The Current State of Virtual Reality

Phil Lelyveld
Entertainment Technology Center @ USC
School of Cinematic Arts

etc ENTERTAINMENT TECHNOLOGY CENTER

Founded 1993 by George Lucas

Adamantly neutral
• Discussions
• Collaborations
• Research
• Coverage

Agenda

1. The AR – Reality – VR continuum
2. Use cases, markets
3. Tech; cameras, audio, stitching and distribution
4. Story; (visual, audio, UI), experience, social
5. Different ways to experience VR; what to build to?
6. Business model(s), ROI
7. Skill sets, learning, participating
8. In Conclusion

In Augmented Reality, the world that you would normally see if you walked down the aisle without the screen is being augmented – enhanced, supplemented, added to - with additional data and experiences.

In Virtual Reality you are virtually – nearly, almost – but not really there in the grocery store aisle.

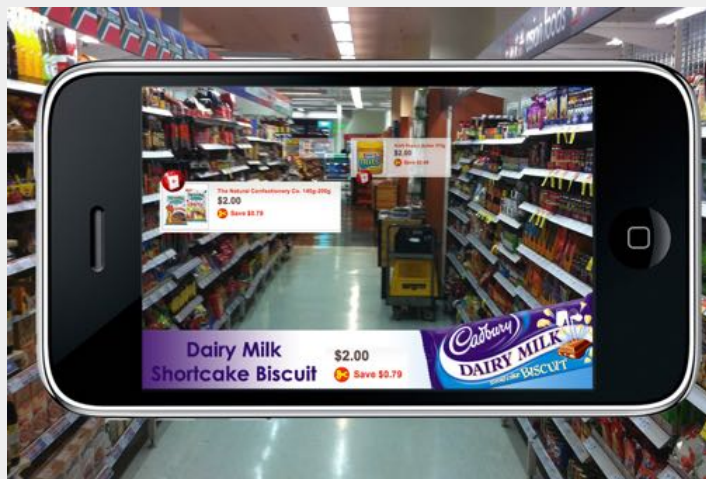# The AR – Reality – VR Continuum

Augmented Reality (AR)

Real Environment

Virtual Reality

Spatial Real World

Immersive Virtual World

Reality Plus

The AR – Reality – VR Continuum

Augmented Reality (AR)

Real Environment

Virtual Reality

Spatial Real World

Immersive Virtual World

Into the Storm
VR Experience

The AR – Reality – VR Continuum

Augmented Reality (AR)   Real Environment   Virtual Reality

Spatial Real World   Immersive Virtual World

Mindcraft

Transitional
Mixed Reality
Blended Reality

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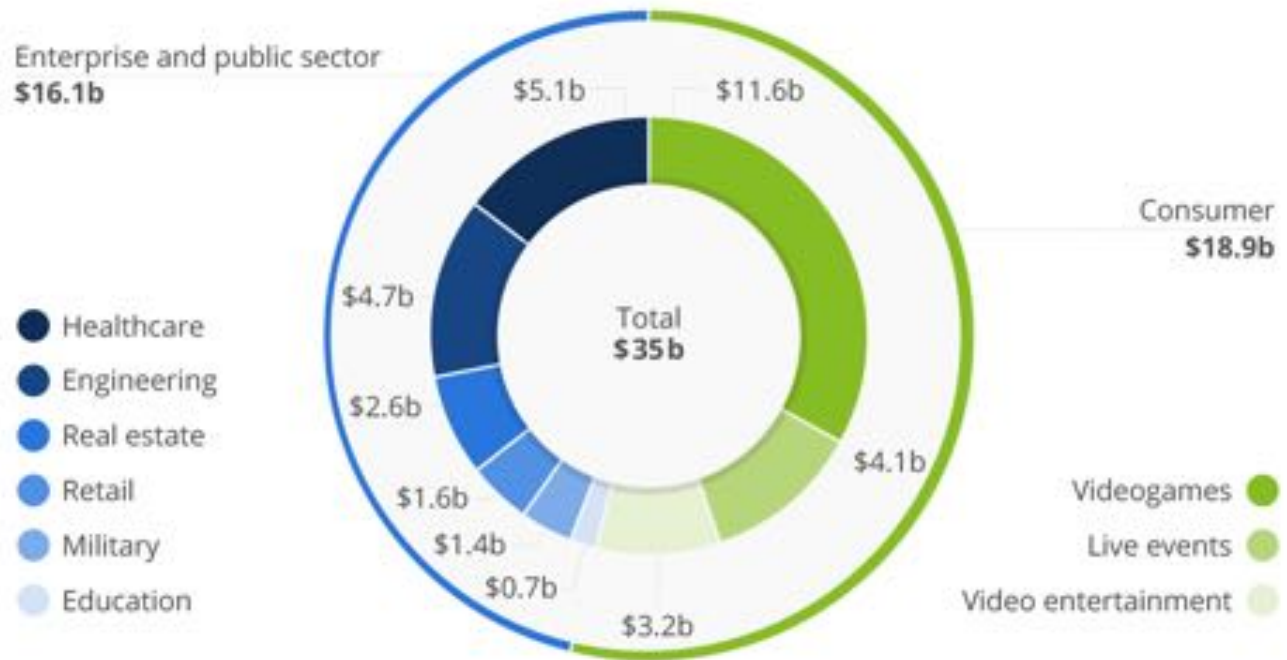7. Skill sets, learning, participating
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2025 Market base case

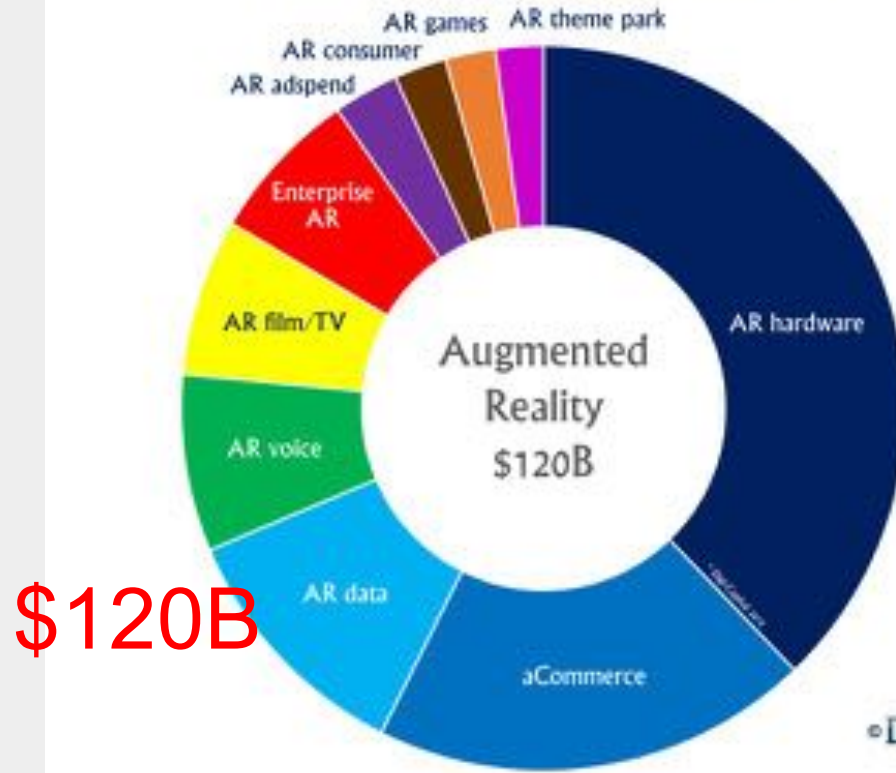Goldman Sachs breaks VR/AR together into 9 markets

1/13/16

Tech Chart of the Day

The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025*

Enterprise and public sector
$16.1b

$5.1b
$11.6b

Consumer
$18.9b

$4.7b

Total
$35b

$4.1b

$2.6b

$1.6b

$1.4b

$0.7b

$3.2b

- Healthcare
- Engineering
- Real estate
- Retail
- Military
- Education

Videogames
Live events
Video entertainment

* Base case scenario

BUSINESS INSIDER

Source: Goldman Sachs Global Investment Research

statista

ENTERTAINMENT
TECHNOLOGY
CENTER

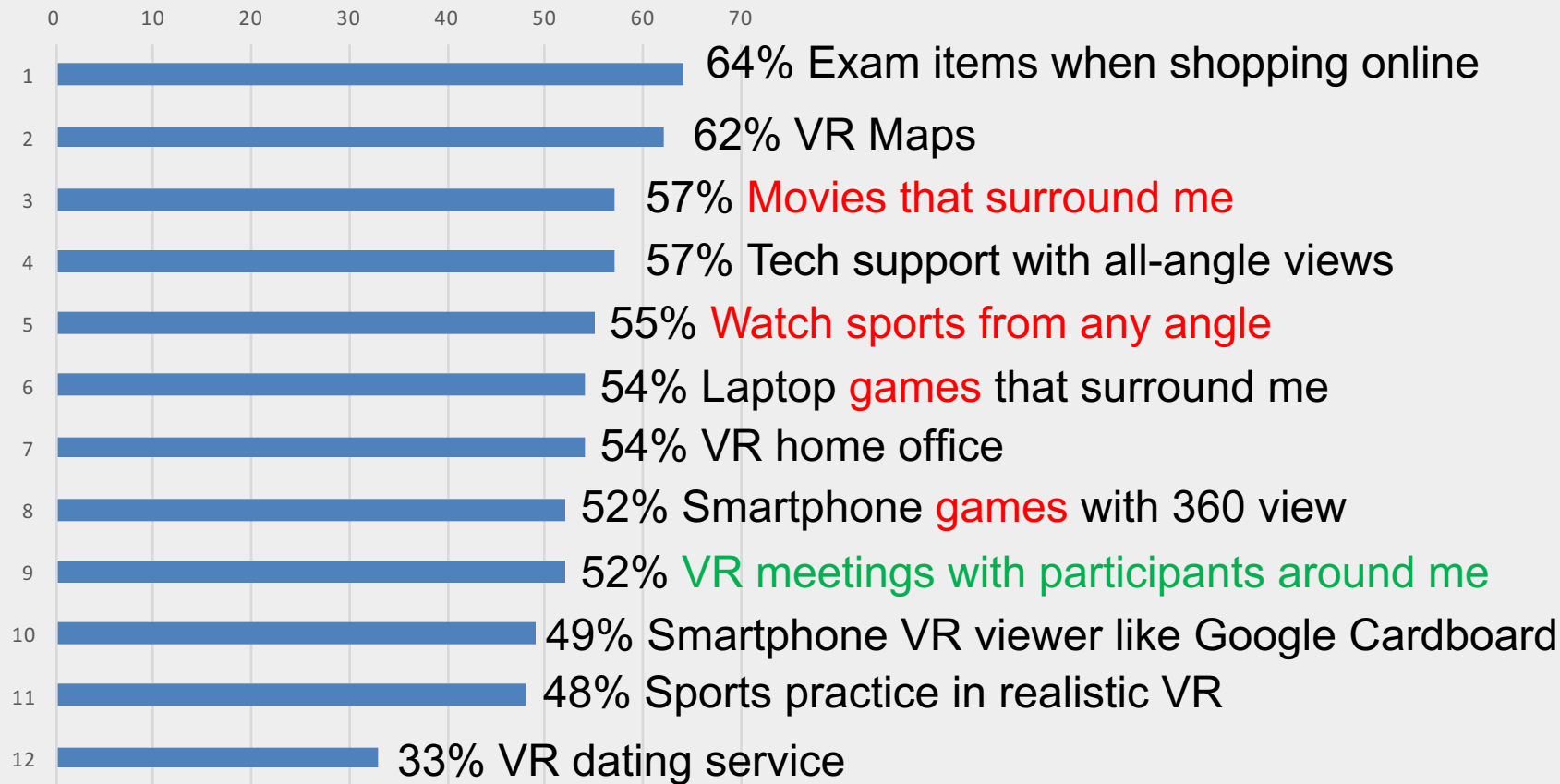# Augmented/Virtual Reality Revenue Share 2020F

$120B

$30B

©Digi-Capital

Augmented And Virtual Reality To Hit $150 Billion, Disrupting Mobile By 2020, Digi-captial, 4/15

# VR activities that interest smartphone users worldwide

1	64% Exam items when shopping online
2	62% VR Maps
3	57% Movies that surround me
4	57% Tech support with all-angle views
5	55% Watch sports from any angle
6	54% Laptop games that surround me
7	54% VR home office
8	52% Smartphone games with 360 view
9	52% VR meetings with participants around me
10	49% Smartphone VR viewer like Google Cardboard
11	48% Sports practice in realistic VR
12	33% VR dating service

Source: Ericsson ConsumerLabs, "10 Hot Consumer Trends 2016," Dec. 8, 2016 (n=6,649, ages 15-69)

How retail stores are using virtual reality

Toms Shoes on Abbott Kinney in Venice, CA
LA Times, 4/10/16

Fashion and Retail
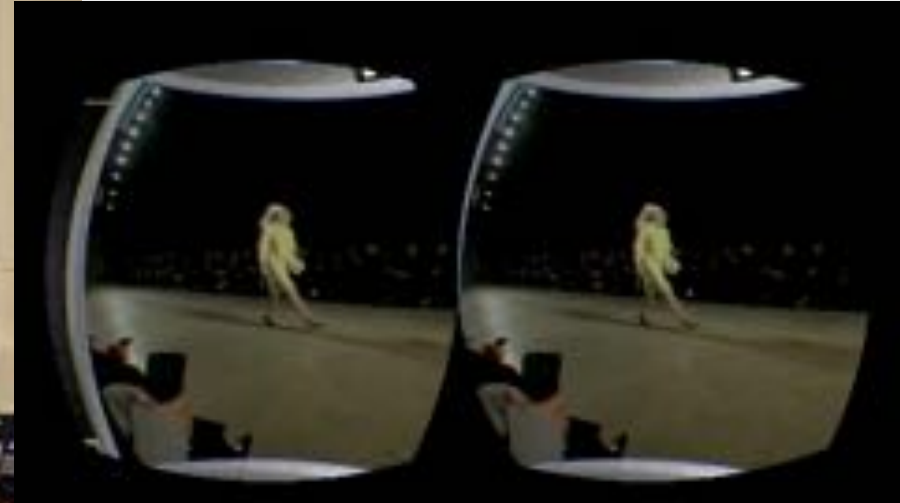
Story Extension

Director Robert Stromberg created a 15-25 minute 3D VR compliment to Ridley Scott's The Martian

Six Flags and Samsung partner to add VR to roller coasters this summer

News

CNN
1:30 Live Streaming VR panel

Des Moines Register Adds
VR to News Reporting

VR Farm includes text, image, video
News story revealed by wandering

Immersive Journalism

The Displaced
(New York Times and Chris Milk, VRSE)

Waves of Grace
(Chris Milk, VRSE)

Concerts and events

Vantage.TV
1:30 Live Streaming VR panel
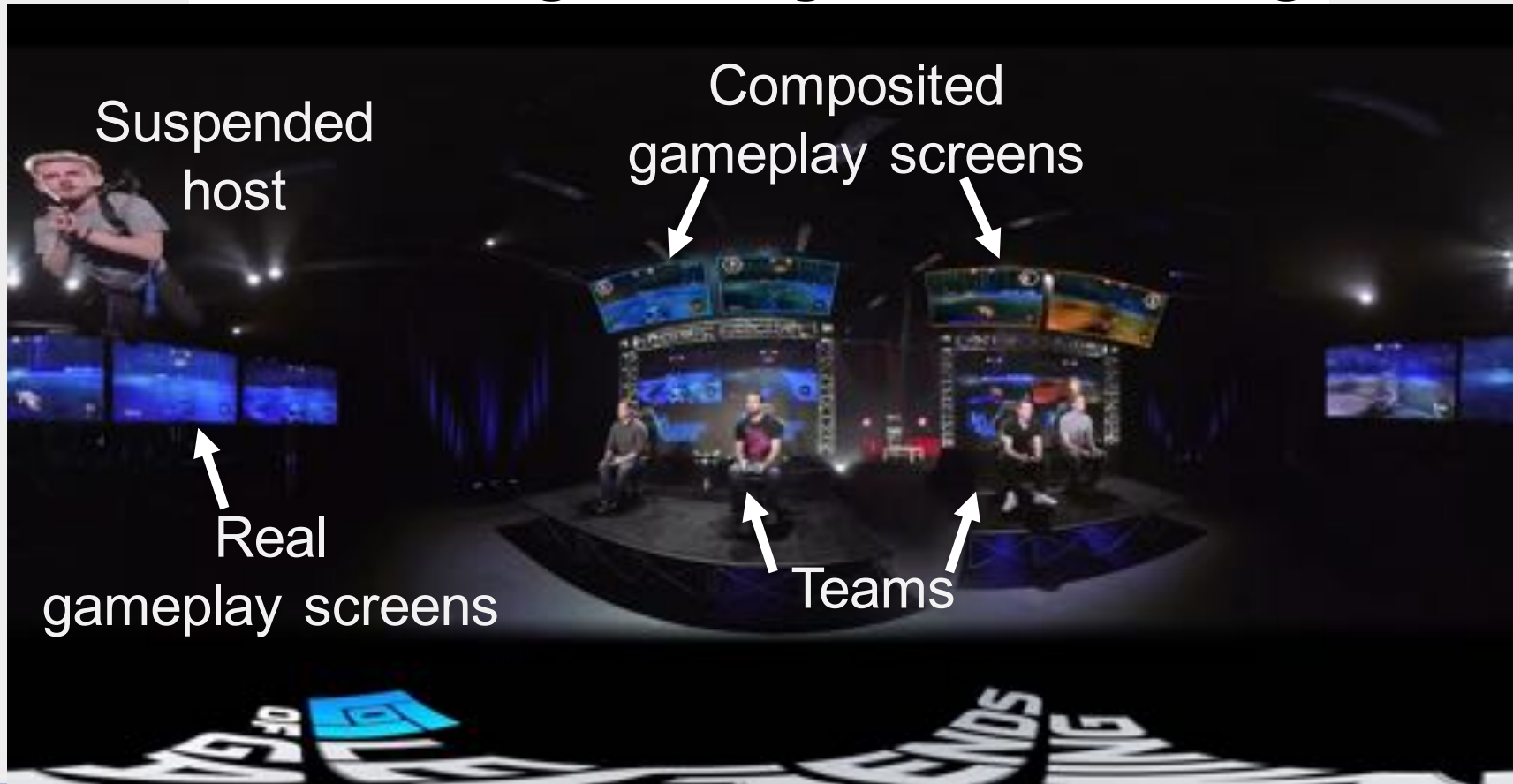
Vantage.TV VR live-casting from Coachella 2016

Concerts

Fox Sports Media Group
NextVR
1:30 Live Streaming VR panel

3/31/16

21

Rocket League – Legends of Gaming

Endomel

VR Talk Show

The Foo Show
guest game developers take you inside their games

Travel and Tourism

HR & Recruiting

General Mills

Facilities tour for job recruits

Consumer Education

VR Quiz: What info to capture after an accident.

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VR Cameras

Captured 3D

Algorithmic 3D

NextVR 360 3D Rig
6 Red Pro 6K cameras
60 fps

Jaunt
32K (16K per eye)
120 fps

VR Cameras
(consumer mkt.)

Ricoh Theta

Bublcam from Bubl

Kodak SP360

Samsung 360

Nikon KeyMission 360

Giroptic

Orah 4i live-streaming Prosumer VR camera from VideoStitch

4 fisheye lenses, 4 mikes, 4K output, 30 sec delay, ~$3,600

Stitching

Stitching

From talk by Anrick Bregman

Stitching

Standard VR camera rigs can have built-in stitching software

From talk by Anrick Bregman

Solving problems

Green screen helmet onto headless torso.

Head bounces differently from body.

From talk by Anrick Bregman

Sound

3:30 VR Audio panel
3 vendors
3 artists

Sound

Wild – The Experience, VR short from Fox (Reese Witherspoon, Laura Dern)

Ambisonic Audio

TetraMic

Binaural Audio

3Dio

Sound

Audio breakdown

- Live spatial audio capture
- Miked audio and spatial positioning
- Audio with no position (music score)
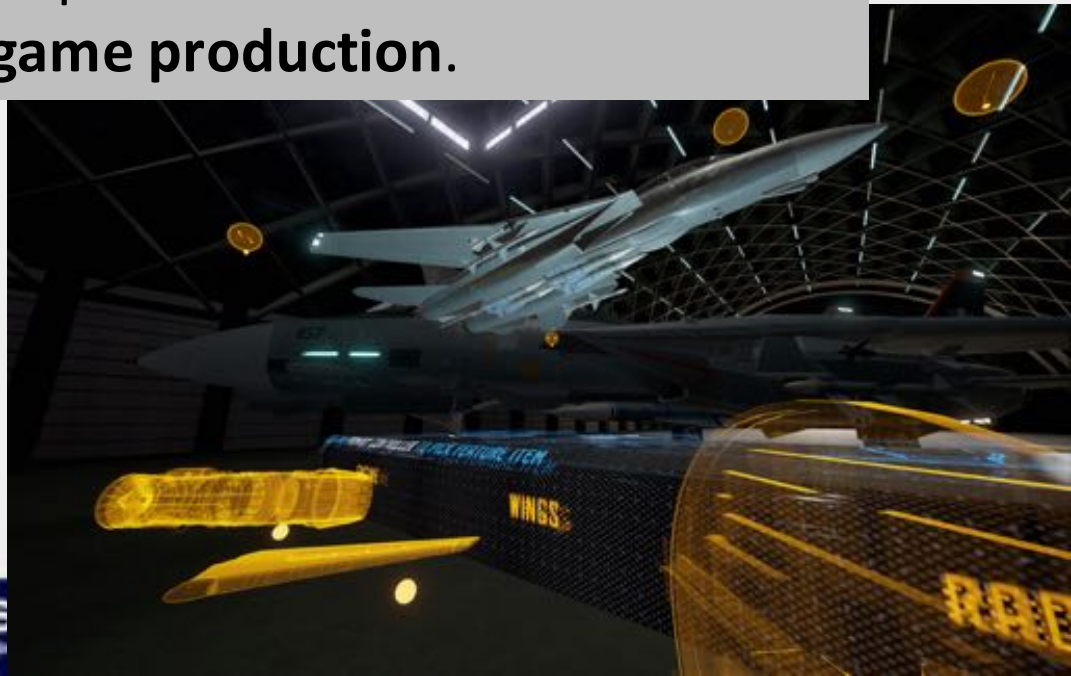
3:30 VR Audio panel
3 vendors
3 artists

Sound

Wild – The Experience, VR short from Fox (Reese Witherspoon, Laura Dern)

Deluxe Launches VR Unit to Facilitate Industrial-Scale Virtual Reality Productions

Deluxe assembled a **team** of specialists from both the world of **visual effects and video game production**.
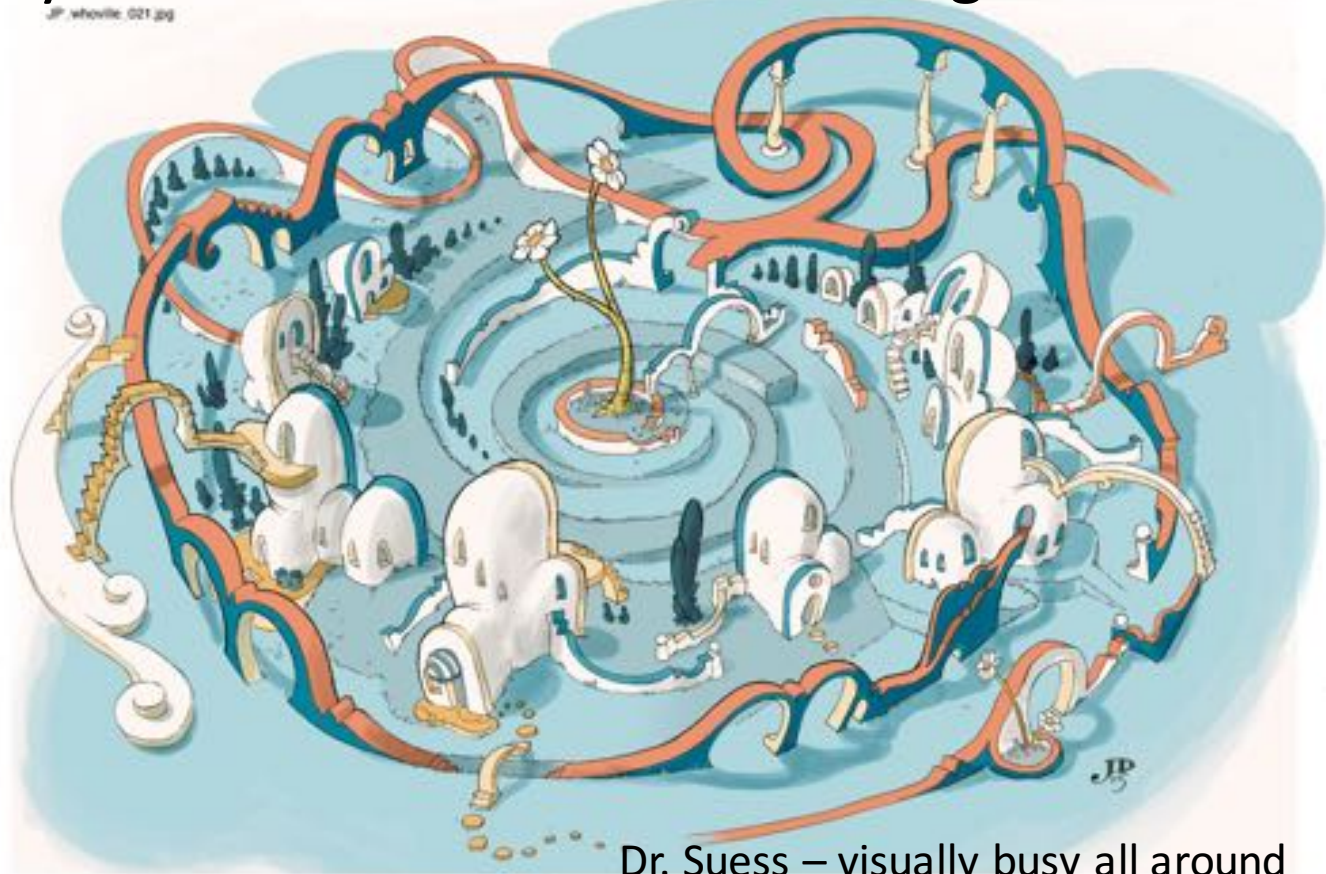
Variety, 4/11/16

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Have a reason to do VR!

Why create 360° if there is nothing to see in 270°?

Dr. Suess – visually busy all around

Decision

Camera-captured VR
Locked to camera position
The Director's Journey

Computer Rendered VR
Free to wander (Story world)
Subtle coercion

Mixed Reality
Spherical capture live and insert into CGI

Lytro Cinema light-field camera
Cinema frame today, volumetric VR in the future

Every pixel has color, direction, x/y/z position info
Every object can be separated from its surroundings – green screen
755 RAW megapixel 40K resolution, 300 FPS, *400 Gbps of data*

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unleash

The Camera is Your Audience's Head!!!

We see the world differently
sitting and standing

We don't see shaky-cam
when we run

The world doesn't tilt when
we tilt our heads

Cyber-Sickness

NABSHOW #NAB *Where Content Comes to Life*

Presence

Into the Storm
VR Experience

Samsung Entrim 4D Headphones
Galvanic Vestibular Stimulation (GVS)

GVS uses tiny electrical impulses to stimulate your vestibular system into thinking you're moving when you're not.

Entrim 4D has been declared "safe",
- 1500 human guinea pigs,
- 30 'movement patterns'
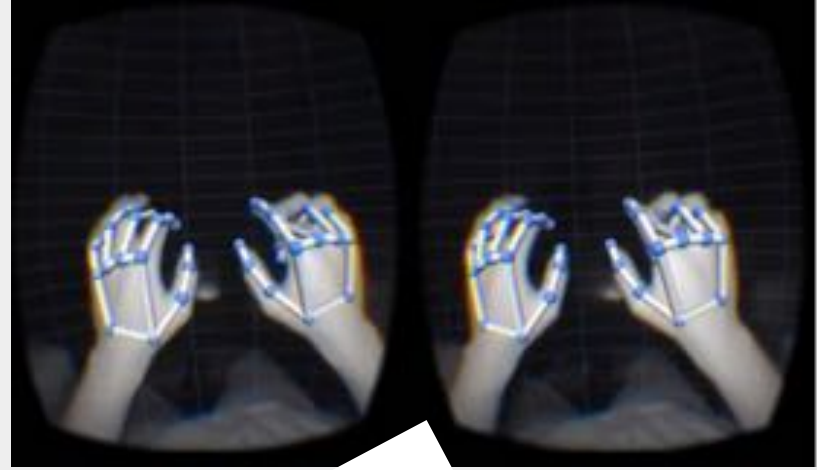
3/24/16 Demo at SXSW

Language of VR

Content

User Interface (UI)

- Controls

- Information

UI must feel natural in the situation

Heightened Sense of Empathy

Henry

Oculus Story Studio

7/28/15

Heightened Sense of Empathy

3D facial expressions evoke stronger emotions
than their 2D counterparts
due to the illusion of non-mediation

Source: 11/24/15 research from Aalto Univ. & Univ. of Helsinki

Agency

"Hunger" (Virtual Food Bank) by Nonny de la Pena

The ultimate VR experience will be a story that knows you are in the story.

Mark Bolas

Language

You are in a snow storm
You must get warm in 5 minutes or you will die

s t o r m

Audio is a key 'presence' component
Players 'feel' colder as they play
Your body moves slower as time goes on
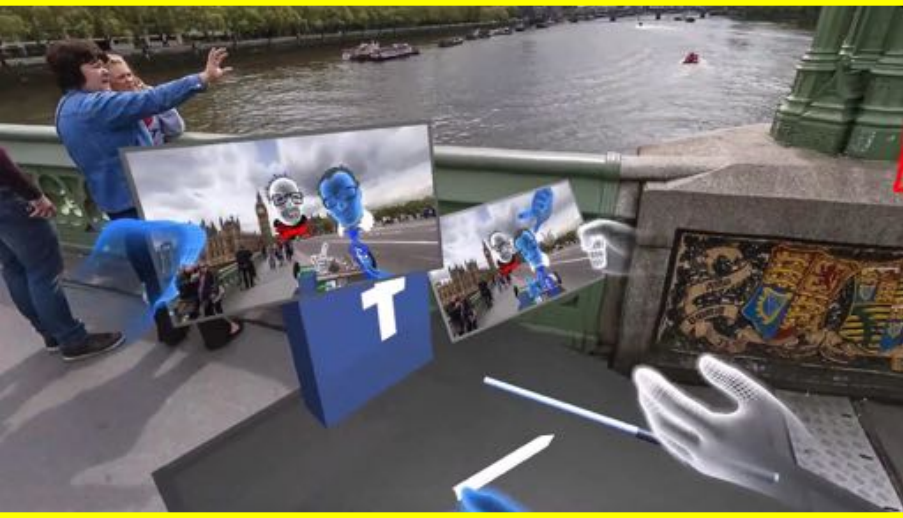
From "Storm" by Andrick Bregman

Social VR

Social VR may be VR's killer App

...people want to share experiences with others...

Business Insider, 7/20/15

Social VR

Facebook's Social VR Could Be The Killer App For Virtual Reality

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Different ways to have a VR experience

Magic Window

Cellphone-based viewer (Cardboard, Gear VR)

Head Mounted Display (HMD)

Group VR / Location-based VR

Google Cardboard SDK supports **spatial audio**

Google

Spatial audio come...

Wednesday, January 13, 20...

Posted by Nathan Martz, Pr...

What to build to?

Head Mounted Display
Technical Targets

4K-8K resolution per eye

>90 frames per second

<20 msec latency

220^0 field of view (FOV)

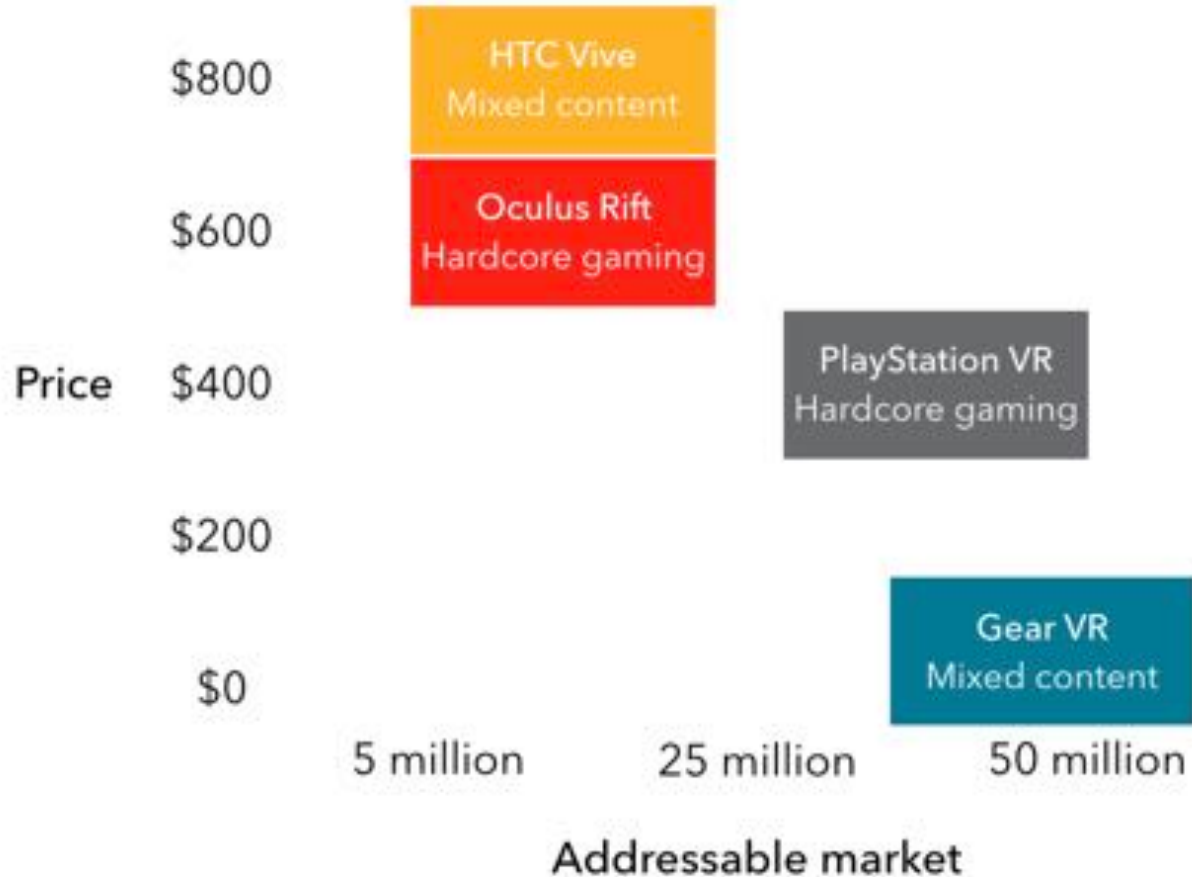**Maximum Amount that US Internet Users Would Be Willing to Pay for a Virtual Reality Device, Oct 2015**
% of respondents

- $1K+ 11%
- $0 6%
- $600-$999 9%
- $1-$199 23%
- $400-$599 20%
- $200-$399 31%

Note: n=1,781 ages 18+
Source: Greenlight VR, "Virtual Reality Consumer Report October 2015" conducted by Touchstone Research, Nov 23, 2015

Virtual Reality HMD price versus market size

Source: Jackdaw Research

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Financing VR

- Budgets – advertisers don't see the value yet; no installed base, no metrics/ROI

Research on VR and memory retention needed!
•VR appears to trigger strong memory retention
•Some people recall VR experiences as real memories

Time Warner and Nielsen Will Study How Virtual Reality Affects the Subconscious

By measuring eye-tracking, facial movement, heart rate and brain activity to better understand how consumers think and feel at a deeper level

In-VR Advertising

LA-based **Immersv** Launches Video Advertising Platform for Virtual Reality Apps

THE FOLLOWING **VIRTUAL REALITY APP** MESSAGE
HAS BEEN APPROVED BY THE **IMMERSV** AD NETWORK

≡ımmersv

≡ APPROVED! ⬗
PLEASE ENJOY THE FOLLOWING MESSAGE ®

Stare at an ad to unlock bonus features

Virtual Reality Film House
Penrose Studios
Raises $8.5 Million
3/10/16

UTA Signs Digital Content Studio *Secret Location*

UTA will work with Secret Location
- to expand its business in both non-traditional and traditional media
- to advise on its social and digital media strategy

THE VR FUND 2016 VR INDUSTRY LANDSCAPE v1.1

BY TIPATAT@THEVRFUND.COM

www.thevrfund.com

The VR Fund
2:30 Business of VR panel

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Extend existing production and distribution skills and tech

Learn about
    UI design
    Spatial audio
    Game engines and game mechanics

etc
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unleash

New Course for February Session:

NEW at GCI: "Virtual Reality and Cinematography"

This one-of-a-kind class covers a new, exciting field for Cinematographers

The bounds of Expanded Cinematography® continues to grow to encompass ___ t will be the *next* revolutionary venue for visual storytelling, the ever evolving ___ tual **Reality**. In the past few years, the accessibility to Virtual Real ___ emand for content has exploded, creating an unique opportuni ___ embrace the medium and apply their skills in "tr ___ component to GCI's mission to prepare Cla ___ possibilities.

With the generous suppo ___ Reality cameras a ___ of our "Level 1" p ___ immersive storyte ___ ny in this new "arena", and ___ on with the latest in Virtual Reality eq ___

To better prepare stu ___ Reality capture, GCI has enlisted two of the top experts ___ new, innovative course: **Andrew Shulkind** and **Sinclair** ___ s at the forefront of working Directors / Cinematographers in the ___ R, and Sinclair is an expert at creating solutions and training for "traditional" filmmakers to approach the creative possibilities / restrictions of Virtual Reality. We welcome both Andrew and Sinclair to the GCI Teaching Faculty!

Apply today to GCI Level 1 - February Session to be part of this new, one-of-a-kind course "Cinematography for Virtual Reality" - taught ONLY at Global Cinematography Institute!

Virtual Reality and Cinematography

Support for GCI's
"Virtual Reality and Cinematography"
Class Provided by:

R A D I A N T
I M A G E S

SEMINARS
VENDOR COURSES
FREELANCE LECTURERS
DEMO / TRAINING

INTERACTIVE MEDIA PEER GROUP

THE TELEVISION ACADEMY

Television Academy | Pivotal Labs

Next Thursday April 28, 2016

INSIDE VR | LA

PIVOTAL LABS | 1333 2ND STREET, SANTA MONICA
THURSDAY, APRIL 28TH, 6:30PM

PRODUCED BY L.A. 2016

PRESENTED BY **PGA**

JUNE 4-5   SONY PICTURES STUDIOS

EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT VIRTUAL REALITY BUT WERE AFRAID TO ASK

VRLA   VROC   VRSV VRDC VR__

http://www.virtualrealityla.com

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In Conclusion

Modern era consumer VR is <3 years old

New art form and communication tool

In VR storytelling, the inherent limitations of gaming don't apply.
We need to bring cinematic visual and audio craftspeople into this field
Paraphrased from conversation with **Jacqueline Bosnjak**, CEO, Q Department

Consumers buy experiences, not technologies

Storymaking

Social

Business

Gaming

Education

Virtual Reality Summit

1:30 – Live Streaming VR
2:30 – The Business of VR
3:30 – VR Audio

PLelyveld@ETCenter.org

Thank you

Phil Lelyveld

Entertainment Technology Center @ USC
School of Cinematic Arts