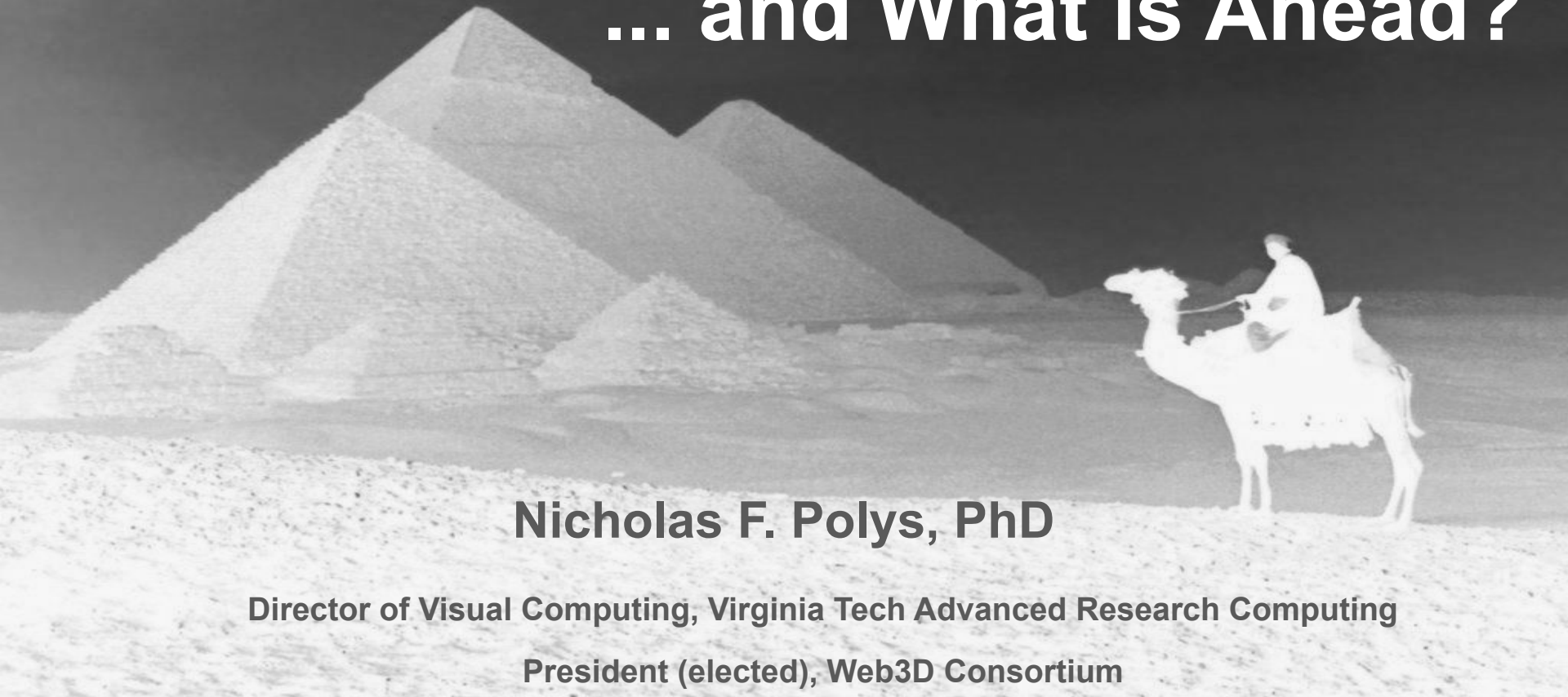


# What is behind the Metaverse? ... and What is Ahead?



**Nicholas F. Polys, PhD**

Director of Visual Computing, Virginia Tech Advanced Research Computing

President (elected), Web3D Consortium

*Alternative Title:*

# **Homo Informaticus**

*Can we evolve???*

# Personal History

- ... a rural upbringing in
  - *the time of typewriters and payphones*
- 24 years of 3D graphics software and interactive content building experience
- 27 years in the Internet and WWW building for the world's largest open computer and communication platform

# Witness to History

- Multiple epochs of hype (and failure) have wasted a ridiculous amounts of time and money toward our goal
- Plenty of shame and blame to go around:
  - Decades of real work getting done w X3D and VRML
  - When undergrads can build it, but big companies can't

# What's behind *this* 'Metaverse'?

Major progress recently:

- Immersive technology
  - performant 3D graphics across 6DOF devices
- Informatics and service integration
- Ubiquitous computing
  - Augmenting our senses w digital information
- Lots of \$

# What's Ahead?

## Cyber Citizens & Society:

- Agency
- Trust & security
- Common infrastructure

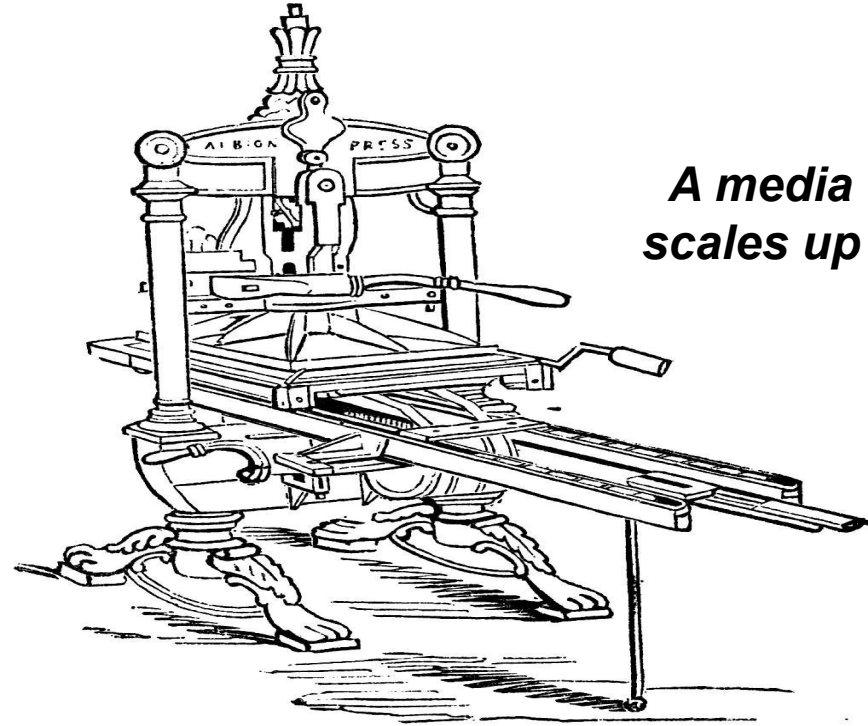


**“Those who don't study history are doomed to repeat it. Yet those who *do* study history are doomed to stand by helplessly while everyone else repeats it.”**

# ***Presence***

***From Oral to Printed media...***

***A media transformation that  
scales up reproducible worlds***



# Media & Reality Transformations

- Print
- Telecom
- Radio
- ...



# 54 years of Engineering & Research into Sensory Augmentation / Substitution

- 1968 Sutherland
  - <https://www.youtube.com/watch?v=0iyNrV7w4f4>
- 1992
  - Caudell and Mizell [1992] at Boeing use 'AR' to wire up complex airplane circuits
- ...





*Cyberspace*

<https://youtu.be/W8r-tXRLazs>

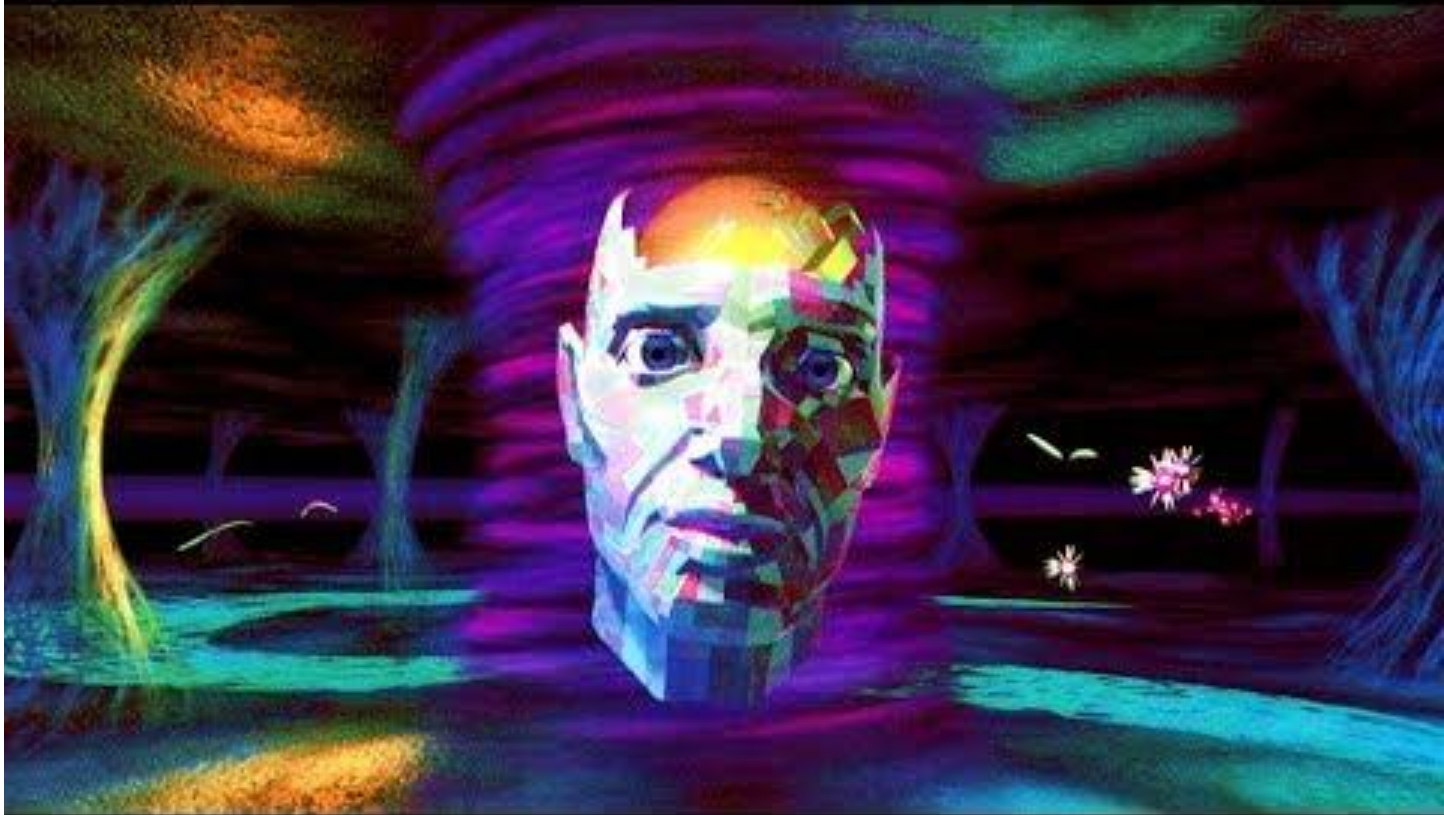
Video Killed  
the Radio Star  
1980



The Mind's  
Eye  
1990



Beyond  
The  
Mind's  
Eye  
1993



# Multi-User Worlds - late 1990s

*In 1998 I picked a handsome avatar and went to the Eiffel Tower and Arc de Triumph in an interactive 3D world, chatting, flying and gesturing with people from around the world, on a 28.8 modem!*

...

- blaxxun (now bitmanagement)
- Canal+
- VNet
- DeepMatrix v1
- Sony



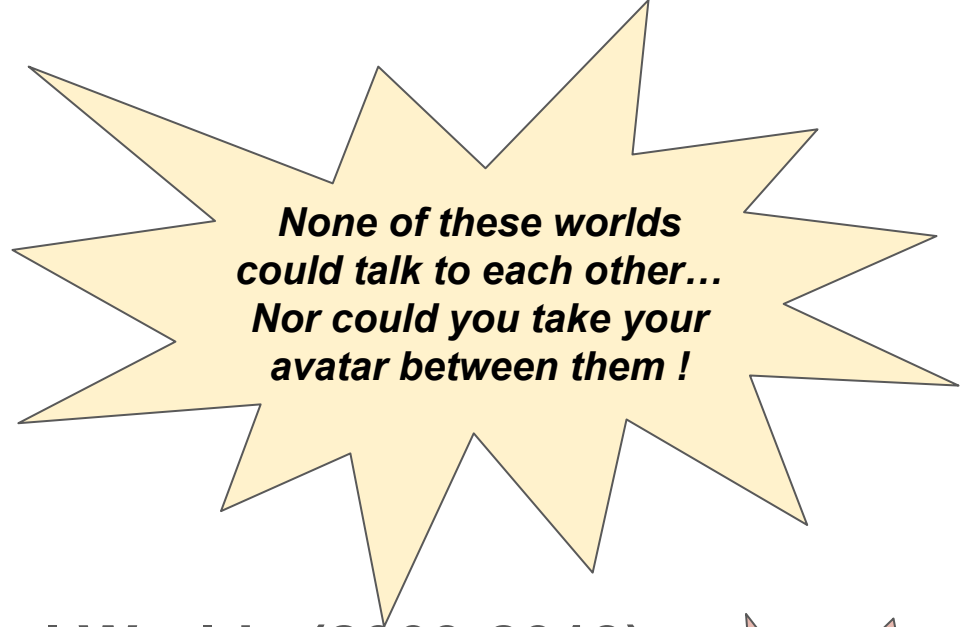
# Economies and Politics

- Colony City
- Cybertown  
*early 2000s*



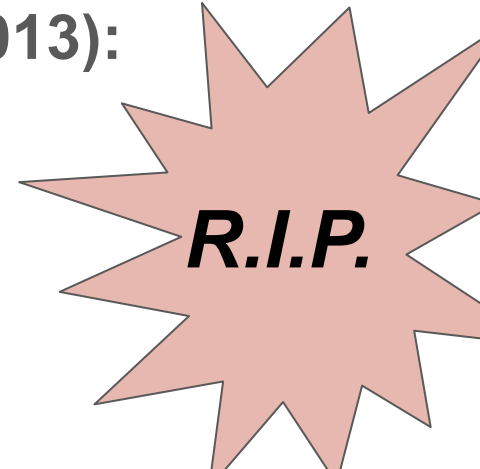
# Mid 2000s

- ActiveWorlds
- Second Life
- There
- Google Lively



## Federal Consortium of Virtual Worlds (2009-2013):

- Avaya
- Teleplace
- VastPark
- Olive





# ::Microverse(s)?

A thought experiment:

Imagine virtual goods in the Metaverse:

- Transportation
- Clothing
- ...

# Metaverse Ingredients

## Common Elements:

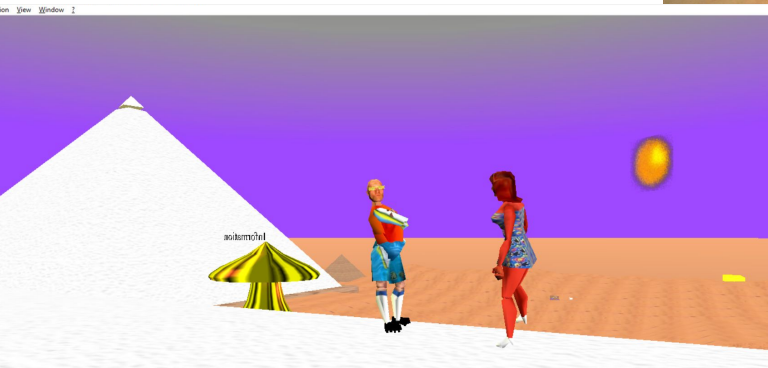
1. Realtime 3D scene in clients with lighting, animation, objects, interaction
2. Load assets into scenegraph
3. Add input devices and output displays
4. Scene updates on user interactions (proximity of entities and events, protocols for messaging of events over the network)
5. Distribution of changes to all connected clients with minimal latency
6. Often text chat and telephony on parallel channels

[\*Web3D's Metaverse Position Paper is online and available HERE!!\*](#)

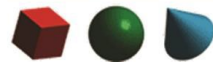
# VirtuWorlds Giza (1998-2022)

*Running faster than ever:*

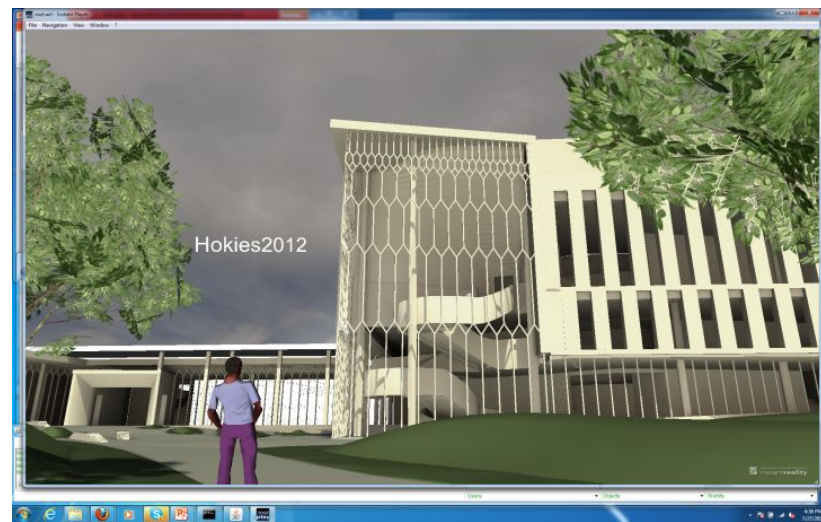
- *WWW*
- *GIS*
- *HANIM*
- *Multimedia*
- *Archival 3D*



**VRML**  
VIRTUAL REALITY MODELING LANGUAGE



# X3D Blacksburg (2010 - present)



# In 2010/2011:



DeepMatrix v2

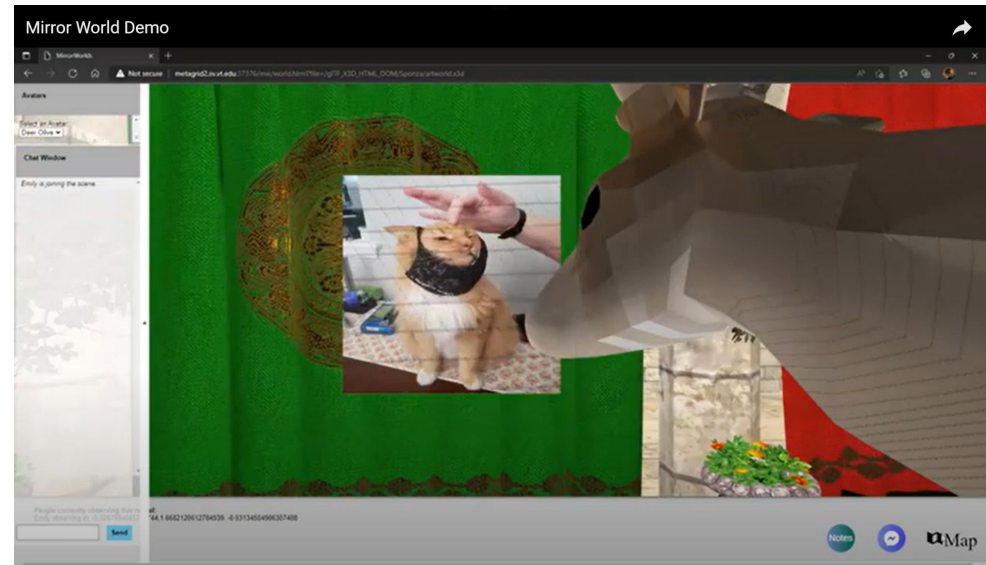
# Same X3D world; different client and server



**BitManagement  
Server**

# Virginia Tech HCI Capstone Groups (Spring 2022)

- Project-based requirement for CS HCI Seniors
- User-centered design, prototyping, and evaluation
- Mirror World concept with Moss Arts Center and VT's Fusality Server (node.js):
  - Multimedia in the Metaverse
  - X3D for lighting and interaction
  - GLTF & X3D models
  - X3DOM + Javascript
  - Private / Proximity chat



# ***All Still True:***

see *Web3D 2011 Tutorial: [Building Networked Virtual Worlds](#)*

## **Observations in 2022:**

- Use of 3D is rising in every vertical market: “Silos of Excellence”
- X3D plays well with others in the WWW ecosystem of Standards
- The Babelization / fragmentation of digital life
- Myriad Microverses monetizing you



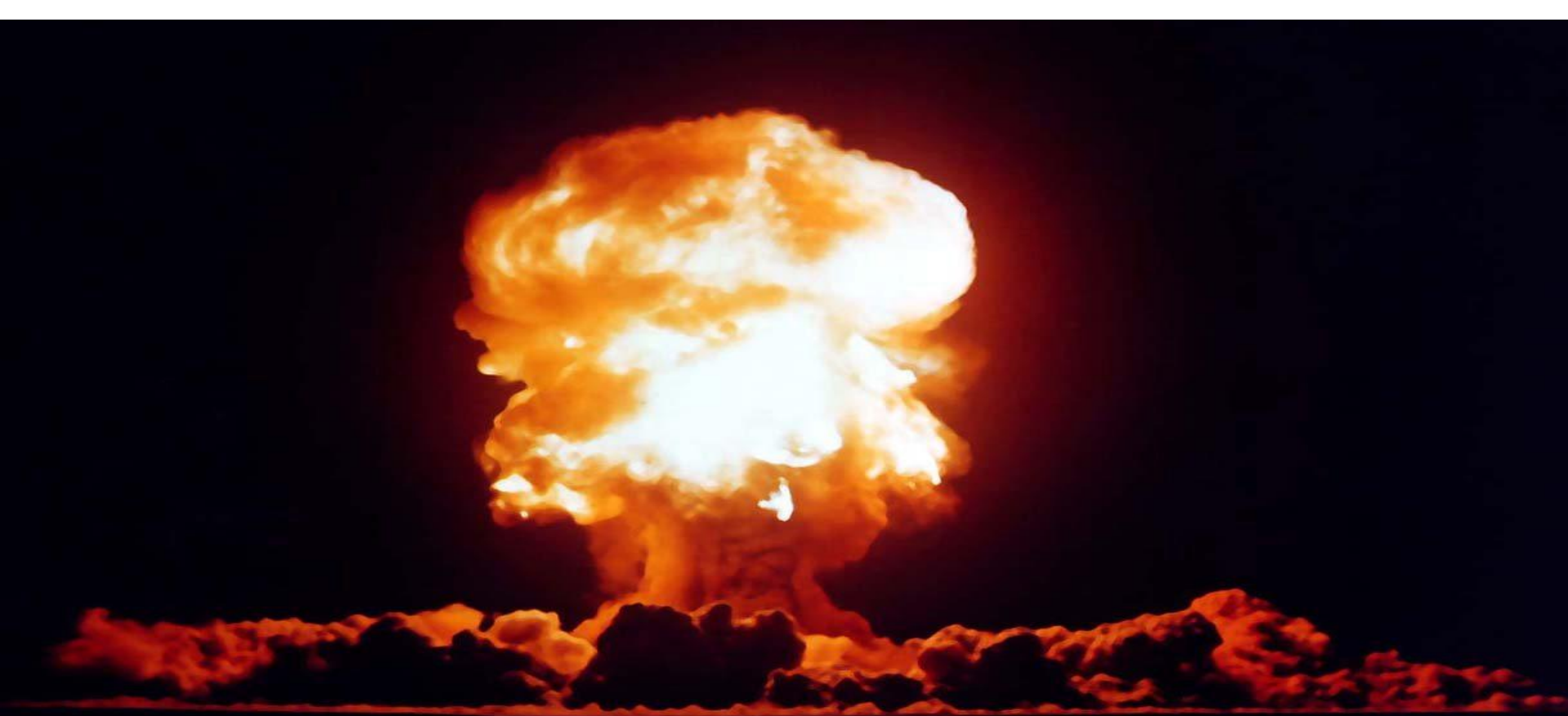
# Micro or Meta Markets?

**User experience still lags expectations.**

- Will the Metaverse be just another ad-tracking environment?
- Will it be specialized to tasks (work, personal, ...)?
- Security and Safety are key factors for consumer adoption:
  - Is my data protected?
  - Can I remove myself at any time?
  - Cultural norms?? Rules of engagement???

# Blockers to Progress

- ***‘Not invented here’***
  - mentalities of venture capitalists and academics
- ***‘The Highlander pathology’***
  - there can be only one
- ***Market Hype***
  - *‘The Valley of Disillusionment’*



USDOE

# What's Ahead?

An appetite?

*Bake the pie before you take a slice!*

History has proven the benefits of innovation on top of a common infrastructure (\*Standards).

# Metaverse Security & Safety

## *Challenges:*

- Legal protections for your private personal data and behavior
- Always bad actors...
- Protecting Minors

## *Chances:*

- Consider how the rights of real-world citizens apply in the Metaverse
- The Metaverse is not a game
- Jerome Lanier's Micropayments scheme ?
- Technology, again, is not the blocker
  - Encryption in WWW, PGP

# X3D4 ; WebXR

- Rich graphical capabilities (X3D + glTF)
- Rich audio capabilities (X3D + WebAudio)
- Data and API interoperability across verticals and WWW
- Device-independence
  - Interaction
  - Presentation
  - Connectivity

# Take-Aways

- Learn lessons from the past
- Extensibility and Interoperability are *not just buzz words*, they are a philosophy for sustainable growth and long-term, productive ecosystems
- A **Declaration of Digital Human Rights** could be a vehicle for industry to behave well and invest in a common Metaverse infrastructure.

# Welcome to the Web3D Community!

- *Proven process*
- *Proven products*
- *Proven people*

*... An open, global community!*

[www.Web3d.org](http://www.Web3d.org)

[npolys@vt.edu](mailto:npolys@vt.edu)