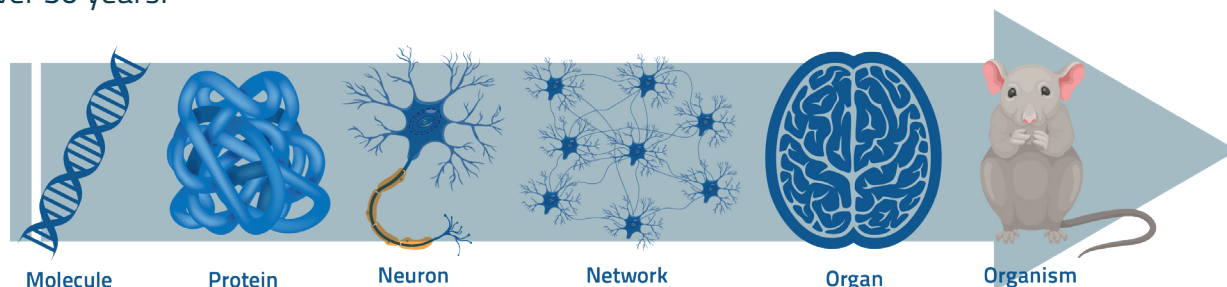


Neuroscience Solutions From The Life Science Leader

Basic and preclinical neuroscience research has contributed to significant advancements in the fundamental knowledge of neurological functions and related disorders. Despite these advancements, there is still much about the human brain and nervous system that is unknown. This has driven increased neuroscience funding from organizations throughout the world looking for techniques to provide more translatable and reproducible results. Due to the complexity of brain functioning and neurological disorders, using multidisciplinary approaches has been demonstrated to bring great promise for advancing neuroscience research. From the molecule to the whole organism, HBIO provides a broad range of reliable *in vitro* and *in vivo* solutions that have been serving the neuroscience space for over 50 years.



Key Research Areas

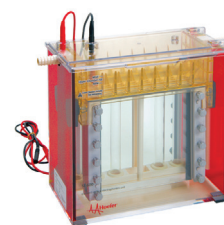
Neurodegenerative Diseases, Alzheimer's Disease, Aging, Huntington's Disease, Parkinson's Disease, Schizophrenia, ADHD, Autism, Behavioral Therapies, Stress, Anxiety, Depression, Fear, Addiction, Compulsive Behavior, Circadian Rhythm, Sleep, Epilepsy/Seizure, Brain or Spinal Cord Injury/Trauma, Neuropathies

Molecular (*in vitro*)

Transfection Electroporation is commonly used for molecular delivery, genome editing, and performing functional studies of genes and proteins in living cells. Electroporation is a key technique for creating genetically modified animal models used in all areas of neuroscience research and the study of brain development. With Gemini X2 and ECM 830 electroporator systems, BTX offers high-tech solutions for all your electroporation needs, including CRISPR, *in vivo*, *in vitro*, *in ovo*, and more.



Gemini X2 Electroporator
BTX



E600 Protein Electrophoresis Unit
Hoefer



Microvolume Spectrophotometer
Biochrom

Electrophoresis, Immunoblotting, and Spectrophotometry

Techniques to determine the presence, quantity, and molecular weight of solubilized proteins or amino acids (DNA, RNA) in brain extracts. Hoefer is specialized in developing tools and complimentary accessories for gel electrophoresis and blotting applications. Biochrom is one of the world's leading manufacturers of Amino Acid Analyzers, UV/Visible spectrophotometers, as well as Microplate Readers and Washers.

Cells & Networks (*in vitro*)

Patch Clamp Study the electrophysiology of ion channels in tissue sections, individual living cells, or patches of cell membrane. Together, HEKA and Warner offer complete patch clamp set-ups, including anti-vibration tables, high-quality amplifiers, pullers, microscopes, faraday cages, as well as temperature control and perfusion systems. HEKA's sophisticated patch clamp amplifiers provide clamp circuitry that follows rapid changes in membrane potential, such as neuronal action potential. Corresponding data acquisition and analysis software as well as a wide range of peripheral devices complete the set-up from one source.

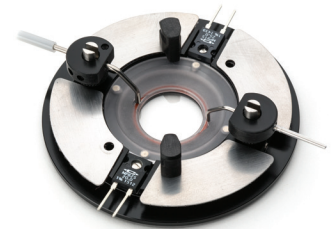
Neuroimaging and Recording Warner provides complete set-ups for live cell neuron imaging and recording, including perfusion chambers for imaging and recording, perfusion systems for patch clamp and other electrophysiology studies, temperature controllers, stage top microincubation chambers, and brain slice products.

Electrophysiological Extracellular Recording and Microelectrode Arrays (MEA) Techniques to better understand how neurons behave as a population. Multi Channel Systems' (MCS) MEA2100-Systems use neuronal cells, stem cells, or acute brain slices to capture spontaneous or induced functional behavior of any neural network. MCS MEAs record extracellular field potential non-invasively with high spatial resolution and the ability to perform long term studies.

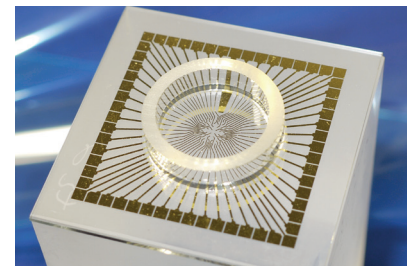
Multiwell Approaches and CMOS Based Arrays Increase throughput, channel count, and spatial resolution. Multi Channel Systems' (MCS) Multiwell-MEA-System can be used with neurons or cardiomyocytes from derived stem cells for high throughput to investigate subtle changes in neuronal activity or cardiac beating behavior.



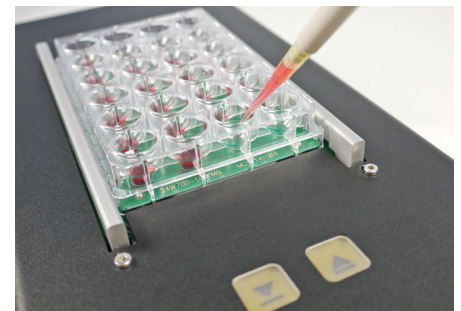
Patch Clamp Amplifiers
HEKA



Imaging Chambers for Live Cells
Warner Instruments



MEA 2100 System
Multi Channel Systems



Multiwell System
Multi Channel Systems

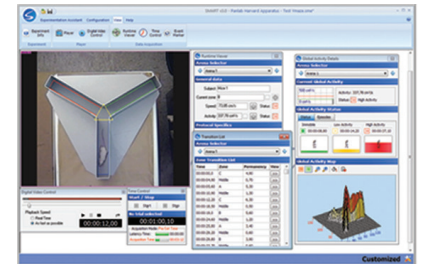
Whole Organisms (*in vivo*)

In vivo Electrophysiology Neural recording and stimulation solutions to collect *in vivo* data required in neuroscience research areas such as behavior, memory functions, or sleep studies. Multi Channel Systems (MCS) offers the full range of head stages for *in vivo* recording, amplifying, and analyzing of CNS electrical signals from freely moving animals, anesthetized animals, or organ explants. Wireless and tethered solutions from 4 to 256 channels for optical as well as electrical stimulation are available.



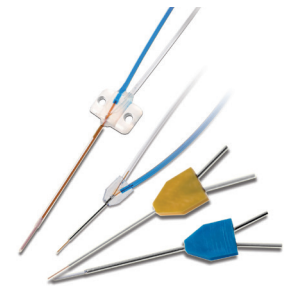
ME2100 System
Multi Channel Systems

Behavioral Studies A broad range of solutions for the automated evaluation of behavior in small laboratory animals. Panlab and Coulbourn offer stand-alone and complete hardware/software integrated solutions for both standard and advanced needs. Solutions include actimeters, rota rods, treadmills, tail flick, mazes, video tracking, startle system, fear conditioning boxes, operant boxes, metabolism, food and drink intake, and more. Neurobehavior tests can be combined with other Harvard Bioscience techniques, including telemetry, *in vivo* electrophysiology, optogenetics, and microdialysis to complement your study design.



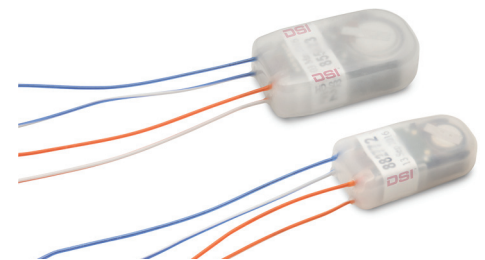
SMART Video Tracking
Panlab

Microdialysis Study CNS neurophysiology through the release of neurotransmitters, monoamines, and metabolites, amino acids, and other small endogenous compounds in very specific areas of the brain and spinal cord. CMA Microdialysis offers full solutions for *in vivo* microdialysis research on aware and freely moving small laboratory animals, including microdialysis probes, pumps, fraction collectors, and related accessories. The CMA microdialysis probes for CNS applications have a worldwide reputation of quality and reliability.



CNS Microdialysis Probes
CMA

Implantable Telemetry Collect continuous, chronic, wireless measurements of CNS electrical signals in small and large animal models. Telemetry provides a reduced stress approach, enabling trustworthy data that more accurately mimics the human condition. Acquisition and analysis software including video solutions offer researchers a streamlined platform to confirm sleep stages, seizure activity, and other behavioral events. Tethered approaches are also available for acute data collection with higher bandwidth and sampling rates. Additional research techniques, like optogenetics, respiratory plethysmography, behavioral products and more, can all be synchronized with telemetry data.



Mouse and Small Animal CNS Implants
DSI

Complementary Tools (*in vitro*, *in vivo*)

Syringe Pumps Syringe and peristaltic pumps are commonly used in neuroscience research for a wide variety of procedures including drug administration, perfusion fluid flow control in microdialysis probes, perfusion fluid in imaging/recording chambers, liquid delivery as reinforcement in behavioral studies, and more. Harvard Apparatus offers the most reliable syringe and peristaltic pumps available, providing precise control over experiment conditions.



Pump 11 Elite Syringe Pump
Harvard Apparatus

Surgery, Anesthesia, and Animal Monitoring Surgery and anesthesia procedures complement experimental set-ups at all levels including *in vitro* experiments for extracting cells and tissues, *in vivo* experiments for implanting a specific electrophysiology electrode, microdialysis probes or of a catheter into the jugular vein for drug administration in a behavioral study, and more). Harvard Apparatus and Hugo Sachs Elektronik offer a full surgical suite including complete anesthesia set ups, associated ventilators, and vital sign monitors.



Small Animal Physiological Monitoring
System (HPMS)
Harvard Apparatus