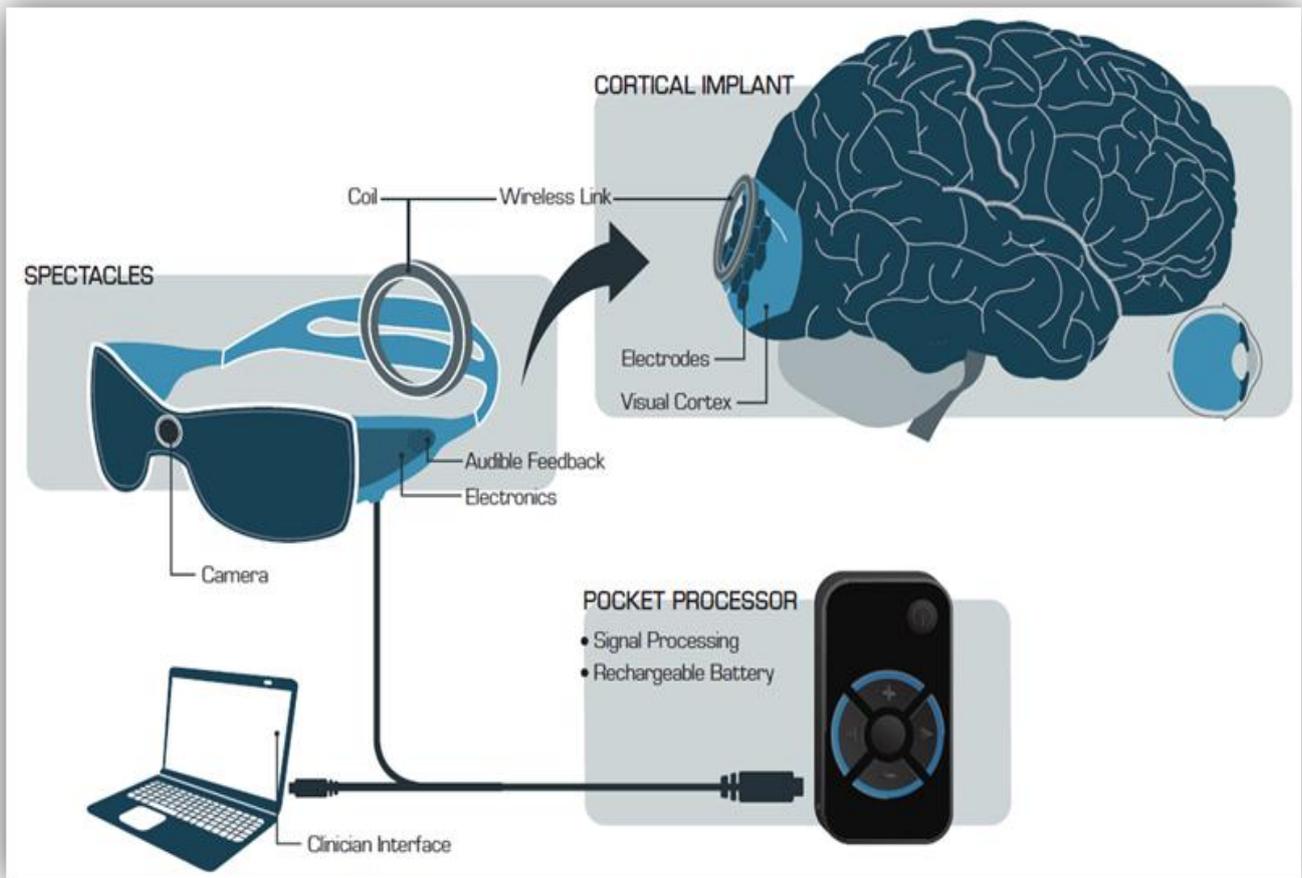


## **Information Sheet**

### **The ‘Direct to Brain’ bionic eye**

The ‘direct to brain’ bionic eye system, is designed to mimic the human visual pathway. A healthy visual pathway works through light from an object hitting the retinal cells in the eye, and initiating chemical reactions which ultimately result in the generation of electrical impulses in nerve cells. These cells form the optic nerve that runs into the brain to arrive at the primary visual cortex. The primary visual cortex starts the processes which allow us to interpret light as images, which form our vision. If parts of this pathway don’t function properly, a person can become vision impaired or blind.

The Monash Vision Group’s ‘direct to brain’ bionic eye system will combine state of the art digital and biomedical technology with everyday spectacles and a discrete digital camera, similar to those found in a mobile phone.



The digital camera is mounted on the spectacles and captures information from a real scene in the user's environment. This information is transmitted to a processor unit, which extracts the critical features of the scene and using intelligent algorithms or modes, creates a new signal for transmission to the implant. The user can select specific modes to optimise vision for different situations, such as identification of a clear path for navigation or the presence of people or objects in their environment.

This new signal is transmitted by a wireless communication system through the skin and skull to an implant in the primary visual cortex. This results in activation of a number of hair-thin electrodes, or wires, that have been surgically implanted. These electrodes stimulate groups of neurons in the brain with electrical signals, to produce the perception of brief flashes of light known as phosphenes. If enough phosphenes are evoked in a particular pattern, gradually the brain can learn to interpret these patterns as sight.

## **How will the device be implanted?**

Using standard neurosurgery techniques, a small area of the skull will be temporarily opened in surgery at The Alfred Hospital. The sterile device will be implanted directly into the primary visual cortex of the brain. The skull will then be replaced and will eventually heal, providing a natural barrier to protect against infection. The implant comprises materials that are safe for use in the human body over extended periods of time.

## **Learning to use the device**

Patient safety is of the highest priority and as such, our clinical team will work closely with patients prior to and following surgery to

provide support and training. Initially the device is expected to work in conjunction with aids such as a seeing-eye dog or a white cane. Over time, however, we hope that the bionic eye will replace these aids and eventually the technology will be refined to enable the reading of large print.

Although in early stages the implant will not produce high definition vision, our team aims to provide enough visual information to assist the user in performing daily activities such as navigating familiar environments (for example, their home) and to recognise the presence of people and objects around them.

## **Who will it help?**

This device is being developed for people with vision impairment caused by conditions such as glaucoma, macular degeneration and diabetic retinopathy. These three conditions cause up to 85% of cases of untreatable clinical blindness. The device may also help people who have suffered physical trauma to the eye or do not have a functional optic nerve, which is often a limitation of other bionic eye technologies.

## **About The Monash Vision Group**

The Monash Vision Group (MVG) is a consortium of engineers, computer scientists and biomedical researchers from Monash University and doctors from The Alfred Hospital in Melbourne, along with Victorian companies Grey Innovation and MiniFAB. MVG was established in April 2010 to develop the ‘direct to brain’ bionic eye and is supported by an \$8 million grant from the Australian Research Council. First patient tests are scheduled for 2014.

## **Contact Us**

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