



Nanotechnology and Cyberspace: Two roads to the same city.

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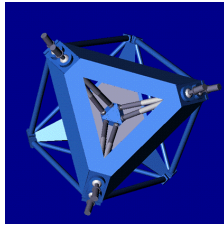
Glenn F. Cartwright

McGill University, Montreal, Canada

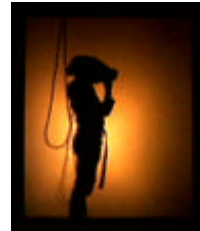
Presented at the World Future Society, Washington Hilton, July 30, 1999

Overview

Nanotechnology



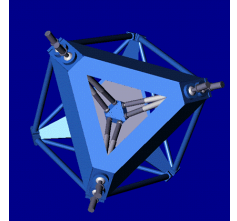
Cyberspace



Convergence to Compvergence

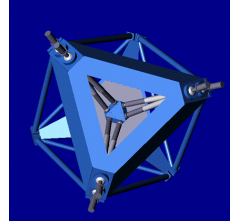
Discussion of Themes

Nanotechnology



- What is nanotechnology?
- Nanothinc (1996) definition:
 - “...the precise and purposeful manipulation of matter at the atomic level”
- K. Eric Drexler (1986) definition:
 - *Molecular* Nanotechnology

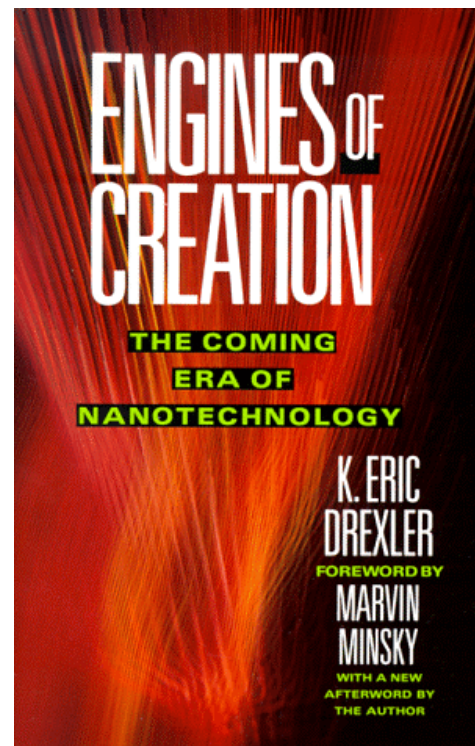
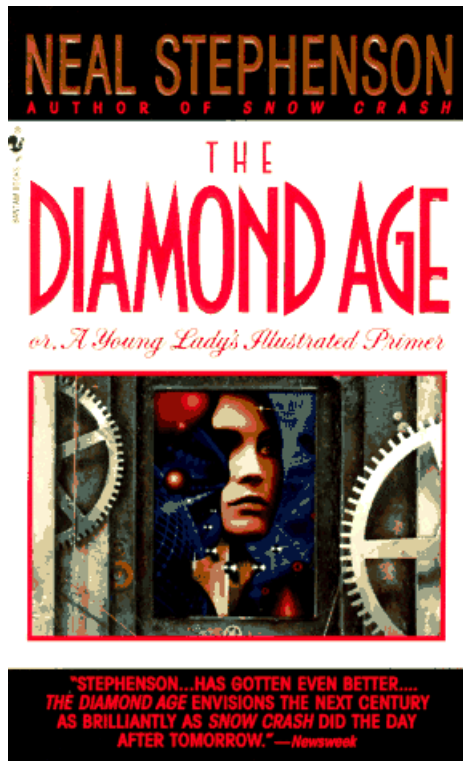
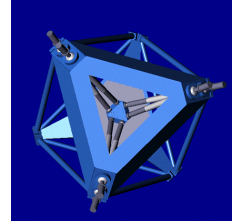
Nanotechnology History and Origins



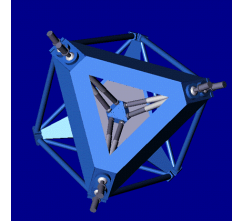
- Richard Feynman (1959): “There’s plenty of room at the bottom...”
- K. Eric Drexler (1986): “Engines of creation: The coming era of nanotechnology”



Nanotechnology Pivotal Literature



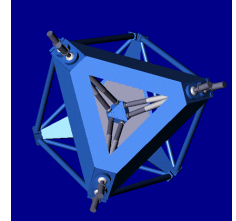
Nanotechnology



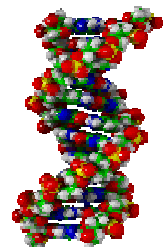
- K. Eric Drexler
 - *Bulk technology*
 - Top-down manufacturing

 - *Molecular technology*
 - Bottom-up manufacturing

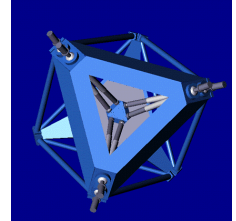
Nanotechnology



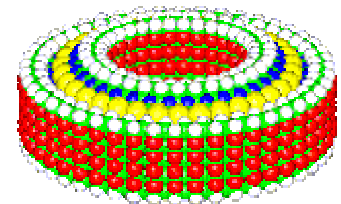
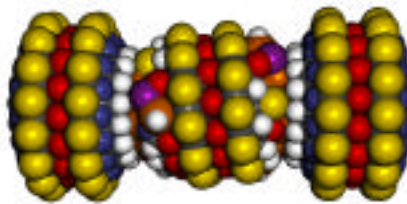
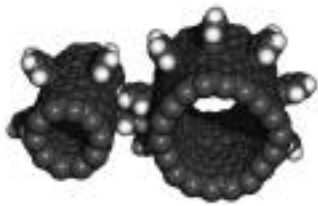
- *First generation* nanotechnology
 - DNA, RNA, Ribosome = Self assembling protein machines
 - Protein not resilient to temperature, radiation and stress; limited strength



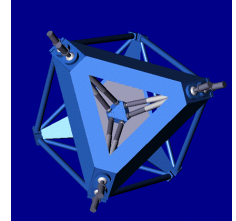
Nanotechnology



- *Second generation* Nanotechnology
 - Universal assemblers / disassemblers
 - Self-assembling and *durable*
 - Directed by nanocomputers
 - Disassemblers dismantle & record
 - Assemblers build

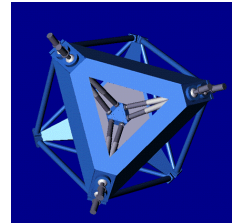


Nanotechnology

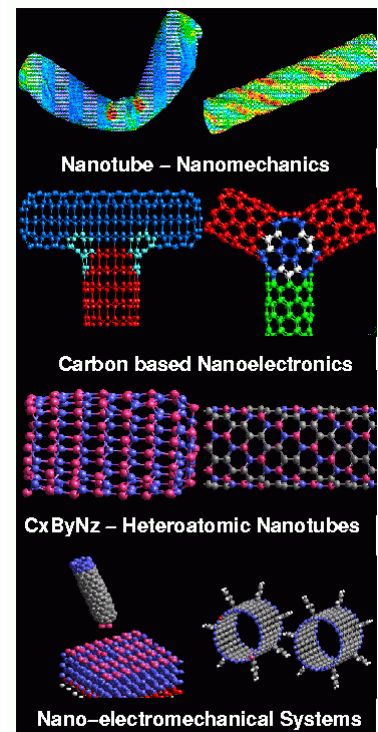
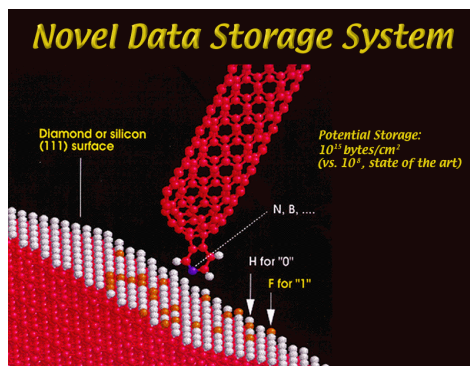


- Benefits of nanomaterials
 - Pollution-free manufacturing
 - Flawless assembly, almost perfect quality
 - Potentially stronger, lighter, more durable than bulk technology materials
 - Minimize waste, maximize efficiency

Nanotechnology: Current Research

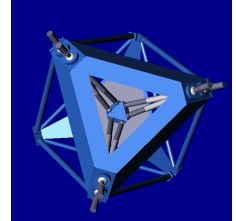


- Computational Nanotechnology
 - Xerox Parc, IBM, NASA Ames

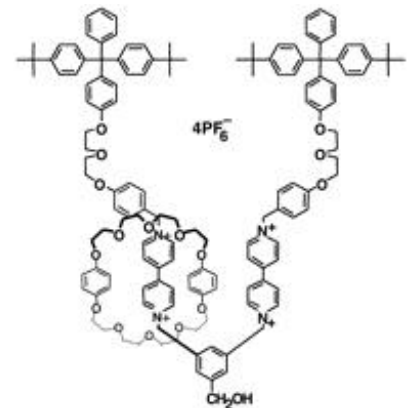
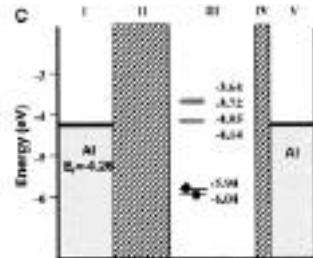
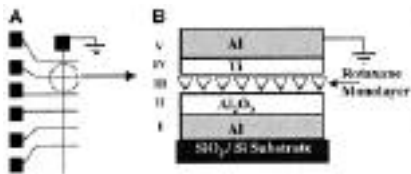


Deepak Srivastava

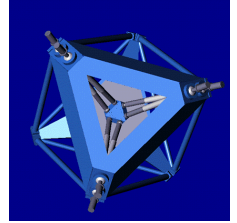
Nanotechnology: Current Research



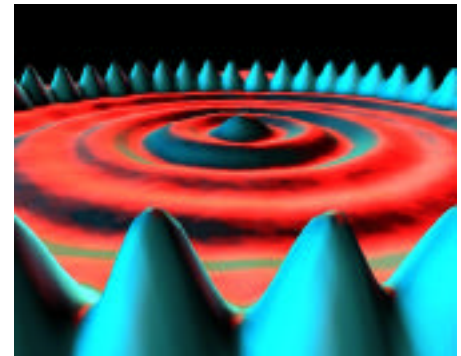
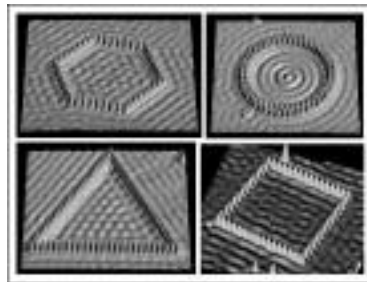
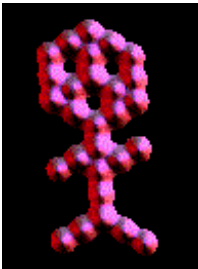
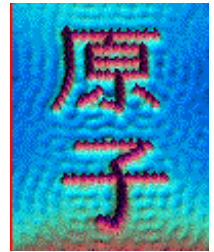
- Electronically configurable molecular-based logic gates
 - Roxatane molecules
 - Collier et al (1999)



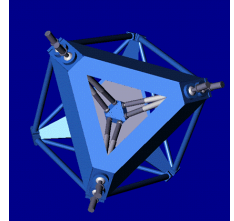
Nanotechnology: Current Research



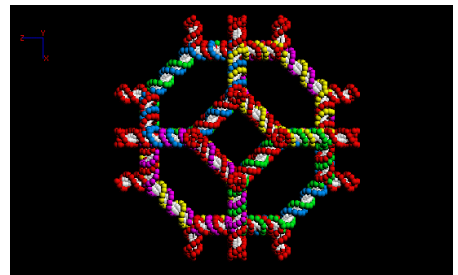
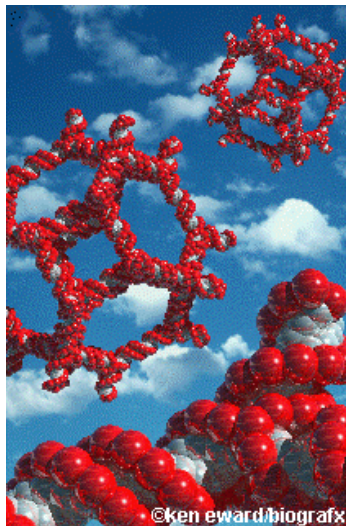
- Scanning tunneling microscope
 - IBM Zurich examples



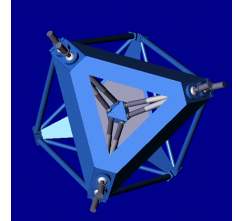
Nanotechnology: Current Research



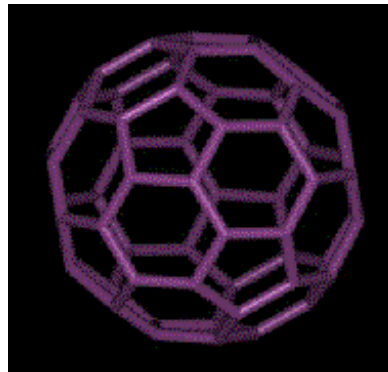
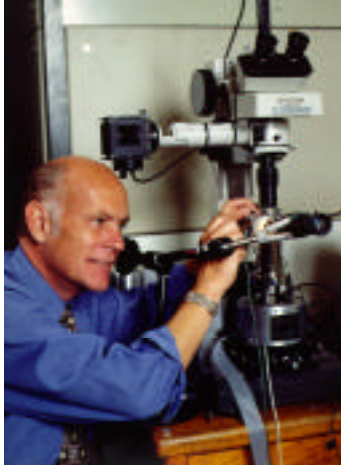
- Synthetic DNA: Smart materials
 - Nadrian Seeman (1995 Feynman Prize)



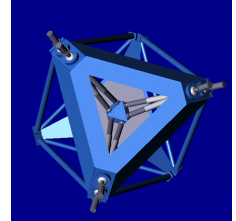
Nanotechnology: Current Research



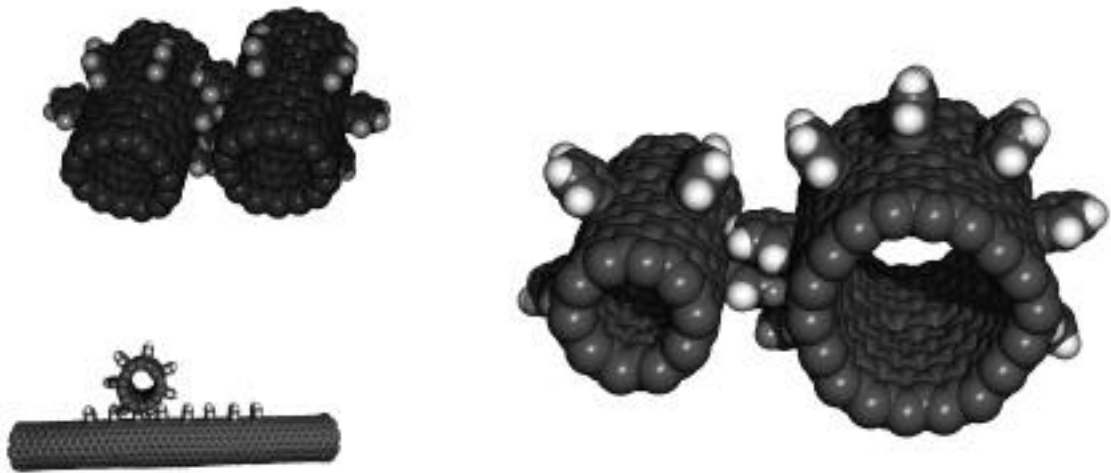
- Carbon fullerene nanotubes
- Richard Smalley (1996 Nobel Prize)



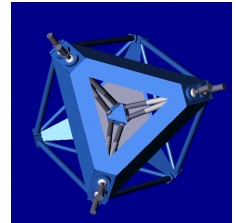
Nanotechnology: Current Research



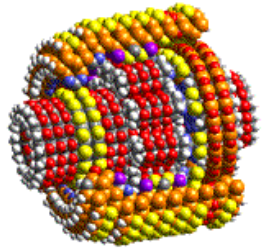
- NASA Carbon fullerene gears



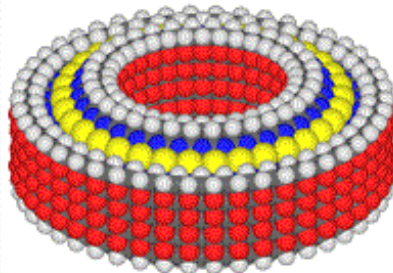
Nanotechnology: Current Research



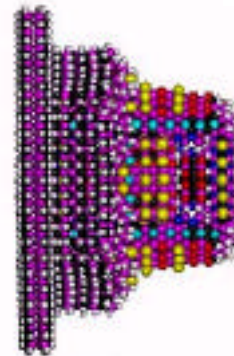
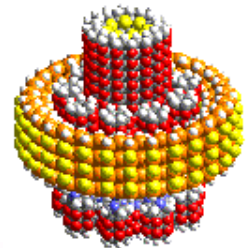
- Institute of Molecular Manufacturing
– K. Eric Drexler and Ralph Merkle



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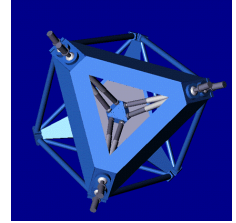


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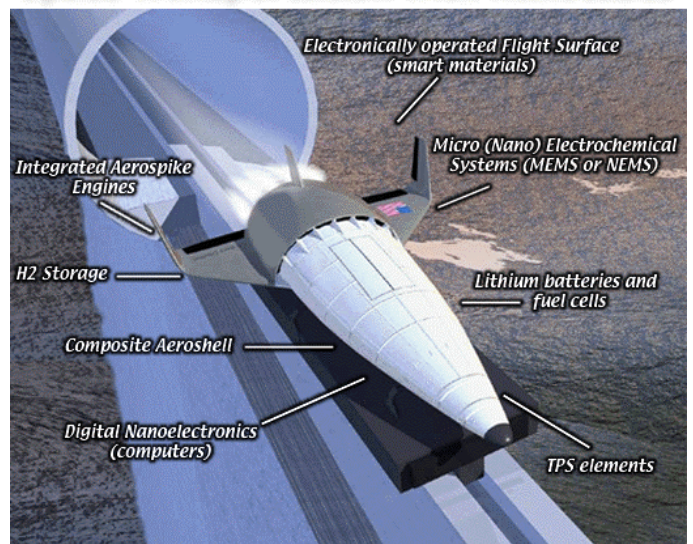
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Future Uses of Nanotechnology

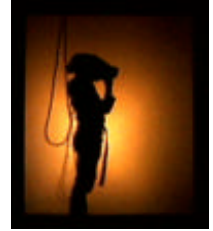


- Repair Earth's ecosystem
- Nano supercomputers
- Consumer replicators
- Space Colonization
- Military shields
- Utility Fog
- Medicine

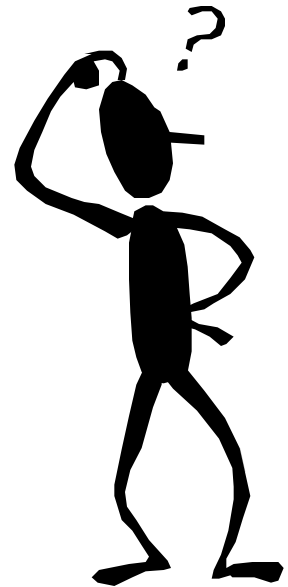
*Faster, Better, Cheaper
Space Transportation with Nanotubes*



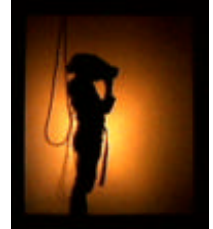
Cyberspace



- The problems of a definition
- William Gibson's Neuromancer
 - consensual hallucination



Cyberspace

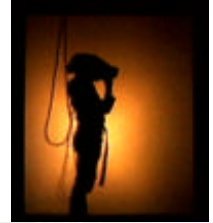


- Jaron Lanier
- Father of “Virtual Reality”

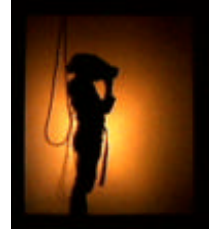


Cyberspace

- 1962 - Morton Heilig
- Sensorama Simulator



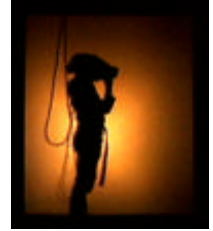
Cyberspace



- Lanier at VPL Research
- Datagloves - touch computer world
- Head mounted display - see computer world

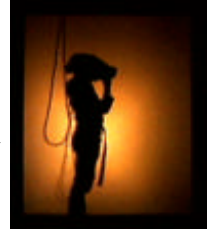


Cyberspace



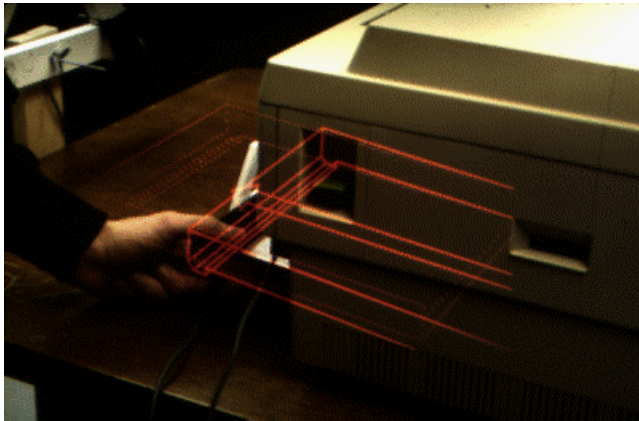
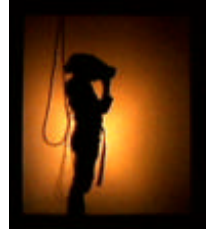
- How can it be better defined?
- Definition by architecture:
 - Technology
 - Human
 - Language

Technological Architecture

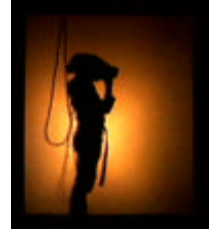


- Definition by types of technologies used in virtual reality systems
- Cockpit simulators - Flight simulators
- Telepresence systems - telesurgery
- Teledildonics - sexual contact at a distance

Technological Architecture

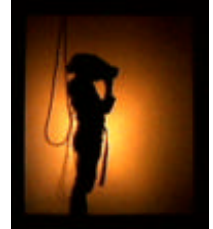


Human Architecture

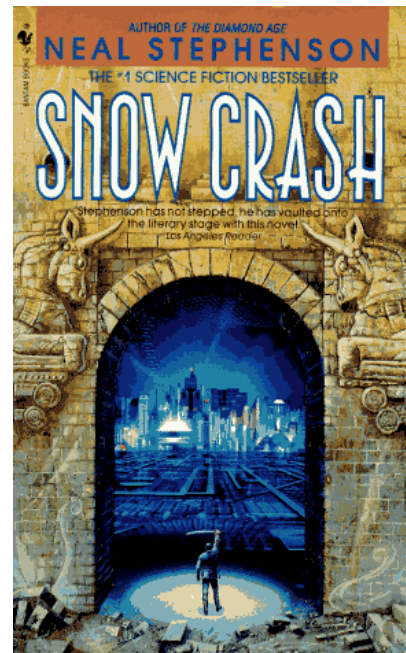
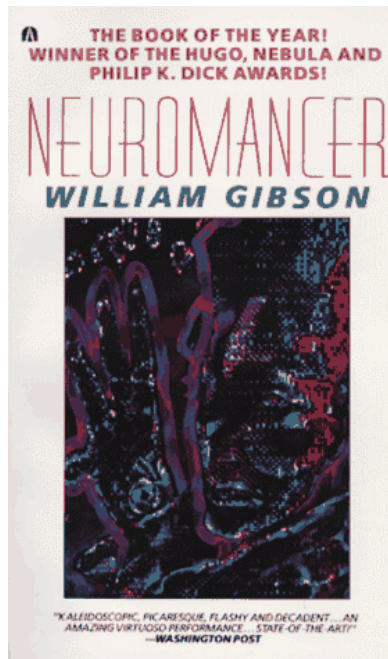


- Focus on psychological elements of VR
- “computer control of the senses”
- Immersion
- Telepresence

Language Architecture



- Metaphors to describe experience

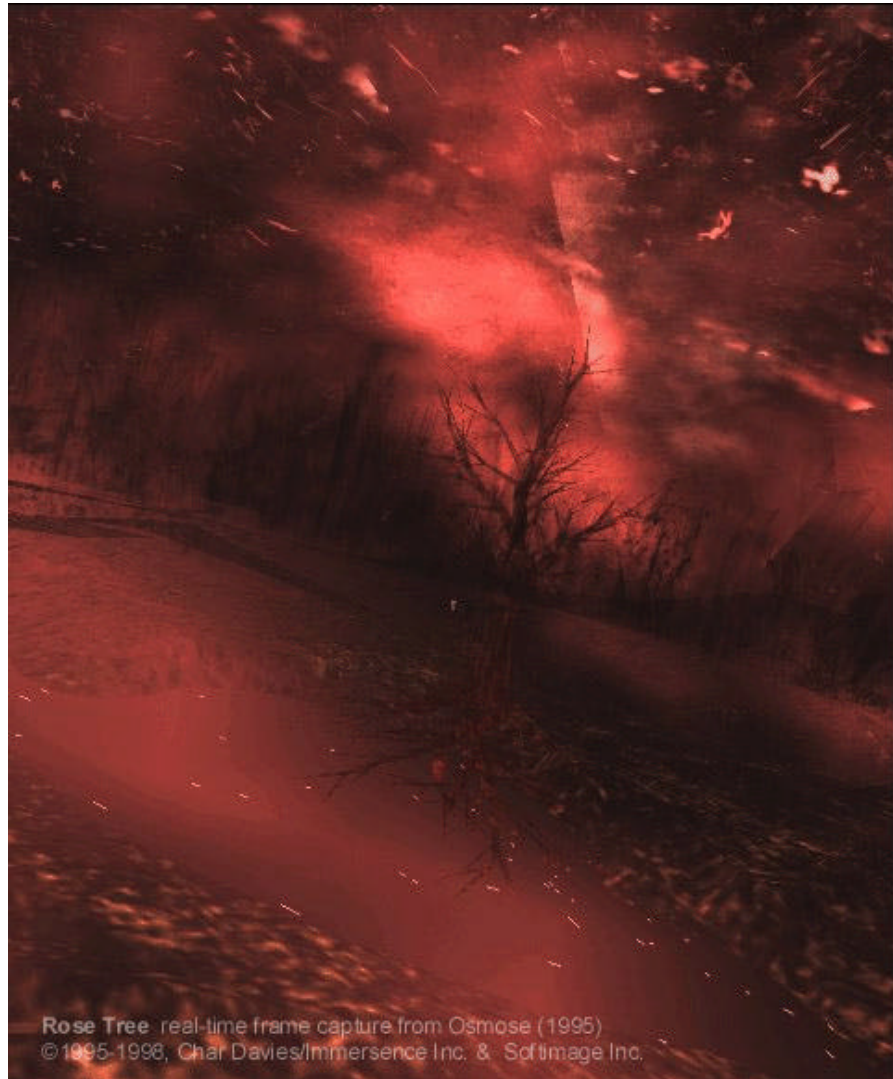


Contemporary Example

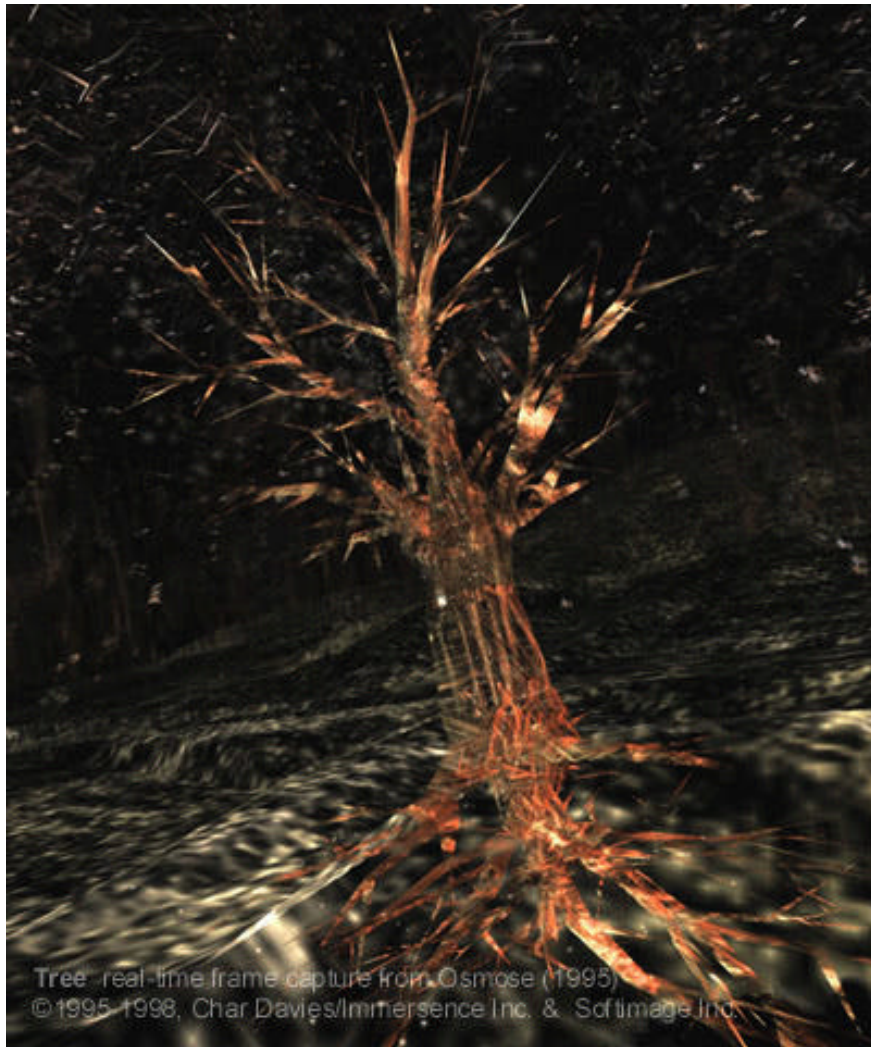
Osmose



- VR art piece developed at SoftImage
- A view into Char Davies' mind
- Simple gear - affective experiences



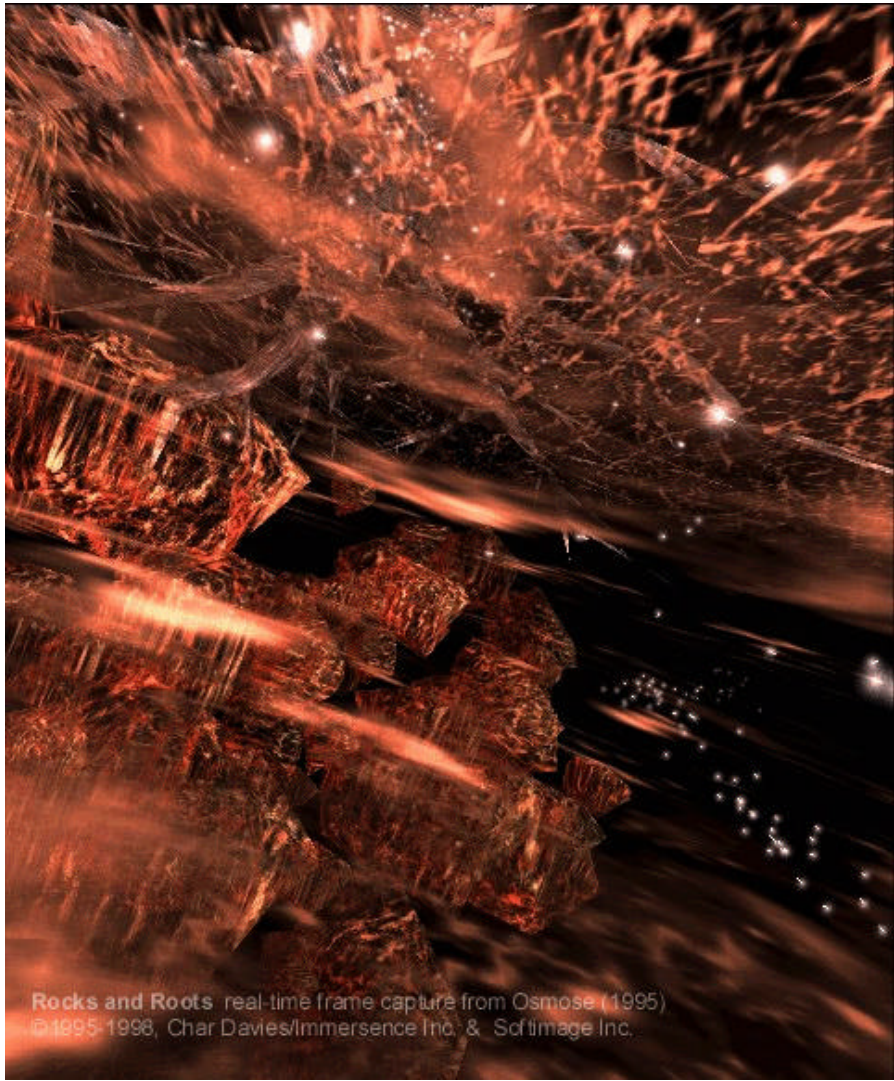
Rose Tree - real-time frame capture from Osmose (1995)
©1995-1998, Chal Davies/Immersence Inc. & Softimage Inc.



Tree - real-time frame capture from Osmose (1995)
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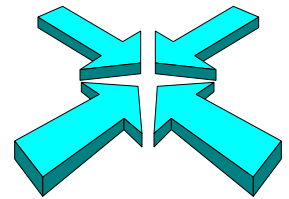


Forest and Grid real-time frame capture from Jurassic Park (1993) © 1993-1998, Char Davies/Immersence Inc. & Softimage Inc.



Rocks and Roots real-time frame capture from Osmose (1995)
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Convergence to Compvergence



- Convergence
 - Nanotechnology and cyberspace
 - different methods to achieve the same result
- Compvergence
 - Implies intelligence within machines and converging technologies
 - Nanotech + cyberspace + machine intelligence

Themes



- Fiction becomes fact, fact becomes fiction
- Self-imposed scarcity, society-imposed abundance
- Unconstrained design methodology

Themes



- Birth of the aesthetic economy
- Flaw attains value
- Status revisited

Themes



- Zenith of medicine
- Learning becomes life
- Frictionless thought transfer

Final Considerations

- Utopian and dystopian visions
- Monster and cage technologies
- Caged cyberspace:
 - Benedict's Laws of Cyberspace
- Caged nanotechnology:
 - Drexler's guidelines
- Towards future



Nanotechnology and Cyberspace: Two roads to the same city.

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