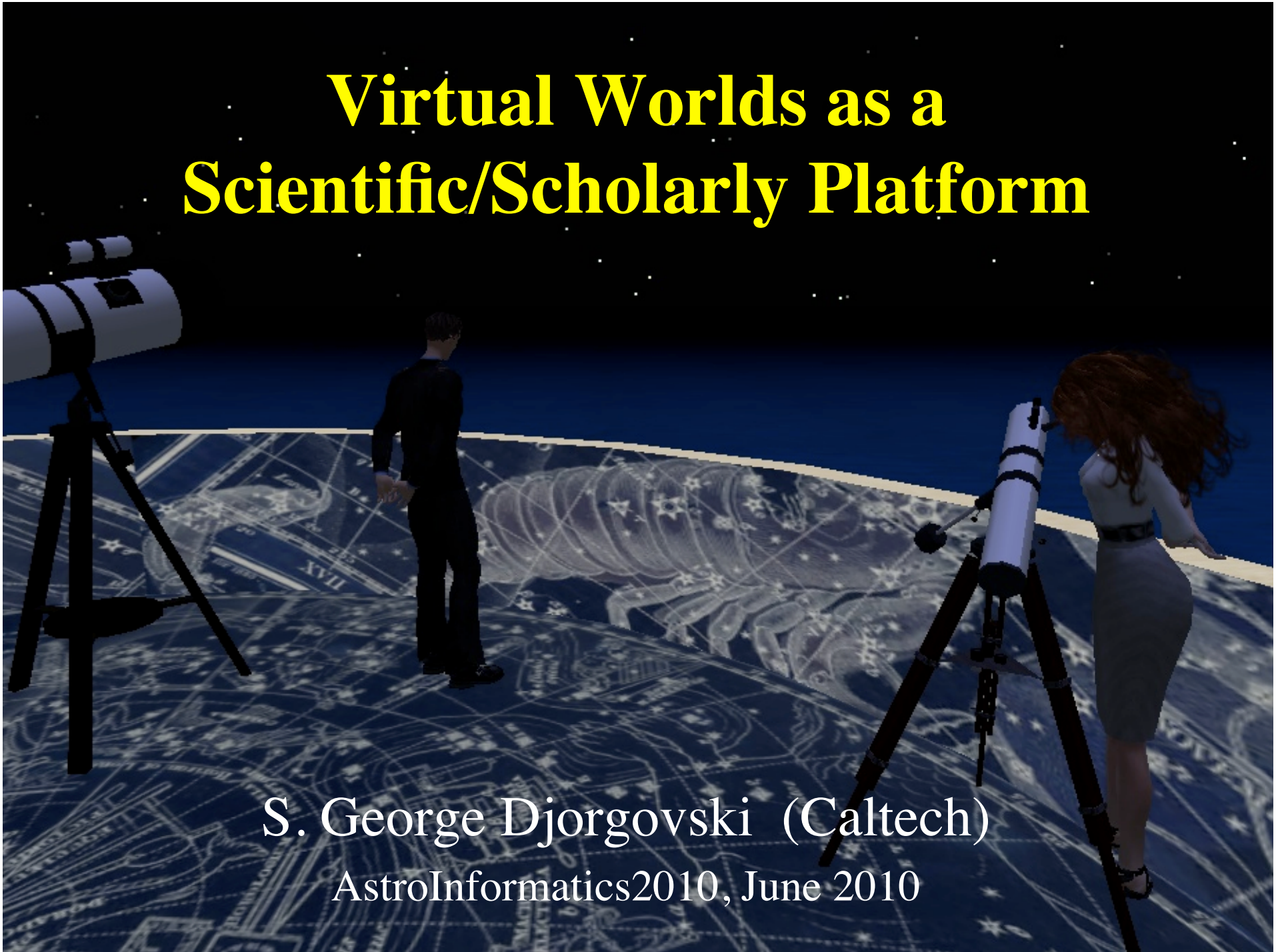


Virtual Worlds as a Scientific/Scholarly Platform

S. George Djorgovski (Caltech)

AstroInformatics2010, June 2010



What Are Virtual Worlds?

- Distributed, immersive, virtual environments, usually 3-D, where people are represented as avatars, and interact with each other and with virtual content (often user-generated)
 - There are probably > 300 VWs currently on line; many are games, some are universal platforms, e.g., Second Life (SL), and its open source counterpart, *OpenSim*
- They are applications of immersive virtual reality (VR); augmentative VR is a related technology
- Institutional presence: Over 300 universities; many gov't agencies (e.g., NASA, NOAA, military, etc.), science museums, media (e.g., Reuters, NPR Science Friday), major companies, etc.
- SL economy is > \$ 600 million per year

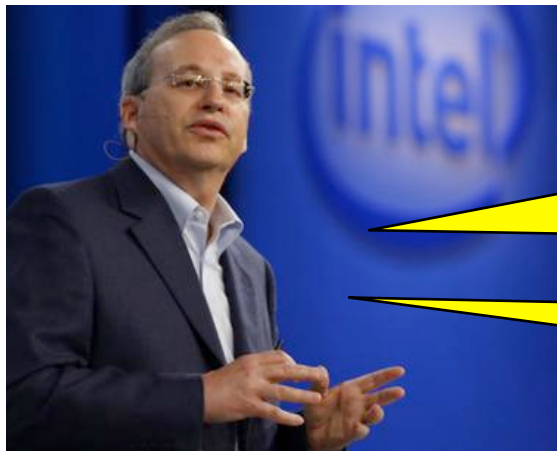
Why Should You Care?

- **Immersive VR is a fundamentally transformative technology, on par with the Web browser (or more)**
- The next generation Web/Cyberspace will likely be accessed via immersive and augmentative VR interfaces
- This will change dramatically how we interact with each other and with informational constructs
- 3D display technology is exploding
 - Currently driven by the entertainment industry, and that pays the bills...
- **These are still the very early days**
 - Improved interfaces, from cartoony graphics to photorealistic
 - Haptic interfaces, Wii, Natal, Sixth Sense, ...

Immersive VR and the Emerging 3D Web



... and the future of the Web:



Justin Rattner, Intel CTO, in a keynote talk at the SC'09:

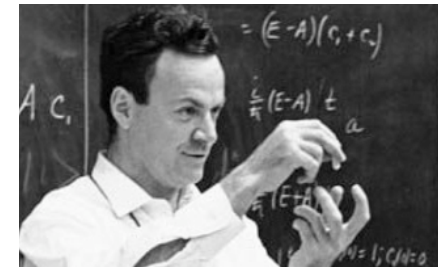
“... There is nothing more important to the long-term health of the HPC industry than the 3D Web...”

“... the 3D Web will be the technology driver that revitalizes the HPC business model ...”

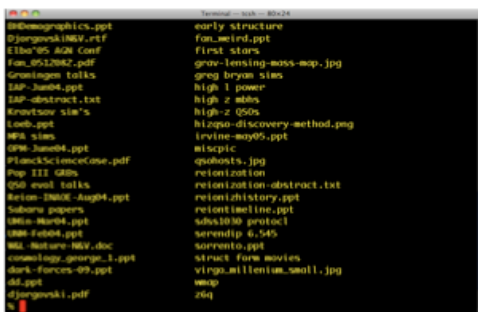
What should the academic community be doing about these emerging technologies? How can we use them?

Human Interactions

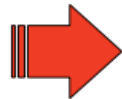
- Science originates on the interface between human minds, and humans and data (measurements, simulations, literature, etc.)
- Any technology which facilitates these interactions is enabling science, scholarship, and education



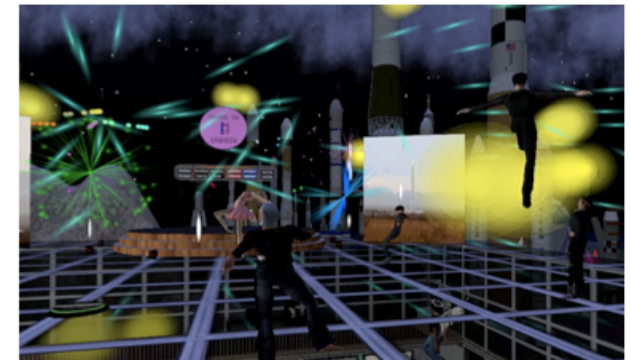
The way in which we interact with computers, and with each other, and with the world of information using computers, is evolving



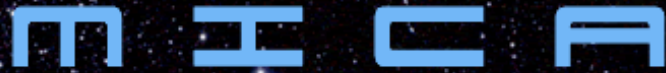
From ASCII text terminals ...



... to Web browsers and hypertext ...



... and now immersive virtual environments



Meta Institute for Computational Astrophysics

Exploring Astrophysics in Virtual Worlds

<http://mica-vw.org/>

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Meta Institute for Computational Astrophysics

The Meta Institute for Computational Astrophysics (MICA) is a professional scientific and educational, non-profit organization based in virtual worlds [VWs] (currently in Second Life [SL], but with an intent to expand its presence in other venues as the VWs evolve). The goals of MICA include:

- ▶ Exploration, development and promotion of VWs and virtual reality [VR] technologies for professional research in astronomy and related fields.
- ▶ Providing and developing novel social networking venues and mechanisms for scientific collaboration and communications, including professional meetings, effective telepresence, etc.
- ▶ Use of VWs and VR technologies for education and public outreach.
- ▶ Exchange of ideas and joint efforts with other scientific disciplines in promoting these goals for science and scholarship in general.

MICA is an experiment in the scholarly use of VWs technologies

- Currently ~ 50 professional members and > 100 affiliates
- Regular schedule of events: seminars, workshops, public lectures, etc.

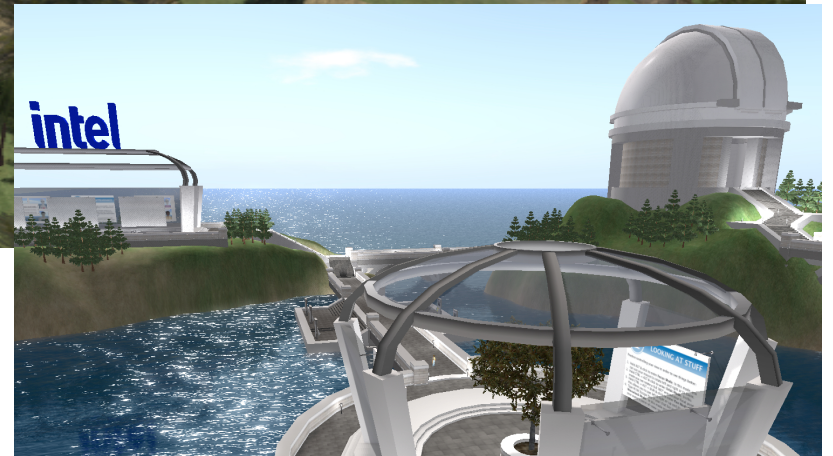
StellaNova Sim, MICA's home in SL:

A pleasant virtual environment for scientific communication,
collaboration, and experiments

<http://slurl.com/secondlife/StellaNova/127/129/32>



A part of the SciLands virtual continent:
<http://www.scilands.org/>



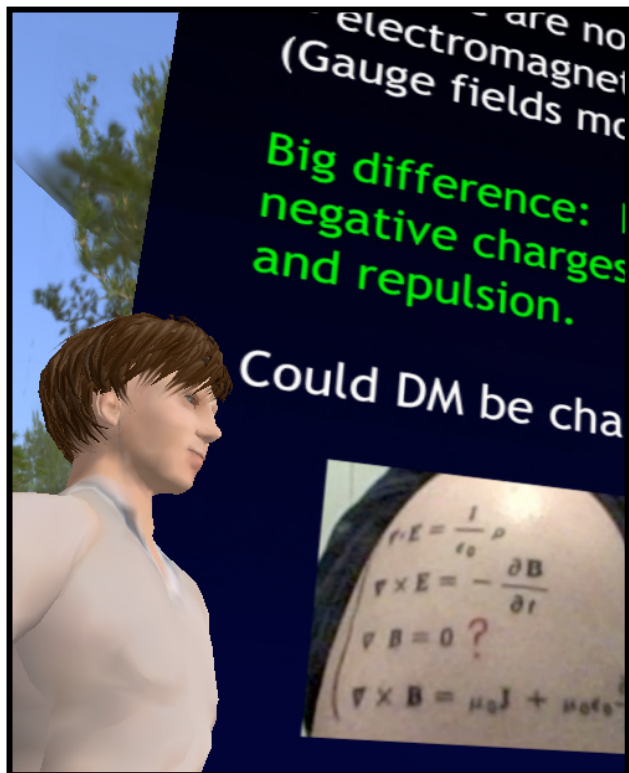
Now migrating to the *OpenSim*-based
VWs, e.g., Intel's *ScienceSim*

Djorgovski

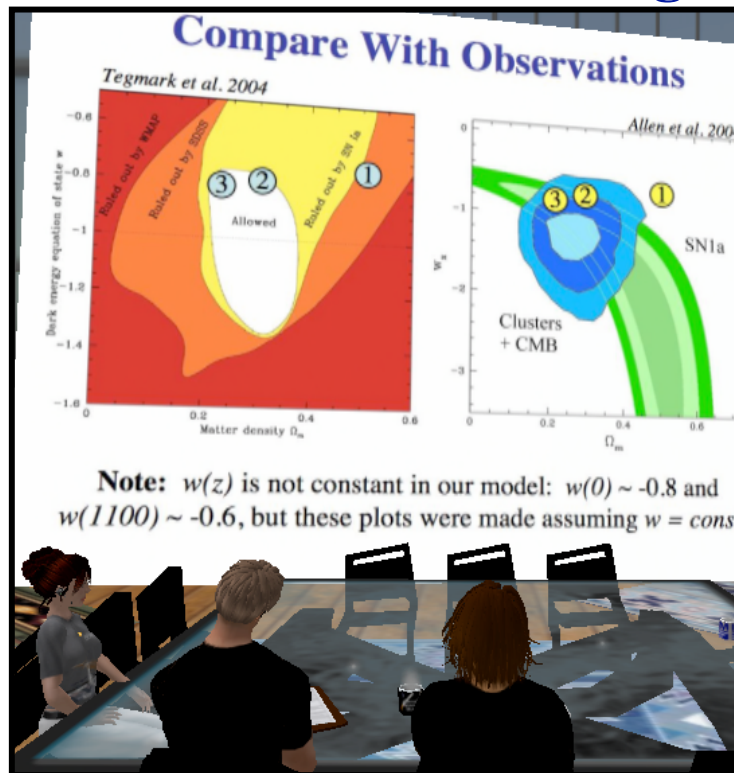
MICA: Scientific Communication and Collaboration in VR Environments

- Subjective experience quality much higher than traditional videoconferencing (and it can only get better as VR improves)
- Effective worldwide telecommuting, at $\sim$ zero cost
- Professional conferences easily organized, at $\sim$ zero cost

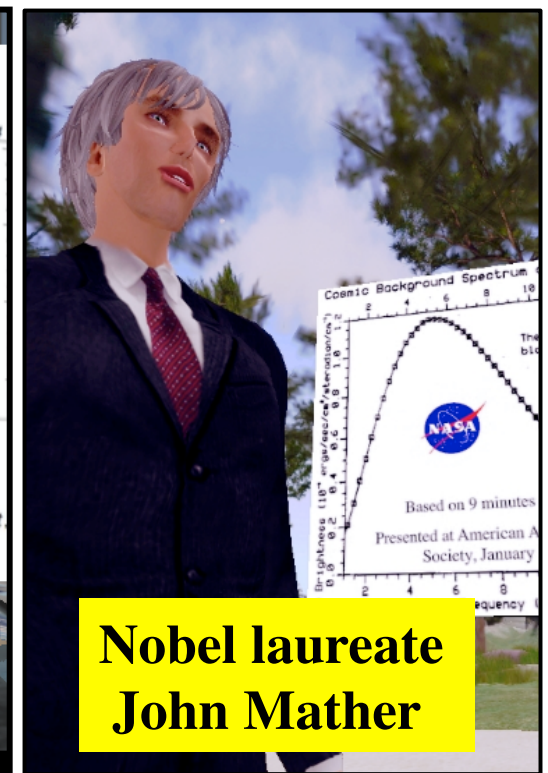
Professional seminars



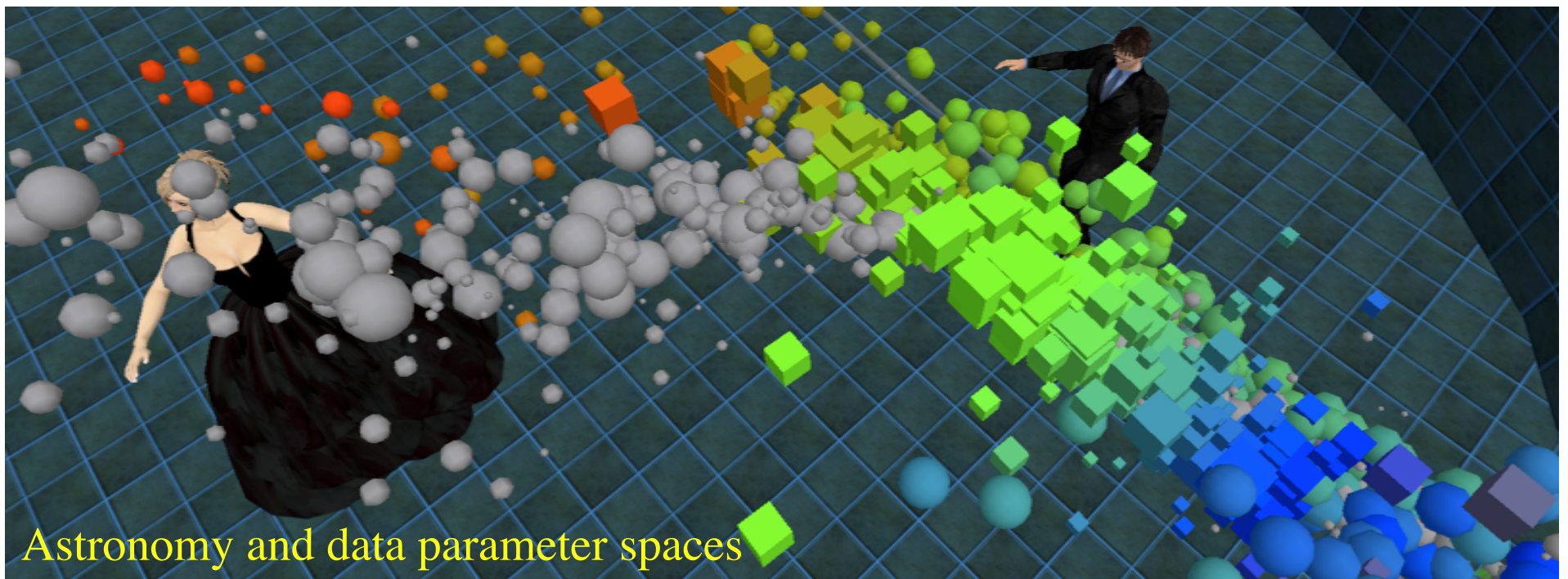
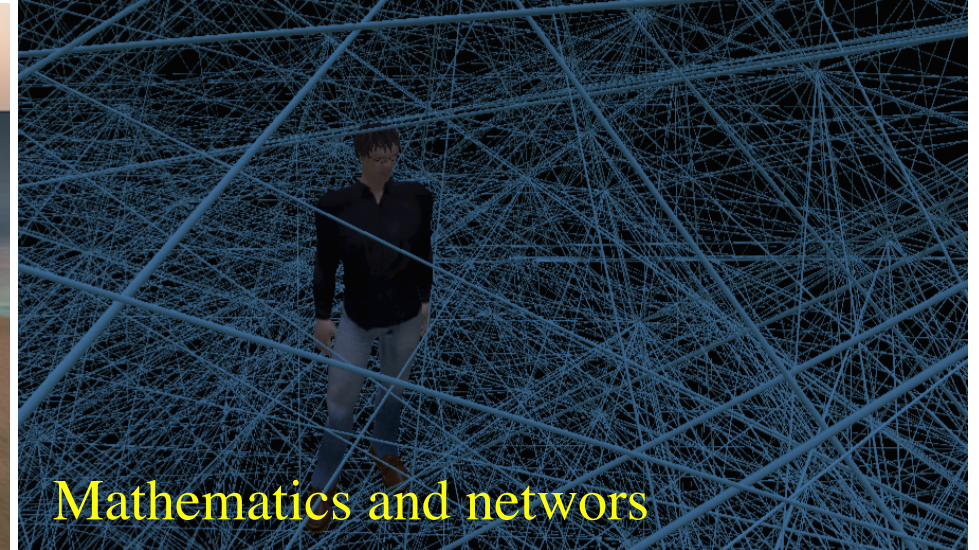
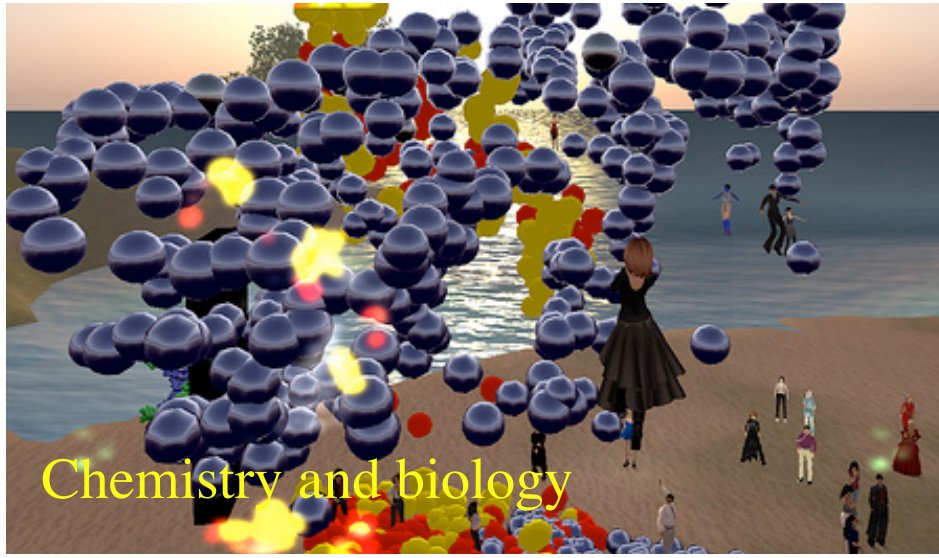
Collaboration meetings

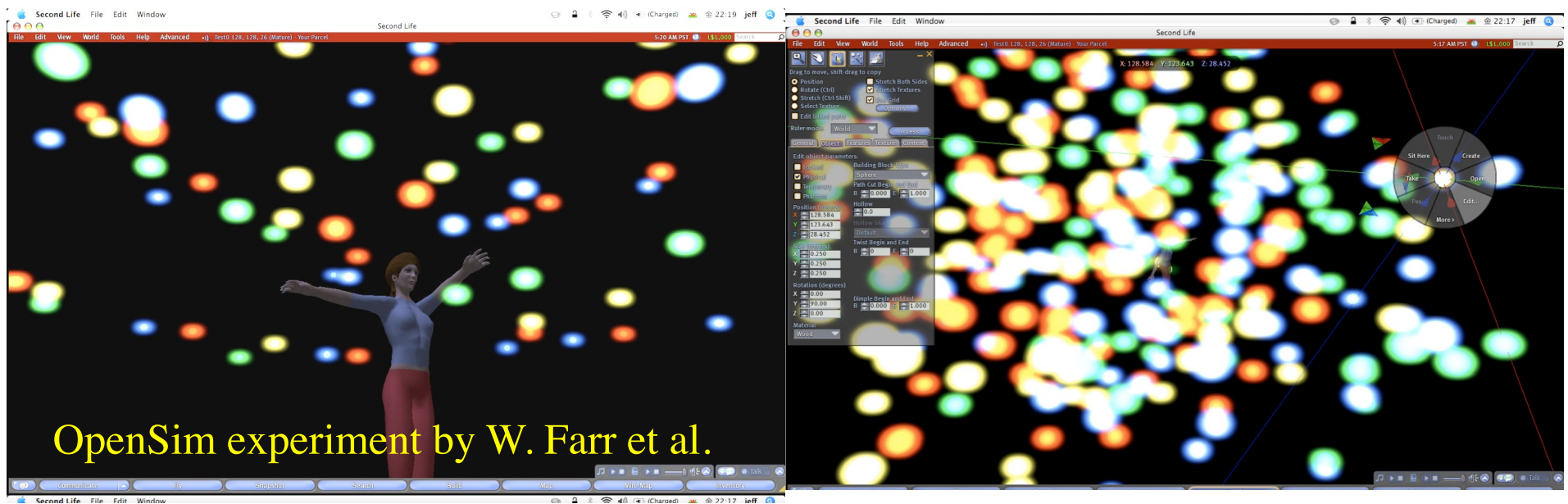


Public outreach



Immersive Data Visualization

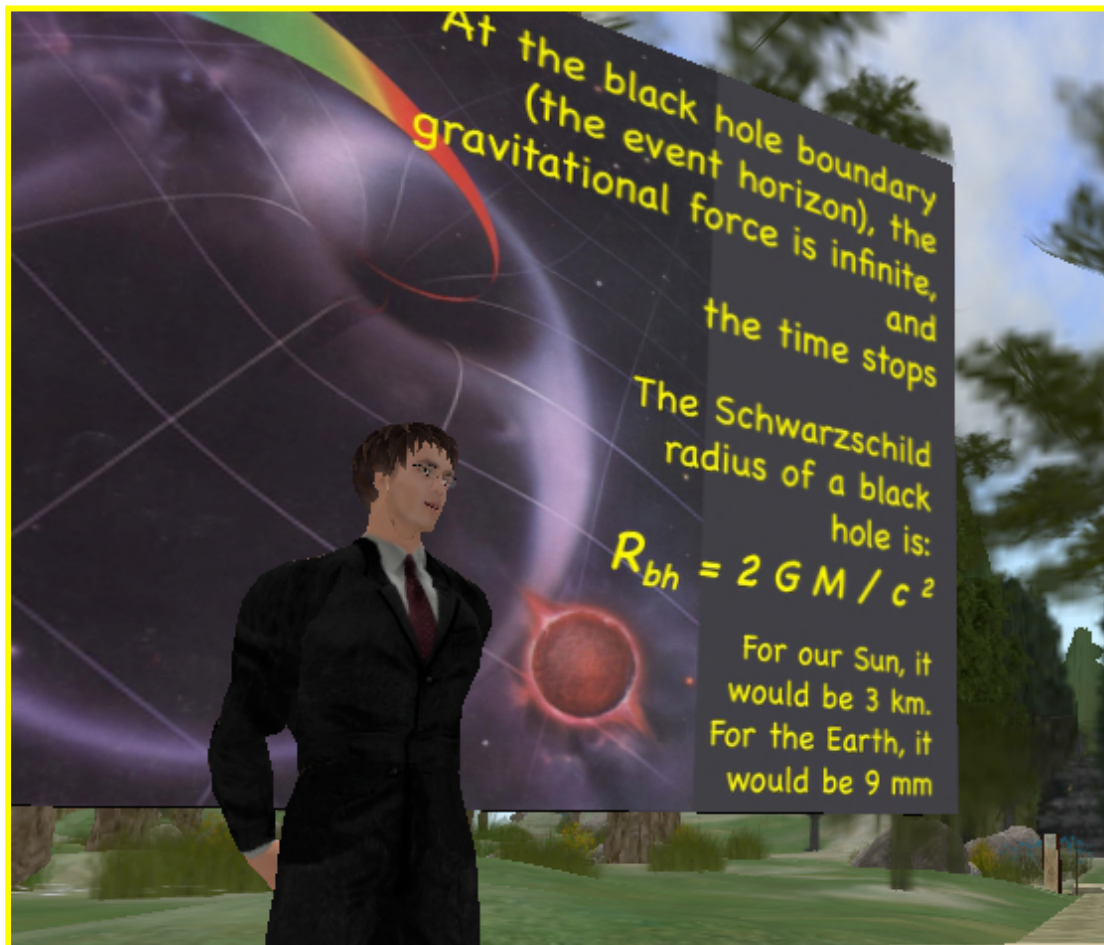




Scientists
immersed in,
and
interacting
with,
numerical
simulations
of star
clusters

Education and Public Outreach

- Already a very powerful platform: public lectures, etc.
- Many virtual science museums already exist
- Classroom instruction being explored





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Second Life Education Wiki

<http://www.simteach.com/>

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A great set of
resources and
links

Getting Started: Frequently Asked Questions and Guidelines

- [Guidelines for Educators](#)

[Programs for Educators](#)

Towards the Immersive Web

- Humanity's information holdings are largely, and will be, on the Web
- The challenges of information discovery, representation, and understanding, can only get sharper
- Immersive 3-D VR is obviously a powerful approach, well suited to a human intuition
- The future is in the synergy of the Web and the immersive VR technologies as the next generation interface



How do we architect effective displays of structured information (e.g., databases, data grids, semantic web constructs, etc.) in immersive, pseudo-3D environments?

Key Points



- VR technologies may revolutionize the ways in which humans interact with each other, and with the world of information; immersive and augmentative VR may become the standard interface for the next generation Web
- The current state of these technologies is still very primitive, but it will get *a lot better*
 - *SL* is currently the most convenient platform, esp. for outreach
 - *OpenSim* is the path we will be pursuing over the next few years
- It is already at a “killer app” level for scientific communication, collaboration, and education/outreach
 - Virtual meetings are very easy to set up, and *free*
- Immersive visualization is the next promising application
- Join MICA and see what this technology can do for you