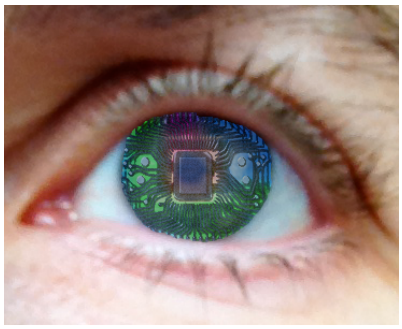
THE 'BIONIC' EYES HAVE IT



Back in the day I remember being gobsmacked at the idea of a bionic man. The notion that body parts, especially sophisticated ones like eyes, could be replaced when damaged seemed so fantastic that it was beyond belief. But, by today's standards, how out-of-this-world is the concept of a bionic eye?

To understand the magnificence of this invention, let's first take a closer look at how the eye functions. When light comes into our eyes, it hits a thin membrane called the retina that lines the back of our eyeball. The light is then converted into neural impulses by specialised cells called photoreceptors (the rods and cones), so named because they detect photons (light) that pass into the eye. The neural impulses created by the photoreceptors are then carried into the brain by output cells, and the brain then decodes these signals into meaningful images.

So, if we wanted to make a bionic eye, we would need to assemble devices that could capture light, convert that light signal into a neural impulse, and transmit the neural impulse into the brain. Although that seems like a big ask, many of these functions are still intact in people with visual impairment. Macular degeneration and retinitis pigmentosa, two of the leading causes of blindness, result mainly in loss of photoreceptors. So, our bionic eye really only needs to replace the photoreceptors with artificial light detectors, and be able to convert the light signal into neural impulses that the brain can understand. Artificial light detectors with a wide range of sophisticated abilities abound – just think about all the options you considered when buying that new camera. But how can we convert the camera output into neural impulses that the brain can understand?

New research, performed at Cornell University in the United States, has recently uncovered the code of neural impulses that is sent from the retina into the brain. Researchers began by recording the patterns of neural impulses that were created when a series of images were viewed by a normal patient, in this case a mouse. This allowed researchers to understand the relationship between specific features of images and specific neural impulses, and to represent this as a generic code.

Once this retinal code was revealed, researchers quickly developed the new bionic eye. In preliminary tests the code appears sophisticated enough to reconstruct images of simple faces. Wow! Similar research has also recently been performed by Bionic Vision Australia, a partly government-funded research consortium. The Australian device directly stimulates the retinal output cells, without using the retinal code, and has been successfully implanted into human participants. Although simple, this device is easily implantable and recipients have reported 'seeing' flashes of light for the first time.

Exciting times are clearly ahead for the advancement of this technology. And its simplicity means it will be available for you and me. How cool is that?

REFERENCES:

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