

HIMSS[®]18

The leading health information and technology conference

WHERE **THE WORLD** CONNECTS FOR HEALTH

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Las Vegas | Venetian – Palazzo – Sands Expo Center

Virtual Reality Gets Real in Healthcare

Session 47, March 6, 2018

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COMMITMENT

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DISCLAIMER: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of HIMSS.

Conflict of Interest

Richard Krohn, MA., MBA

David Metcalf, Ph.D.

Rick Krohn has no real or apparent conflicts of interest to report.

David Metcalf has reported a recent J&J Wearables trial and ownership in an outside investment company- DM2 Research

Agenda

- Context
- Industry Adoption
- Industry Applications
- Obstacles
- Cases
- Outlook

Learning Objectives

- Analyze the disruptive application of VR technology throughout the healthcare landscape
- Describe how VR is being architected to create immersive, personal health prevention and treatment experiences
- Discuss actual cases of VR applications that address personal and population health
- Recognize VR healthcare solutions that are in development, pilot and launch pad

VR vs. AR

Virtual reality (“VR”) is an artificial environment created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment.

Augmented reality (“AR”) is the integration of digital information with the live video of the user's environment in real time. AR takes an existing visual digital feed and blends new information to create an augmented environment.

So what’s the difference?

While VR aims at immersing the user into a computer generated virtual world, AR describes virtual computer generated objects that are added to a real physical space.

VR isn't a new concept



Flight simulator
1929



Sensorama
1962



SEGA VR
Gaming Headset
1993

The Technology has Advanced....



and Price Points have Dropped

Samsung Gear VR
2015 - \$99
2017 - \$39

Oculus Rift
2016 - \$800
2017 - \$400

Dream Vision
2017 - \$10

Global Market for Healthcare VR

ABI Research forecasts that VR services in the medical and healthcare segment is about to explode in value from **\$8.9 million in 2017** to around **\$285 million in 2022**. Although still niche, the growing interest and investment in VR applications from professionals, hospitals and medical institutions is going to lead to a significant new wave of applications being used to treat patients around the world.

Over 40 years of academic research and over 3000 studies demonstrate that VR can improve behaviors and health.

Medical Applications of VR

Behavioral Health
Clinical Interventions
Professional Training
Health and Wellness

Today, there are VR Solutions for Phobias and Mental Health

- Phobias and Anxiety
- Drug/Alcohol Abuse
- Schizophrenia
- PTSD
- Depression
- Autism
- ADHD



Flying



Heights



Spiders



Anxiety



Dementia



PTSD  #HIMSS18

...for Clinical Interventions



Cancer Treatment



Burn Treatment



Telemedicine



Physical Therapy

- Physical Therapy and Rehab
- Stroke/Brain Injury
- Speech Therapy
- Pain Management
- Telemedicine

...for Professional Training



Medical Education



Simulation – 70 year old



Surgical Training

- Clinical and Surgical Skills Training
- Use of Equipment and Tools
- Team Training - eg: Emergency Department, Surgical Team
- Emergency Response Training and Rehearsal
- Interpersonal Skills, Protocols and Empathy

...for Health and Wellness



Meditation



Stress



Exercise



Gaming

- Weight Management
- Exercise
- Stress Management
- Behavior Modification
- Addressing Isolation
- Grief Counseling

But it's still early days in healthcare....

Healthcare is dwarfed by gaming as VR investments, but Industry-wide, it's a green field for innovation.

VR in the Office/Enterprise

Behavior change
Virtual diagnosis
Education and Prevention

VR in Pharma

PTSD
Rehabilitation
Pain management
Behavioral health (ex. pain management, Drug efficacy)

VR applications for patients and consumers

Immersive health/wellness
Gamification
Brain injuries
Behavioral health (ex. anxiety, body image, phobia)
Chronic disease management



VR Effectiveness Proof Points

- **Phobias:** Researchers at Yonsei University's Gangnam Severance Hospital in South Korea used VR training programs with a group of 82 South Korea-based participants. The training sessions brought about a reduction of nearly 90 percent in fear of heights and public speaking in the group.
- **Pain Reduction:** Dr. Brennan Spiegel of the UCLA School of Medicine found patients experienced a 24% reduction in pain after only ten minutes of using a special visualization and administered via Samsung Gear goggles. And in a 2011 study conducted by the military for soldiers with burn injuries from IED blasts, etc. VR worked better than morphine. Patients reported 60 to 75-percent less pain than before their VR sessions. For comparison, morphine averages around 30-percent pain reduction.

VR Effectiveness Proof Points

- **Professional Education:** Brian Sweeney, M.D of the Department of Surgery, University of Massachusetts Medical School , has reported that “simulation can increase the learner’s knowledge base, improve decision making, teach teamwork, develop psychomotor skills ... and ensure some degree of competency in the learner.”
- **Rehabilitation:** The University of Aarhus and Hammel Neurocenter (Denmark) conducted a study of stroke patients using a VR game in which the patients wore gloves with sensors, their movements tracked by an infrared camera and transferred to a virtual arm on screen. The researchers found the virtual reality solution to be as effective, less expensive, and more motivating than physical therapy.

There are, of course, hurdles to VR Adoption in Healthcare

- **Funding** – the real development action is still in gaming
- The **headsets** currently used in VR are still bulky and not the most comfortable, and the visual presentation and interactivity continue to improve.
- Infrastructure, Integration and Gadget **cost**
- New **technology aversion** – VR is a young technology not easily deployed in enterprise environments (but has shown effectiveness in ER, OR and with field staff to drive better outcomes).
- Creating a truly engaging **VR experience** in a practical, consumer-ready device.
- **User** discomfort(disorientation, motion sickness)
- **Privacy, compliance**
- **Pushback** from doctors unaccustomed to retail solutions

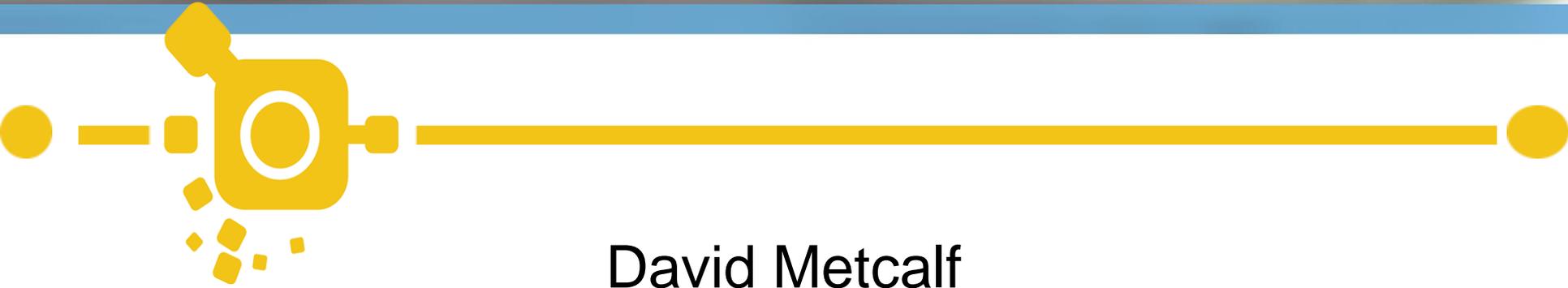
3D/AR/VR Examples



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David Metcalf

Institute for Simulation and Training

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INDUSTRY

GOOGLE

Johnson & Johnson



Moving Knowledge™

LOWE'S



Microsoft™

cognition

TECHNOLOGIES

WEB 2.0

mobile

collaboration

learning

KNOWLEDGE

MILITARY



**COMBAT MEDIC
PLAYING CARDS**



USMC
COMBAT HUNTER

HEALTH



REALITY MEDS
VIRTUAL FAMILY

SOCIAL

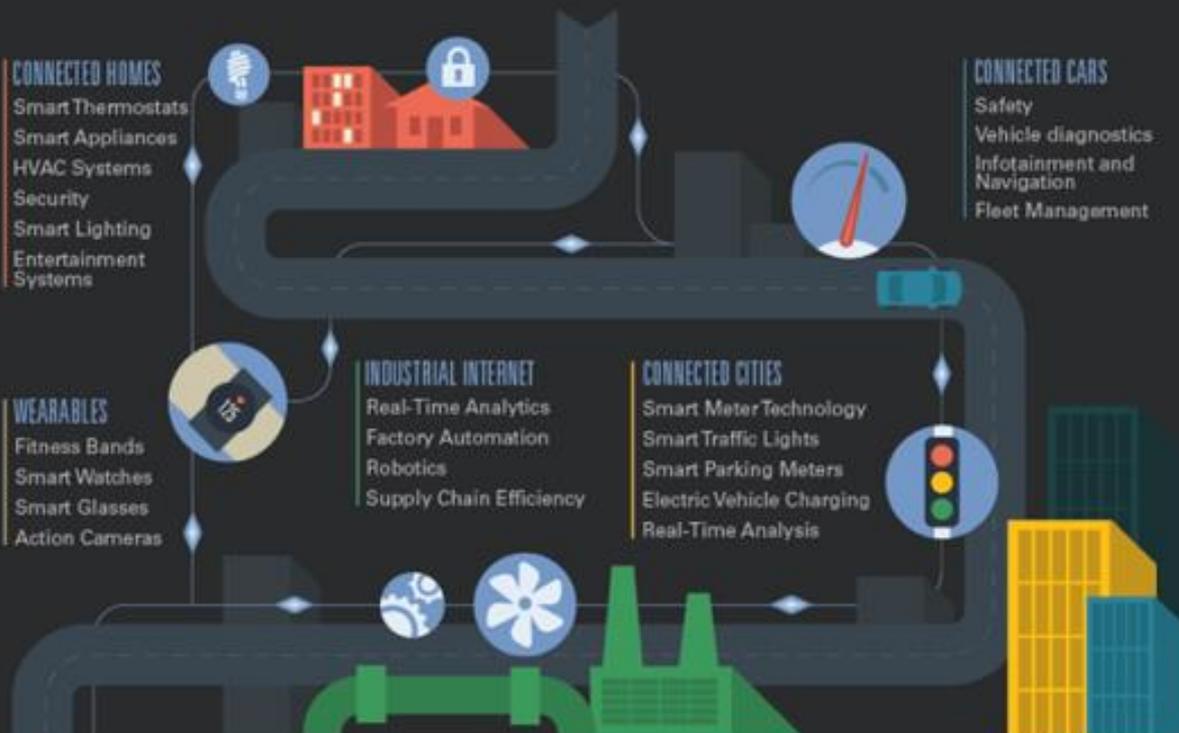


HADR

HUMANITARIAN ASSISTANCE
DISASTER RELIEF

WHAT IS THE INTERNET OF THINGS?

The Internet of Things connects devices such as everyday consumer objects and industrial equipment onto the network, enabling information gathering and management of these devices via software to increase efficiency, enable new services, or achieve other health, safety, or environmental benefits.

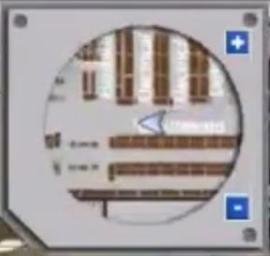




Zone Walk Quit

- 1. Top Stock
- 2. Obstruction
- 3. Electrical
- 4. Top Stock
- 5. LP

Main Menu



technology conference

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Picture-based playing cards



Flash card mobile app



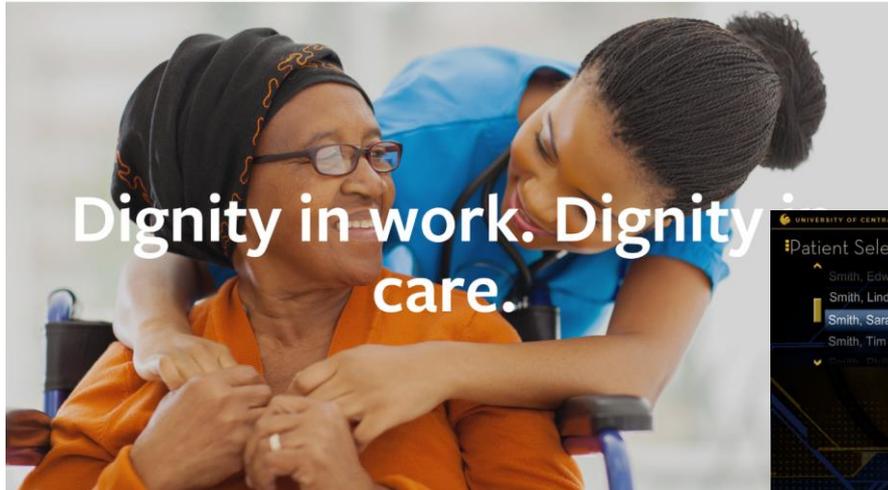
MMS

Messaging



Pull video from posters using your iPhone or iPad.

Advanced Simulation and Mobile



Cognotion, CNA eLearning/Sim



Juan Cendan, MD, UCF



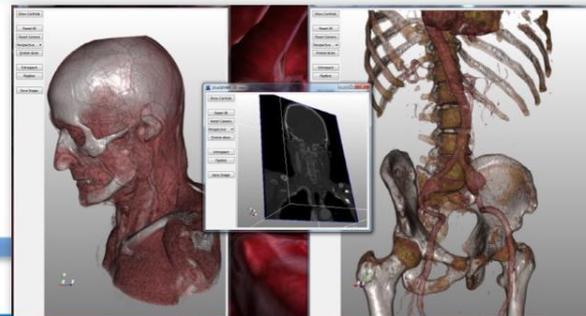
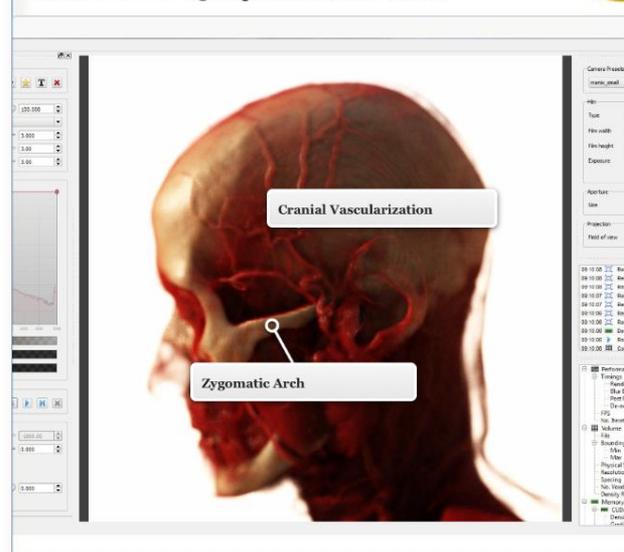
MHEALTH

Volumetric Rendering

Using DICOM imagery, 3D volumetric models are generated in near real-time. This data is usable in multiple formats including those optimized for mobile platforms.

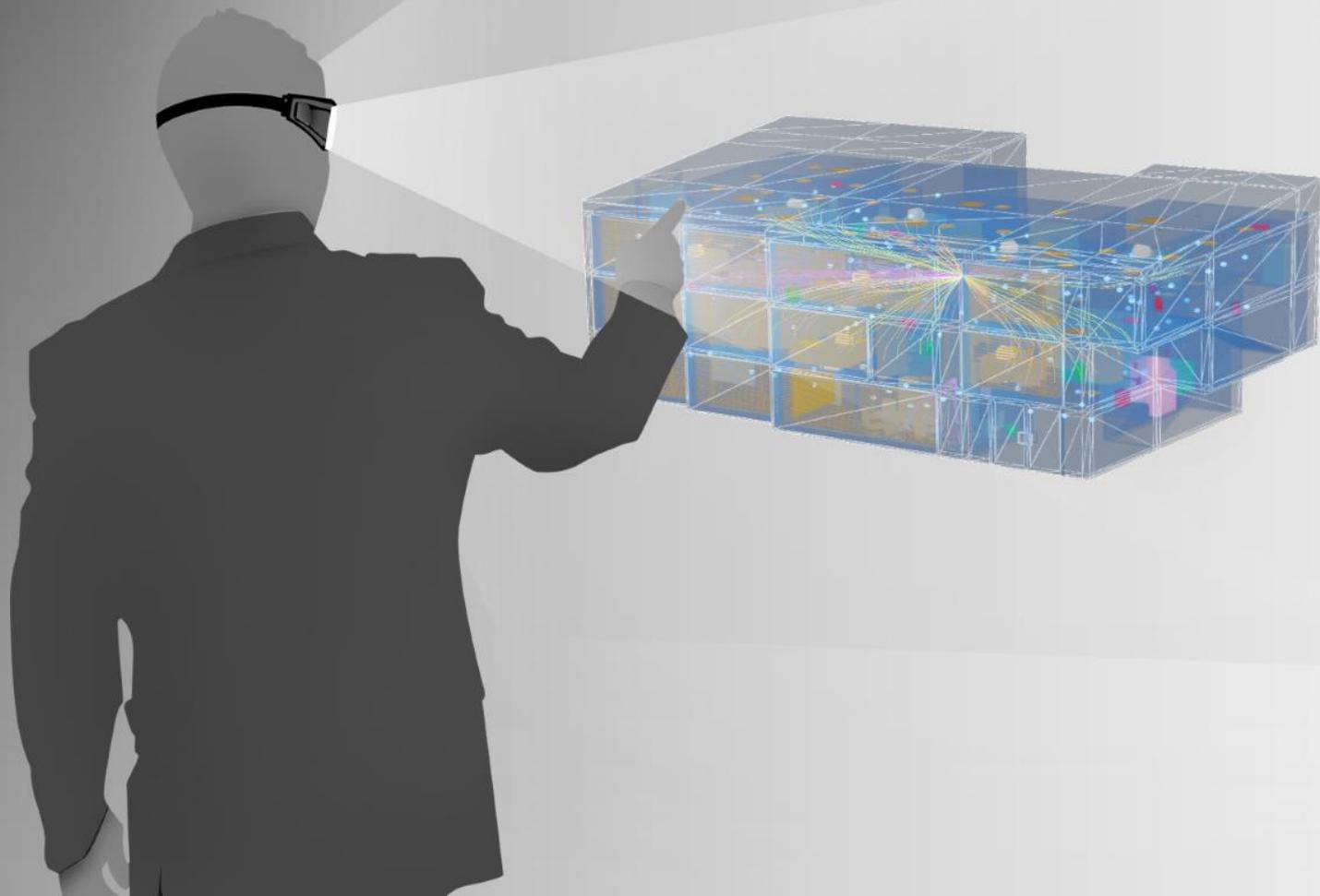


INTERACTIVE 2.3 Exposure Render Viewer















UCF Construct at WHIT Intelligent Garage
Studio for 3D virtual reality, augmented reality and holographic visualizations



*Ideation
Creation
Evaluation*



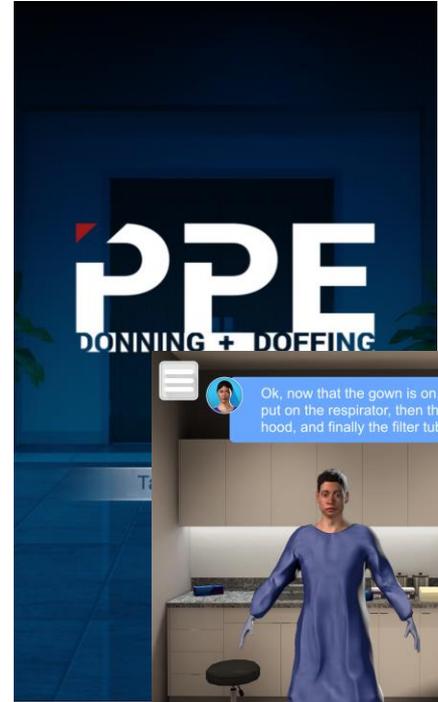
3D Visualization
Wellness
Health
Performance
Living Laboratory
Mixed Reality
Weable Evaluation



VA SimLEARN- AR Training Sim and mHealth VA-VMC PPE App



University of Central Florida, Institute for Simulation & Training 2017



Betty Social Companion Robot/Hologram

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WHERE THE





Voice of:
VIRTUAL CO-PILOT

Look at the lower right-hand corner.
That is our taxi route.

1-Mobile LTE
Done 0:19



WITH THE VIRTUAL CO-PILOT
STUDENTS WEAR
VIRTUAL REALITY GOGGLES



AND SEE THE AVATAR OF A MALE OR
FEMALE CO-PILOT OF ANY CULTURE
RIGHT NEXT TO THEM



ENGINEERS BELIEVE THIS
COULD BE FLIGHT TRAINING
OF THE FUTURE

Virtual Co-Pilot





Alex

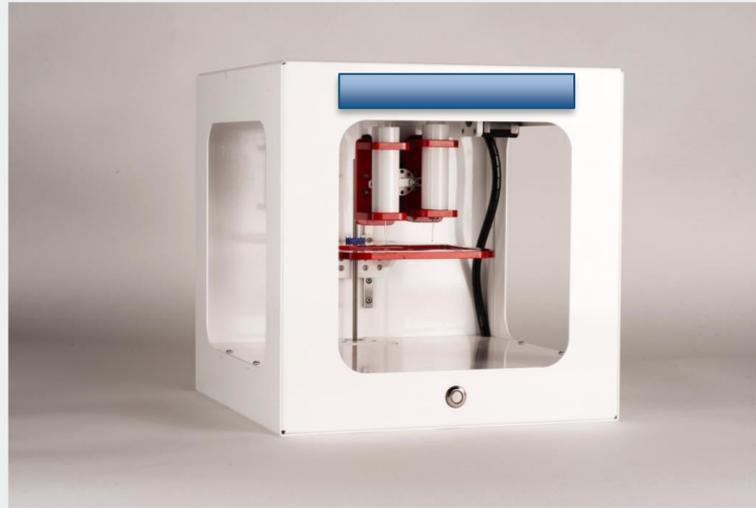


Julianna



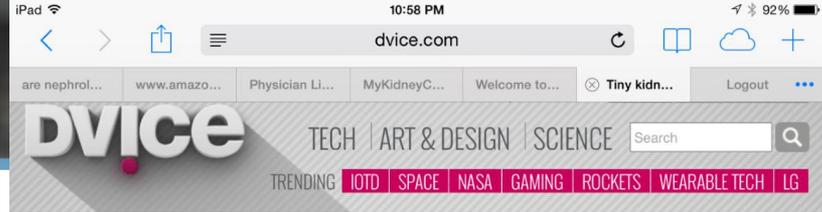
Wyatt





is a desktop 3D bioprinter that builds 3D living tissues out of human cells. It is a beautifully designed, precision manufactured robot that prints cells and bioinks, bringing a new dimension to biology.

WHAT WILL YOU BUILD?



3D PRINTING | MEDICAL TECH | ARTIFICIAL ORGANS
Tiny kidneys are world's first 3D printed living organs
Colin Druce-McFadden Monday, September 9, 2013 - 4:26pm



Credit: [Youtube](#)
Two years ago, Anthony Atala **took to the stage** at TED and showed the world that human organs could be 3D printed. Now, a team from eastern China has successfully printed a series of living kidneys. This is a huge step forward in the quest for 3D printed replacement organs.

While Atala's original 3D printed kidneys were made with a bio-ink that perfectly replicated kidney tissue. The problem was that these tissues were not vital (living). Without the ability to create living organs, 3D printed **transplants** would remain impossible. That's why this new breakthrough is so important.

TOP STORIES

NASA's new warp-speed spaceship concept is very familiar

Forget batteries: future devices could store power in wires

E3 2014: Everything Sony announced for PlayStation 4 and PS Vita

MIT fusion reactor gets restarted

Tesla's 1901 vision for wireless power transmission is reborn



Partnership approach at Univ of Central Florida Institute for Simulation and Training

- Partners with similar vision
 - Public, nonprofit university
 - Compelling projects with the potential for global impact
 - International partnerships that meet the broad goals of UCF, and the Institute
 - We can be an academic partner that understands how to interact with NGOs, Government and Industry partners
 - Joint pursuit of grants
- Resource strategies for people, funding, and tools that create sustainable innovation
 - Spin-off multiple commercial entities and help launch/fund startup activities for students, faculty and our staff
 - Develop next generation leaders and technologists



VR Innovation – Trends

- Smart, adaptive virtual simulations that learn as a patient interacts with it
- Commoditization and retail availability of VR devices and solutions
- Increasingly immersive – from passive viewing to active engagement
- Granular range of apps, better resolution, heightened expectations for creative content
- Form factor – lighter, more comfortable, less scary
- Presentation will grow closer to the Star Trek holodeck.

“After years of validation and use by early adopters - VR technology is poised to move to the mainstream” – Dr. Walter Greenleaf, Stanford University

Questions?

Speakers

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*Please complete the online session evaluation