

What is the Bionic Eye?

The bionic eye is a retinal prosthesis designed to restore a sense of vision to people with profound vision loss due to retinitis pigmentosa and age-related macular degeneration. This technology makes use of a retinal implant surgically placed in the back of the eye, as well as an external digital camera and processor.

What is medical bionics?

Medical bionics is the field of science at the interface of engineering, biology and medicine, which seeks to replace lost physiological functions through technical and electronic means.

The most prominent Australian example of medical bionics is the highly successful cochlear implant, or 'bionic ear', developed at the University of Melbourne and the Bionics Institute, and commercialised by Cochlear Ltd.

What will bionic vision be like?

The bionic eye works by stimulating the perception of light in a patient. A phosphene is a perceived spot of light in the visual field. Our technology aims to stimulate many of these phosphenes across the visual field in a way that enables the patient to put together a picture of what they are looking at. The more electrodes an implant contains, the more phosphenes are capable

of being generated, and the more detail a patient may be able to see.

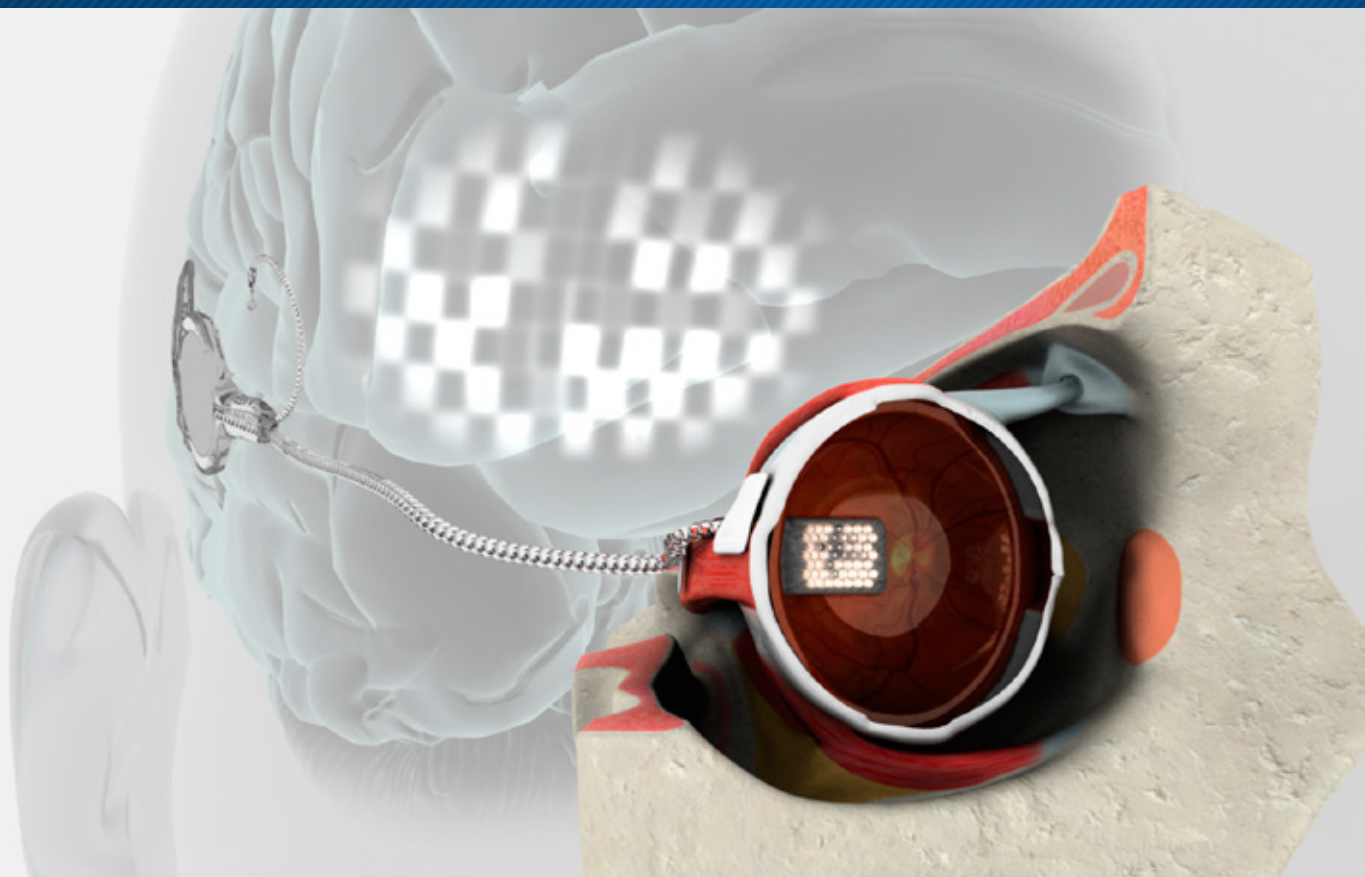
Patients will need training to adapt to the visual information provided by the implant. Further, each and every patient's experience with a bionic eye will be different. With time, training and patience, people will be able to use this visual information provided by the implant to be more independent and mobile.



How does the bionic eye work?

The bionic eye utilises an eyeglasses-mounted digital camera to capture the visual scene in front of the patient. This image is processed and then the data is sent to the implanted electrode array, which stimulates the surviving nerve cells in the patient's retina. Electrical impulses from the retina then travel along the optic nerve to the vision processing parts of the brain and are decoded into vision.

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Bionic eye prototype diagram - image courtesy of the Bionics Institute

24-electrode prototype

The 24-electrode device is an early prototype bionic eye that was implanted in three patients in 2012 as part of a two year trial. A small lead wire extends from the back of the eye to a connector behind the ear. The patients were provided with a portable system and camera to undertake mobility tasks in a laboratory setting.

Testing with the device helped researchers learn more about how the brain interprets visual information provided by the implant. Findings from patient tests fed back into development of the 44 and 98 channel devices.

44 and 98 channel devices

The retinal implant for the two devices under development will have electrodes array with 44 and 98 stimulating electrodes respectively. The implants will be placed between the choroid and the sclera layers of the retina, protecting the retina from damage during insertion and helping to maintain the implant's position. The devices use materials with established biocompatibility and biostability and they aim to restore vision to a degree that enables increased mobility and independence for patients.