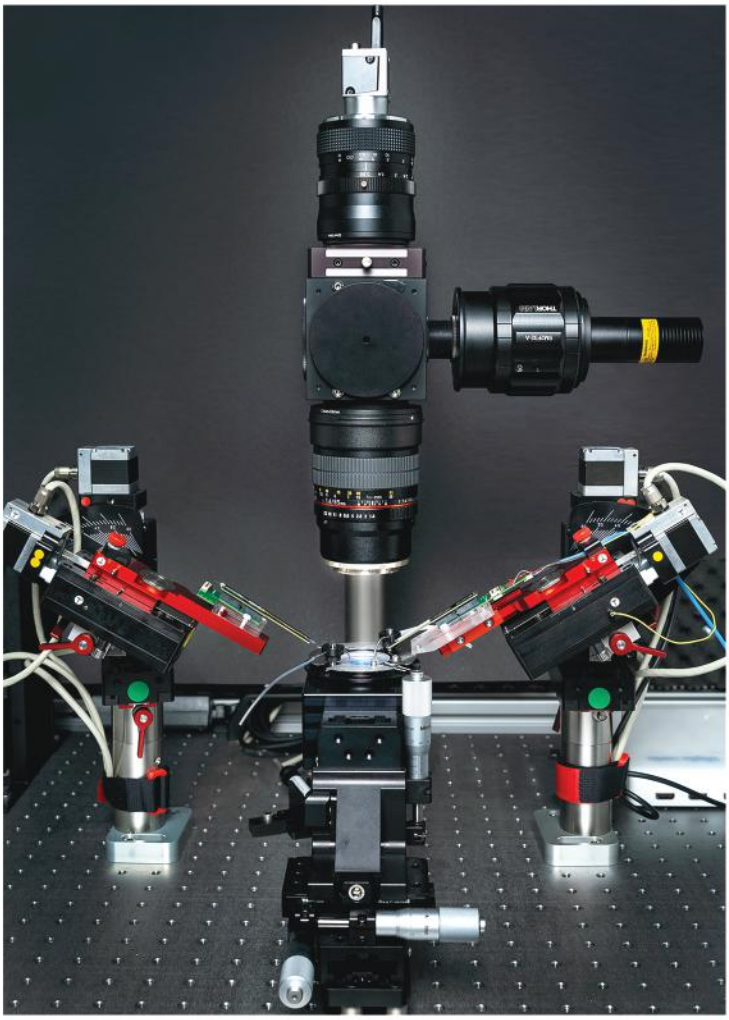
OrganoStation

Welcome electrophysiology in brain organoids

- Precise electrode location
- Fluorescence imaging
- Optogenetic stimulation
- Acute drug application

Technical specifications

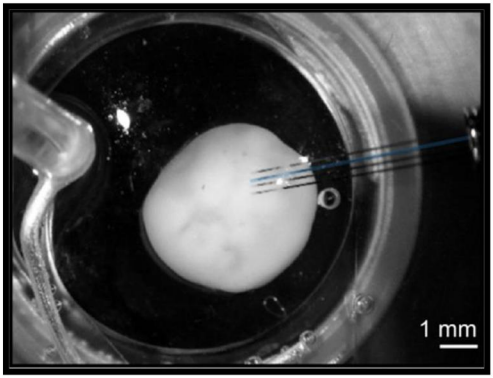
- ✓ Simultaneous acquisition of up to 512 electrical signals at 30 kHz
- ✓ Micromanipulators to allocate the electrodes with micrometer precision
- ✓ Long working distance infra-red and fluorescence wide-field imaging
- ✓ Electromagnetic isolation and chemically resistant components
- ✓ Peristaltic drug application and temperature control of sample

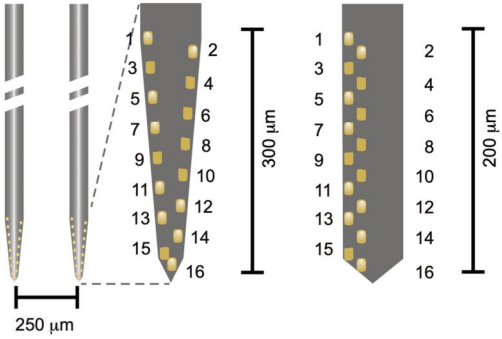


Precise electrode location

Precise movement of neural probes together with tip sharpening permits penetrating the organoid with minimal damage.

The microelectrodes are arranged in **200-300 µm** shanks to sample the outer core of the brain organoid – where active neurons exists.

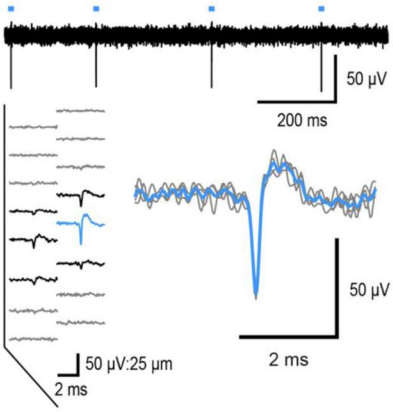




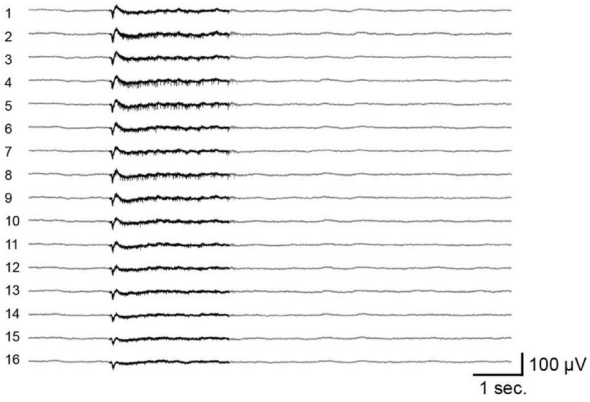
Application example

Low-impedance small microelectrodes are designed to record single-active neurons or neuronal population events in brain organoids.

Single-neuron activity

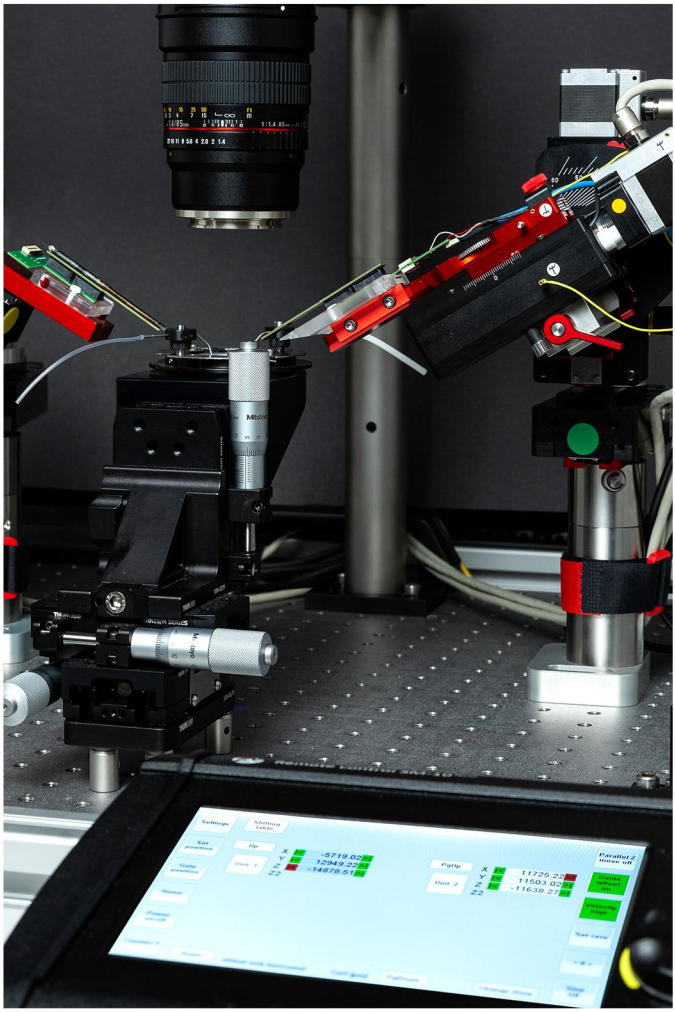


Population event



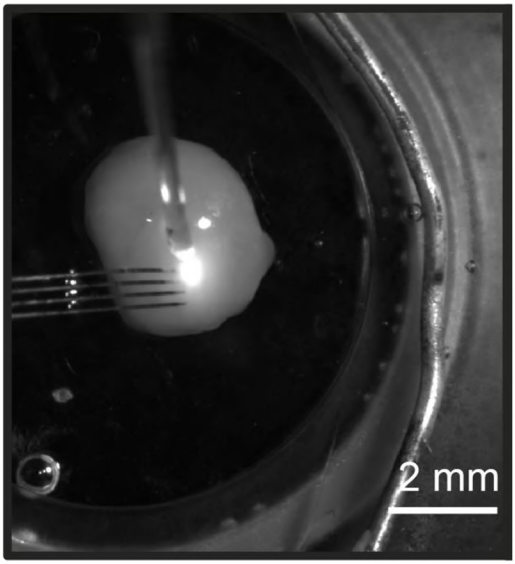
Precise electrode location

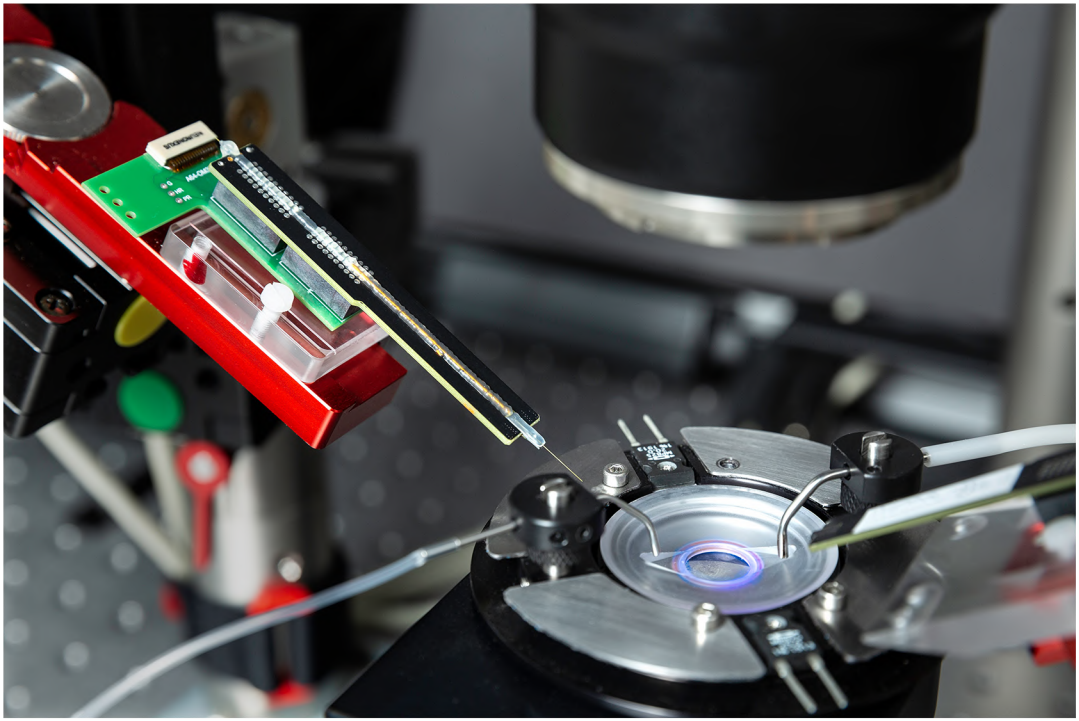
- ✓ Precise (< 1 um) motorized (4.8 nm resolution) XYZ micromanipulators with 25 mm travel distance.
- ✓ XYZ manual controlled (25 mm) stage oxidized to reduce toxicity or chemical degradation.
- ✓ Vibration-damping optical table (600 x 900 mm L x W) and the associated passive-isolation table.



Optogenetic stimulation

The heterologous expression of an optogenetic actuator (a channelrhodopsin, e.g. Cheriff) permit using light to activate neurons in brain organoids and test its function.



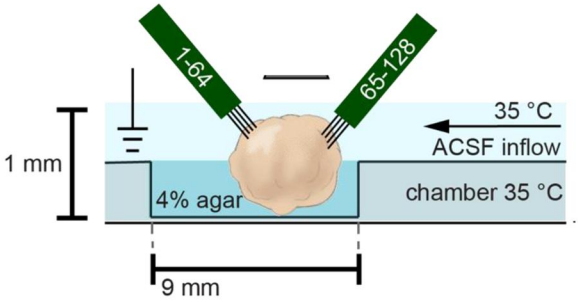


Fluorescence imaging

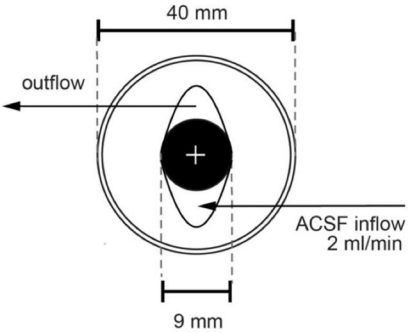
- ✓ Large (20-80 mm) working distance and field of view (12 x 9 mm) with 0.6-1.7X magnification range.
- ✓ Computer vision infrared video-camera with 3.5 µm per pixel resolution up to 227 frames per second.
- ✓ Broadband or single-colored (e.g., 470 nm) strong up-right illumination (up to 1200 mW).
- ✓ Filter sets for green (470 BP/495 LP/525 BP) or red (590 BP/660 LP/700 BP) fluorophores.

Acute Drug Application

Precise **temperature control** for solution and organoid to preserve physiological conditions.

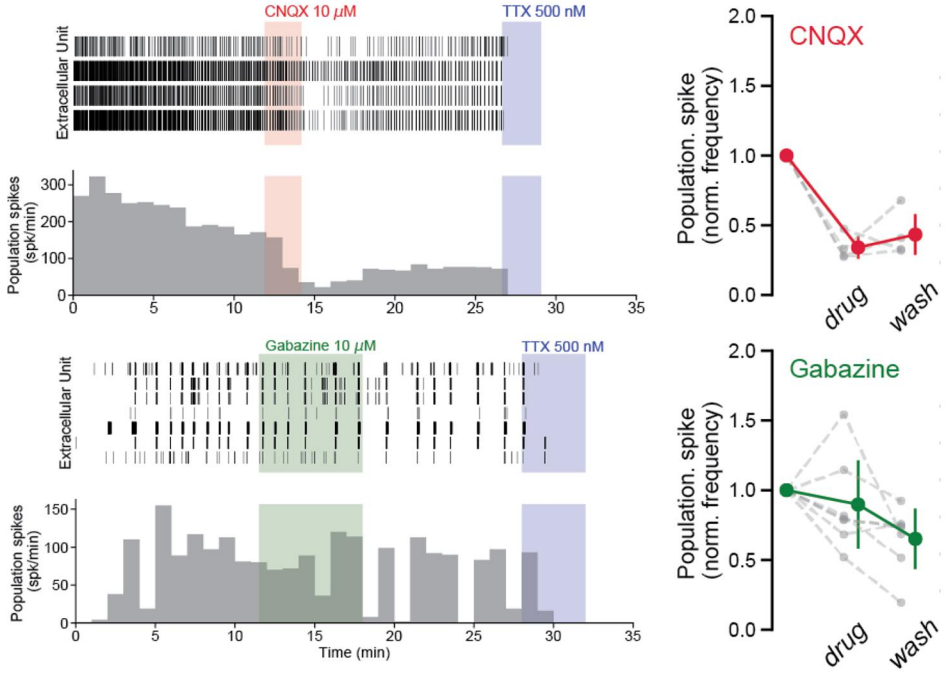


Recirculation of small volume for **cost-effective** drug application.



Application example

Effect of a glutamate antagonist (CNQX) and GABA antagonist (Gabazine) on extracellular spikes recorded in human brain organoids.



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