

Biomedical Computation Review

Stanford University

318 Campus Drive

Clark Center Room S231

Stanford, CA 94305-5444

seeing science

SeeingScience

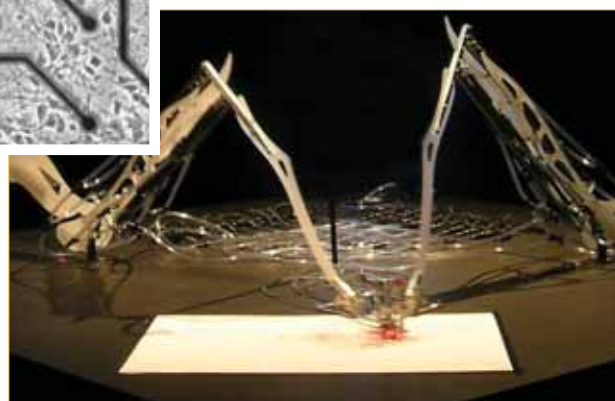
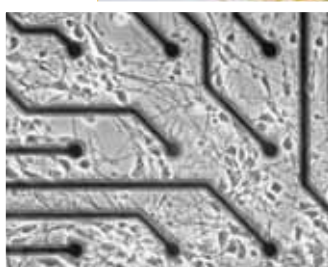
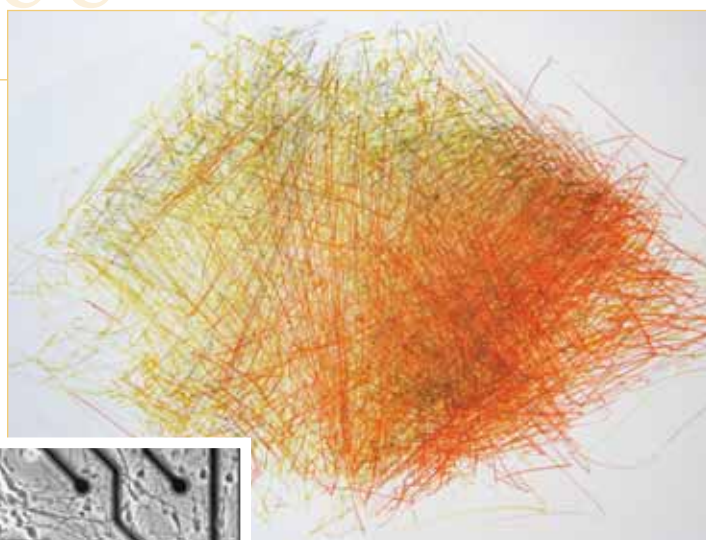
BY KATHARINE MILLER

MEART: The Semi-Living Artist

MEART's creators link the basic components of the brain (isolated neurons) to a mechanical body (robotic arms) through the mediation of a digital processing engine across the Internet. The goal: to create a semi-living entity that will seemingly learn, evolve, and become conditioned to express itself through art. The project was originally created in 2001, but has changed and evolved in seven art galleries since then, most recently in Shanghai, China this year.

How it works: Neuroscientist **Steve Potter, PhD**, who runs the Laboratory for Neuroengineering at Georgia Institute of Technology cultures neurons from the cortex of embryonic rats in a Petri dish with 60 microelectrodes (a multi-electrode array or MEA) embedded in it. Through these electrodes, the researchers/artists can send sensory inputs (electrical stimuli) to generate responses (action potentials) that can be converted into movement (drawing) by robotic arms located remotely (over the Internet). For each artwork, a single camera shot of a viewer in the art gallery is converted into a 60 pixel image (corresponding to the 60 microelectrodes) and is sent to the neurons as an electrical stimulus. Computer software processes the resulting neural signals to create a vector that represents the relationship between the current position of the drawing arm and the position on the culture plate of the highest neural activity. This vector is then used to move the robotic arms holding colored pens.

By closing the loop from neural activity to behavior, sensing, and stimulation, the researchers hope that the semi-living artist will learn something about itself and its environment. At the same time, MEART provokes humans to explore questions such as: "What is creativity?" and "How does the evolution of biotechnology alter our definition of creativity?"



Here we see the MEART brain (neurons cultured on a multi-electrode array), the artist's body at work (moving robotic arms), and one of the artist's drawings. Courtesy of Symbiotica Research Group at the University of Western Australia in collaboration with Steve Potter's Lab. Photos by Philip Gambien (robotic arm; drawing) and Steve Potter (multi-electrode array).