EXPLORE THE SCIENCE OF VIRTUAL REALITY

REINVENTING REALITY

EXHIBIT CATALOG

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REINVENTING REALITY

Reinventing Reality is a 5,000 ft² exhibition that investigates the science of virtual reality. Guests not only have fully-immersive VR experiences, but also learn in fun and interactive ways how human perception, tracking technology and digital models all come together to make imaginary worlds feel real.

FEATURES

SIZE
5,000 square feet

LANGUAGES
English, Spanish (French available)

TARGET AUDIENCE
Families with children, teens, adults, school groups

DWELL TIME
45 minutes to 1 hour

THROUGHPUT
120 guests per hour

SHIPPING
Four 53'0" trucks. Inbound shipping paid by host venue

INSTALLATION AND DISMANTLE PERIOD
10 business days each, supervisor provided

HOSTING CONSIDERATIONS
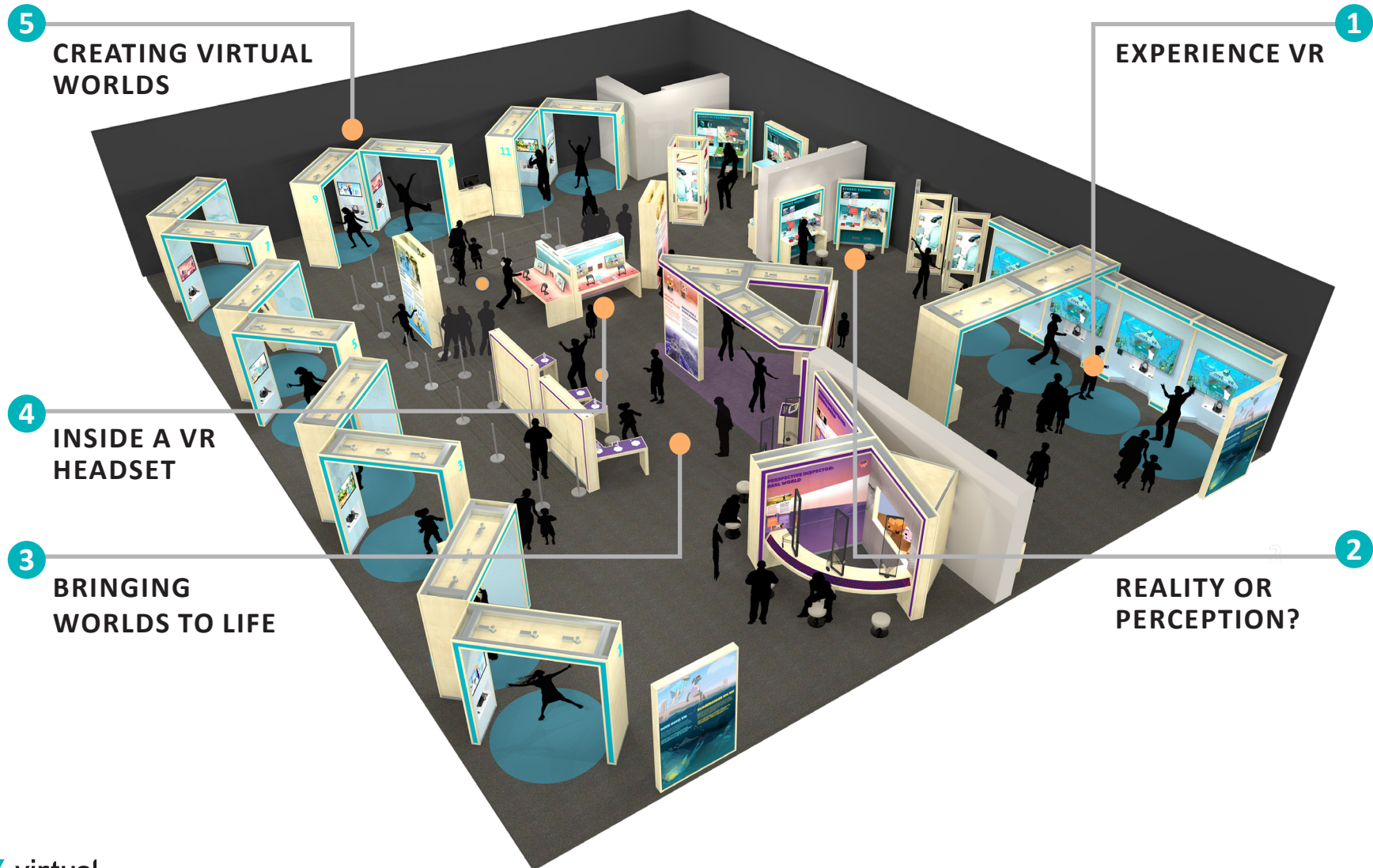Internet connectivity is required within gallery space

TECH SUPPORT
Available through TeamViewer

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5 CREATING VIRTUAL WORLDS

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2 REALITY OR PERCEPTION?

EXPERIENCE VR

DIVE INTO VR

BIG IDEA

Virtual reality matches your perspective in real time so you feel completely immersed in another world.

REINVENTING REALITY

VISITOR EXPERIENCE

In this introductory experience, guests are submerged in an underwater virtual enviroment. As they look around and explore they notice that the luminous jellyfish react instantly to their movements. Audio prompts encourage guests to slide the headset up to their forehead to experience virtual reality tracking on the large screen in front of them.

4 exhibit stations

Bilingual instructions

Closed Captions

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AREA TITLE
REALITY OR PERCEPTION?

EXHIBIT TITLE
STRETCH YOURSELF

BIG IDEA
Coordinated visual and sensory cues can fool us into believing a virtual body is ours.

REINVENTING REALITY

VISITOR EXPERIENCE

On a virtual space station, the guest sees a lab scientist brush their slowly stretching virtual arm, while a real brush strokes their real arm. Since the physical sensation matches what the guest sees, they are startled to feel as though their real arm is stretching to an impossible length. After the activity, a short video explains how this works.

This exhibit recreates an early VR lab experiment based on the 'rubber hand illusion' where you temporarily believe that a rubber hand is your own hand.

2 exhibit stations

Bilingual instructions and interpretive graphics included

Closed Captions

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AREA TITLE

REALITY OR PERCEPTION?

BIG IDEA

The eyes can trick the brain into hearing sounds that don't exist.

EXHIBIT TITLE

BAR OR FAR?

REIN**V**ENTING
REALITY

VISITOR EXPERIENCE

For this compelling illusion, guests watch a split-screen video which shows two mouths. One is saying the word "bar" and the other is saying the word "far," but only the sound of "bar" is played. When guests look at the mouth saying "bar," they hear the word "bar." However, when they look at the mouth saying "far," they hear the word "far" instead. The visitor is surprised to learn that what they see overrides what they hear.

Bilingual instructions and interpetive graphics included

Closed Captions

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AREA TITLE

REALITY OR PERCEPTION?

EXHIBIT TITLE

TROMPE L'OEIL

BIG IDEA

Virtual reality engineers and artists both play with light and shadow to trick our brains into seeing depth.

REIN**V**ENTING
REALITY

VISITOR EXPERIENCE

Here, younger guests can let their imaginations run wild by engaging with a giant dragon that appears to be flying through a cave straight at them. Even though they know the artwork is flat, their brains are deceived into seeing depth where there is none. This trompe l'eoil was commisisoned from world-renowned illusionist artist Edgar Mueller, and provides a great photo-op.

Bilingual interpretive graphics included

REALITY OR PERCEPTION?

Virtual reality, like optical illusions, relies on visual trickery to challenge human perception.

EXHIBIT TITLE

VISUAL ILLUSIONS

VISITOR EXPERIENCE

Here, guests interact with some astonishing optical illusions. For the checkerboard shadow illusion, they slide a panel back and forth and learn to their amazement that two seemingly-different diamonds are actually identical, even though they appear to be extremely different shades of gray. The Ebbinghaus illusion and Shepard Table illusion further illustrate how we don't always see what we think we see.

🌐 Bilingual instructions and interpretive graphics included

REALITY OR PERCEPTION?

EYE TRACKING AND VR

BIG IDEA

Computers can now detect exactly what we are looking at, transforming how we interact with VR content.

REIN**V**ENTING **R**EALITY

VISITOR EXPERIENCE

Using cutting-edge eye tracking technology, guests play a game of finding futuristic spacecraft and other unusual natural features in an ethereal landscape using only their eyes. The image is only in focus where they are looking, while the rest of the scene is blurred. Bystanders can see this but, incredibly, the player won't notice.

2 exhibit stations

Bilingual instructions and interpretive graphics included

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REALITY OR PERCEPTION?

STEREO VISION

Stereoscopes, like VR, draw on our brain's ability to combine slightly different images to create the illusion of depth.

REIN**V**ENTING **R**EALITY

VISITOR EXPERIENCE

Guests peer into a large stereoscope viewer at an animated galactic landscape, ablaze with stars and planets. They can see left and right images on two screens and, when looking through the viewer, the images fuse together to form a fully three-dimensional scene. Spaceships and flying objects soar across the display when the guest pushes a button. Low-tech View-Masters working on the same principle are placed nearby.

2 exhibit stations

Bilingual instructions and interpretive graphics included

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BRINGING WORLDS TO LIFE

DEPTH CAMERA:
MAPPING REALITY

Depth cameras create 3D models of spaces and objects that can be used in virtual reality.

REINVENTING REALITY

VISITOR EXPERIENCE

While moving and dancing in front of a depth camera positioned within giant screens, guests see a live point cloud of their bodies. These billions of points show the location of every reflection, and perfectly capture their physical movements. Pin screens are available for guests to create their own low-tech depth model.

Depth cameras allow VR creators to scan real objects and environments and then place them in a virtual world.

🌐 Bilingual instructions and interpretive graphics included

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BIG IDEA

Depth cameras allow you to project and interact with real 3D objects in virtual environments.

VISITOR EXPERIENCE

In this exhibit, guests experiment with augmented reality and see their friends appear virtually as a live point cloud. While one guest stands in front of the depth camera, another can view and walk around the point cloud model on the iPad.

🌐 Custom app features bilingual options

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AREA TITLE

BRINGING WORLDS TO LIFE

EXHIBIT TITLE

PERSPECTIVE INSPECTOR:
REAL WORLD

BIG IDEA

Your brain constantly collects information about the position of objects around you to form a model of the world.

REINVENTING REALITY

VISITOR EXPERIENCE

Using dry erase pens, guests trace colorful block animals onto a glass frame. As they move between each of the three drawing stations, they notice that their view of the creatures changes.

🌐 Bilingual instructions and interpretive graphics included

AREA TITLE

BRINGING WORLDS TO LIFE

EXHIBIT TITLE

**PERSPECTIVE INSPECTOR:
DIGITAL WORLD**

BIG IDEA

VR worlds feel so believable because the digital models shift at exactly the same rate as the user's own movements.

REIN**V**ENTING
REALITY

VISITOR EXPERIENCE

Here, a virtual model of the same animals in Perspective Inspector: Real World are shown on the large screen. As guests slide a VR headset between three stations, they notice that the scene is changing to match the perspective of the VR headset.

🌐 Bilingual instructions and interpretive graphics included

BRINGING WORLDS TO LIFE

VIRTUAL SOUND

Sounds are attached to objects in a virtual reality environment to make the experience feel extremely realistic.

REINVENTING REALITY

VISITOR EXPERIENCE

In this interactive music experience, guests are challenged to put together the band to play a concert. Wearing a set of unique VR headphones, they lean close to the stages to determine the location of each musician--drummer, singer, keyboardist, and guitarist. As the guest places each musician on the correct stage it lights up. When the whole band is set up, the concert begins!

- 2 exhibit stations

- Bilingual instructions and interpretive graphics included

- Closed Captions

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INSIDE A VR HEADSET

TRACKING MOVEMENT

BIG IDEA

To engage and interact with the virtual world effectively, tiny sensors in the VR headset constantly track our head's direction and precise location.

REIN**V**ENTING **R**EALITY

VISITOR EXPERIENCE

Here, guests explore a woodland landscape while seeing how different types of sensors affect how the VR headset tracks movement. Visitors can turn on/off the Rotation sensor, which allows them to see all around them. They can also experiment with the Translation sensor, which allows movement in six directions for fully immersive VR.
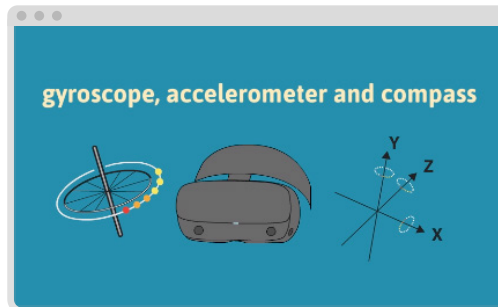
After visitors experiment with the sensors, a short video plays on the screen and in headset, explaining how headset tracking works.

2 exhibit stations

Bilingual instructions and interpretive video included

gyroscope, accelerometer and compass

Explanatory video plays on screen

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BIG IDEA

External cameras and sensors see invisible lights (infrared LEDs) on the headset to detect and track where you are looking.

REINVENTING REALITY

VISITOR EXPERIENCE

Entering a scene at dusk populated with creatures, guests can turn on and off infrared cameras that track the movement of the headset. Without the cameras, the scene freezes, but when the cameras are on, visitors are immersed in a virtual world. A live feed camera on the monitor reveals the hidden LEDs on the headset, allowing visitors to see how their movement is tracked.
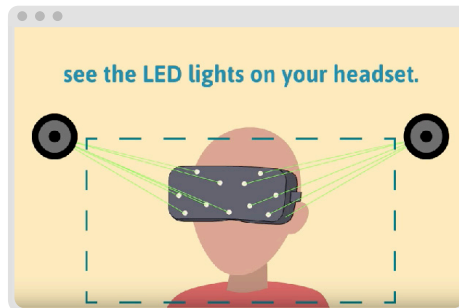
After visitors experiment with the buttons, a short video plays on the screen and in headset, explaining how this works.

2 exhibit stations

Bilingual instructions and interpretive video included

see the LED lights on your headset.

Explanatory video plays on screen

AREA TITLE

INSIDE A VR HEADSET

EXHIBIT TITLE

INSIDE-OUT TRACKING

BIG IDEA

Current VR headsets have built-in cameras and sensors that detect their exact location, making VR more convenient and accessible.

REINVENTING REALITY

VISITOR EXPERIENCE

Here, guests experience how a VR headset can use internal cameras and sensors to map its surroundings and immerse the viewer in a virtual world. Guests are guided through a calibrating activity which then pops them into a virtual desert environment. They can explore the animated desert terrain and enjoy getting up close to the animals and geological features.
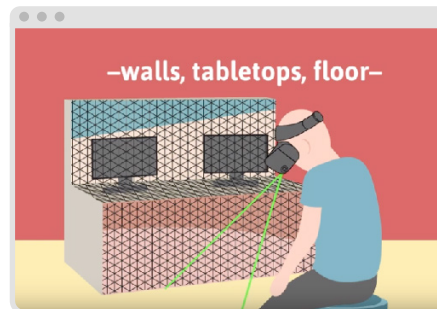
Afterward, a short video plays on screen and in headset explaining how inside-out tracking works.

🖼 2 exhibit stations

🌐 Bilingual instructions and interpretive video included

Explanatory video plays on screen

CREATING VIRTUAL WORLDS

CAREERS AND CREATORS

People are using virtual and augmented reality at work to design, train, learn, and create new experiences.

REINVENTING REALITY

VISITOR EXPERIENCE

In this area, guests can imagine what the future holds for immersive technologies and visualize STEM-related career opportunities. Six STEM professionals spanning a range of industries from healthcare to space exploration are interviewed in the series of two-minute documentaries. These are shown across three stations, each comprising two large monitors.

The content is available at:
www.virtualsciencecenter.org/careers-creators

🖳 3 exhibit stations; each includes 2 monitors

🌐 Videos are subtitled and dubbed. Audio wands are included that allow guests to listen in English or Spanish.

🅾🅲 Open Captions

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CREATING VIRTUAL WORLDS

EXHIBIT TITLE

VR EXPERIENCE PODS

BIG IDEA

In addition to learning about the science of virtual reality, guests enjoy a thrilling full-body VR experience.

REINVENTING REALITY

VISITOR EXPERIENCE

Leaving reality behind, guests can choose to float down the Grand Canyon, make 3-D sculptures or slash the beats to music in one of twelve VR Experience Pods. Facilitators use simple RFID cards to start each five minute VR experience, and an instruction video demonstrates how to put on and take off the headset. A customized software platform runs the VR experiences which can be selected by the host venue.

- 12 exhibit stations with full VR set-up
- VR experiences are customizable
- CC Closed Captions on request

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INCLUDED

- 15 unique interactive exhibits
- 12 VR Experience Pods
- 6 Careers and Creators modules
- 4 staff stations
- 6 area graphic panels
- Exhibit support laptop
- Custom show controller
- WLAN base and satellite station
- Custom stools
- Batteries and chargers

VENUE REQUIREMENTS

- Exhibit lighting requires (6) 110V 20A circuits and multimedia requires (8) 110V 20A circuits.

- Daily exhibit operation and support requires one fast internet-connected Ethernet link to the system support location with ports 80, 443, and 5938 open to traffic between the support laptop and the internet.

- Acceptable temperature range is 65-80 degrees Fahrenheit.

- Acceptable humidity range is 30-60% relative humidity.

OPERATIONS AND TECHNICAL SUPPORT

Reinventing Reality includes a show control support laptop. Individual exhibits can be started up, shut down, and have their app relaunched via the computer management tool on the support laptop. The entire exhibition can also be powered on, shut down, and set to run on custom schedules through the show control web interface, from any device connected to the exhibits network.

Exhibits are connected to a Wireless Local Area Network (WLAN) via Wi-Fi to Ethernet bridges to connect the show control program and to allow troubleshooting from the support laptop. Offsite support is available via TeamViewer to the support laptop, which can reach non-internet-connected exhibit computers using Windows Remote Desktop on the local network. Each Core VR station is also running TeamViewer.

NETWORK SECURITY

All exhibit computers (except the Core VR stations) are kept off the internet by disabling DNS at the machine level. Automatic Windows updates are disabled and updates for Oculus and Steam are disabled by machine level firewall for exhibits connected to the internet and by isolation from the internet. Core VR team connection runs in semi-offline mode for game licensing and support purposes only.

EXHIBIT NAME	AREA	L	D	H	QUANTITY	EQUIPMENT
Dive into VR	Experience VR	4'2"	18'0"	8'10"	4	75" display; VR computer; Oculus Rift S VR headset; custom floor mats
	Overhead structure	7'0"	1'6"	8'5"		
Stretch Yourself	Reality or Perception?	6'6"	2'8	6'6"	2	43" display, VR computer, Oculus Rift, S VR headset, custom interactive
Bar or Far?	Reality or Perception?	5'6"	2'4"	6'6"	1	32" display, speaker, video player
Trompe L'oeil	Reality or Perception?	10'3"	5'0"	8'5"	1	SEG fabric print on custom frame
Visual Illusions	Reality or Perception?	5'6"	2'4"	6'6"	1	Custom interactives built into tabletop
Eye Tracking and VR	Reality or Perception?	6'6"	2'4"	6'6"	2	43" display, VR computer, Tobii eye tracker
Stereo Vision	Reality or Perception?	5'6"	1'6"	6'6"	2	17" displays (2), computer, polished steel mirror
Depth Camera: Mapping Reality	Bringing Worlds to Life	14'0"	14'0"	9'0"	1	46" displays (4) , computer, depth camera, custom floor mat, table with pinscreens
AR Depth Data	Bringing Worlds to Life	1'6"	2'0"	2'6"	1	12.9" iPad Pro in Armodilo case, table w/ tether
Perspective Inspector: Real World	Bringing Worlds to Life	8'6"	12'3"	8'6"	1	Custom set w/ animals, drawing stations on railing (3), dry erase markers
Perspective Inspector: Virtual World	Bringing Worlds to Life	8'6"	8' 6"	8'6"	1	75" display, VR computer, Oculus Rift S VR headset, custom interactive stations on railing (3)
Virtual Sound	Bringing Worlds to Life	7'9"	5'1"	6'6"	2	43" display, VR computer, Oculus Rift VR headset, U-shaped custom table with integrated interactive, custom VR headphones
Tracking Movement	Inside a VR Headset	6'6"	3'3"	4'6"	2	27" display (2), VR computers (2), Oculus Rift S VR headset on custom mounts (2)
Outside-In Tracking	Inside a VR Headset	6'6"	3'3"	5'0"	2	27" display (2), VR computers (2), Oculus Rift VR headset on custom mounts (2), infrared sensors, infrared cameras
Inside-Out Tracking	Inside a VR Headset	6'6"	3'3"	4'6"	2	27" display (2), VR computers (2), Oculus Rift S VR headset on custom mounts (2)
Careers and Creators	Creating Virtual Worlds	5'5"	3'1"	8'0"	6	43" display, SD cards, 2 soundsticks per display
VR Experience Pods	Creating Virtual Worlds	8'6"	3'0"	8'6"	12	32" display, Oculus Rift S VR headset, custom floor mats