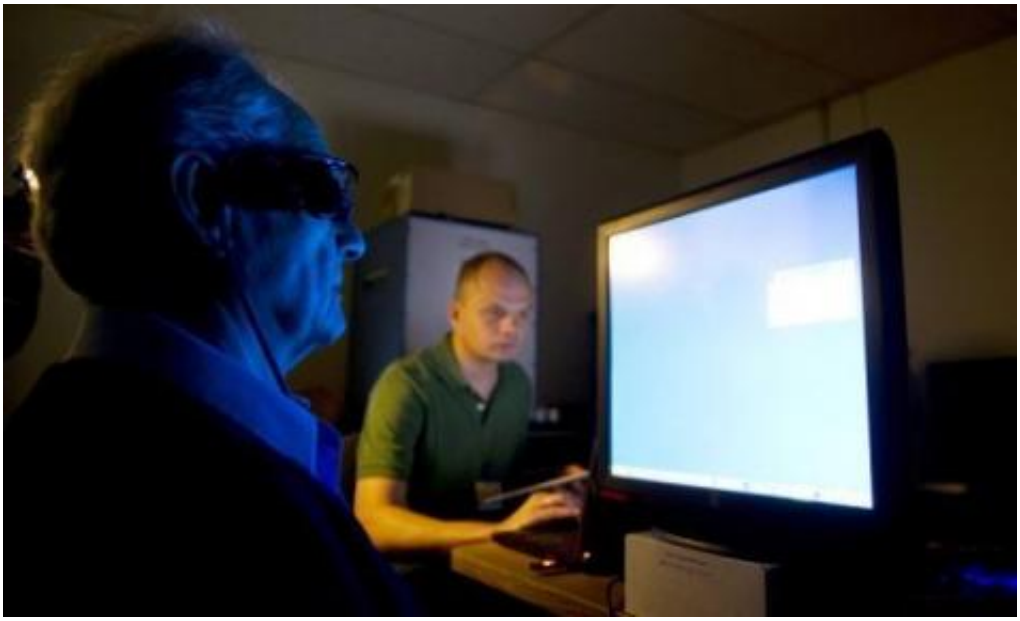
'Bionic eye' implant offers hope to the blind

April 3 2011, by Kerry Sheridan



Elias Konstantopoulus runs through an optics test with his "bionic" eye glasses during a session at the Lions Vision Research and Rehabilation Center at Johns Hopkins University in Baltimore, Maryland. Konstantopoulus is blind but working with Johns Hopkins University he has been implanted with a microchip and given a set of glasses that enable him to distinguish between light and dark.

For a man whose view of the world has slowly faded to black over 30 years, a device that allows him to see flashes of light has enkindled his hope of one day gazing upon his grandson's face.

A career electrician who grew up in Greece and came to the United States as a young man, Elias Konstantopoulos first noticed his vision

getting poorer when at age 43 he absentmindedly tried on a relative's eyeglasses and found he could see more clearly with them than without.

Soon after, he visited a doctor who tested his sight and discovered he was no longer able to see his outstretched arms from the corners of his eyes. His peripheral vision was deteriorating.

He was diagnosed with an incurable condition known as retinitis pigmentosa, which affects about 100,000 people, or one in 3,000, in the United States.

A leading form of hereditary blindness, the disease gradually eats away at the retina's rods and cones, which are photoreceptors that help people see light and identify color and detail.

About 10 years later, he could no longer see well enough to keep working.

"You lose your sight, you pretty much lose everything," said Konstantopoulos, who is now 72 and lost his final bit of vision about five years ago.

When his doctor asked in 2009 if he would like to join a three-year trial of a futuristic technology involving an electrode array in his eye and a wireless camera mounted on a pair of glasses, Konstantopoulos was eager to take part.

Now, every morning he puts on the glasses, straps a wireless device to his waist and stands by the window or out in the yard waiting to hear the sound of a car approaching. When it passes, he says he can see a block of light go by.

He can also distinguish light-colored objects against dark backgrounds,

and he can orient himself in a room by being able to see where there is an open window or door letting the sun in from outside.

The device, known as the Argus II, is made by a California company called Second Sight. It was recently approved for use in Europe, and in the United States it has given a handful of test patients like Konstantopoulos cause for optimism.

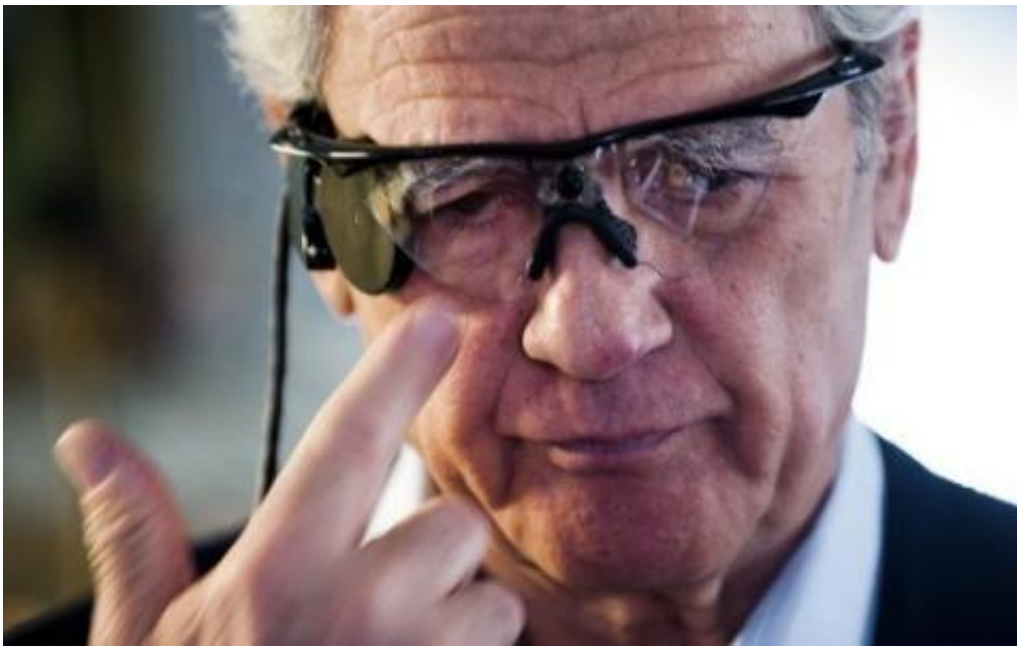
"Without the system, I can't see anything. With the system, it's some kind of hope. Something is there," he said.

"Later on, who knows with technology what it can do? Everything comes little by little."

The device is similar to the cochlear implants that have allowed hundreds of thousands of deaf people to hear again, and is part of a growing field known as neuromodulation, or the science that helps people regain lost abilities such as sight, hearing and movement by stimulating the brain, spinal cord or nerves.

Ear implants work by picking up sound through a tiny microphone, then converting those signals into electrical impulses and sending them to an electrode array implanted in the patient. The electrodes gather the impulses and ship them to the auditory nerve, which hears them as sounds.

The retinal prosthesis follows a similar process. A tiny video camera on the glasses captures images and converts them into electrical signals that are fed to an electrode array that is surgically implanted in the patient's eye.



Elias Konstantopoulus puts on his bionic eye glasses at his home in Glen Burnie, Maryland. Konstantopoulus suffers from retinosa pigmentosa, a genetic eye condition that leads to incurable blindness, yet working with Johns Hopkins University he has been implanted with a microchip and the glasses that enable him to distinguish light and dark.

The visual signals are sent to the optic nerve and then to the brain, and the patient sees them as flashes of light and blurry shapes.

"It is still a very crude level of vision but it is the beginning of an improvement," said Gislin Dagnelie, an ophthalmologist who is working with Konstantopoulos and other blind patients at Johns Hopkins University in Baltimore. "We have to learn how to talk to the retina, basically."

The implant is unnoticeable. The surgery took about three hours and caused hardly any pain, said Konstantopoulos.

According to Second Sight vice president of business development Brian Mech, the latest generation of the technology has 60 electrodes, compared to an earlier version that had 16.

"Surgery is much shorter and requires only one specialist (Argus I required 3)," Mech said.

In all, 14 devices are being used in the United States and 16 in Europe. The Argus II costs about 100,000 dollars.

The company plans to apply soon for a humanitarian device exemption with the Food and Drug Administration, and hopes for approval in 2012.

In the meantime, Konstantopoulos practices with the device one day a week in the lab with Dagnelie. At each session, Konstantopoulos traces objects he sees on a computer screen. Sometimes they walk arm in arm around the medical complex trying to spot certain objects.

He is gradually improving in his ability to interpret the light flashes and identify them as lines and shapes, the doctor said.

But among other patients, the response "varies quite a bit."

"People who have been blind for a long time probably don't have as much benefit," Dagnelie said.

As time goes on, doctors hope that the device could extend to people who suffer from macular degeneration, the primary cause of vision loss among people over 60.

"We hope that 10-15 years from now we'll have something that is quite useful, clinically," said the Dutch-born doctor.

Konstantopoulos still manages to do plenty of work around the house. He recently retiled the bathroom floor and showed visitors how he can still operate his table saw in the garage, pausing a few times to ask if his 18-month-old grandson, Anthony, was underfoot.

"He does everything. He is such a proud man," said his wife, Dina.

Back in the living room, Konstantopoulos sat in his recliner and scooped up the chubby-cheeked little boy who calls him "Papou."

"That has been my biggest complaint. I have never seen his face," he said, cradling the boy on his lap.

"I cannot see his face. Yet."