

# **CVG Behavioral Phenotyping Core**

Revision: 1 December 2007

## **Introduction**

The CVG behavioral phenotyping core was formed in 2005 with seed funding from the Cornell Center for Vertebrate Genomics (CVG). As of this writing, the CVG core comprises a modest yet modern set of equipment, of which details are provided below. All BP core equipment to date is sized and designed for work in mice.

The purpose of the behavioral phenotyping core is to provide a range of state-of-the-art equipment to enable behavioral phenotyping of genetically modified mice by CVG and affiliated Cornell laboratories interested in behavioral testing but unwilling or unable to purchase expensive behavioral testing equipment for only occasional use. As of this writing, the core equipment does not have a permanent home; it is housed in the administrator's laboratory and is available to be used in its current location or relocated as necessary for a particular project.

The core has been designed with flexibility in mind, under the principle that original research often requires original approaches. Consequently, core equipment has been constructed or acquired with preference for open hardware and software standards, and many experiments can be run by a fully programmable interface using LabVIEW. This principle is not absolute, however; proprietary testing systems are included when they are judged the best practical option.

We are interested in growing this core into an official Cornell core facility. Please contact the administrator with any questions, to arrange for the use of core equipment, or to express an interest in future use of the core. We intend to grow the core so as to meet the current and projected needs of Cornell and CVG faculty research, so the more information that we have on possible future use, including recommendations for additional equipment, the better.

Below are listed sets of equipment in three categories: (1) CVG equipment purchased with funds allocated to the core by the CVG, (2) other equipment co-housed with CVG equipment in the present facility that may also be available to core users, and (3) equipment that has been purchased, is being planned for purchase, or is scheduled for loan or donation to the core but that is not yet available.

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Core location: Corson-Mudd Hall, second floor  
Core equipment is also available for temporary relocation by arrangement

URL: <http://www.vertebrategenomics.cornell.edu/Resources.html>

## **CVG Core Equipment**

This equipment is owned by the CVG Behavioral Phenotyping Core and is available for use by member laboratories.

**Control Station:** Desktop computer with National Instruments digital I/O interface running LabVIEW. Breakout box with low-impedance -28V power supply for interfacing with Coulbourn equipment. Many low-level LabVIEW virtual instrument drivers for digital equipment interface, as well as high-level experimental control Vis for particular classes of experiment, are provided (see below). Mounted on rolling cart.

**Shuttle cage (Coulbourn):** Two-chamber shuttle cage with shock-enabled floors, infrared position sensors, and automatic guillotine door programmable from control station. Used for conditioned place preference, inhibitory avoidance, light/dark exploration, and related tasks.

**Programmable shocker (Coulbourn):** For use with Coulbourn cages; delivers 8-pole rotating shock to the feet (“footshock”), the standard aversive unconditioned stimulus for cued and contextual fear conditioning, contextual discrimination, and other types of aversion learning.

**Infrared movement sensor (Coulbourn):** Mounts on cage lids to record movement underneath.

**Microvideo infrared cameras:** For mounting within Coulbourn cages. Enables direct visualization of mouse movements and freezing even in the dark and/or in enclosed boxes. Requires infrared LED illuminators (available) when used in darkness.

**Video recording to DVD:** Sony DVDirect standalone DVD video recorder. Useful for post hoc video scoring of behavior and long-term storage of behavior records.

**Radial maze (Coulbourn):** Eight-arm radial maze with shock-enabled or non-shock floor. Also includes square center for use as a T-maze or a plus-shaped four-arm radial maze (not the same as an ‘elevated plus maze’). Includes infrared photocell sensors that can be mounted in flexible locations. The radial maze is often a better alternative to the Morris water maze for mice, being able to support many of the same assessments of spatial processing, spatial short- and long-term memory, and working memory.

**Accelerating rotarod:** Used to screen for general balance and motor capacities in mice. Needs some computer interface work for full functionality.

**Add-ons for Coulbourn cages:** To support a variety of training and testing paradigms.

- Triple-lumen tastant delivery tube (requires syringe pump or equivalent). Including shocker connections to support the Vogel conflict task.
- Nose-poke operanda. To record nose pokes (arguably the best way to get mice to perform the equivalent of lever-pressing operant tasks). Operanda include ports for odorant inputs.
- Visual cue LED arrays
- White noise generator with speaker
- Tone generator with speaker. Produces near-pure tones at a variety of selected frequencies.
- Photocell sensors. Flexibly mountable.
- Contact sensors for novel object tasks.
- Visible-spectrum and infrared light sources.

### Additional equipment available via the Core

Some laboratories possess behavioral phenotyping equipment that they are willing to make available to core users by arrangement. Any special considerations for using such equipment can be discussed during the planning stage.

**Three-arm mini-maze** [Cleland]: For spontaneous alternation testing, a means of measuring working memory.

**Standard operant testing cage** [Cleland]: Single-compartment cage with shock-enabled floor. Coulbourn add-ons, microvideo cameras, etc. can be mounted.

**Audio isolation cubicles (Coulbourn)** [Cleland]: Two boxes with auditory shielding, large enough to contain operant cage, shuttle cage, etc.. Includes ventilation fan and ports for experimental control. Useful for cued conditioning or auditory testing.

**Programmable syringe pumps** [Cleland]: For control of triple-lumen tastant delivery for gustatory training or testing.

**Infrared movement sensor (Coulbourn)** [Cleland]: A second sensor to supplement the CVG one. Mounts on cage lids to record movement underneath.

**Auditory stimulation system** [Cleland]: Two-channel amplifier and two reasonably flat mini-speakers for delivery of better-quality auditory stimuli to test cages. Limited in frequency range. Tones generated by computer audio card.

**Video monitor** [Cleland]: Black-and-white video monitor for directly monitoring signals from video cameras. A VCR is also available if the DVD recorder or direct-to-disk recording is contraindicated.

### Additional equipment pending

This section lists equipment that is in the process of being acquired or otherwise being made available for use via the core. It is not yet available for use, and no clear date for its availability is guaranteed; it is listed here to aid in future planning. The owner or prospective owner is noted in brackets.

**von Frey filament apparatus** [CVG]: To test mechanical allodynia (pain owing to exaggerated, normally non-noxious stimuli) and the effectiveness of analgesia.

**Thermal hyperalgesia hot plate** [Pavek]: For testing of thermal pain and analgesia. This item and the von Frey filament apparatus together comprise a reasonably complete battery for pain and analgesia testing.