

Cybernetic artist gives culture new meaning

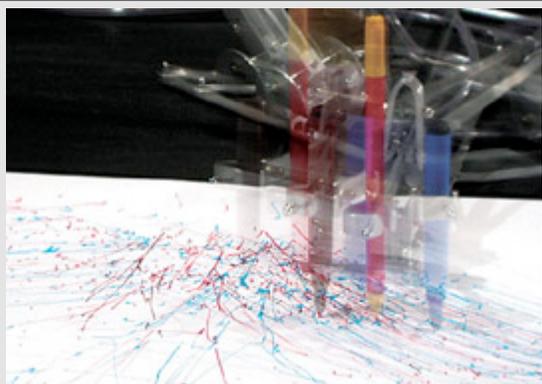


Photo Courtesy Phil Gamblen

Armed with a pair of pens, MEART's robotic arms fly across the page as it creates another masterpiece.

By Hernando Jimenez

Contributing Writer

Among innumerable research projects across the Institute, a semi-living artist is breaking ground in bioengineering and art. What at first glance seems to be a confusion of cables, computers and cell cultures in a fridge is in fact a living entity capable of producing, albeit in primitive ways, art pieces. Its name, complete with a subtle reference to its purpose, is MEART.

The Multi-Electrode Array aRT project was spawned from the artistic minds of Philip Gamblen and Guy Ben-Ary of the SymbioticA

Australia. "[SymbioticA] is a unique place in that it is located in a scientific department and formalizes the relationship between art and science," Ben-Ary said.

Gamblen and Ben-Ary's objective is to investigate the aesthetic outcome of living neurons interfacing with a physical body. The concept uses the electric signals produced by neurons, which are subsequently fed to a mechanical arm equipped with a pen. In turn, a digital camera records what the arm draws and feeds a signal back to the neurons.

The goldfish brain cells and electronic equipment helped them name this first installment of MEART "Fish and Chips." The prototype and full-scale model were presented in 2001 at the Ars Electronica exhibit in Linz, Austria.

A World Away

It was then that these creative artists found their scientific counterparts here at Tech. "Guy was searching around for other science-related projects and we found Steve," Gamblen said, referring to Assistant Professor Steven Potter. Potter is an assistant professor in the Department of Biomedical Engineering and one of the leading researchers at the Laboratory for Neuroengineering. "After contacting him, he replied to us and visited SymbioticA," Gamblen

Cybernetic artist gives culture new meaning

replied to us and visited SymbioticA," Gamblen said. "We decided to collaborate."

The son of an engineering father and an artist mother, Potter has numerous achievements as a scientist and a strong connection to art. His website has both professional and artistic pages presenting his work in both areas.

"My maternal influence certainly gave me an appreciation for art in all forms," Potter said.

Thanks to the collaboration with Potter, Ph.D. student Douglas Bakkum and a small army of undergraduate assistants, the project has received an invigorating scientific infusion. "The technology is totally different...it helps us put more order and rules on what we are studying," Ben-Ary said. "Doug helped us get the arm to reflect what is happening with the neurons in the dish and to be more accurate [in drawing]."

"The idea is that neurons make associations about what goes on in their environment. We want to give them a body and see what associations are made, what they learn and how they do it," Bakkum said. "We constantly record the voltage output from the neuron cultures and see how they change with different inputs."

"We use [MEART] as a visualization tool to look at changes in neural activity that may be related to learning. As such, it may help us

or forget," Potter said.

Currently MEART is considered a geographically detached bio-cybernetic project. While the neuron cultures and interfacing hardware (the brains of MEART) are located at Tech, the mechanical arm and digital camera are with Gamblen and Ben-Ary in Perth, Australia. This makes communication a critical issue.

"Perth and Atlanta are almost on opposite points of the planet; there is a 14-hour time difference" Ben-Ary said. "Still we manage to run experiments in real time."

"We do use a lot of instant messaging though," Bakkum said.

"Because of this separation, the weeks just prior and during an exhibit are crucial. Having Doug meet us in all of the exhibits has been essential," Gamblen said. "It gets pretty intense because it is the only time we are physically together."

Currently, though, Gamblen and Ben-Ary are in a three month residency at Tech.

When the team is apart, the time zone difference isn't all bad, despite the communications challenges. "One time an exhibit in Melbourne opened at 4 a.m. Eastern time," Bakkum said. "We felt bad for all the undergrads up at those hours so we bought a couch for them on

Cybernetic artist gives culture new meaning

up at those hours so we bought a couch for them on eBay from Australia with MEART sponsorship and had it delivered to the lab."

Machine or Living Being?

One could call MEART a Cyborg of sorts, though the term could be misleading if it conjured up images of the Terminator or other science fiction.

Potter calls MEART "semi-living." It contains living components in its brain, which is the culture of neurons and glia. The rest of its functionality is carried out by non-living robotic components.

"It is a semi-living artist that can produce art and can die," Gamblen said in summary. What exactly does "semi-living" mean, however?

The jury may still be out on that one.

"It is a difficult subject, trying to define whether [MEART] is a living being or not. There is no cut and clear answer to that question, you can get a whole prism of answers depending on who you ask," Bakkum said.

"SymbioticA works quite closely with an ethical board. We have had to learn and become equipped to deal with some of our research requests," Gamblen said.

"[At Tech] any researcher who uses animal tissue must create a detailed protocol, reviewed annually, for the ethical and humane treatment of

approved by the Institute Animal Care and Use Committee, which includes veterinarians and animal lovers from the community."

For MEART, death is not necessarily the end of the road either.

"One time in an exhibit we had the computer screen projected on a wall," Ben-Ary said. "The arm suddenly stopped moving. We sent an IM to Atlanta wondering if something was wrong. Seconds later they replied saying the culture [of neurons] had died. What was a normal event at the lab seemed much more dramatic to the people looking at the projection on the wall."

The research efforts put into MEART raise further questions beyond the definition of "living" for both artists and scientists.

"We are interested in the gap between the philosophical and scientific definition of art," Gamblen said. "The artist is MEART, not Doug, Phil or Guy."

"You don't just go to your studio and say 'I am going to make a painting.' Instead you engage in a process. We want to explore what this process is," Gamblen said.

Drawing Conclusions

The outcomes of the MEART project are certainly intriguing for scientists and artists alike. "We want to gain scientific understanding of

Cybernetic artist gives culture new meaning

"We want to gain scientific understanding of neurons, successfully record and identify their behavior," Bakkum said. "This line of work can be directly applied to the study and design of neuro-prosthetics. It can be a mechanical arm connected to the brain, cochlear implants for the hearing impaired or visual prosthetics for the blind."

"I am just delighted that we have created an art form that gets a lot of artists, scientists and laypeople thinking about big issues on both the art and science sides," Potter said.

For more information, as well as photographs of MEART and its pieces, visit <http://www.fishandchips.uwa.edu.au>.