



## The Evolution of Visual Experience

*Jerry Legerton, OD, MS, MBA, FAAO*  
*Co-Founder, Innovega Inc.*



## March of Technology



### Connectivity to Rich Media

- The internet of things
  - Machine to Machine to bypass human effort
  - Information to People to enrich our lives
- How fast can we process?
  - Improving the quality (or quantity) of life
  - Making the invisible visible
  - Seeing and mentally processing faster than vision



### Spectacle Wearable Devices



right neighborhood



### The Beginning or the End?



Sergey Brin



Google Glass

Right eye views screen  
 13° horizontal x 7° vertical  
 640 X 360 pixels



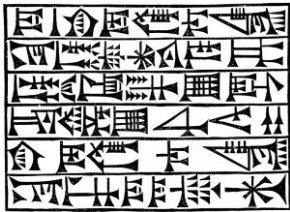
### The Evolution of Visual Experience



### Nature to Cave Art



### Cave Art to Early Writing



### Refined Art



### The Printing Press



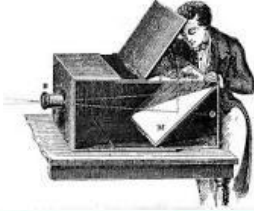
### Telescope and Microscope



*Making the invisible visible*



### The Camera



### The Stereoscope



### Black and White Movie



### First Color Movie



### Cartoons, Mixed Reality, 3D and iMax



Why did Facebook pay \$2 Billion for Oculus Rift?



the visual experience



just like being there



immersive



emotionally engaging



endorphin dripping



The Experience Opportunity



Mark Zuckerberg



Oculus Rift

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Characteristics	Google Glass	Oculus Rift
Reality	augmented	virtual
Size	small	large
Weight	light	heavy
Field of View	tiny	huge
Mobile	yes	no

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### Field of View

Google Glass  
13° H X 79° V FOV  
640 X 360



iOptik®  
53° H X 34° V FOV  
1280 X 720




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Defining the value proposition in an experience economy

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### Connectivity:



Your Virtual or Augmented Reality Dashboard

Personalized Ultimate Reality

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### The Wagons Are Circling



Labels: VUZIX - Intel, Lumus, VUZIX, Facebook, Google, Zeiss, Recon, SONY, Microsoft, Epson, Olympus, SONY, SONY

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### And the Investment Continues



Labels: brother, eSight, FUSAR, GlassUP, ATHEER LABS, KOPIN, OPTIK by INNOV8, LASTER, LG, OAKLEY, magic leap, MetaPro, Optinvent, SKULLY, ODG, SAMSUNG, TOSHIBA

Atheer Brother Fusar

**VM global leadership SUMMIT 2015** What about contact lenses:

- Sensing
- Drug delivery
- Myopia control – Refractive Error Regulation
- Photonics and Molecular Biology
- Presbyopia
- Low Vision
- Wearable displays

**VM global leadership SUMMIT 2015** Sensing

- IOP – Sensimed - Triggerfish
- UC Davis – Silver Wire

**VM global leadership SUMMIT 2015** Sensing

Google – Alcon

- Blood Sugar
- Blood Alcohol
- Inflammatory mediators
- Systemic disease molecular Correlates
- Pulse
- Blood Oxygen level

**VM global leadership SUMMIT 2015** Camera Contact Lens

- Google
- Iris recognition
- General image capture
- Low vision

**VM global leadership SUMMIT 2015** Drug Delivery

- Collagen Mesh – Ocugenics
- Imprinted and Surface Nanoparticle
- Micro-fluidics

Time (hrs)	Imprinted Contact Lenses (ng/ml)	Non-imprinted Contact Lenses (ng/ml)	Eye drops (ng/ml)
0	0	0	0
2	150	50	20
4	180	60	25
6	200	70	30
8	220	80	35
10	230	85	38
12	240	90	40
14	250	95	42
16	260	100	45
18	270	105	48
20	280	110	50
22	290	115	52
24	300	120	55
26	310	125	58

**VM global leadership SUMMIT 2015** Refractive Error Regulation

Electromagnetic Radiation Refractive Therapy

- Myolite
- Chromaticity
- Brightness
- Direction
- Duration

US Patent: 8,876,284

**VM global leadership SUMMIT 2015** **Photonics and Molecular Biology**

**Seasonal Affective Disorder**

- Vistakon

Multiple Patents Pending

**VM global leadership SUMMIT 2015** **Presbyopia**

**Accommodating Contact Lenses**

- Vistakon
- Energized Fluid Meniscus

Multiple Patents Pending

**VM global leadership SUMMIT 2015** **Presbyopia**

**Electro-Optical**

- eVision Smart Optics
- University of Manchester

Multiple Patents Pending

**VM global leadership SUMMIT 2015** **Telescopic Low Vision**

**Folded Reflective Optics with Shutter Polarizer**

- UCSD
- EPFL
- Innovega
- Paragon Vision Sciences

**VM global leadership SUMMIT 2015** **Night Vision**

- Military and Low Vision
- University of Michigan
- Photo-excited Graphene

**VM global leadership SUMMIT 2015** **Wearable Displays**

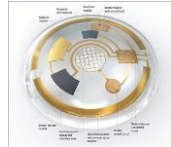
**Contact lens alone:**

- University of Washington

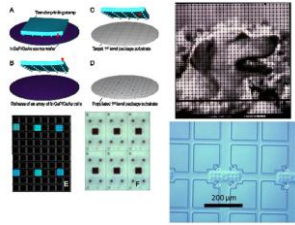
**VM global leadership SUMMIT 2015** **Wearable Displays**

Contact Lens Alone

- Semprius




● Thin film micro-solar cells



**VM global leadership SUMMIT 2015** **Wearable Displays**

Contact Lens Enabled

- Innovega – iOptik®




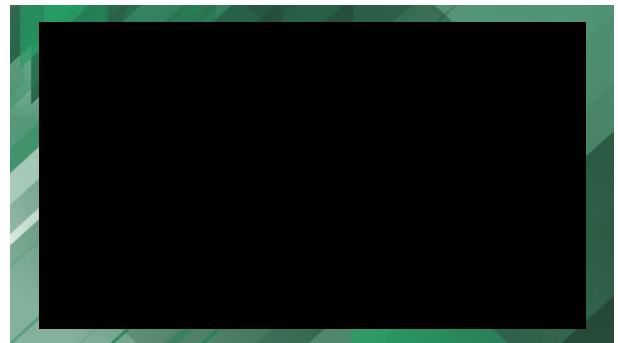
“...of imagine if all the digital media you needed were covered perfectly onto the real world ... in front of you.”

**VM global leadership SUMMIT 2015** **Stylish Comfortable Eyewear**

Eye-borne Optics Facilitate

- Field of view
- Style and Comfort
- Multiple eyewear configurations





**VM global leadership SUMMIT 2015** **Where do we go from here?**

Alice: “Would you tell me, please, which way I ought to go from here?”

“Cheshire Cat: That depends a good deal on where you want to get to.”

**Alice in Wonderland  
Lewis Carroll**

***Connectivity will happen***

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**Ophthalmic Industry: Get ready – It’s a  
MEGATREND**





## Roles for all players

- Frame manufacturers: Managing style and weight with electronics on board
- Lens manufacturers: Managing vision correction and ambient light for optimum display contrast ratio and reduced power demand
- Consumer electronics partners: Supply chain management for cost control, size reduction and performance enhancement
- Software partners: Applications and user experience
- Eye-care practitioners: Managing psychophysiological optics considerations and adaptation issues related to a new set of near eye display related problems.
- Eye-care practitioners: Prescribing and fitting of smart contact lenses and display eyewear; implementing the technology for low vision, vision therapy and sports performance enhancement.
- Combined effort of all in market making



## *THANK YOU*