Bionic eye in sight

IT'S THE TALK of Australia and of scientists around the world and something Stan Skafidas says will finally cure age-related macular degeneration (AMD) - the world's first bionic eye.

The talk of Australia and of scientists around the world: thw world's first bionic eye.

Skafidas, who is head of research at the Victorian Research Laboratory of NICTA - Australia's Information and Communications Technology Research Centre of Excellence at the University of Melbourne - says the ambitious goal is to provide bionic vision within the next five years.

AMD is "the leading cause of blindness in first-world countries," Skafidas tells the Athens News in a telephone interview from his research lab at the university. "This collaboration between biology and electronics is capable of developing new technologies that will benefit everyone."

The disease gradually destroys the nerve cells that detect light. It affects a person's central vision, which is needed for seeing objects clearly and for common daily tasks such as reading and driving. AMD is uncommon among persons under the age of 50.

According to World Health Organisation data, AMD is responsible for 8.7 percent of all blindness due to eye diseases, affecting about 3 million people.

If all goes as planned, the world's first bionic eye will be the next big invention in terms of impaired vision since Louis Braille invented his special alphabet more than 200 years ago.

Skafidas' chances of success grew tremendously two years ago when the Australian government awarded the project 42 million Australian dollars in funding.

The bionic eye is currently undergoing animal testing.

Human trials are slated to begin in the coming years, paving the way for the first implant at the back of the eye, when wireless transmission could make vision a reality.

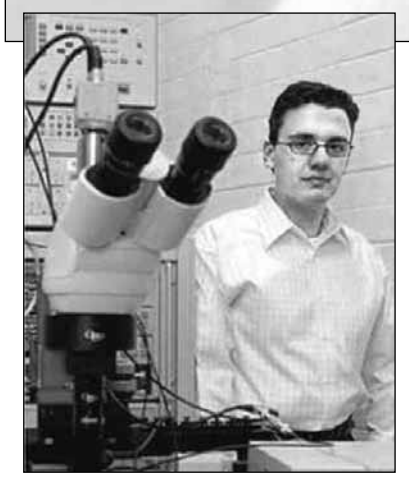
The project made newspaper headlines when Australia's prime minister, Kevin Rudd, announced the research two years ago.

Tell me more about what you are working on.

Essentially, what happens with age-related macular degeneration (AMD) is that the rods and cones in the retina deteriorate. Usually, you've got a relatively intact retina, meaning that the renal dangling cells and bipolar cells and the rest are actually still alive and still functioning. The problem is that the rods and cones in the eye are no longer functioning. With this disease, a large part of your vision is no longer - it just disappears. I guess you might have a little bit of peripheral vision but, generally, the central vision is no longer present.

How will the bionic eye help?

The bionic eye is a neural prosthesis which resides on the macula of the eye [the centre of the retina]. What it does is that it electrically stimulates the retinal dangling cells in order to give the perception of vision. So, essentially, you've got an external camera which sends a signal to a processing unit, which then determines a stimulation strategy, which essentially sends a signal to the prosthesis sitting on your eye and actually stimulates or sends electrical pulses to the neurons. These neurons send an action potential to the brain which crosses to the visual cortex and essentially gives you the perception of a dot. If you put lots of those [dots] together, they will give you an image.



Head of research at the Victorian Research Laboratory of NICTA - Australia's Information and Communications Technology Research Centre of Excellence at the University of Melbourne, Stan Skafidas

When will the bionic eye be ready for the public?

We have a low-resolution device, which has been in animal trials. We are now looking at the high-resolution device that will be in animal trials in about two years. Usually, after animal trials it takes about a year to assess bio-compatibility. So we are looking at probably the first human implants of the high-resolution device in about four or five years' time. Initially the device will be tried on humans who are having their eye enucleated [surgically removed]. They will keep the device for a couple of hours and we will run some experiments, because they are getting their eye removed, primarily because of cancer. Later we will leave it in for longer times and with more appropriate individuals.

The idea of a bionic eye sounds very futuristic.

Yes, it is. It is powered wirelessly and it involves some very novel materials, including polycrystalline diamonds. The design is also very novel. That's what allows us to build something that has the requisite rigidity and is sufficiently small so that electrodes can penetrate the retina and actually stimulate it. The retina is like tissue paper and [the device] has to be inserted with a sufficient velocity so that it doesn't tear. That's why we decided to use a diamond-like material - primarily because of the hardness.

What has been the reaction from friends and relatives in Australia and in Greece when you tell them about your work?

They're all excited - the problem is trying to explain it! They understand the concept, how it's useful, what it does, what benefit it will produce for people.

Many, however, overestimate its capability. I guess they don't know what AMD is, so they think it's treating all blind people instead of a proportion of people who are suffering from some kind of vision impairment. I guess they are a bit more hopeful.

How often do you visit Greece?

I have visited a few times. My relatives are there. I try to visit every four or five years.

Both my parents are from Greece. My mum is from the Iliea prefecture and my dad is from Messinia, Kalamata.

What was it like growing up in Australia's Greek community, one of the biggest immigrant communities in the world?

Fine. Uneventul, I guess.

There are lots of Greeks in Melbourne. There's nothing strange about it. A lot of my friends are people of Greek backgrounds. My best man at my wedding was Greek.

There's like a little Greece here. I went to a Greek school here. It's a bilingual school run by a Greek monk. It was called St John's Greek Orthodox College. I did my primary school and high school before I went to university.

A Brief Bio

STAN Skafidas is currently the head of research at NICTA, Australia's national research centre of excellence in Information and Communication Technology.

His research interests include wireless communications systems, systems on a chip, high-speed mixed signal and radio frequency microelectronics, wireless power transfer and neural interface circuits. He is currently leading NICTA research in the development of the next-generation retinal stimulation prosthesis.

Prior to joining NICTA in 2004, Prof Skafidas was a cofounder and chief technology officer of Bandspeed, a US-based developer of wireless semiconductor products. He led multinational teams developing chip sets for ADSL/VDSL /Bluetooth. Skafidas is also the co-inventor of AFH, a critical component of Bluetooth coexistence technology. To date, AFH technology has been incorporated in excess of a billion Bluetooth devices and increasing.

Skafidas has over 20 patents granted and 25 patent applications pending in the areas of microelectronics, wireless and other communication systems.

He graduated with a BE (Hons), BSc, MEngSc and PhD in Electrical Engineering from the University of Melbourne.

ATHENS NEWS