Second Sight

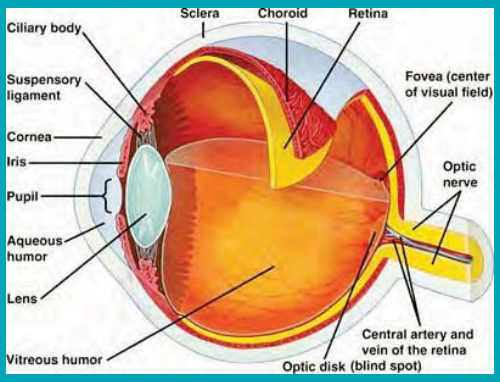
Argus® II Retinal Prosthesis System

Restoring vision to the blind

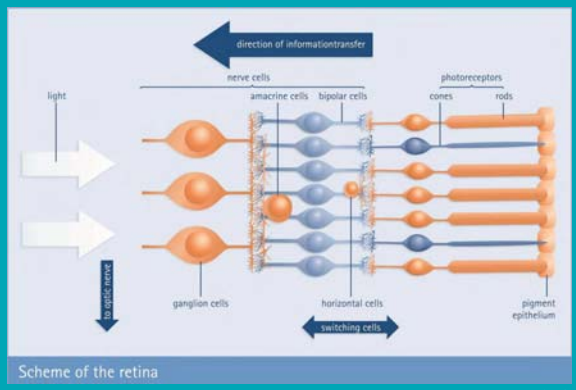
Gregoire Cosendai, PhD VP Europe

The Eye

The Eye's structures



Retina: The Eye's Brain



Scheme of the retina

45 Million BLIND People in The World

Causes of Blindness

- Cataract
- Macular Degeneration
- Trachoma
- Glaucoma
- Diabetc Retinopathy
- Retinitis Pigmentosa

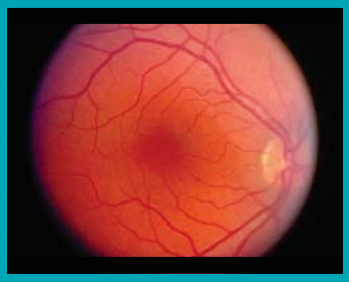
What is Retinitis Pigmentosa (RP)

- A group of inherited diseases causing retinal degeneration
- Abnormalities of the photoreceptors or the retinal pigment epithelium cause loss of vision
- Incidence of RP in the US is estimated at 100,000

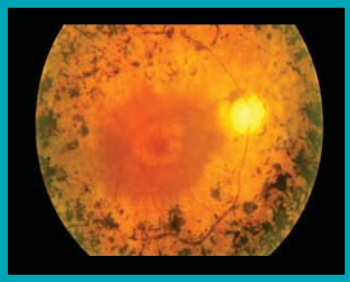
…and Macular Degeneration

- Macula suffers thinning and atrophy
- Leading cause of permanent visual impairment (ages 50+)
- Incidence in US is over 1.7 million

Retinitis Pigmentosa

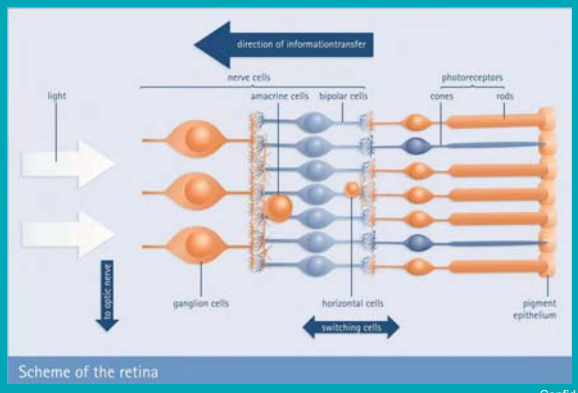


healthy retina



RP retina

Photoreceptor death



Scheme of the retina

How does RP Blindness progress?

Generally:

- Night vision loss by age 20 - Stage I
- Peripherial vision loss by age 30 - Stage II
- Legal blindness by age 40 - Stage III
- Complete blindness - Stage IV

No treatment

Research Therapeutic Strategies

1. Repair the Genes (I-II)
2. Slow the disease (I-II)
3. Regenerate photo receptors (II-IV)
4. Make other cells perceive light (III-IV)
5. Bypass retina (III-IV)

A "Second Sight"

Second Sight® Medical Products Inc.

Founded: 1998
Product: Retinal Prosthesis
Target Population:
Retinitis Pigmentosa (RP)
Founders:
Al Mann
Other private investors
President: Robert Greenberg
Other Funding:
NIH DOE

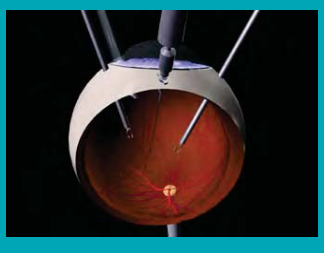
Second Sight

Argus® II Epiretinal Prosthesis Systems

Twenty years ago, in 1992…

Acute Human Studies

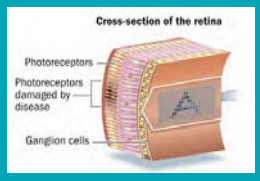
- 1-2 hours of stimulation
- 15 patients
- Local anesthesia
- Demonstrated perception of phosphenes



Second Sight

Argus® Epiretinal Prosthesis Systems

…towards the active implantable device:



- Uses electrical stimulation to bypass defective photoreceptors and stimulate remaining viable retinal cells.
- Image data from an external camera is wirelessly transmitted to the implant which stimulates electrodes in an array on the retina to produce formed vision.
- Robust and designed to last a lifetime.

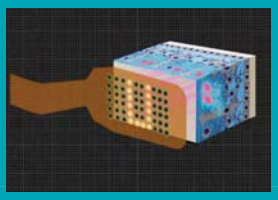
Second Sight

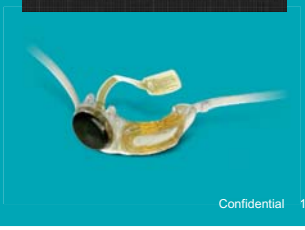
Argus® II Retinal Prosthesis System

Second Sight

Argus® II Retinal Prosthesis System

- Argus II is intended to provide electrical stimulation of the retina to induce visual perception in blind individuals
- Argus II is approved for use in the European Economic Area (CE Mark)





Second Sight

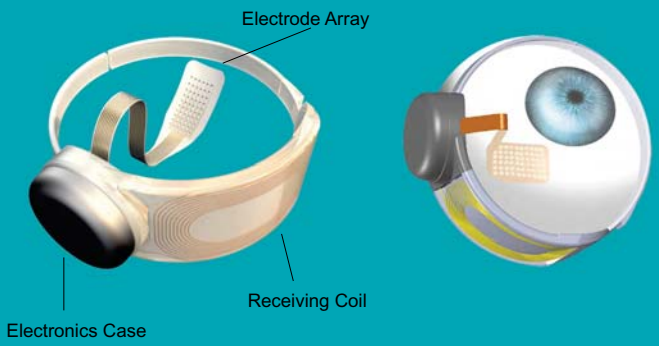
Argus® II Retinal Prosthesis System

Indications for Use:

- Adults, age 25 years or older
- Severe to profound outer retinal degeneration
- Some residual light perception remains, the retina must be able to respond to electrical stimulation
- Previous history of useful form vision

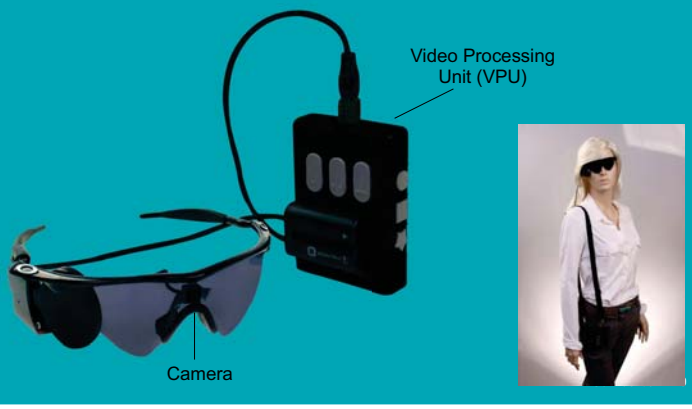
Second Sight

Argus® II Retinal Prosthesis System



Second Sight

Argus® II Retinal Prosthesis System



Second Sight

Argus® II Surgery

Second Sight

Argus® II Surgical Procedure

Second Sight

Scientific Results of Argus® II

Second Sight

Enrolment / Demographics

	Worldwide
Subjects (n)	30* (26 right eye, 4 left eye)
Age at Time of Implant (years)	58 œ10 (range 27 – 77)
Female : Males	9 : 21
# Years Implanted	2.7
Median Surgery Time (hours)	4:04 (range 1:53 – 8:32)
Diagnostic at implant	29 Retinitis Pigmentosa 1 Choroideremia
Acuity at implant	30 Bare Light Perception (worst seeing eye implanted, comparable vision in both eyes)

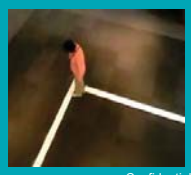
Second Sight

Performance Measurements



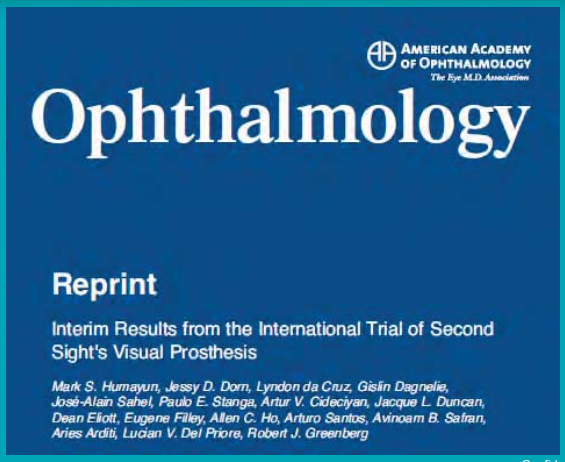
Performance Tests





Performance With System

Performance	% of subjects who perform better with System ON versus OFF
Visual Function Test	
Visual percepts	100%
Square localization	96% perform better ON vs. OFF
Direction of motion	57% perform better ON vs. OFF
Grating visual acuity	23% perform better ON vs. OFF (>2.9logMAR) Best acuity 1.8 logMAR (20/1260)
Orientation / Mobility	
Following a line	significantly better ON vs. OFF ($p < 0.05$)
Finding a door	significantly better ON vs. OFF ($p < 0.05$)



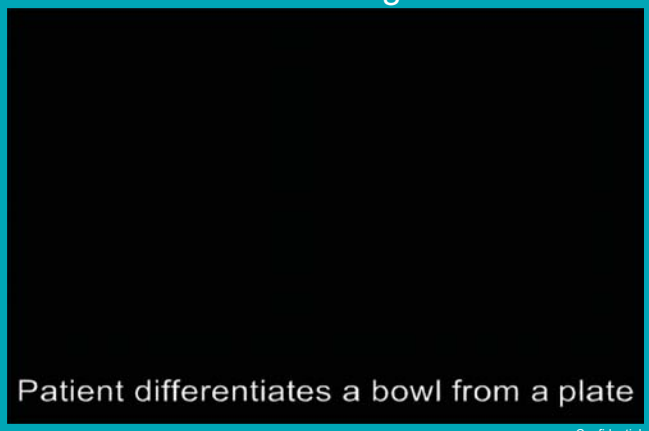
Benefits of Argus® II

- Improvements in ability to perform visual tasks demonstrated in many patients
  - Object detection
  - Direction of motion
  - Orientation and mobility
  - Visual acuity

Benefits of Argus® II

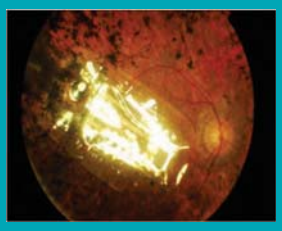
Benefits of Argus® II

Benefits of Argus® II



Features of Argus® II

- Most clinical experience of any retinal prosthesis ever developed
  - As of May 2011, 86 patient-years experience has been gathered overall



Features of Argus® II

- Conventional vitreo-retinal surgery that can be done in as little as 2 hours (mean is 4 hours)
- Minimal time from implantation to first system use and use at home

Features of Argus® II

- Upgradable hardware and software to benefit from future innovations
- Video processor with adjustable settings for individual preferences - ex.:
  - Edge enhancement
  - Contrast enhancement
- Individually programmable electrodes

Features of Argus® II

- Implant is MR conditional
- 20° maximum possible field of view
  - Can be compared to a 30 cm (12 in.) ruler held out at arm's length
- Audible signals that provide information on system functionality

Second Sight

THANK YOU