

Bionic Eyes

Sydney Beck

11/10/2015

BME 281 Section0002

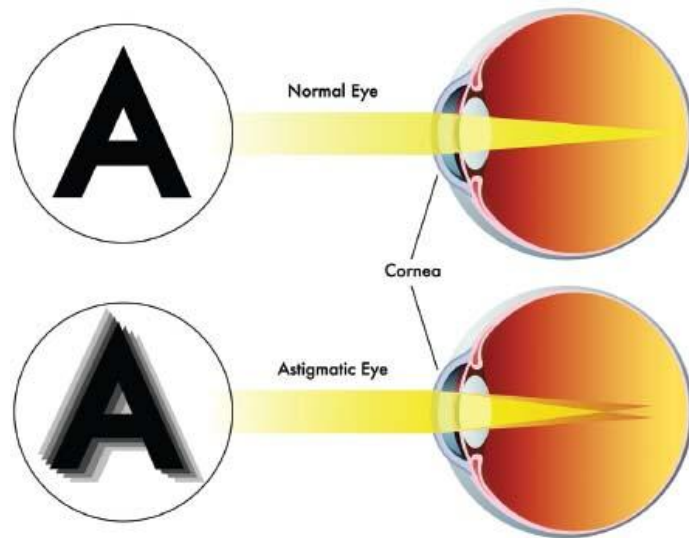
Problem

- Impaired Vision:
 - Myopia: Near-sightedness
 - Macular degeneration: loss of central vision
 - Retinitis Pigmentosa: degeneration of the retina
 - Hyperopia: far-sightedness
 - Presbyopia



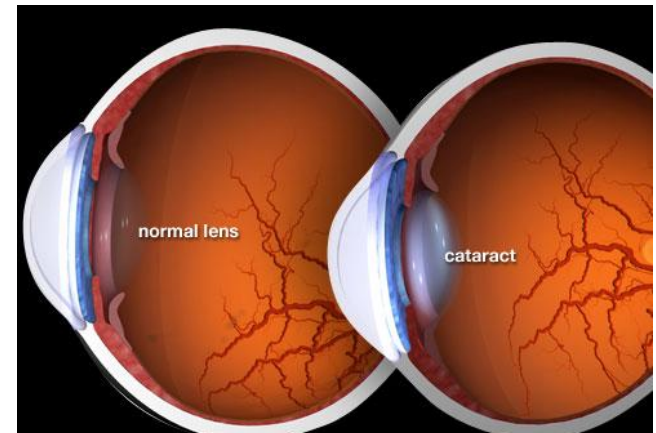
Problem

- Impaired vision:
 - Astigmatism: light does not converge to a single focal point on retina



– [4]

- Cataracts: clouding of lens



• [3]

Currently

- Topical treatments (eye-drops)
- Contacts^[1]
 - Small light-weight plastic devices
 - Correct refractive errors in vision
 - Float on layer of tears
- Cataract surgery
- Glasses:
 - Used to compensate defective vision
- LASIK



[2]

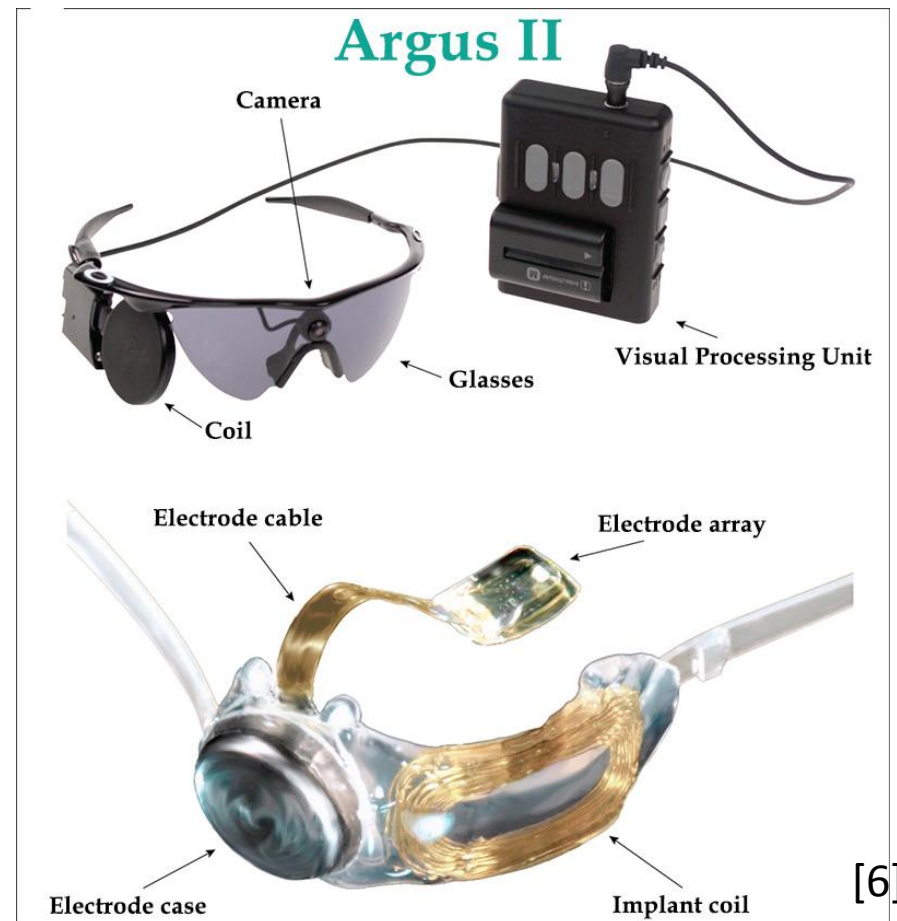
Possible Solutions

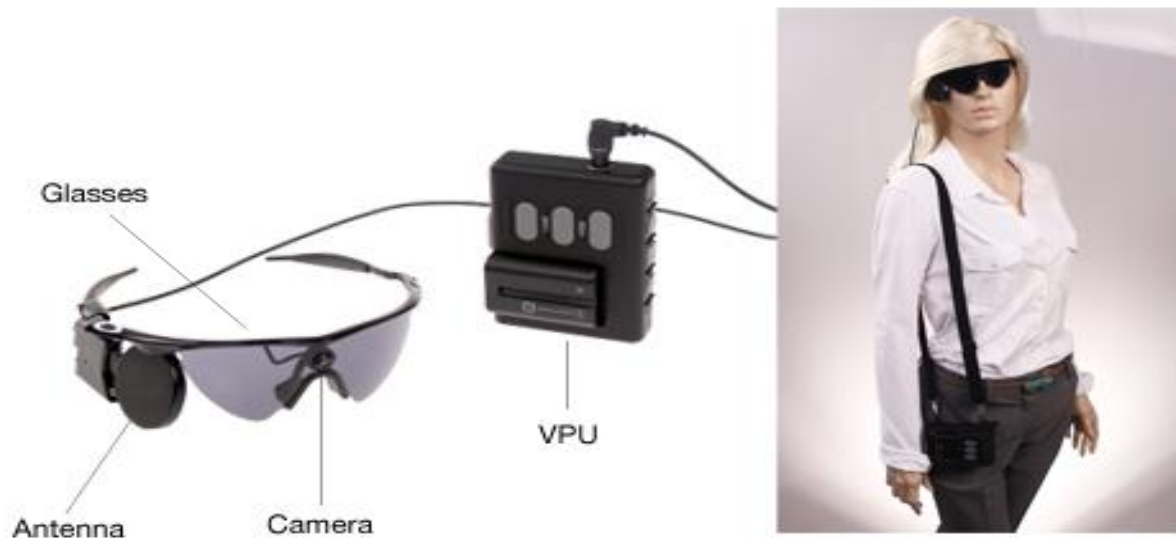
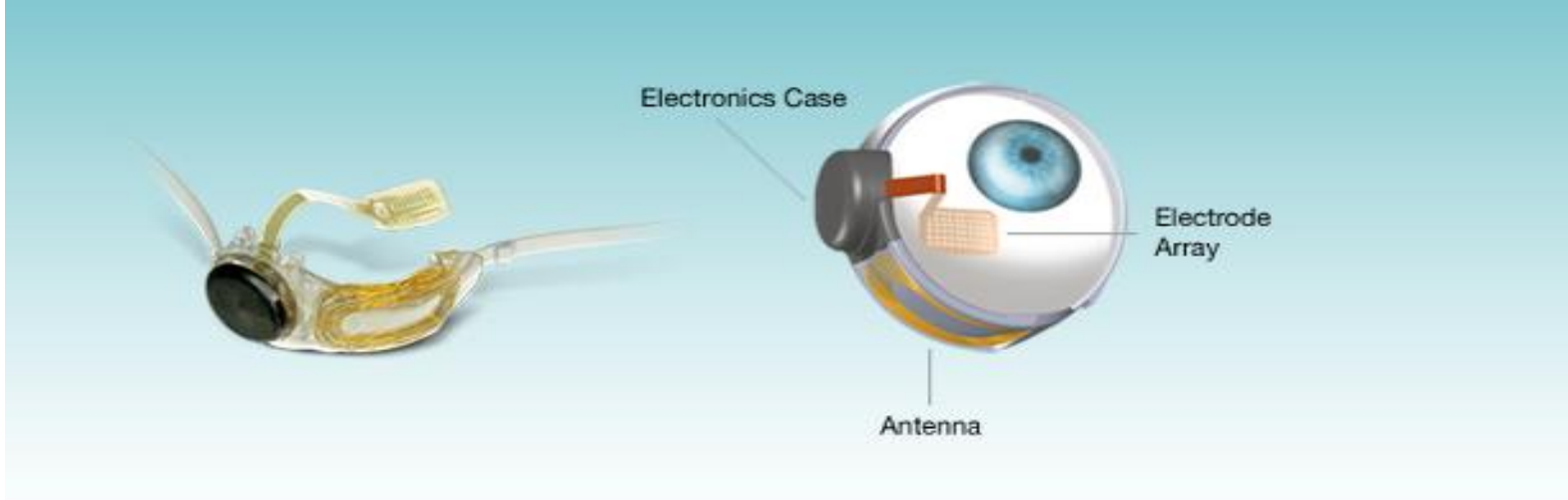
- Argus II Retinal Prosthesis System
- Telescoping Lens
- Ocumetics Bionic Lens



Argus II Retinal Prosthesis System

- Designed for those with degenerative eye disease (i.e. retinitis pigmentosa, macular degeneration)
- Takes place of damaged photoreceptors
- Consists of 5 parts:
 - Digital camera
 - Video-processing micro-chip
 - Radio transmitter
 - Radio receiver
 - Retinal implant





Argus II

- Has been implanted into 6 subjects
- New versions
 - more electrodes = greater image resolution
- Estimated cost \$30,000
- Third version has 1000 electrodes on implant
 - Ability for facial recognition

Argus II Retinal Prosthesis System

Advantages

- Can aid in virtual reality simulations
 - Combat
 - Flight
- Can monitor a persons health
- Can correct vision impairments

Disadvantages

- Limited battery life
- Cant see full detailed images
- Still need guidance
- Bulky

Telescoping lens [7]

- Switches: normal and magnified vision
- 1mm thick
- Advantages:
 - Less bulky
 - Better job of collecting light
 - Less invasive
- Disadvantages:
 - Need to wear special glass with lens to switch on and off
- Working on hands-free infrared LED to activate functions from wink or blink

Ocumetics Bionic Lens

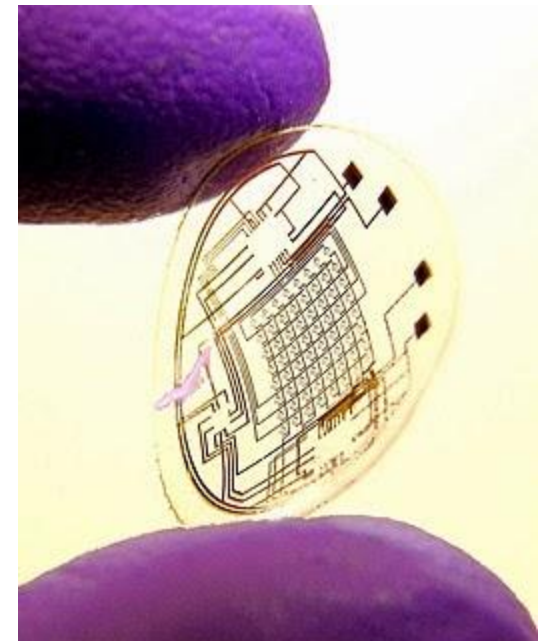
- Goal: to eliminate glasses ad contacts forever [10]
- Surgically inserted [8]
 - No anesthesia or overnight stay
 - Folded and placed in eye using a syringe with a saline solution
 - within 10 seconds, the lens unfolds by itself [10]
- Advantages:
 - No more cataracts
 - No more contacts, glasses
 - Safer than laser surgery
- Disadvantages:
 - Still unclear how the technology actually works. [10]
- Could be available as soon as 2017

FUTURE [11]

- Future versions serve as platform for applications i.e:
 - surfing the Internet on a virtual screen
 - immersing gamers in virtual worlds
 - monitoring patients' medical conditions.
- First obstacle:
 - resolving the fundamental incompatibility between
 - 1.)fabrication process for microchips
 - 2.)light-emitting diodes
 - 3.)types of polymers used for contact lenses.

FUTURE [11]

- rabbits tolerated the lenses well during 20-min fittings
- If safety and engineering issues are addressed:
 - future lens could be engineered to camouflage the circuitry
- Disadvantages:
 - questioned the ability of the display producing a sharp image
 - Power could be a limitation



Video

- [Bionic lens](#)

QUESTIONS?

REFERENCES

- [1] http://go.galegroup.com.uri.idm.oclc.org/ps/pdfViewer?inPS=true&prodId=GVRL&userGroupName=rhode&docId=GALE%7CCX2760400267&contentSegment=&searchId=R1&tabID=T003&resultListType=RESULT_LIST¤tPosition=1&searchResultsType=&accesslevel=FULLTEXT&c2c=true#docViewNav
- [2] <https://www.eyeboston.com/PublishingImages/Services/Contact-Lenses.jpg>
- [3] http://img.webmd.com/dtmcms/live/webmd/consumer_assets/site_images/articles/health_tools/cataract_overview_slideshow/webmd_rm_photo_of_cataract_illustration.jpg
- [4] http://www.eyecarebusiness.com/content/archive/2013/September/images/EB_September_A12_fig5.jpg
- [5] https://nei.nih.gov/sites/default/files/health-images/normalvspigmentosas_1.jpg
- [6] "How Does a "bionic Eye" Allow Blind People to See?" *HowStuffWorks*. 20 Feb. 2007. Web. 7 Nov. 2015.
- [7] "OPHTHALMOLOGY/MICRO-OPTICS: Telescoping Contact Lens Switches between Magnified and Normal Vision." - *BioOptics World*. Web. 7 Nov. 2015.
- [8] Bains, Camille. "Ocumetics Bionic Lens Could Give You Vision 3x Better than 20/20 - Technology & Science - CBC News." *CBCnews*. CBC/Radio Canada, 19 May 2015. Web. 7 Nov. 2015.
- [9] "Vision of the Future Seen in Bionic Contact Lens." *Msnbc.com*. 21 Jan. 2008. Web. 7 Nov. 2015.
- [10] Smith, Dave. "This Insane Device Promises to Give You Perfect Vision for the Rest of Your Life." *Business Insider*. Business Insider, Inc, 22 May 2015. Web. 8 Nov. 2015.
- [11] "Vision of the Future Seen in Bionic Contact Lens." *Msnbc.com*. 21 Jan. 2008. Web. 8 Nov. 2015.
- Dictionary.com