WHAT IS VIRTUAL REALITY?

Ivan Sutherland (1963)
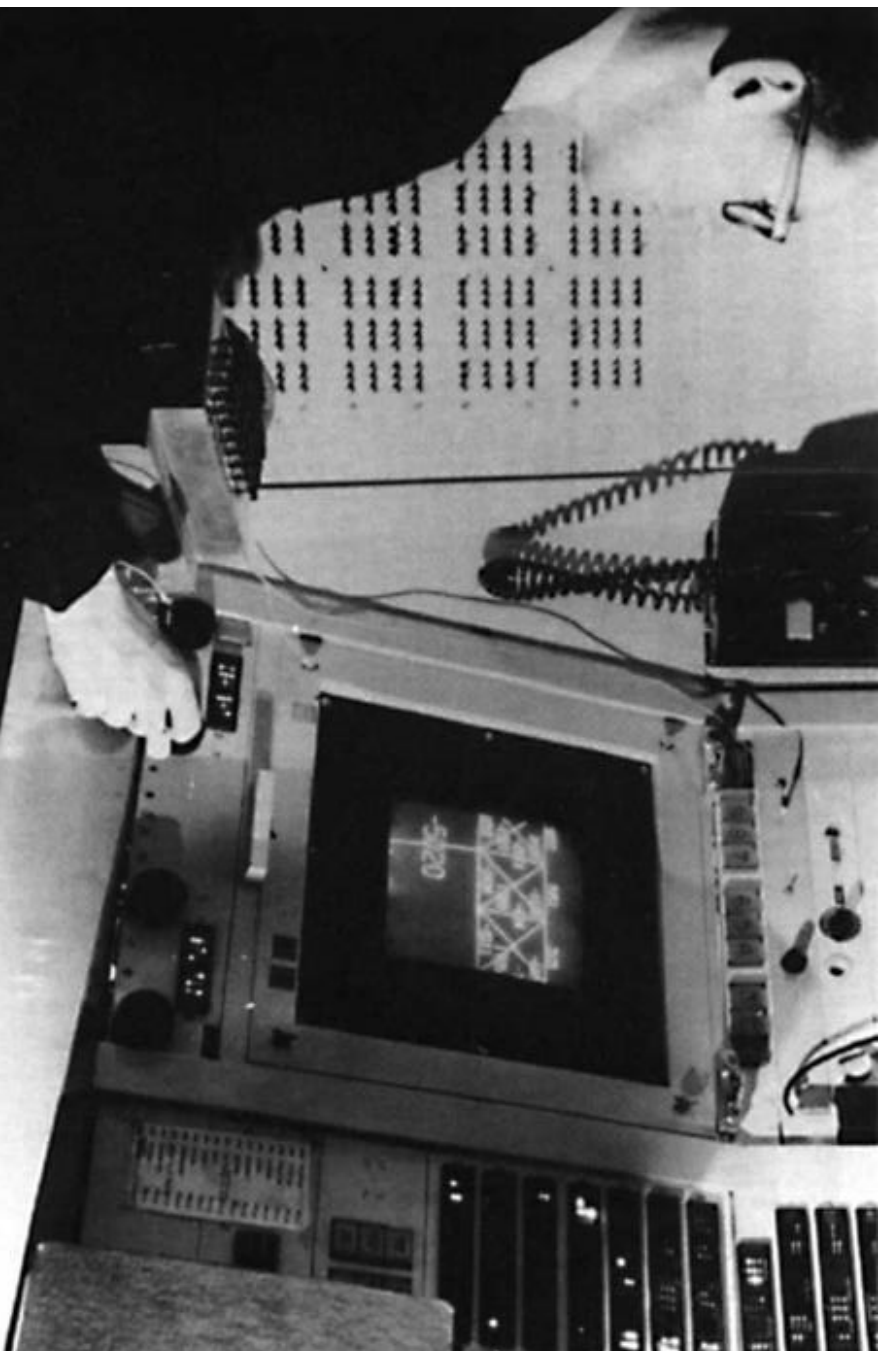
- Sketchpad – first interactive graphics program
- https://www.youtube.com/watch?v=DWAlp3t6SLU

The Ultimate Display

"The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal".

Ivan Sutherland, 1965

What is Virtual Reality?

virtual reality

noun

Popularity: Bottom 40% of words

Simple Definition of VIRTUAL REALITY

: an artificial world that consists of images and sounds created by a computer and that is affected by the actions of a person who is experiencing it
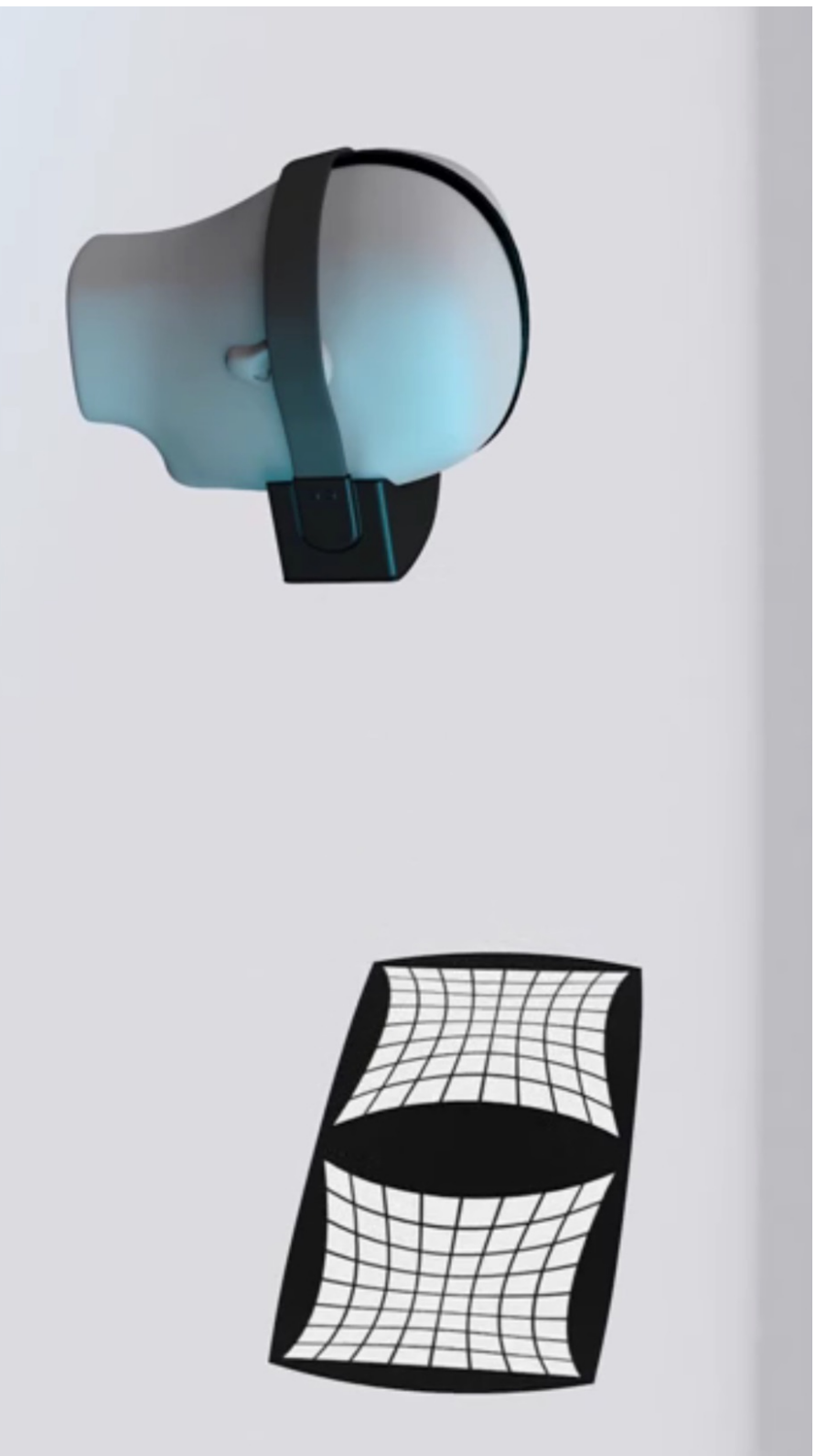
Key Characteristics for VR

- Virtual Reality has three key characteristics
  - 3D stereoscopic display
  - Wide field of view display
  - Low latency head tracking

- When these three things are combined they provide a compelling immersive experience

Defining Characteristics

- https://www.youtube.com/watch?v=FPcbBJbGhmk

Defined in Terms of Presence

- Presence is the key to defining VR in terms of experience
- Presence is defined as the sense of being in an environment
- Telepresence is defined as the experience of presence in an environment by means of a communication medium.
- A "virtual reality" is defined as a real or simulated environment in which a perceiver experiences telepresence.

Types of VR
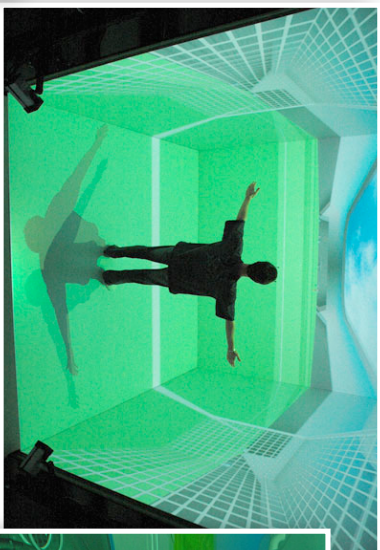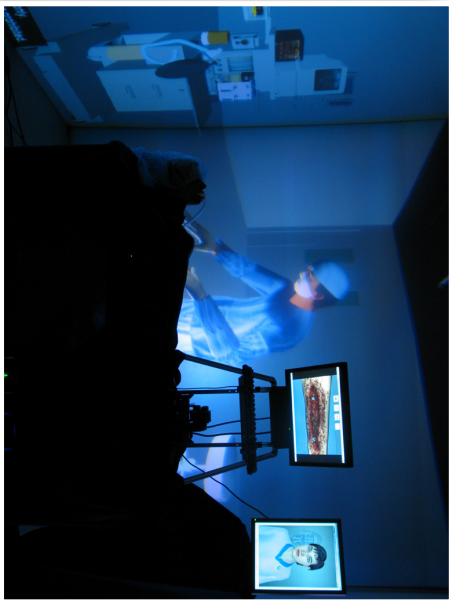
Immersive VR for
Pain Control
*Doctors see exciting results
using SnowWorld*

Immersive Virtual Reality distraction is showing
great promise for clinical pain control. Firsthand
designed and developed SnowWorld with
specialists Dr. Hunter Hoffman and Dr. David
Patterson, Harborview Burn Center, Seattle.
SnowWorld is an interactive journey through an
ice canyon designed to deliver an engaging
interactive experience within the constraints of a
wound care procedure.

HISTORY OF VR

VR History Timeline

A walk through VR history

1516
'Sala delle Prospettive' created by Baldassare Tommaso Peruzzi Villa Farnesina in Rome

1960
Morton Heilig creates 'Sensorama' a multi-sensory simulator

1968
"The Sword of Damocles" created by Ivan Sutherland first AR HMD system

1978
Andy Lippman's team at MIT create the Aspen Movie Map

1982
Thomas Furness develops Visually Coupled Airborne Systems Simulator

1982
Steven Lisberger's TRON is released

1984
William Gibson publishes 'Neuromancer'

1985
Data Glove for commercial use developed by VPL Research Inc.

1987
"Virtual Reality" coined by Jaron Lanier of VPL Research Inc.

1988
Star Trek: The Next Generation introduces "the holodeck"

1988
Eyephone HMD for commercial use developed by VPL Research Inc.

1992
Brett Leonard's The Lawnmower Man

1993
Sega announce Sega VR prototype for Mega Drive console

1995
CAVE Automatic Virtual Environment

1999
The Wachowski Brothers' The Matrix is released

2003
Linden Labs releases Second Life

2007
Google introduces Street View

2013
Nintendo files patent for VR 3D technology

2014
Facebook buy Oculus VR for US$2 billion from Palmer Luckey
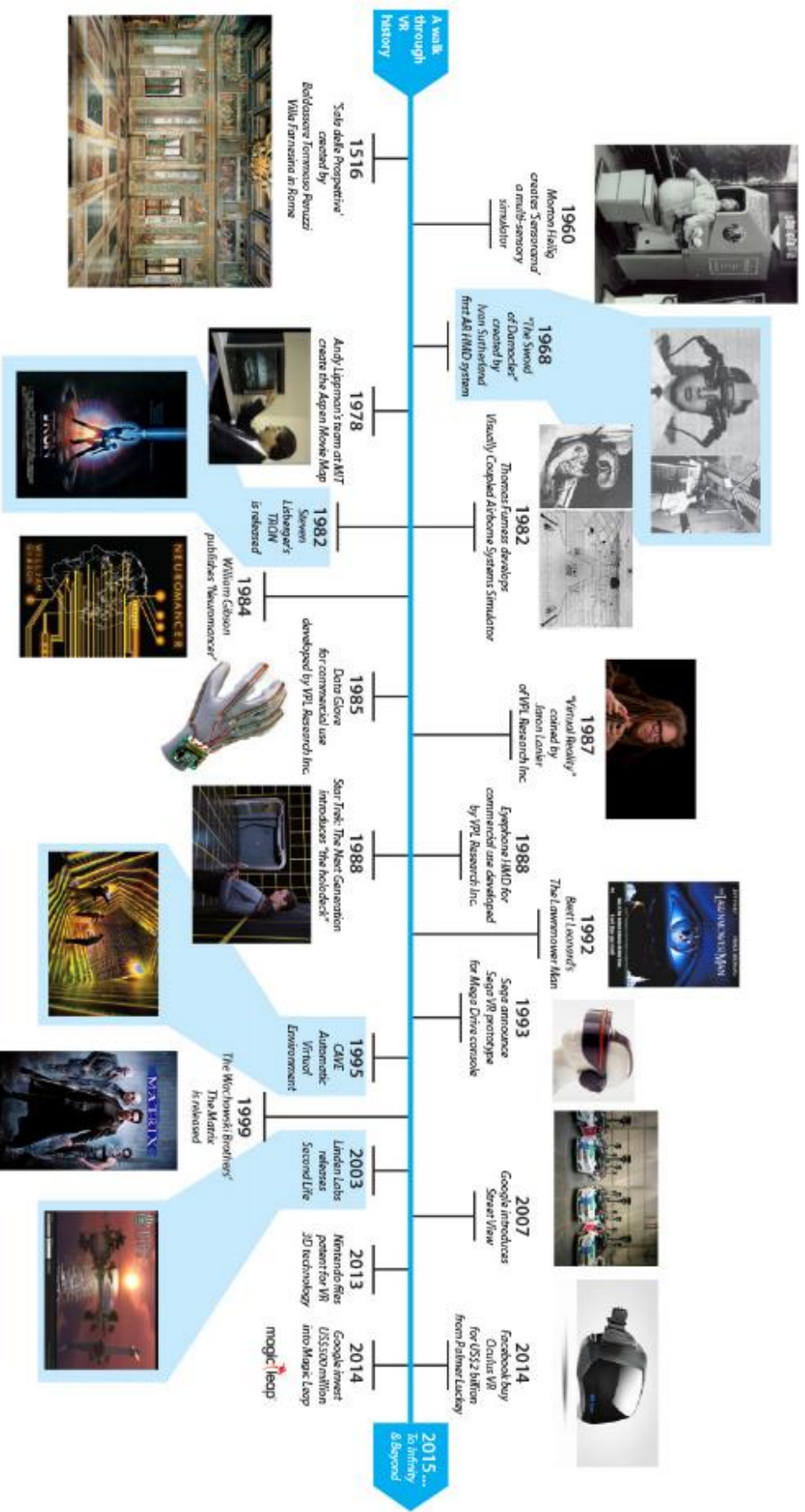
2014
Google invest US$500 million into Magic Leap

magic leap

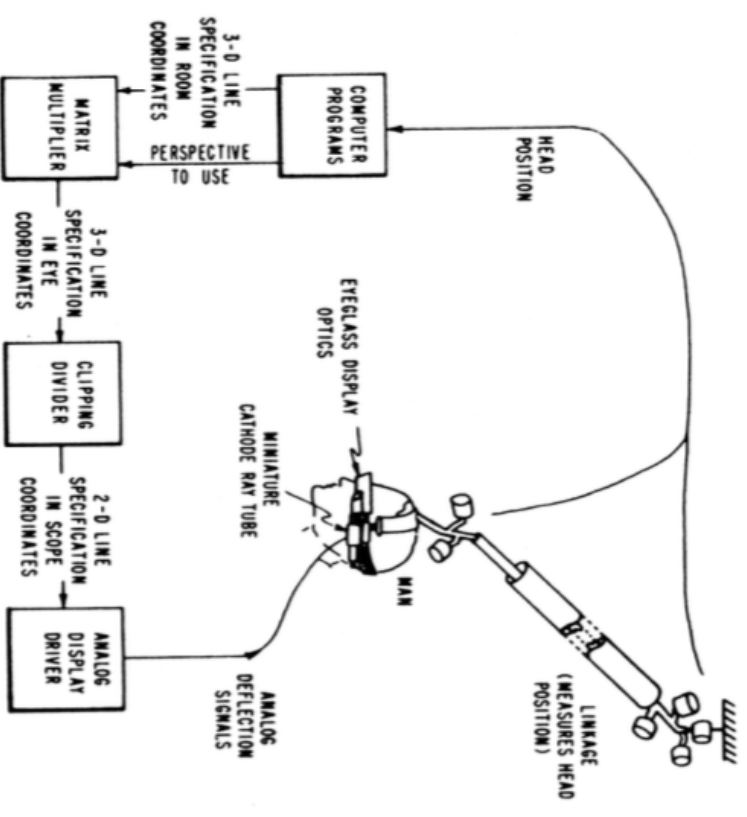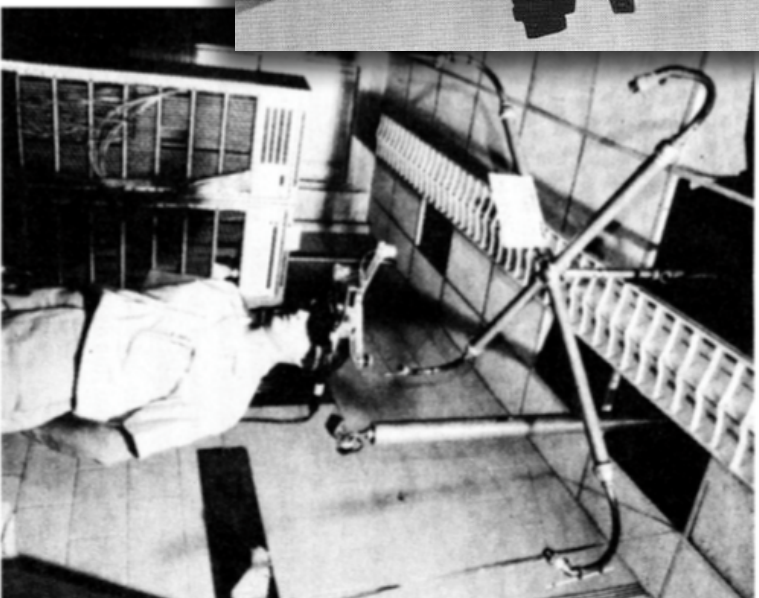2015....
To Infinity & Beyond

1900s – Interactive Experiences

- **Early Simulators (<1960s)**
  - Flight simulation
  - Sensorama (1955)
- **Early HMDs (1960s)**
  - Philco, Ivan Sutherland
- **Military + University Research (1970-80s)**
  - US Airforce, NASA, MIT, UNC
- **First Commercial Wave (1980-90s)**
  - VPL, Virtual i-O, Division, Virtuality
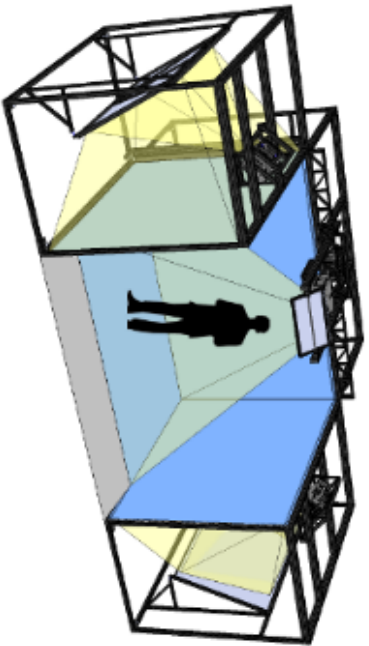 - VR Arcades, Virtual Boy

Ivan Sutherland (1960s)

Ivan Sutherland's Head-Mounted Display (1968)

CAVE (1992)

- Projection VR system
  - 3-6 wall stereo projection, viewpoint tracking
  - Developed at EVL, University of Illinois Chicago
- Commercialized by Mechdyne Corporation(1996)

C. Cruz-Neira, D. J. Sandin, T. A. DeFanti, R. V. Kenyon and J. C. Hart. "The CAVE: Audio Visual Experience Automatic Virtual Environment", *Communications of the ACM*, vol. 35(6), 1992, pp. 64–72.

Rise of Commercial VR Companies

- W Industries/Virtuality (1985 - 97)
  - Location based entertainment
  - Virtuality VR Arcades
- Division (1989 – 1998)
  - Turn key VR systems
  - Visual programming tools
- Virtual i-O (1993 -1997)
  - Inexpensive gamer HMDs
- Sense8 (1990 - 1998)
  - WorldToolKit, WorldUp
  - VR authoring tools

2016 - Rise of Consumer HMDs

Oculus Rift

Sony Morpheus

HTC/Valve Vive

Multiple Mobile VR Viewers Available

Conclusion

- Virtual Reality has a long history
  - \> 50 years of HMDs, simulators
- Key elements for VR were in place by early 1990's
  - Displays, tracking, input, graphics
  - Strong support from military, government, universities
- First commercial wave failed in late 1990's
  - Too expensive, bad user experience, poor technology, etc
- We are now in second commercial wave
  - Better experience, Affordable hardware
  - Large commercial investment, Significant installed user base