

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

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TIFF (LZW) decompressor
are needed to see this picture.

My attempts to save the world...

Prof. Tom Furness
Human Interface Technology Laboratory
University of Washington
Seattle, Washington USA

25 October 2006

Attempt #1:

Sharpening the sword...

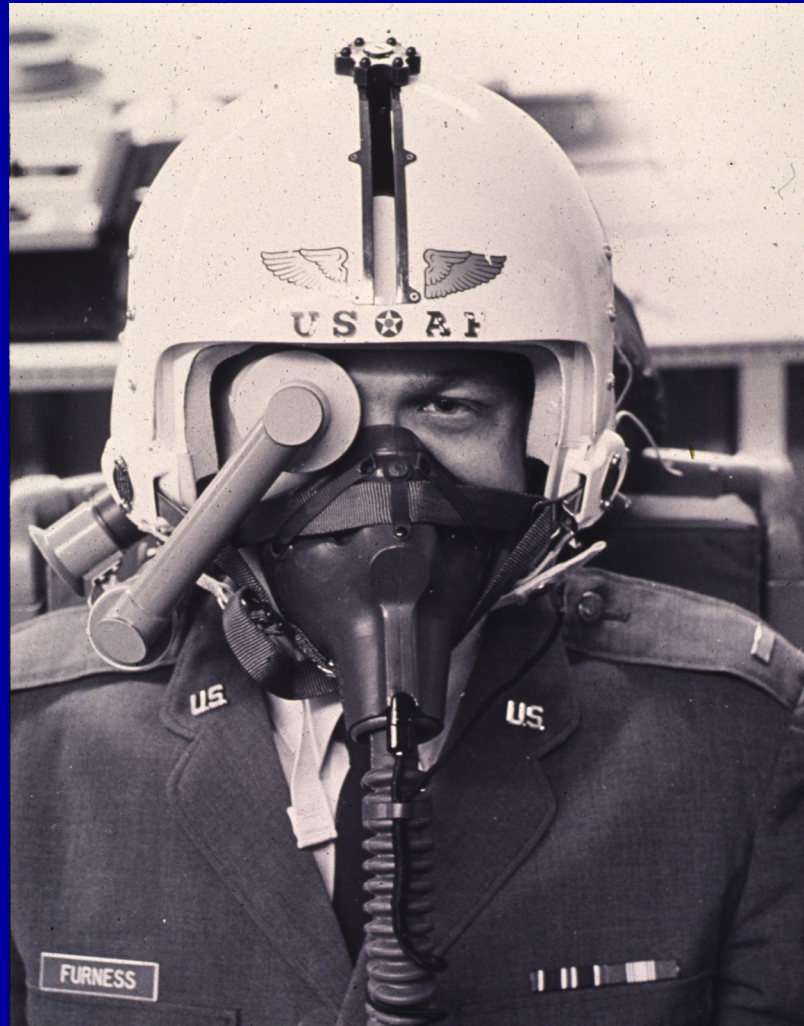
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



F-15A Cockpit

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

first helmet-mounted display (1967)



early helmet sight (1968)



F-106 with experimental helmet sight



Visor-projected sight/display

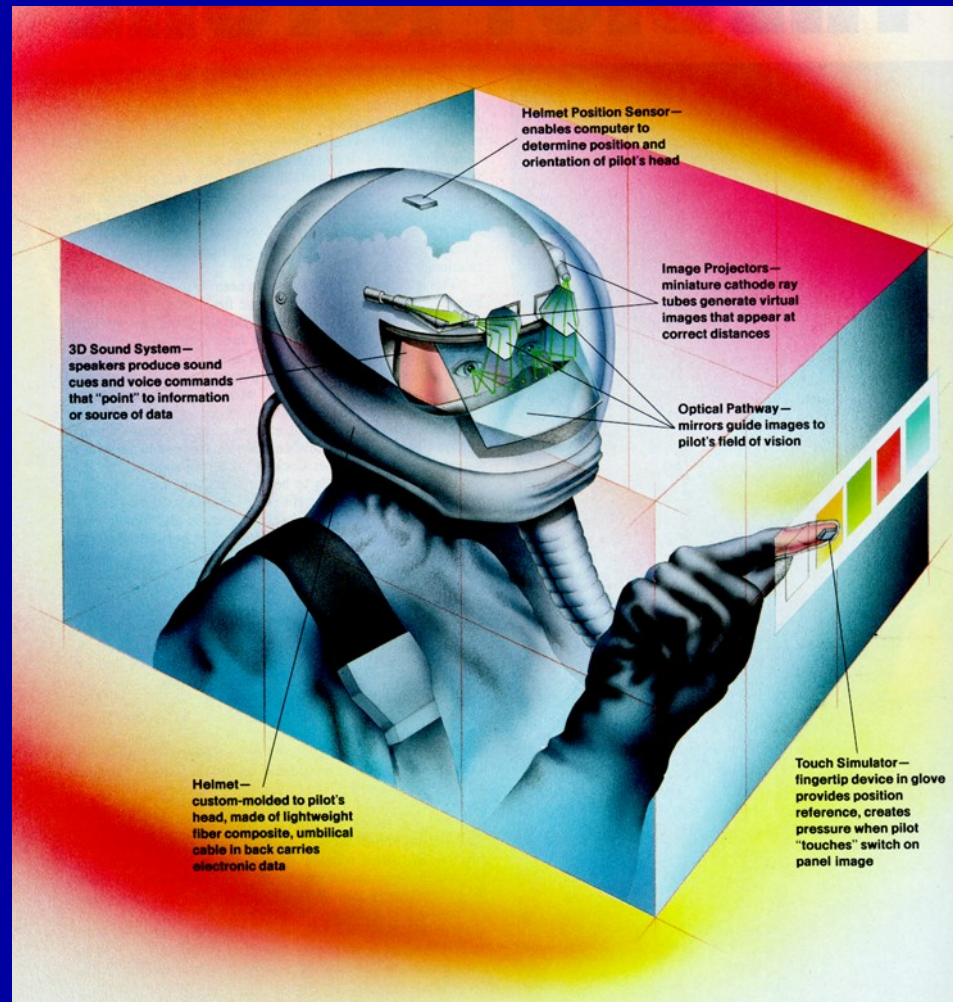


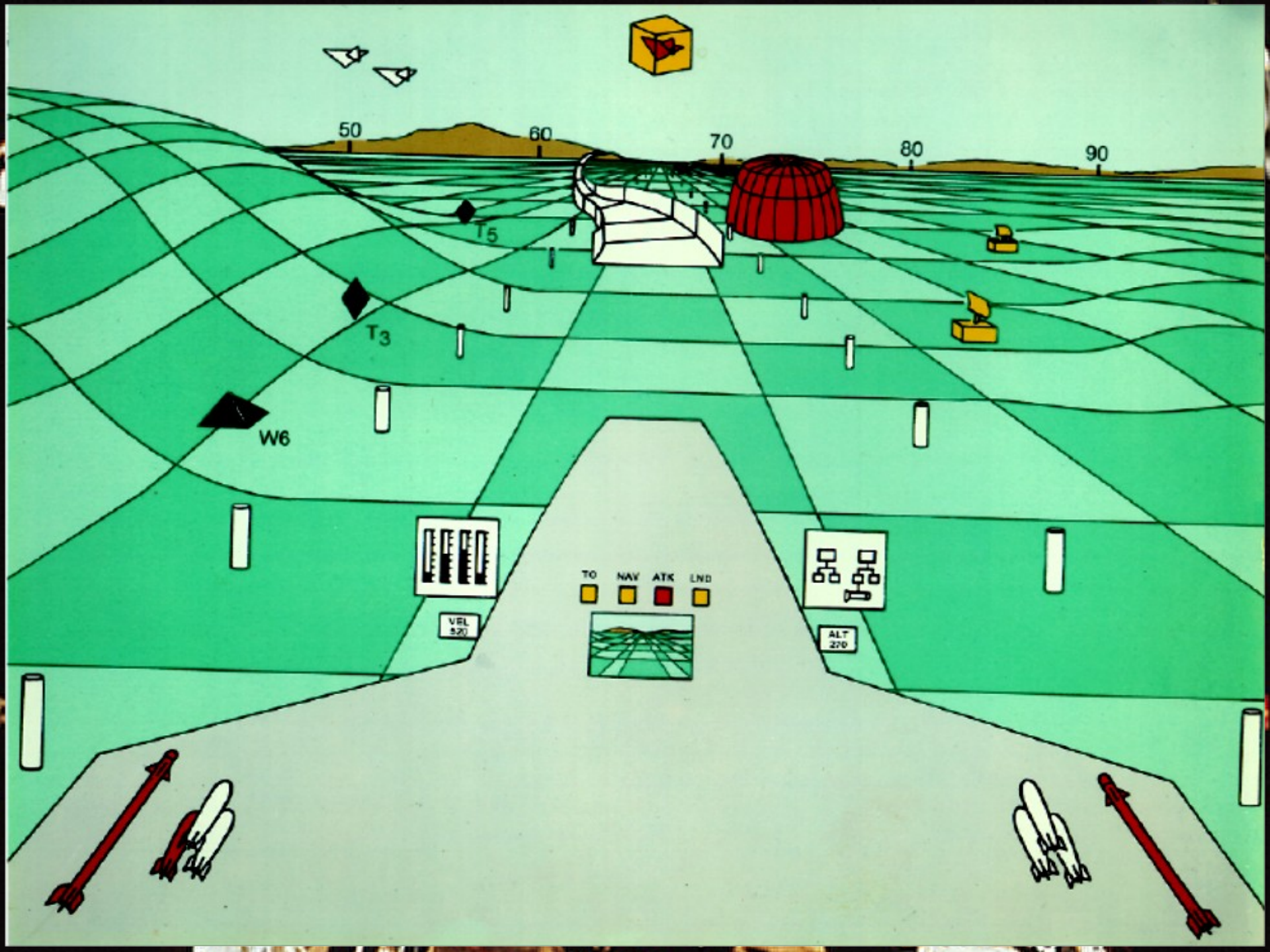
F-16: one operator for 50 computers





Super Cockpit revisited





Darth Vader simulator



Super Cockpit Development*

QuickTime™ and a
H.263 decompressor
are needed to see this picture.

**courtesy NOVA: Top Gun and Beyond*

Agile eye



What I learned!

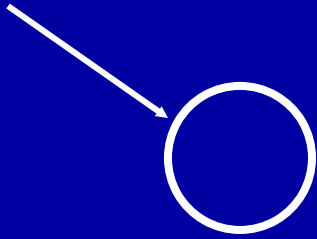
- Good interfaces can empower people
- Virtual Reality really works!!
 - Intuitive
 - Increased bandwidth to the brain
- Wide field-of-view needed to immerse
- Accelerated learning when immersed
- Never forget a virtual experience

Attempt #2:

Swords into plowshares ...

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HIT Lab



QuickTime™ and
Photo - JPEG decompr
are needed to see this



QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Early Furness Patent

United States Patent [19]
Furness et al.

US005162828A

[11] Patent Number: 5,162,828

[45] Date of Patent: Nov. 10, 1992

[54] DISPLAY SYSTEM FOR A HEAD MOUNTED VIEWING TRANSPARENCY

[76] Inventors: Thomas A. Furness, 4070 Hyland Dr., Dayton, Ohio 45424; Robert E. Fischer, 2060 Hillsbury, Westlake Village, Calif. 91362; Peter K. Purdy, 4233 Phinney Ave., N., Seattle, Wash. 98103; Kirk Beach, 2411 24th E., Seattle, Wash. 98112

[21] Appl. No.: 345,886

[22] Filed: May 1, 1989

Related U.S. Application Data

[63] Continuation-in-part of PCT/US87/02455, Sep. 24, 1987 continuation-in-part of Ser. No. 36,424, Apr. 10, 1987, Pat. No. 4,757,714, which is a continuation-in-part of Ser. No. 911,571, Sep. 25, 1986, Pat. No. 4,722,222.

[51] Int. Cl.³ G02B 24/17

[52] U.S. Cl. 353/122; 351/158; 359/618

[58] Field of Search 340/705; 353/30-37; 353/122, 101, 14; 350/169-174; 351/158, 119, 120

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2149140 6/1985 United Kingdom 353/30

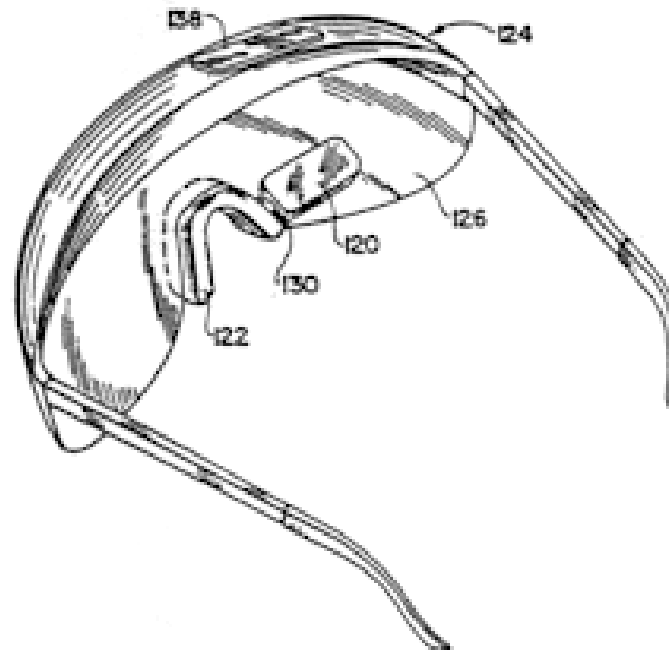
OTHER PUBLICATIONS

IBM Tech. Disc. Bull., vol. 22, #1, Jun. 1979, projected image display-Leon-
Displays, vol. 2, #3, Oct. 1980, pp. 129-130, Helmet mounted display system etc-Walker et al.

Primary Examiner—Harry N. Haroian
Attorney, Agent, or Firm—McAndrews, Held & Malloy, Ltd.

[57] ABSTRACT

A display system for conventional eyewear having a transparency that defines a field of view and a frame for supporting the transparency on a user's head is shown. The display system includes a light transmissive display mounted on the frame of the eyewear and optics for collimating light to project an image of the displayed information at a distance from the user in the periphery of the field of view defined by the transparency. The optics may include a single mirror that receives the information directly from the display wherein the mirror is toroidal or the like so as to project an enlarged image at an apparent optical distance from the user that is greater than the actual optical path. Alternatively, a planar mirror may be employed with a collimating lens to project the image at a desired distance from the user. The mirror may be fully reflective or partially reflective so as to superimpose the image of the displayed information on the scene viewed by the user through the transparency of the eyewear. Further, means are provided for automatically adjusting the optical path defined by the relative position of the mirror, the display and the user's eye to accommodate heads of various sizes.



Personal Eyewear Display



Wearing Virtual Vision Display



Virtual image inset into real world



Entertaining the patient!



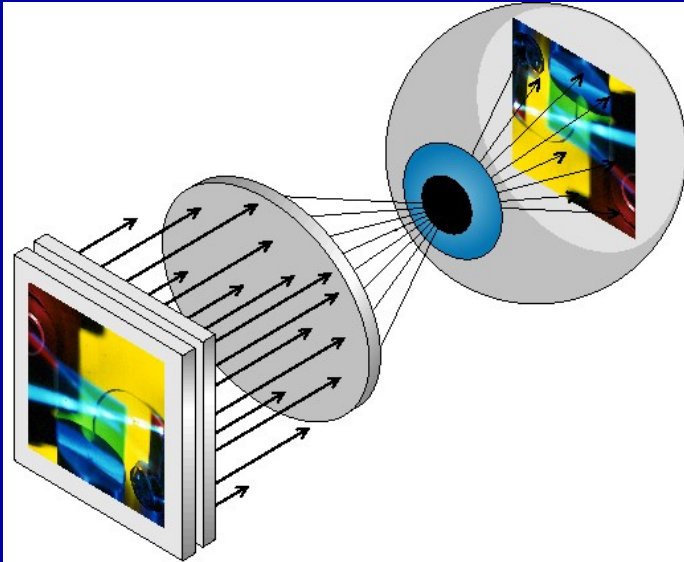
Entertaining little patients!



eMagin Inc.

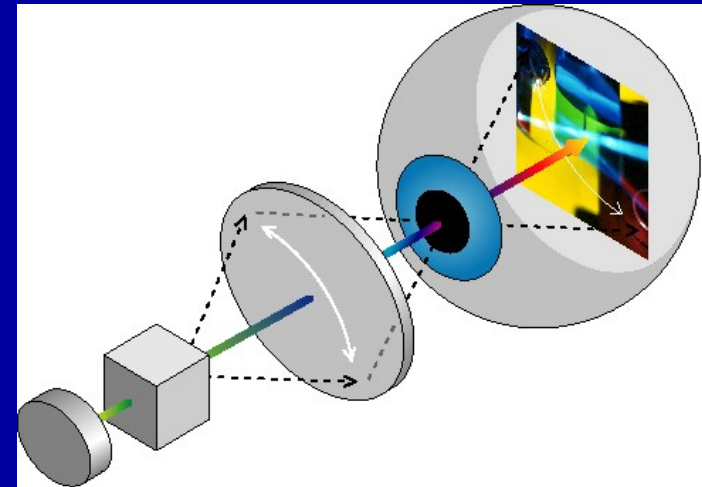


Flat Panel vs. VRD



**Matrix Element
Display**

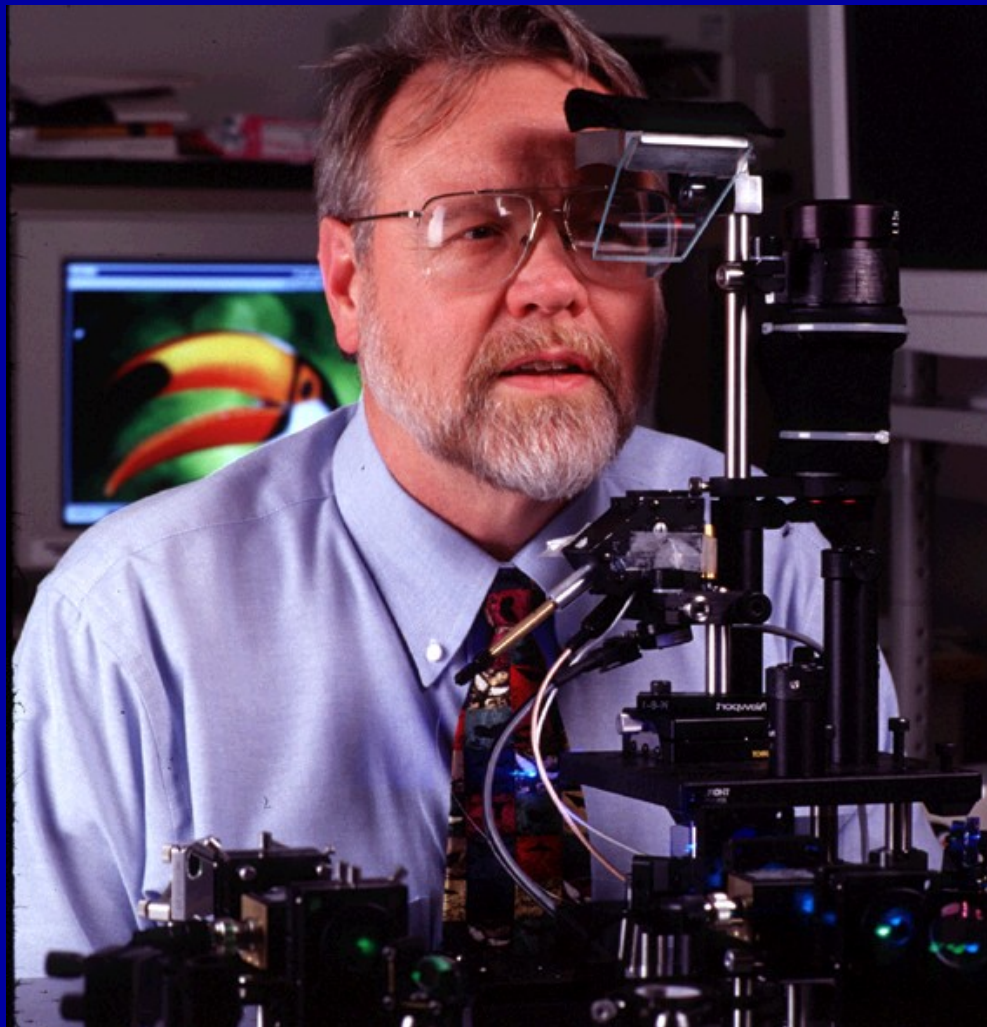
Matrix of 1,000,000 pixels



**Virtual Retinal
Display**

One pixel

Virtual Retinal Display

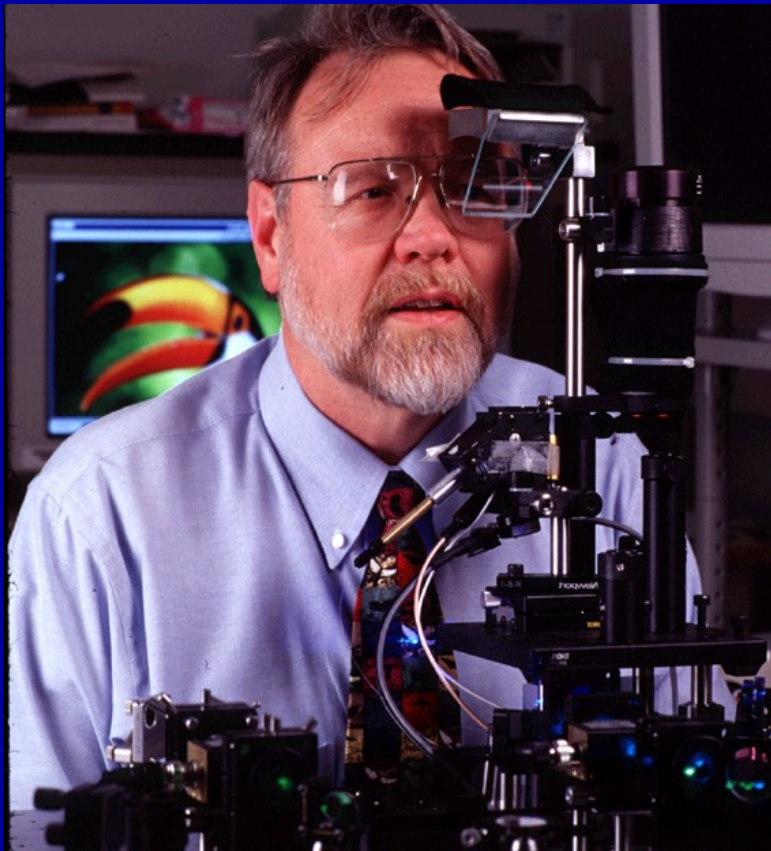


Unexpected outcomes

- Low vision aid
- Discover Award
- Microvision Inc.
- Nomad Display

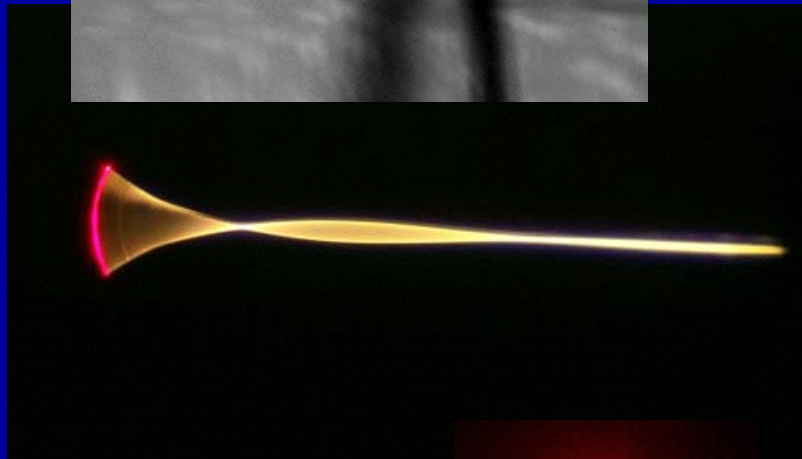
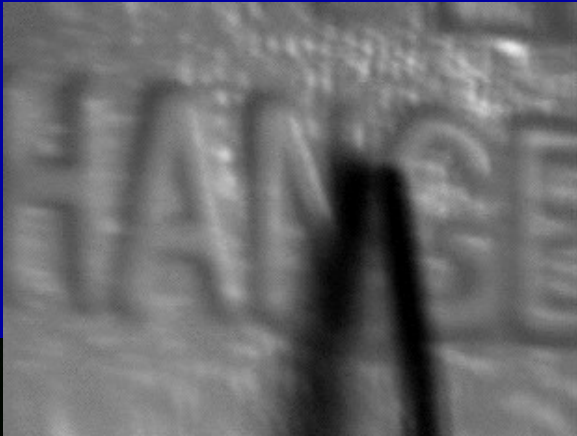
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Interactive Virtual Retinal Display



- Uses VRD scanning aperture for head and eye tracking
- Combine optical and inertial subsystems for high accuracy, high update rates and low latency
- Funded by ONR, DARPA, SRA, NASA
- PI - Tom Furness

Fiber Scanning



- Precision mechanical manipulation of optical fibers
 - Display
 - Endoscopy
- Visiongate: optical tomography for lung cancer
- Catheterscope (Pentax/NIH)
- Wearable Low Vision Aid
- PI-Eric Seibel

True 3D Display



- Provides accurate mapping of stereographic and accommodative cues in 3D virtual displays
- High resolution direct retinal scanning
- Investigate ways to manipulate light wave front
- Compare fatigue with traditional 3D displays
- 3 patents
- Funded by NSF, Intel
- Investigators: Seibel, Furness, Schowengerdt

Mark Billinghamurst-Student



MagicBook



STAR WARS

WHERE SCIENCE MEETS
IMAGINATION

QuickTime™ and a
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- NSF sponsored project at Boston Museum of Science
- ARToolworks Inc.
 - HIT LAB US
 - HIT LAB NZ
- Technical Director - Dr. Nick Hedley
- Opening Oct 27, 2005
- www.starwars.mos.org

Plowshares lessons

- Technology is cool but what do you do with it?

Attempt #3:

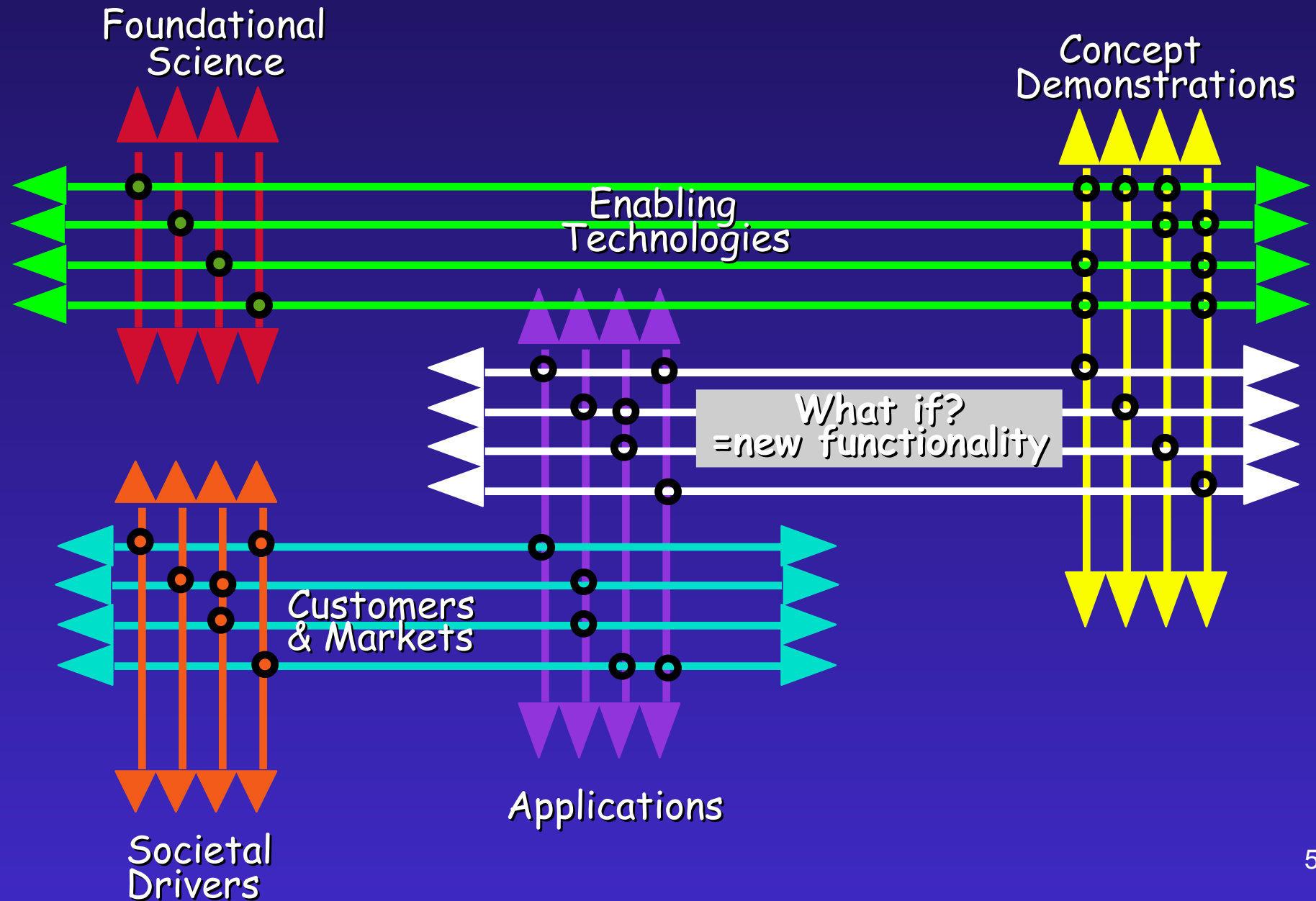
Saving the world with
technology

Problems we have to solve!

- Population ills
 - disease
 - hunger
 - Crime + terrorism
 - environment
 - energy
- Education of population
 - awakening children
 - life long learning
- Aging of population
 - Health maintenance
 - quality of life
 - pain management



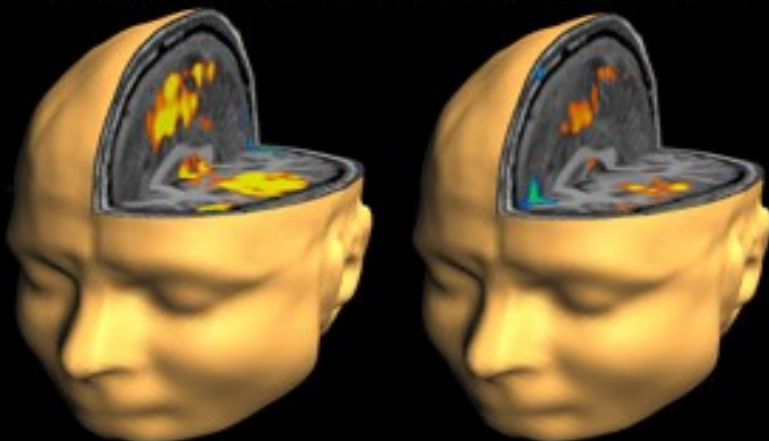
The Dynamics of Achieving Marketable Products



Pain



Pain-related brain activity

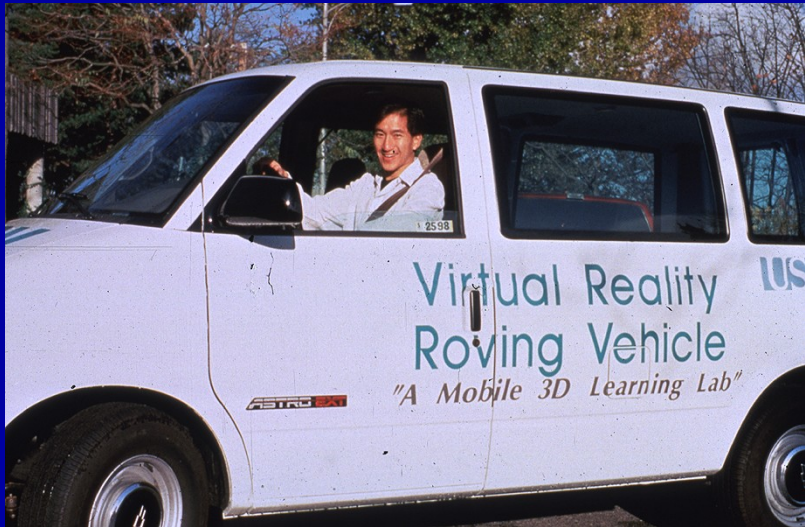


No VR

VR

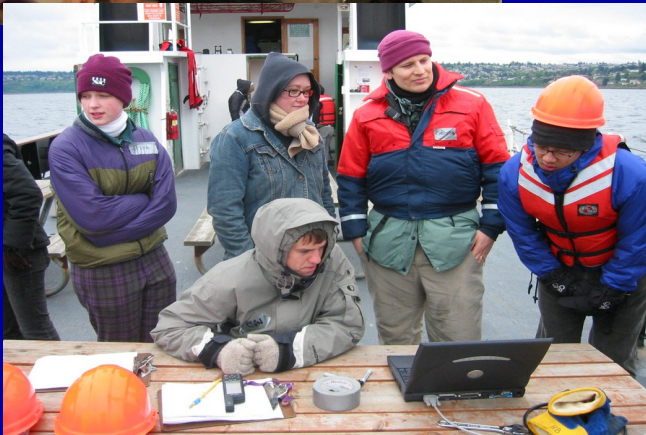
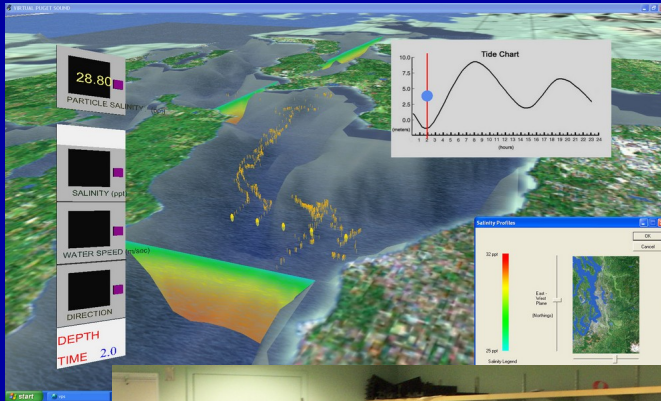
- Use VR as a distraction during burn wound care
- VR system for water immersion
- Harborview Burn Center
- Paul Allen Foundation
- NIH
- Brain imaging to measure effect of VR Analgesia
- PI-Hunter Hoffman

Teaching in VR



- Pacific Science Center
Technology Academy I & II
- At Risk kids
- Virtual Reality Roving Vehicle (VRRV)
 - 8000 children
 - 350 built worlds
 - WA & NE
- Virtual Puget Sound (NSF)
- Starship (Museum of Flight)
- Treasures from a Lost Civilization (Seattle ART Museum)

Virtual Puget Sound in Classes



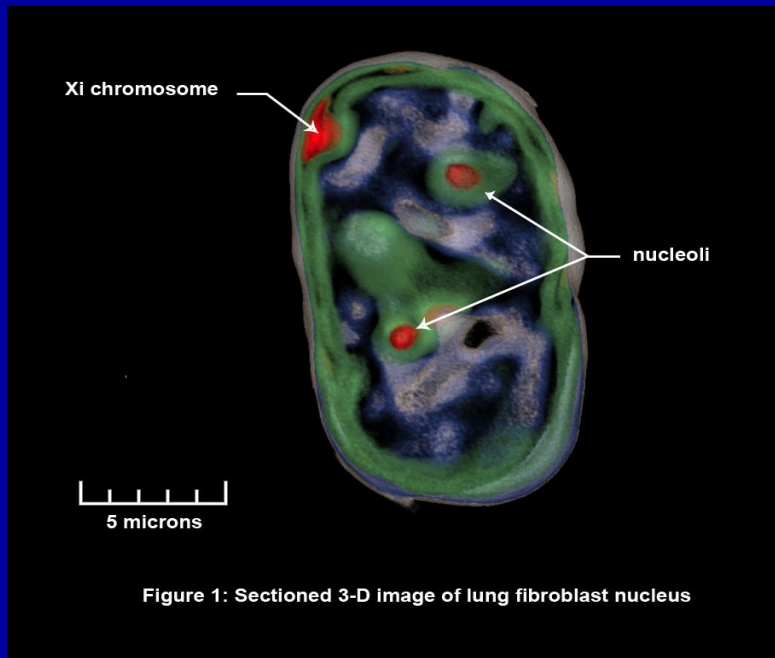
- Learning about the ocean.
- Preparation for cruises.
- Helps students generalize and transfer information.
- But a cruise is more "authentic"!
- Helps children in grades 4 - 6 learn about the ocean.
- Improves dyslexic children's problem-solving and motivation through interaction with a dynamic visualization.

Virtual Simulation for Medicine



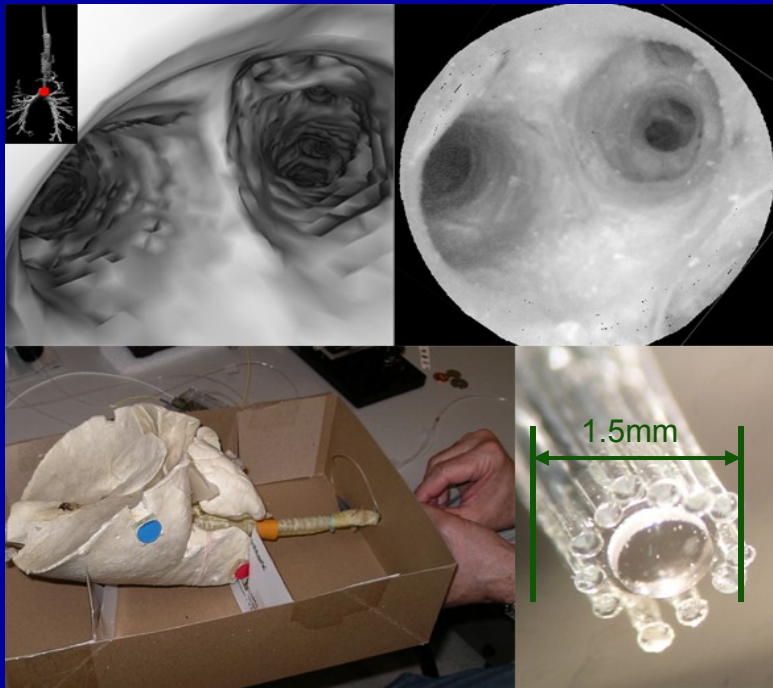
- Virtual emergency room
- Sinus surgery simulator
- Suturing simulator
- Laparoscopic simulator
- TURP simulator
- Mimic Technologies Inc.

Single cell optical tomography



- VisionGate, Inc.
- Automated screening system for pre-invasive lung cancer
- High resolution optical projection tomography
- Tomographic 3D reconstructions
- Pattern recognition of reconstructions
- 3D nuclear morphology

Ultrathin laser scanning bronchoscope



- < 1 mm diameter scanner
- Single fiber vibrated in spiral scan
- 250 rings
- 15 scans/s
- 60 degree scan angle
- 12 fiber pickup (4 for each color)
- 500 line resolution
- Early diagnosis of lung cancer in the peripheral lung
- Funded by NIH



HITLabNZ

'Saving the world' lessons

- Important to work on driving problems
- Saving the world is interdisciplinary
- Necessity is the mother of invention
- Need creative tension between technology 'push' and application 'pull'
- Count on serendipity!

But...

Things that break my heart

Aids in Africa...a long goodbye

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Return of the Fallen

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QuickTime™ and aTIFF (Uncompressed) decompressor are needed to see this picture.

QuickTime™ and aTIFF (Uncompressed) decompressor are needed to see this picture.

Moving mass...



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Violence in Children

“The typical American child watches 28 hours of television a week, and by the age of 18 will have seen 16,000 simulated murders and 200,000 acts of violence. Commercial television for children is 50 to 60 times more violent than prime-time programs for adults, and some cartoons average more than 80 violent acts per hour.”

“Impact of violence on children.” Joy D. Osofsky, p. 34



World Future Society - Outlook 2006

2. U.S. public education will face an uphill battle for survival.

- Cost to repair/modernize = \$322 billion
- 10X what states are spending

The way we fund research!

Concerns

- War
- Public education is broken!
- Universities are broken!
- Corporations are broken!
- Government sponsored research is broken!
- We are killing the earth!

We need a rebirth!

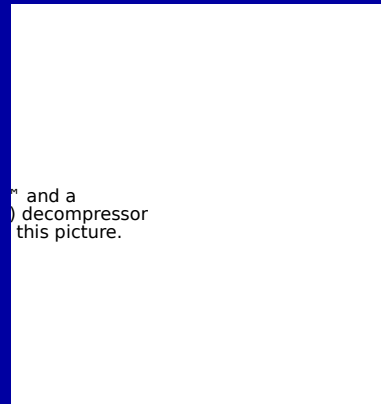
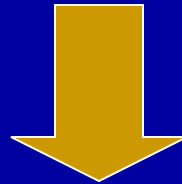
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Our raw material...

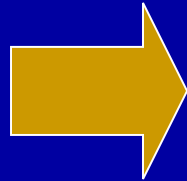


Formula for Rebirth

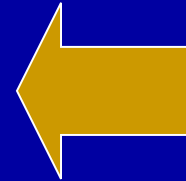
Kids (lots of them)



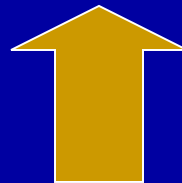
Pervasive
problems



Serious
games



Research
opportunities



Attempt #4:

Turning the hearts of the
children!

Some Facts and Figures

- 430 Million gamers globally
- \$ 30 billion in revenue (2002)
- Online Gaming is the fastest growing gaming segment.
- By 2005 online gaming is expected to generate \$5-\$10 billions in revenue.

What if...

- One million young people paid \$30 per year to be member of a not-for-profit society that...
 - Enriches their experiences using computers
 - Enables their participation in research
 - Funds scholarships and internships
 - Funds organizations for high risk research

The Virtual World Society

The Vision

To empower young minds.

Virtual World Society

- Explore
- Create
- Share
- Understand



Empowerment

Components of mission

Virtual World Society



Enriching young
pioneers



Funding research in
technology to solve
world problems

How...

- Create a platform for engaging minds in exploration, creation, sharing and understanding...
 - Games
 - Network
 - Content

Ingredients

- Interface Appliances
 - Webcam
 - Webcam + PDA
 - Handheld glasses (w/tracking)
 - Headset
- ARToolkit
- Serious games
 - Content
- Research opportunities

Fact File: National Geographic

- Estimated membership 8 - 12 million
- Reach: 180 countries
- Total Income: \$465,981,983 (2001)

For example...

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How get it started...

- Formulation
- Discuss with strategic partners
- Raise start up funding (~\$5M)
- Phases
 - Phase 0: Organization
 - Phase 1: *Generate & Test Market Benefit package*
 - Phase 2: Introduction
 - Phase 3: Sustained growth

Watch this space:

www.virtualworldsociety.org

Also:

- <http://spotlight.macfound.org/>

Take home story...

- Work on real problems...
- Work with children...
- Help with the Virtual World Society
- Be happy!

My Family

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My 'other' family





HIT Lab NZ 2005 Virtual Worlds Consortium

Sponsors

- National Science Foundation
- NIH/NCI
- DARPA
- ARDA
- Dept of Homeland Security
- NZ Foundation for Research, Science & Technology
- NZ Trade and Enterprise
- Consortium members

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