

A tropical landscape featuring palm trees and a body of water, overlaid with a semi-transparent grey rectangle containing text.

Epiretinal Vision Prostheses

Stephanie Liddle

Content

- Application of epiretinal vision prostheses
- History of optical electrical stimulation
- Components of epiretinal prosthesis
- Studies to date
- Future work







Retinitis Pigmentosa

- Degenerative disease
- Affects 1 in 4000 people in the world
- Destroys light sensitive rods and cones of the retina
- Loss of peripheral vision
 - Over time field of site gets smaller and smaller

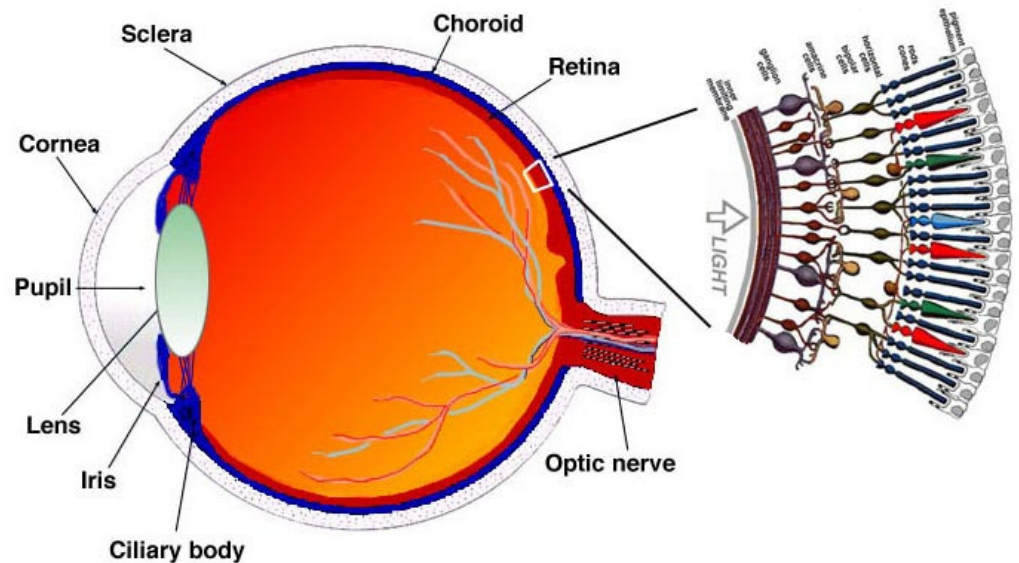


Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.

Retinitis Pigmentosa

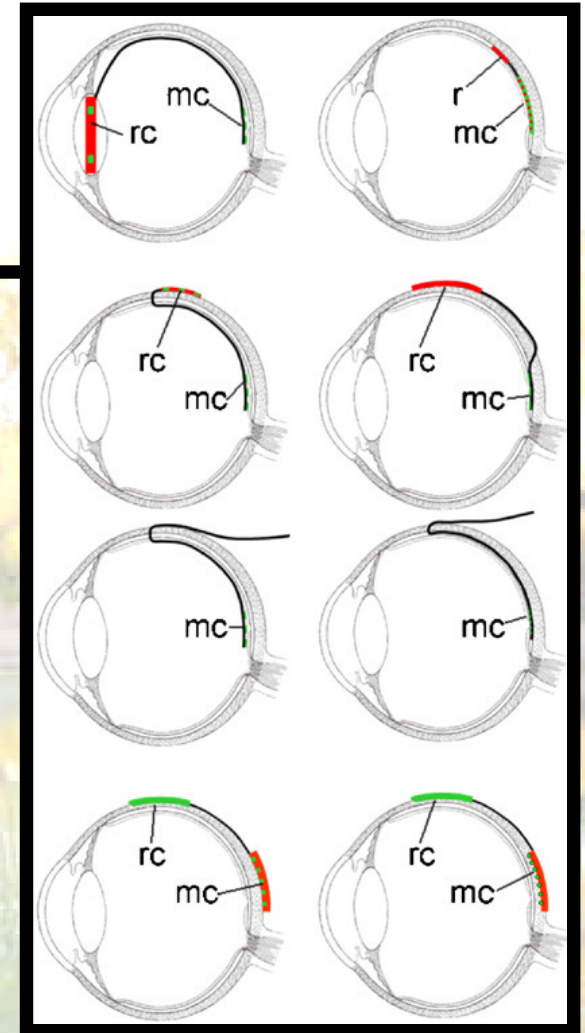
Good News

- 30% of the ganglion cells remain working after years of blindness
- Electrical stimulation of cells can yield visual sensation
 - Bypass degenerated photoreceptors

Optic Stimulation History

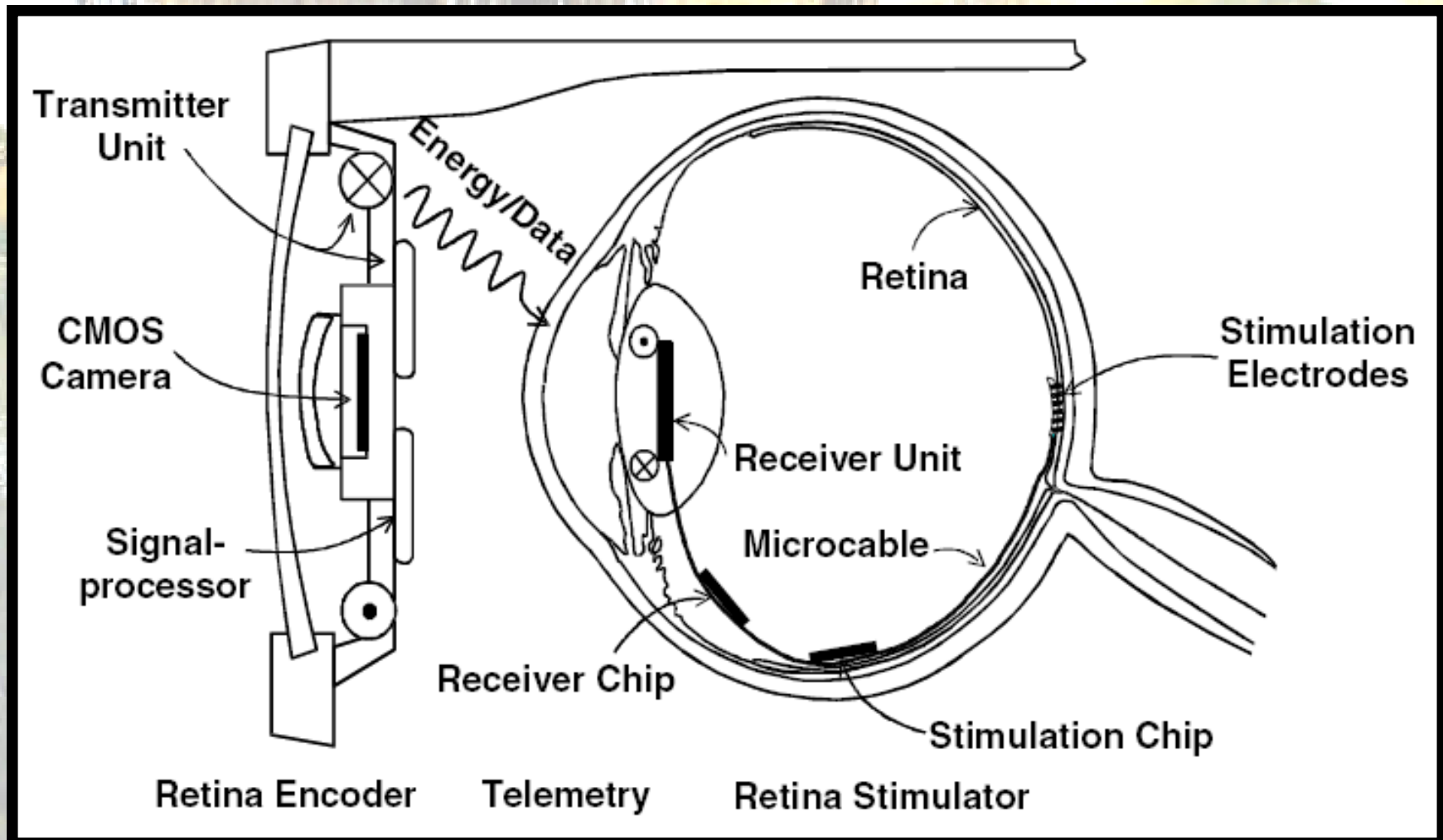


- 1755: Charles Le Roy electrically stimulated blind person



- Today: Over 20 groups around the world working on retinal implants to restore basic orientation to the blind population

Epiretinal Vision Protheses

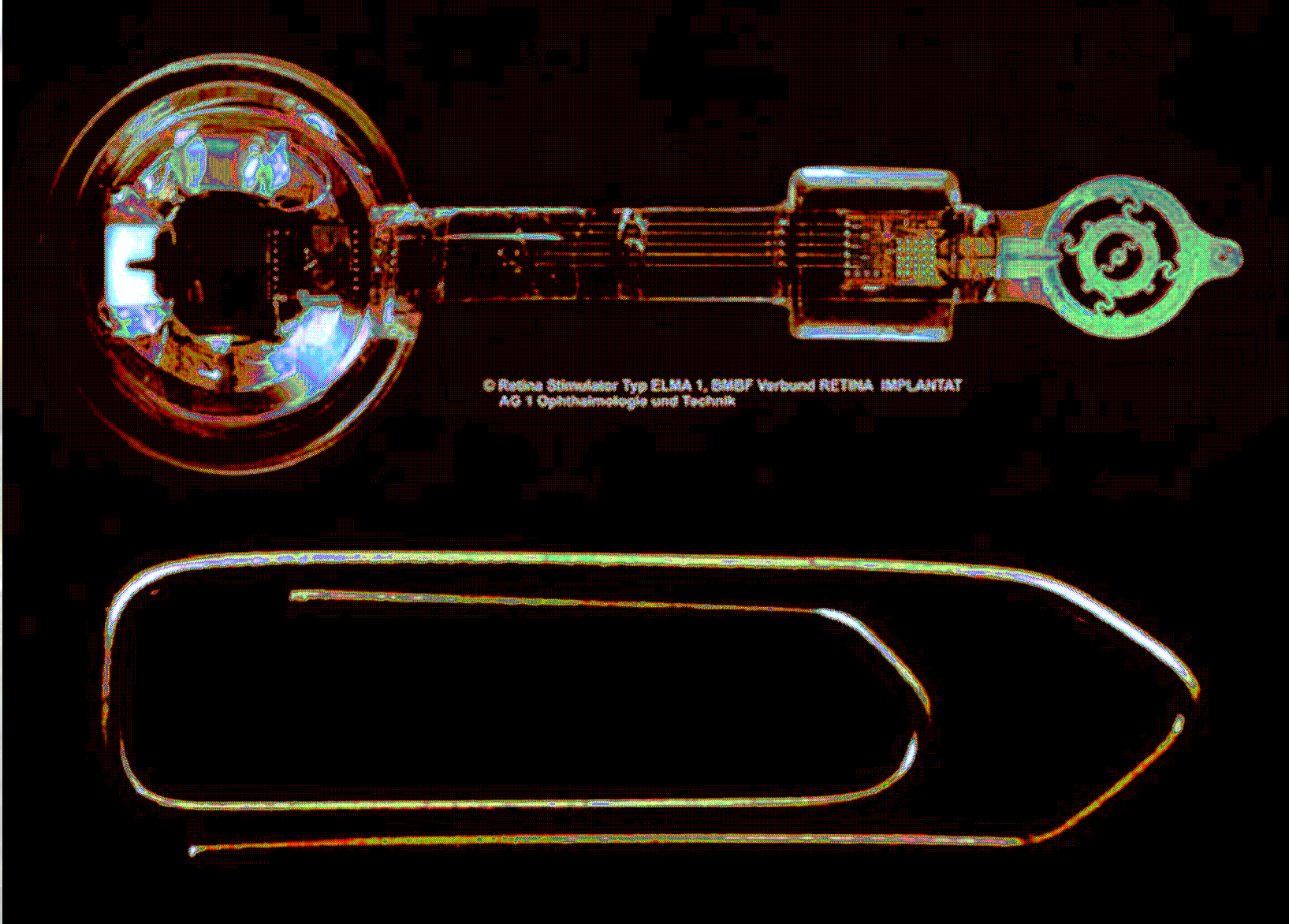


Extraocular Components

- CMOS image sensor
 - Acquires visual images
- Artificial neural net
 - Transforms images to control signal
- Energy supply
 - Powers intraocular components
- Transmitter
 - Transmits signal and energy to intraocular part

Intraocular Components

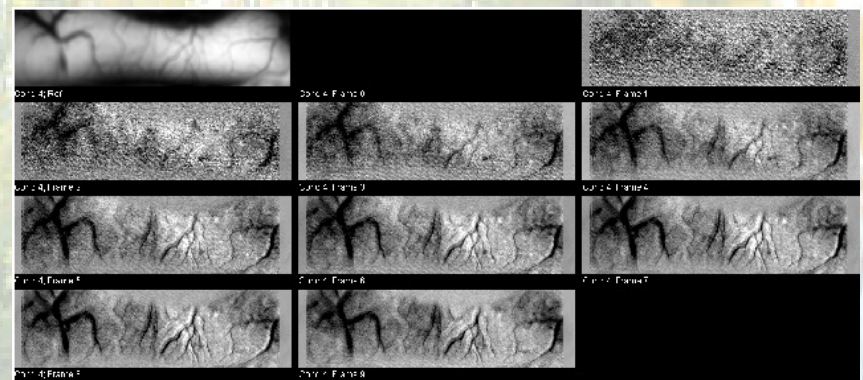
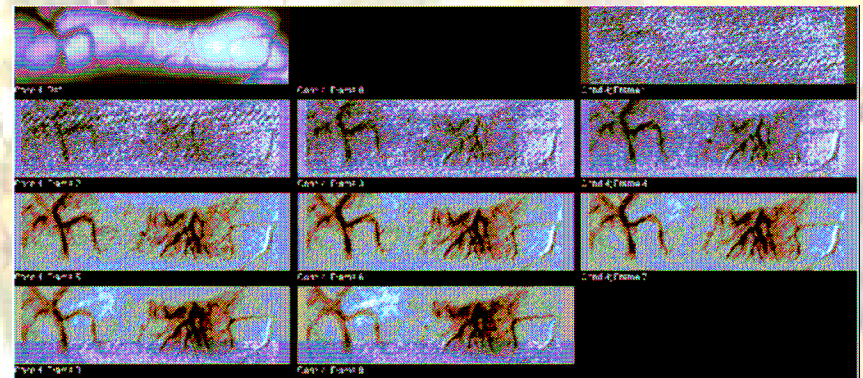
- Receiver Unit and Chip
 - Receives data & separates energy and data signals
- Micro cable
 - Connects intraocular components
- Integrated circuit
 - Decodes data stream & selects impulse programme
- Electrodes
 - Applies current to upper ganglion



© Retina Stimulator Typ ELMA 1, BMBF Verbund RETINA IMPLANTAT
AG 1 Ophthalmologie und Technik

Results of Testing

- Implantability and long-term tolerability studies
- Implantation studies in mini pigs and cats



Further Developments

- Further miniaturization
- Heat dissipation
- Long-term survival of ganglion cells
- Biocompatibility

A tropical landscape featuring palm trees and a body of water. The scene is captured in a soft, golden light, suggesting late afternoon or early morning. The palm trees are reflected in the calm water, and the overall atmosphere is serene and peaceful. The text "Thank You" is centered in the lower half of the image in a white, serif font.

Thank You

References

1. Gerding, H. "A New Approach Towards a Minimal Invasive Retina Implant." Journal of Neural Engineering 4 (2007): s30-s37. 11 Feb. 2008.
2. Mokwa, W. "MEMS Technologies for Epiretinal Stimulation of the Retina." JOURNAL OF MICROMECHANICS AND MICROENGINEERING 14 (2004): s12-s16. 20 Jan. 2008.
3. Rizzo J F and Wyatt J. "Prospect for a visual prosthesis." Neuroscientist 3 (1997): 251-262. 11 Feb. 2008.
4. Wagner, Valero-Cabre, and Pascual-Leone. "Noninvasive Human Brain Stimulation." Annual Review of Biomedical Engineering 9 (2007): 527+. 11 Feb. 2008.
5. Weiland, James D., and Mark S. Humayun. "Intraocular Retinal Prosthesis." IEEE Engineering in Medicine and Biology 2 (2006): 60-65. 11 Feb. 2008.
6. Zhang, Bo, Sheng Liu, and Zhiyin Gan. "Development of Flexible Stimulation Devices for Vision Prosthesis." IEEE: 7th International Conference on Electronics Packaging Technology (2006). 11 Feb. 2008.

Retinitis Pigmentosa

Treatments

1. Nutritional Therapy
2. Gene Therapy
3. Therapeutic Agents to Rod and Cone cells
4. Implantable Microchip

**** NO KNOWN CURE**