ACTIMETRICS & BILANEY CONSULTANTS AUTOMATED SYSTEMS FOR ANIMAL BEHAVIORAL TESTING

ACTIMETRICS - AUTOMATED SYSTEMS FOR
ANIMAL BEHAVIORAL TESTING

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ACTIMETRICS & BILANEY CONSULTANTS

AUTOMATED SYSTEMS FOR ANIMAL BEHAVIORAL TESTING.

COMPANY

Actimetrics makes automated systems for animal behavioral testing. We emphasize ease of use and the application of modern signal and image processing techniques to current problems in neuroscience. We work closely with our users to make each system a natural extension of the experiment itself. Dozens of features designed for high throughput data collection and analysis benefit large and small users alike.

Actimetrics was formed in 1998 by academic neuroscientists with years of experience at designing laboratory software.

Our goal is to create tools for the study of animal behavior that integrate seamlessly with the experiment. By working directly with many different behavioral scientists, we have designed our systems around the experiments that are currently driving the field, and have tailored the features of each program to current lab practices. In addition, Actimetrics has pioneered a number of new analysis methods for behavioral experiments. The result has been a suite of easy-to-use programs that facilitate high-throughput testing, and yet are flexible enough to accommodate new experimental designs.

Many of our systems are now used in large scale mutagenesis screens or drug tests. And our users have given us excellent feedback, telling us that our systems have increased the rate and accuracy with which they can do experiments, or that Actimetrics software allows them to perform new experiments that they otherwise could not have done. At Actimetrics, we design the software around the experiment, rather than forcing the user to design experiments around the software.

„Bilaney Consultants, based in Germany and the UK, supply quality research equipment and software to life scientists and biomedical researchers in Europe since 1966."

We have found that general-purpose tracking software that tries to accommodate too many different tests can become inflexible and cumbersome. The tools needed to manage a water-maze experiment differ sharply from those used in open field testing; and the analyses needed for tail suspension differ from those used in object recognition. So we have built individual applications around small numbers of closely related experiments, incorporating dozens of features that streamline the performance and analysis of just those experiments. These applications are easy to learn, easy for students and technicians to learn, a pleasure to use, and yet extremely powerful and adaptable. We offer these systems at affordable prices, so that labs can pick and choose the combination of programs that best suit their needs.

Another unique aspect of our approach is our explicit partnership with our users. We are continually updating our software based on your new ideas and feature requests, often within a few days. And we never charge for “custom” work, because we benefit as much or more from your ideas as you do from the new features that result. Our programs would not be what they are without this close interaction with users.

CLOCKLAB

CLOCKLAB: DATA COLLECTION AND ANALYSIS FOR CIRCADIAN BIOLOGY

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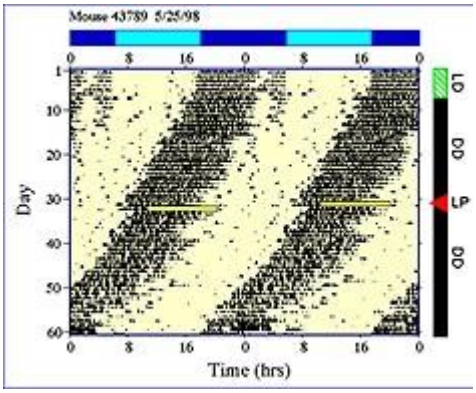

ClockLab software applications and equipment cover a wide array of circadian experiments. Contact us for help configuring a complete system.

Software

ClockLab Analysis 6. A widely used stand-alone program for the analysis of circadian rhythms. It can read and analyze records obtained from almost any circadian data collection system, including the ClockLab data collection program.

ClockLab Data Collection. Our program for recording circadian activity. It can simultaneously record from 448 hard-wired sensors including mechanical switches, IR-based motion sensors, or other digital signals. It can also record wirelessly from up to 500 running wheels or IR-based motion sensors. Wired and wireless connections can be used simultaneously in a single system.

ClockLab Chamber Control. Records from and controls light-tight circadian cabinets from Phenome Technologies. The program makes long-term records of temperature, light levels, and humidity, controls light schedules in any arbitrary waveform and period, controls chamber temperature in daily cycles, and can control and record from Phenome's programmable pellet feeders.

ClockLab Performance Monitor. As a standard feature, ClockLab can be configured to send status messages to our remote servers. If problems develop with the computer, the program, the interface hardware, or the animals, the server will notify designated users by text or email within 20 minutes.

Hardware

Circadian cabinets. Light-tight, fully ventilated cabinets with integrated, programmable LED lighting, sensors for monitoring temperature, humidity and light, and optional heating elements for temperature control.

Cages, running wheels, running-wheel sensors, and motion sensors.

Vertical or horizontal running wheels can be fitted with mechanical switches, magnetic switches, or infrared sensors. Sensors can be hard-wired directly to the ClockLab digital interface, or for easier setup connected wirelessly to the ClockLab base station. Stand-alone infrared motion sensors are also available can be connected to the computer via wires or wirelessly.

Programmable pellet feeders can be integrated with cages and running wheels. Feeding schedules are controlled and food consumption recorded via the Chamber Control program.

Ordering ClockLab

FREEZEFRAME 4

VIDEO SYSTEM FOR FEAR CONDITIONING – TAIL SUSPENSION – PORSOLT SWIM TEST

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- FreezeFrame now supports fear conditioning in optogenetic experiments
- FreezeFrame now ships together with **LimeLight** at no extra cost.

LimeLight is our general-purpose tracking program for Open Field, Plus Maze, Radial Arm Maze and Novel Object Recognition and WaterMaze. Together FreezeFrame and LightLight provide automated video tracking for a complete range of rodent behavioral experiments.

- Complete systems available, including software, cameras, control interface, cages, isolation cubicles, shockers, audio amplifiers and cue and house lights.

FreezeFrame, the first video-based system for fear conditioning, has become the standard in its field. It combines the sensitivity of the human observer with the objectivity and high throughput of automation. While infrared beams can detect gross movements of an animal from one part of the cage to another, FreezeFrame can detect the minute movements of grooming, sniffing, turning and rearing. And FreezeFrame monitors the animal at up to 15 times per second, not once every 5 seconds, for far more objective and reproducible results. FreezeFrame can also collect and process data for learned helplessness experiments, including Tail Suspension and the Porsolt Forced Swim Test.

Not a tracking system. A proprietary motion detection algorithm filters out shadows, light flicker and camera noise, and detects movements as small as 1 mm.

Superior low-light performance.

Fully validated. Greater than 90% concordance between FreezeFrame and trained human observers.

Multiple stimulus protocols can be stored and called up instantly for training and testing phases of the experiments.

New: FreezeFrame now supports pulsing stimuli at frequencies of up to 500 pulses per second and pulse durations as short as 1 ms.
New: FreezeFrame can now generate frequency-sweep sound stimuli. Start and stop frequency, and duration are all user selectable.
Up to 8 individually controlled outputs. For each output, a +5V signal is available for controlling TTL-compatible devices and a +24V (400 mA) output can be used for controlling lights and other high-current devices.

Store video images for later review. Export QuickTime and AVI movies for presentation.
Batch export data and analyses directly to an open Excel spreadsheet. Analyze % freezing, number of bouts, bout duration and intervals for specified periods.
Sounds (white noise or pure tone) are delivered through the computer's sound card. Multiple sounds of different amplitude, frequency and quality (tone/noise or continuous/pulsing) can be delivered at different times during single trial. The shocker-scrambler is controlled directly from the computer, along with additional stimuli such as lights or external sound generators.

Ordering FreezeFrame

LUMICYCLE
LUMINOMETRY FOR CIRCADIAN BIOLOGY

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LumiCycle performs high-throughput luminometry on self-luminous tissues, such as those from transgenic animals containing the luciferase gene.

LumiCycle 32 records from 32 samples in 35-mm Petri dishes using 4 photomultipliers. **New Color Option:** Like LumiCycle 32, the color version records from 32 samples in 35-mm Petri dishes using 4 photomultipliers. In addition, colored filters can be placed on 2 of the photomultiplier so that 16 samples can be recorded simultaneously in 2 different colors.
LumiCycle 96 records from 96 samples in 4 24-well plates.
LumiCycle In Vivo (coming soon) will record from an intact animal in a standard mouse cage.

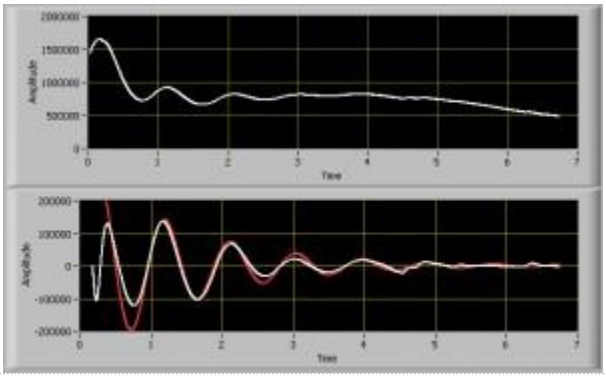
The systems are equipped with photon-counting photomultiplier tubes, each selected for low dark counts and high sensitivity in the green portion of the spectrum at which luciferase emits light.

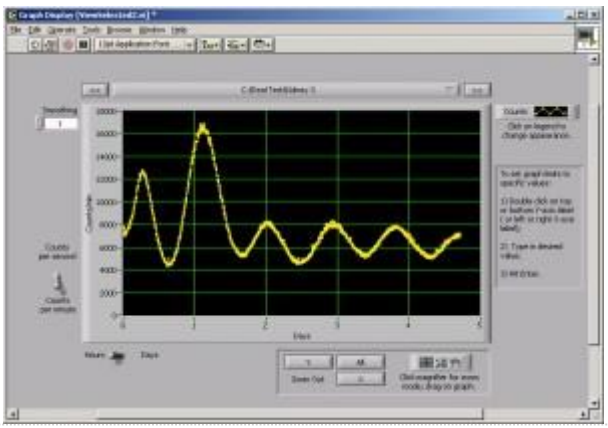
The LumiCycle apparatus fits inside a standard incubator. An internal fan circulates the incubator air to maintain the proper temperature within the chamber. The temperature is therefore as stable as the incubator can make it. The turntable and photon counting are fully automated. System setup and operation is straightforward. Online help files are included with the software.

In addition to its high-precision photon counting hardware, LumiCycle has the most flexible and easy-to-use software for the collection and analysis of circadian rhythms in luminometry data.

- Start and stop each counting channel asynchronously. You may, for example, start one experiment with 10 samples on one day, and start a second experiment with 22 samples the following day, stop the first experiment 5 days later and start yet a third set of dishes in their place.

- Interrupt the data collection to perform experimental manipulations on the samples (such as adding a drug). Once the treatment is complete, LumiCycle will pick up exactly where it left off.
- Flexible counting schedules, from once per hour, to once per minute.
- View records during the data collection process. A single window shows data for all 32 or 96 channels at once. Double-click on one of the graphs to view the data in greater detail (top figure).
- Analysis program (bottom figure) automatically compensates for baseline shifts and signal attenuation over the course of the trial. The dominant circadian period and phase can then be extracted (red curve). View periodograms and actograms, calculate phase shifts, extract periods with spectral or periodogram methods.
- Superimpose multiple records for comparison and figure preparation.
- Calculate rhythm parameters for the complete record, or for multiple subsets of the record. If, for example, a treatment is given halfway through a record that is expected to create a period or phase change, the two halves of the record can be analyzed separately and a phase shift calculated.
- While data collection is in progress, you may repeatedly copy the growing data files onto another computer (via a floppy or the network) and analyze the data collected so far for period and phase. Data collection continues uninterrupted until the end of the experiment.
- Extracted periods and phases can be exported to a text file for later manipulation in Excel or other statistics programs.
- Raw or baseline-subtracted records can be exported to ClockLab for further analysis using periodograms, actograms, and activity profiles.





VIDEO TRACKING

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Actimetrics makes three systems for video-based analysis of behavioral experiments.

LimeLight is a general purpose video tracking program for Open Field, Plus Maze, Radial Arm Maze, Zero Maze, Novel Object Recognition, Conditioned Place Preference, Barnes Maze, and other similar experiments. It will track 4 animals at once, has easy set-up of zones and grids, and extensive analysis functions for quantifying behavior.

WaterMaze, designed in collaboration with Richard Morris (University of Edinborough), is specifically built for designing and executing complex water maze experiments with multiple animals, starting points and platform positions. The program automates all of the standard protocols and analyses used in the field.

FreezeFrame, introduced in 1998, was the pioneer system for video-based automation of fear-conditioning experiments, and remains the standard in the field. It now supports fear-conditioning in optogenetic experiments, with methods to screen out the motion of fiber-optics cables or cables for electrical stimulation.

Mazes, Arenas and Pools for Behavioral Experiments from Phenome Technologies

CELL CYCLE

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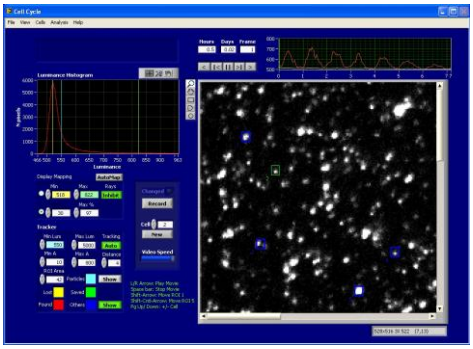

It is now possible to measure luminescence of single PER-LUC labeled cells using cooled CCD cameras. With their high quantum efficiency and low noise, the cameras can extract significant measurements of luminance from the handful of numbers of photons emitted by single cells. Analyzing the image series from such experiments can laborious, however. Each of the many cells must be identified and then tracked through the image series, a difficult prospect given that the cells can move from image to image, and — during the dim phase of the circadian day — can completely disappear from view. **Cell Cycle** facilitates the image analysis.

Movie Playback. Cell Cycle assembles the image stack into a movie that can be stepped through or played back and forth at different speeds using standard video controls. Watching the movie makes is easy to pick out the cells that are suitable for analysis. The program **automatically adjusts the brightness** of the video during playback to compensate for the gradual decline in luminescence of the cells over time.

Automated Cell Tracking. A cell can then be identified for analysis simply by clicking and dragging over it in the image (green rectangle in the image below). The program will then track the cell from frame to frame for as long as the cell remains visible, following it across the image as it moves. Once the cell dims too much for it to be tracked, the program stops automatically. The user can then step frame-by-frame until the cell reappears. A single click on the cell body will cue the program to pick up where it left off and track automatically again through another cycle. With this semi-automated process, it only takes a few minutes to identify a cell and follow it through a complete image series. The program then calculates and displays the luminance trace (graph at the top right). By comparison, extracting the same information from a single cell using generic image analysis programs (such as NIH image) can take hours, since it requires manually shifting the region-of-interest frame by frame.

Circadian Analysis. Once a number of cells have been tracked, the traces can be viewed singly or superimposed for comparison (lower image). The luminance data can also be exported to files that can be read by the LumiCycleAnalysis program. The LumiCycle Analysis program can then extract circadian parameters (period, phase and damping, goodness of fit) using a variety of spectral methods.

Requirements. Cell Cycle is compatible with Windows XP/7/8/10 and can be run on Macintosh OSX using Parallelsor VMWare.

MULTICYCLE

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Circadian Analysis for Multi-Well Plate Readers

MultiCycle can read text-formatted data from any multi-well plate reader, including Tecan, ViewLux and Envision (Perkin Elmer), Synergy (Biotek), and LEADseeker (GE). The program calculates period, phase, amplitude, and damping for each well in a multi-plate trial and exports the parameters in spreadsheet form. Wells can be grouped into experimental and control groups for comparison. With flexible graphical displays (below), differences between control and experimental groups can be readily seen, and unusual samples immediately pop out.

The image below shows the analysis of the one plate in a 15-plate trial. The different groups were selected by clicking-and-dragging over the plate diagram to the left. A portion of the traces is selected with the vertical blue cursors, and the background subtraction method is selected (lower left). The resulting traces are plotted at the upper right. Oscillation parameters are automatically calculated, and period and phase are plotted against amplitude in the graphs below, color coded by group. Colors are user-selectable. The user has then clicked on one of the outlying points in the Period graph (red); and the corresponding point in the phase graph, the corresponding trace, and the corresponding well in the plate diagram are all automatically highlighted in red.

Data can be exported to spreadsheet-compatible text files for the entire trial, or for separately for plates and groups.

Traces can also be displayed in heat-map form (figure below). The well number for any sample in the heat-map can be identified by hovering the curs