Argus II retinal prosthesis is surgically implanted in and around the eye. (Actual prosthesis pictured)

Bionic Eyes - Fact or Science Fiction?

On February 14, 2013, the FDA unanimously approved the Argus® II Retinal Prosthesis System (Argus II) for Retinitis Pigmentosa patients age 25 and up who have severe to profound disease with little or no light perception in both eyes.

The Argus II, also known as the bionic eye or the retinal implant, is intended to provide electrical stimulation of the retina to induce visual perception in blind individuals.

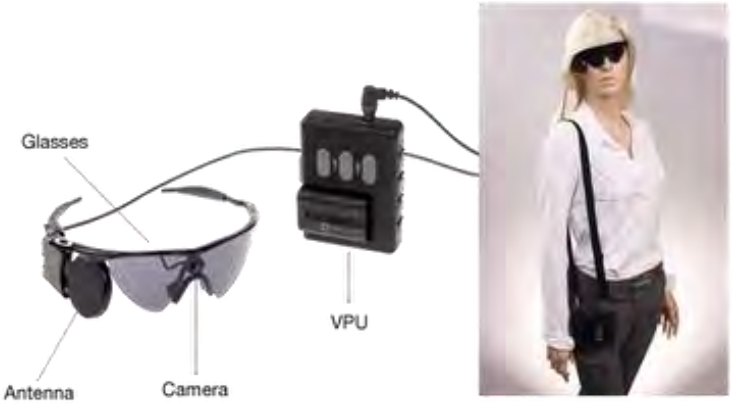
In a healthy eye, the photoreceptors (rods and cones) in the retina convert light into tiny electrochemical impulses that are sent through the optic nerve and into the brain, where they are decoded into images. If the photoreceptors no longer function correctly, the first step in this process is disrupted, and the visual system cannot transform light into images.

Argus II is the first implanted device to treat adults with severe vision impairment or blindness caused by Retinitis Pigmentosa. The System has three parts: a small electronic device implanted in and around the eye, a tiny video camera attached to a pair of glasses, and a video processing unit that is worn or carried by the patient.

The science behind the fiction

The patient wears glasses with an attached video camera that captures images of the surrounding area. These images become an electrical signal which is processed by the video processing unit. The signal is then wirelessly delivered to the eye, stimulating the retina. This electrical stimulation of the retina is recognized by the brain as spots of light.

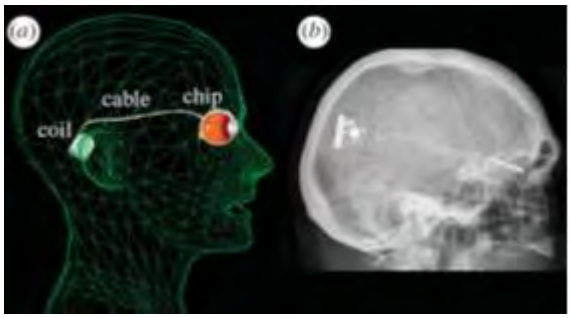
The Argus II is designed to bypass the damaged photoreceptors altogether, and create the perception of patterns of light which patients can learn to interpret as visual patterns.



FDA approval

The FDA specified that the device is approved for patients diagnosed with Retinitis Pigmentosa who have inner layer retina function and a history of being able to see forms. Due to the severity of retinal degeneration in Alström Syndrome and the multiple organ involvement of the disease path, it is not yet known if this medical advancement is now, or will ever be an option for Alström patients.

To the future and beyond….



Future generations of the bionic eye are already being studied with the use of light-sensitive microchips implanted in the inner surface of the eye.

These microchips are approximately 3 mm by 3 mm in size, but are loaded with 1,500 light detectors that send a grid of electrical impulses through a patient's nerves to generate a 1,500-pixel image. The device is implanted under the retina, unlike the Argus II implants that sit outside the retina and require users to wear an external camera mounted onto a pair of glasses.

The signal from the microchip is boosted by a coil implanted in skin behind the ear and sent back to cells still active on the retina, which in turn send an image to the brain through regular neural circuits. *See figure (a) and (b).* A small battery mounted behind the ear -- the only external sign of the device -- contains controls for brightness and contrast.

A recent trial of the microchip gave 8 out of 9 patients sight in varying degrees, with three in the study even able to read letters and see the faces of family members. Given that the Argus II finally crossed the FDA's bionic eye barrier; hopefully we won't have to wait nearly as long for research like this to become a product.