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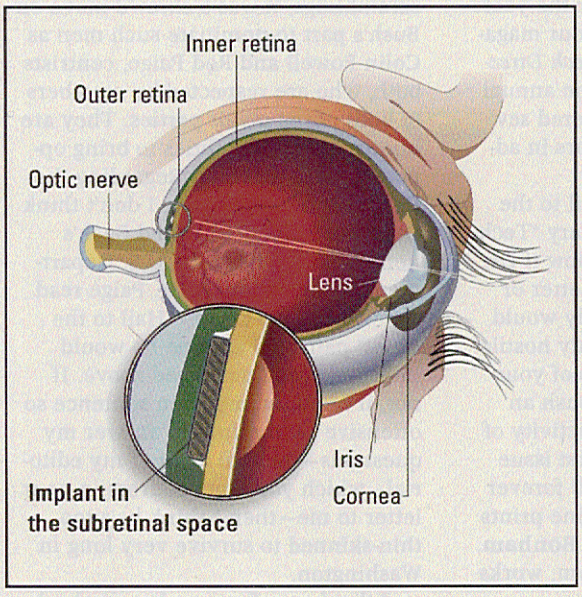
Bionic Sight

DR. Alan Chow originated the idea of a vision chip over 15 years ago. As a Pediatric Ophthalmologist, he was frustrated by his inability to prevent a degenerative eye disease from blinding one of his young patients. In a paper that he wrote, he indicated that he spent a few years researching how the eye's retina converts photonic analog signals into chemical signals that in turn are converted into sight.

This research convinced him of the possibility to design and build a vision prosthesis that could provide some sight to people suffering from certain retinal diseases and accidents that damage only the eye's outer retina.



The figure above illustrates an eye with a vision chip in place.

Chow's vision of a sight prosthesis took its first step toward reality when he discussed the concept with his brother at a Thanksgiving dinner in 1988. Together, Alan the eye doctor and Vincent the electrical engineer formulated the conceptual framework for the first Artificial Silicon Retina (ASR). They started a new company, Optobionics, to develop their vision chip.

The idea behind the vision chip is very simple. Build an electronic bridge that can convert the photonic stimulation of the outer retina into electrical stimulation that the eye's inner retina can process. Optobionics has built a tiny silicon chip containing 3,500 solar cells that convert light into electrical signals. These signals stimulate the working cells of the eye's inner retina. The light it receives from the eye's lens powers the chip. It passes on its signals without using wires or a camera. In reality, it is a bridge that allows the eye's image to pass the transmission dead spot of the outer retina.

To accomplish this task, the ASR is placed in a subretinal position so it can receive and process a full range of light intensities into electric signals. These signals contain continuous shades of light and shadows. To understand this concept, compare the technology to a movie camera. The camera lens projects images of light on the film. ASR receives photonic images from the eye's lens, converts them into electrical signals, and then sends them to the receptors of the eye's inner retina. The photo below shows the relative size of the vision chip compared to a penny.

The FDA has recently approved clinical trials, in up to 10 patients, of Optobionics ASR. To date three patients have now had the ASR implanted. Two of the surgeries were performed on June 28, 2000, at the University of Illinois at Chicago, Medical Center. The third was performed on June 29th at Central DuPage Hospital in Winfield, IL. The surgery itself, for the most part, followed the protocol of detached retina surgery.

Today, patient vision testing, data analysis of the ASR's functionality, and research into the vision chip's effect on the human biological environment are all on-going. You can gather the latest released information at **www.optobionics.com**.

The vision chip, which is an artificial outer retina, might do for sight what the cochlear implant has done for hearing. This very exciting news story is just starting to unfold. We are still very far from being able to restore full human hearing. We are just beginning to be able to restore the slightest bit of human sight. Therefore, the sight and hearing of the bionic man and the bionic woman are still very much just science fiction.

Recalling the Facts:

1. What knowledge did Alan and Vincent Chow each bring to the development of the ASR?
2. Explain why the vision chip is considered an artificial silicon retina.
3. Describe how the vision chip works.