparent multi-unit recording array system fabricated by in-house laboratory technology”, F. Amthor, J. Tootle, A.Yildirim.

VSRC’s core electronics module 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 module 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 module is convenient on-site repair services for lab equipment and tools to save researchers time and money.

VSRC 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.

Selected Module Instrumentation

- LeCroy and YOKOGAWA digital oscilloscopes
- General purpose pulse/ function generator(YOKOGAWA)
- LabView 8.6 Full Development System with A/D and D/A
- CadSoft EDA –Electronics Circuit Design and Layout
- Various Millimeters (METEX, FLUKE) and
- HP-Spectrum analyzers
- Data Loggers (FLUKE)
- Variety of power supplies
- SMD assembly tools and microscope

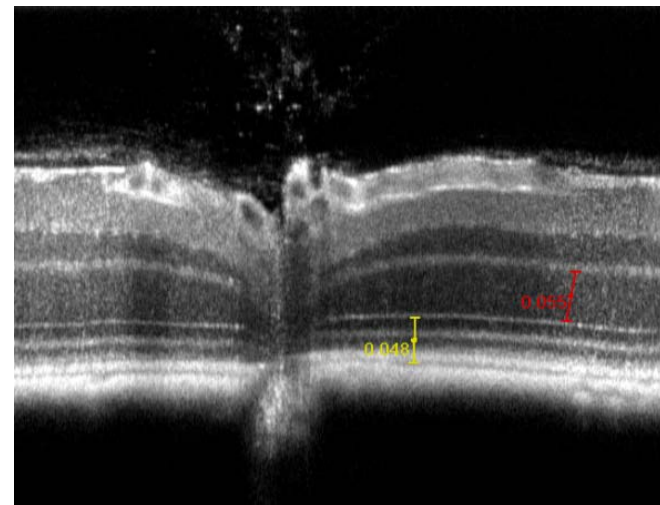


Selected E-Module measurement tools

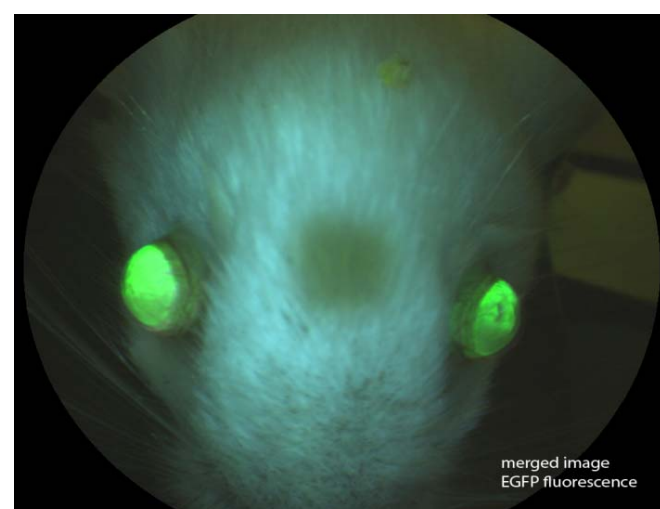
VSRC Molecular and Cellular Analysis Module

Dr. Steven Pittler– Director, Dr. Shu-Zhen Wang Co-Director

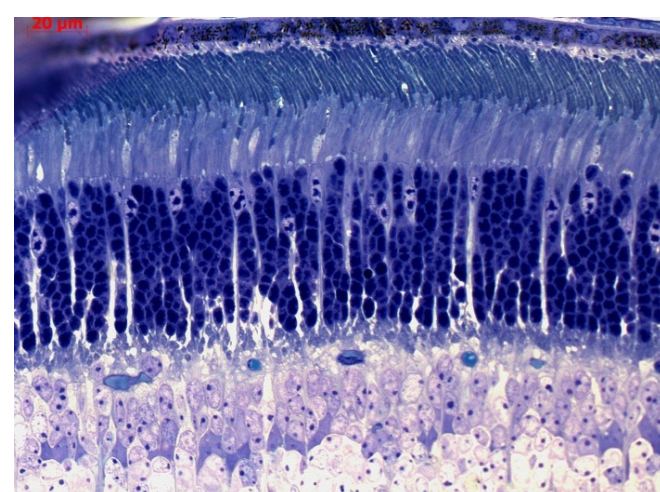
Hank Fortinberry– Module Manager (hkf@uab.edu)



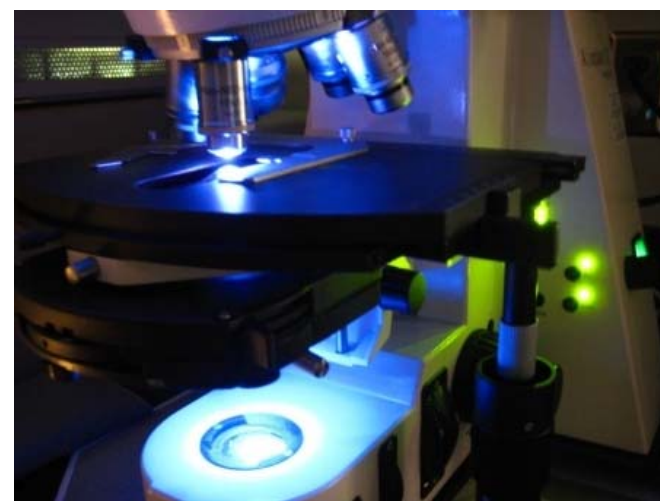
Mouse retina image obtained by Optical Coherence Tomography. Our Bioptigen 840 nm SDOCT allows for non-invasive high resolution imaging of the cornea and retina or any wave penetrable tissue. S. Pittler, H. Fortinberry, S. Sarfare, J. Messinger.



rho-EGFP expression in an albino rat eye imaging using a Phoenix Laboratories Micron III digital fundus microscope with fluorescence capabilities. This instrument is used to obtain semi-invasive high resolution fundus images and movies from mice and rats. T. Wensel, J. Wilson, S. Pittler, A. Gross.



Microscope image of retinal slices of GARP2 Tg mice obtained on our Zeiss AxioPlan2 Microscope. The mouse retina was embedded in Epon sections were cut at 0.5 mm and stained with toluidine blue. for visualization of cell layers within the retina. S. Sarfare, J. Messinger, S. Pittler



Zeiss AxioPlan2 Microscope with broad range fluorescence capabilities including DAPI, TRITC, FITC and Cy5 filters. This scope has Z-stack capabilities. The objectives are 10X, 20X, 40X, 63X and 100X. The 63X and 100X are oil immersion lenses. H. Fortinberry

The Molecular and Cellular Analysis Module offers equipment usage and consulting for molecular biology and histology experiments, as well as, non-evasive imaging of the eye in a variety of animal models. Our goal is to facilitate the research efforts of investigators throughout UAB with primary emphasis on support for UAB vision scientists. Below is a list of some of the equipment available for use:

Bio-Rad iQ5 thermo cycler for real-time quantitative PCR
Zeiss Axio-Plan2 microscope for fluorescence and light microscopy
Leica Cryostat for cutting frozen tissue sections for histologic analysis
Beckman and Eppendorf Centrifuges: micro, swinging bucket and ultra high speed
Bioptigen 840 nm SDOCT ultra high resolution Optical Coherence Tomography
Micron III digital fundus microscope with fluorescence capabilities

More information can be obtained by visiting our website at www.vsrc.uab.edu In addition to the website; specific details on what is available in this core and other core modules can be obtained by contacting the Module Manger at the e-mail addresses listed above.