# Artificial Vision

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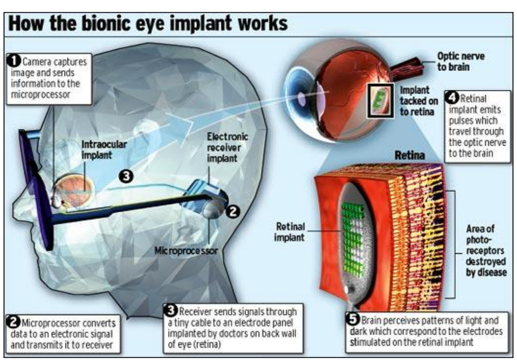
Retinitis Pigmentosa is a group of eye conditions that are responsible for more than 1.5 million cases of blindness worldwide. There aren't many products or procedures on the market that can return vision to people affected by RP. One way scientists are looking to help return vision to blind patients is by retinal stimulation via a retinal prosthesis.

Though the retinal stimulation products may vary from different companies, they all have four major components in common. A battery back is usually externally worn and provides the power to the camera and processing unit of the prosthetic. An image capturing device, such as a camera, is external worn and captures images from the outside world. The processing unit takes the images gathered by the camera and translates them into electronic signals. The electronic signals are then transferred to a microelectrode array, which is connected to the retinal wall of the eye.

The Intraocular Retinal Prosthesis (IRP) was created and developed by Dr. Humayun of the University of California. The device consists of both external and internal components. The external components consist of a camera, connected to a pair of lightweight glasses, and a battery back, usually the size of a page. The internal components are the processing unit, which is pager sized and implanted behind the patients ear, and the microelectrode array. The microelectrode array consists of 16 platinum microelectrodes and is connected to the processing unit by a small wire.




A clinical trial was done with 6 patients suffering with vision loss. The first signals were sent to the processor via an external computer. Then when the patients said they could see different dark/light patterns, they connected the external camera. After a few months, patients were able to detect when lights were on or off, patients could describe an object's path of motion, and patients could count different discrete objects. The results also showed that the healthier a person's retina is, the lower a level of current is needed to operate the prosthetic.

Another prosthetic called the Learning Retina Implant, was created by 14 groups of experts in Germany. This device is similar to the IRP, except that the microelectrode arrays consist of 60 microelectrodes instead of 16. The receiver of the microelectrode also has an infrared receiver, so the signals and energy is transferred wirelessly.

A clinical trial was conducted with 11 patients who suffered from retinitis pigmentosa. The results of the study showed better results than the IRP. After a few months with the device, patients could read letters and form them into words, they could recognize different objects from one another, and they could also tell movements of objects. The most amazing result is that after a few months, the patients could tell the height and arm movements of another person from twenty feet away.

The future for artificial vision looks promising. Scientists hope to change the external glass mounted camera into a less visible contact lens. They also hope to change any wired components into wireless components. This would alleviate the need from extra wires or surgeries. They also hope to incorporate solar cells into the microelectrode arrays; this would turn the incoming light into energy to power the microelectronics. They also hope that, when the technologies is available, they can create microelectrode arrays consisting of thousands of electrodes.

<u>References</u>

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