**Meeting the Minds**

NEUROSCIENTIST BEVIL CONWAY

# Artist's vision: Decode color perception

By Billy Baker
GLOBE CORRESPONDENT

Bevil Conway, an artist turned neuroscientist, was sitting in front of a laptop computer recently at Harvard Medical School showing off one of his latest discoveries. Small squares of color flashed rapidly on the screen — red, yellow, green — until suddenly, as the screen showed a square of deep purple, the computer's speakers crackled with electrical static.

If you ask why an artist would delve into the labyrinthine, and largely unknown, workings of the brain, the look of satisfaction on Conway's face as he leaned back in his chair said it all. The static on the speakers is the electrical signal recorded from a single neuron in a monkey's brain, a neuron that only turned on when the monkey was shown deep purple on a monitor.

"When you discover something new about the brain, it's intoxicating," said Conway. "That's the first deep purple recording in history. Philosophers have been arguing for hundreds of years whether color is encoded in the brain or is external. What's amazing is that this is in a monkey. They don't have language. When I learn something like this, I get the same feeling as when I make a painting that does something that would never have been done if I weren't around."

Conway, 34, a native of Zimbabwe who is an assistant professor at Wellesley College and a visiting scientist at Harvard Medical School, started out as a visual artist. In exploring the techniques of art — why certain color combinations work; why line drawings are effective even though they have no external basis in nature; how movement can be conveyed in a two-dimensional media — he found a desire to understand the way vision and perception work in the brain itself.

He was accepted into a neuroscience program at Harvard in 1996, but his graduate career got off to a rocky start when he told his advisers that he wanted to take art and architecture classes as well. "There was an audible gasp in the room," he remembers. "Someone told me, 'You're not here to paint.' "

But his goal was to understand vision and perception, and Conway felt that you had to go at the mystery from both sides of the campus, and, as it were, both sides of the brain. And it is this dual approach that, his champions in neuroscience say, has allowed him to breathe some new ways of thinking into the field.

"He has a deep understanding of our vision from the fact that he's an artist," said Jay Neitz, a neuroscientist at the Medical College of Wisconsin. "A normal person who's never thought how our vision is operating on a scene would never ask the kinds of questions he does. He's brought a novel and creative way to think about how the brain is breaking down information into a code that we can use."

In 2004, Conway's novel approach kicked up a storm in both the art and neuroscience worlds when he and Margaret Livingstone, a Harvard neurobiologist, published a controversial paper that said Rembrandt was "walleyed" because his eyes pointed away from each other in self-portraits. They argued that the condition, which Conway himself has and leads to poor stereo vision, may have helped the Dutch master to powerfully render a three-dimensional world in two dimensions.

At the moment, Conway, who still spends half his time making art at his Cambridge studio, is fixated on color. Many artists go through such phases — Picasso's famous "blue period" was followed by his "rose period" — but Conway is going deeper. He's looking for the neural basis of color, the answer to how it happens in the brain.

By studying the behavior of Castor and Pollux, his two monkeys, he's made an argument that color, which is accessible only through vision, is encoded into the brain.

He's found that not only are certain cells designated to respond to certain colors, but that those cells usually form in clusters. Within that, he's found that the cell population is biased — the largest population cares about red, followed by green then blue.

Conway says the goal of his neuroscience is not to make himself a better artist, but it has changed his art in subtle ways and has prompted him to observe himself in the act of creation, asking himself why he makes certain choices.

"If you look historically, every artist comes up with a theory as to why what they're doing works or doesn't work," he said. "Picasso wrote voluminously about it. Kandinsky had theories about color. DaVinci really wanted to understand the mechanisms of vision.

"I'm interested in how we see and how we make images that are effective. When I see something, I want to know what's going on in my head. Doesn't it make sense to probe why?"

JOANNE RATHE/GLOBE STAFF

**Harvard neuroscientist Bevil Conway, holding a glass box he designed, is looking for the neural basis of our reaction to color.**

## FACT SHEET

**Hometown:** Born in Harare, Zimbabwe, grew up in Canada, lives in Cambridge.

**Education:** Bachelor's degree in biology from McGill University in 1995; at Harvard, he earned a master's of medical science in 1998 and a doctorate in neurobiology in 2001.

**Family:** His twin sister, Ann-Marie Gill, is a runner who won the Calgary Marathon in July; brother, Byron, 38, is a major in the Canadian armed forces; sister, Clare Galant, 36, is an interpreter for the deaf.

**Hobbies:** Telemark skiing, squash, gardening.