“Calit2--Helping the University of California Drive Innovation in California"

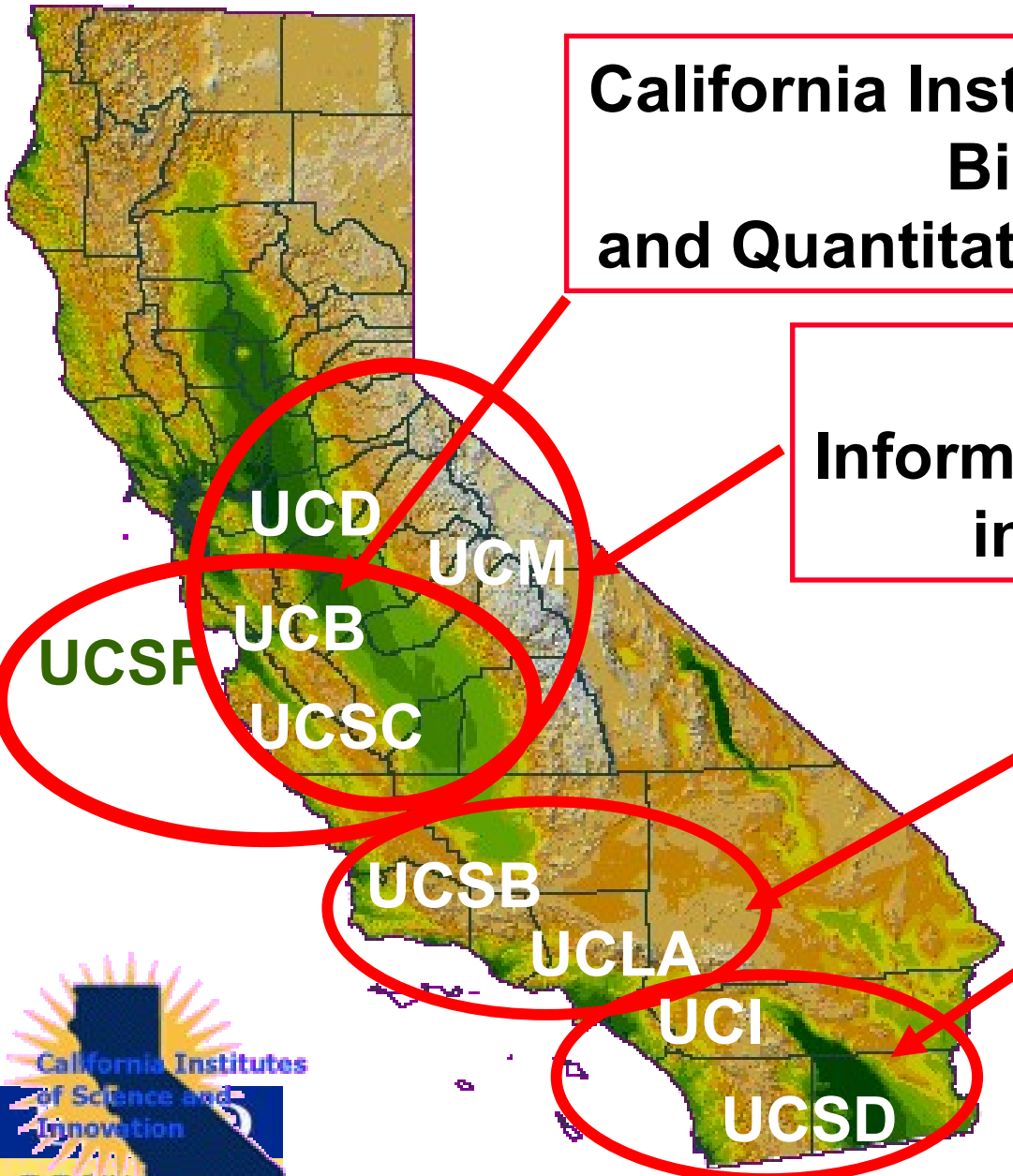
Invited Talk to JUNTO
La Jolla, CA
February 15, 2006

Dr. Larry Smarr
Director, California Institute for Telecommunications and Information Technology
Harry E. Gruber Professor,
Dept. of Computer Science and Engineering
Jacobs School of Engineering, UCSD

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UCIrvine

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California's Institutes for Science and Innovation: A Bold Experiment in Collaborative Research



California Institute for Bioengineering, Biotechnology, and Quantitative Biomedical Research

Center for Information Technology Research in the Interest of Society

California NanoSystems Institute

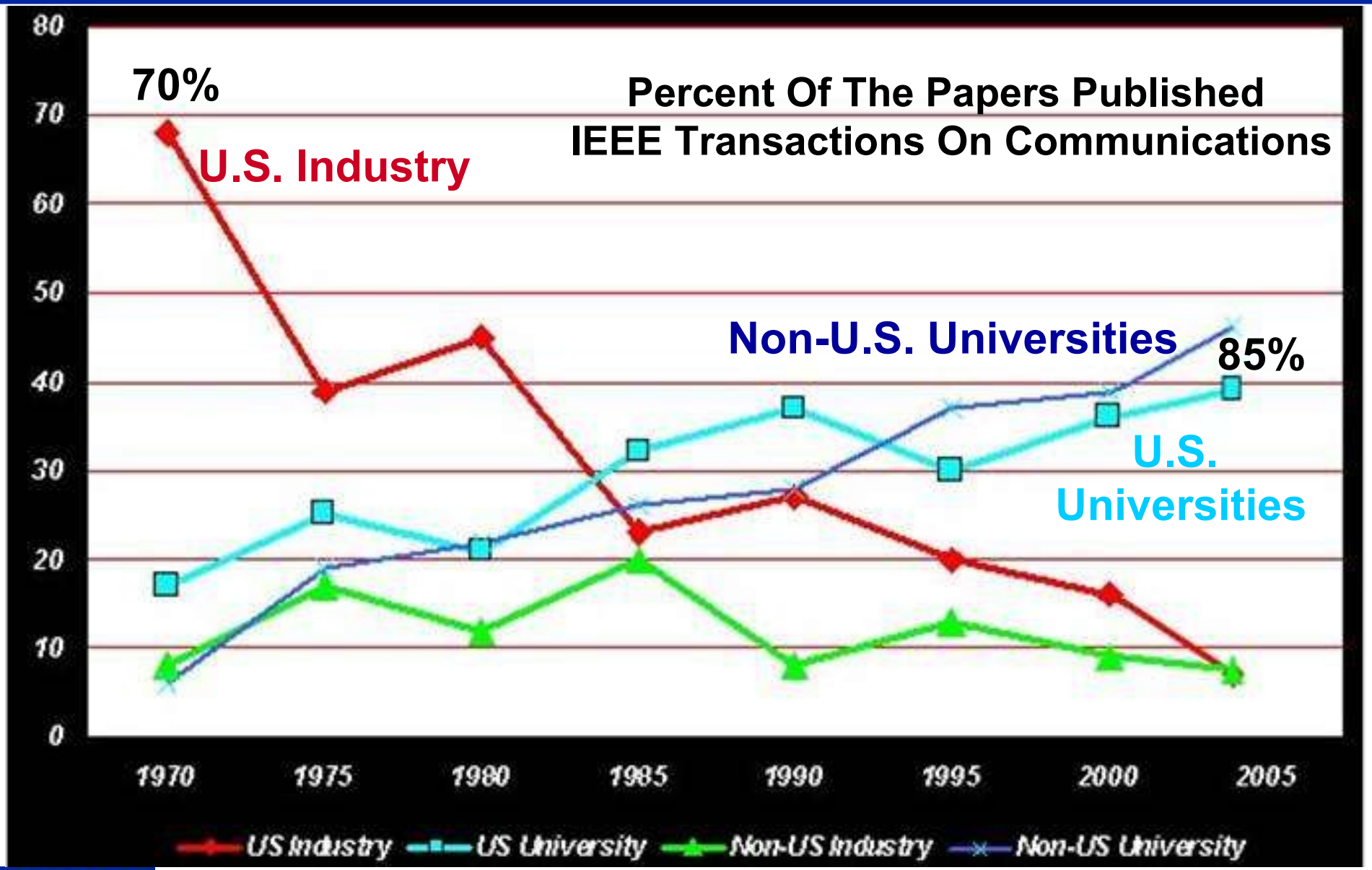
California Institute for Telecommunications and Information Technology

California Institutes of Science and Innovation

UCHV

www.ucop.edu/california-institutes

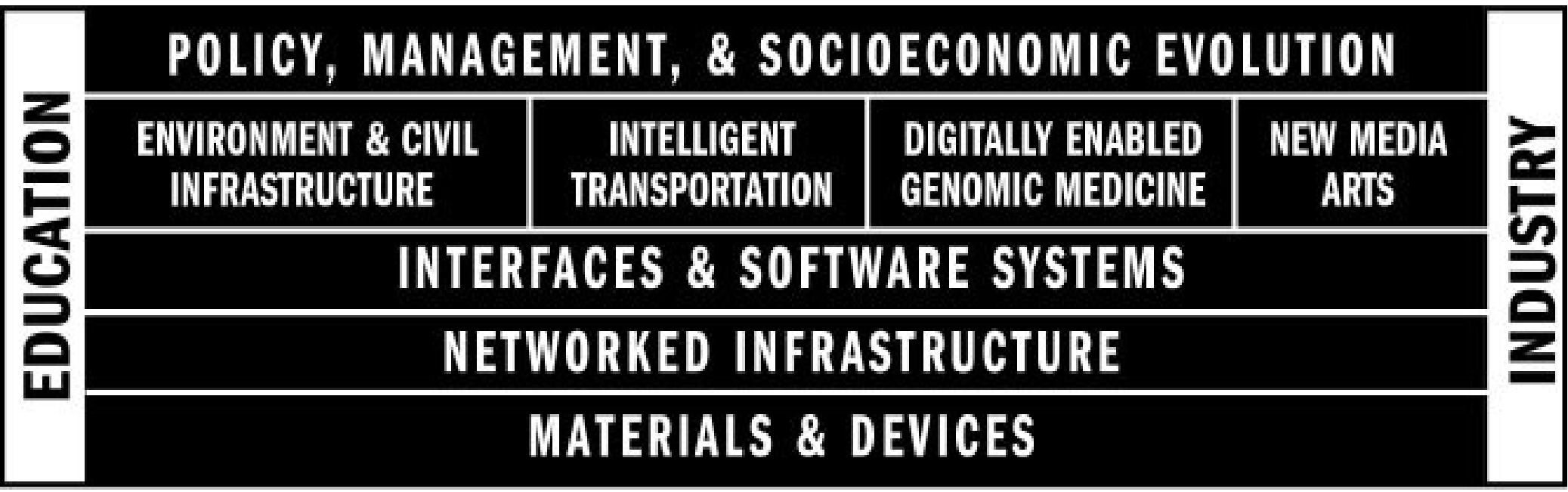
Where is Telecommunications Research Performed? A Historic Shift



Source: Bob Lucky, Telcordia/SAIC

Calit2 -- Research and Living Laboratories on the Future of the Internet

UC San Diego & UC Irvine Faculty
Working in Multidisciplinary Teams
With Students, Industry, and the Community



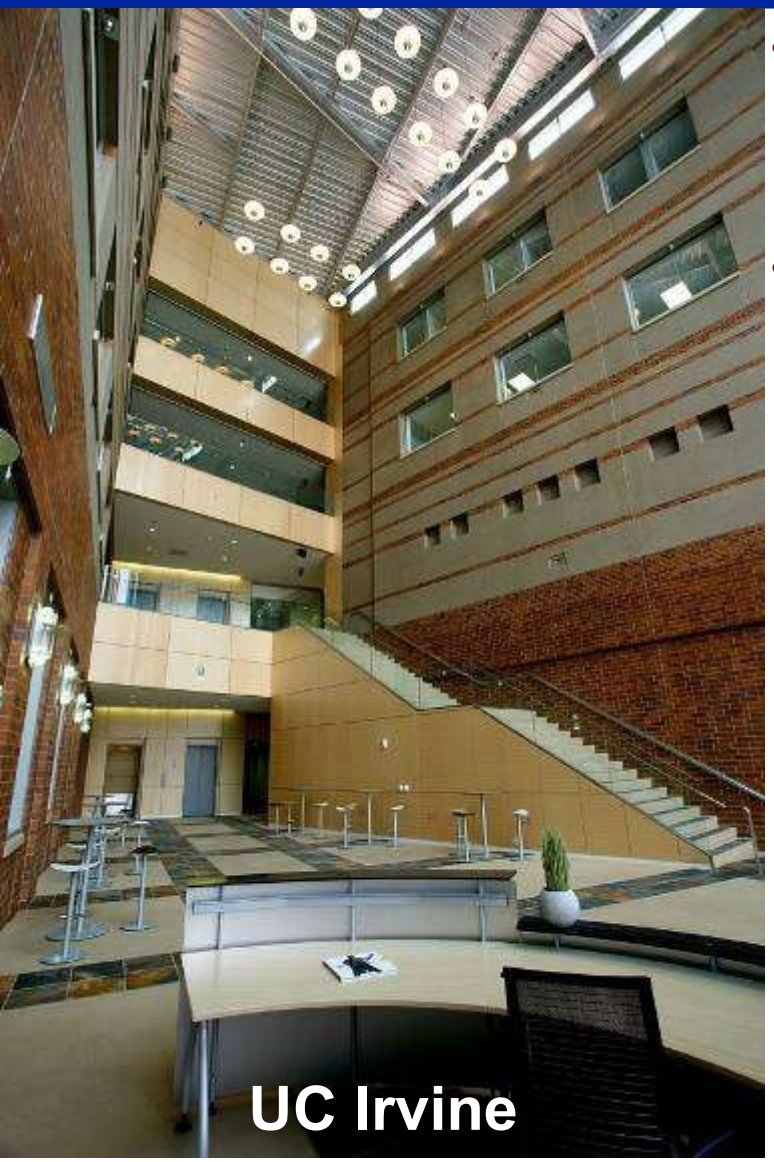
www.calit2.net

California Institute for Telecommunications and Information Technology . Cal-(IT)^2



Extending the Internet Throughout the Physical World

Two New Calit2 Buildings Will Provide Major New Laboratories to Their Campuses



- New Laboratory Facilities
  - Nanotech, BioMEMS, Chips, Radio, Photonics, Grid, Data, Applications
  - Virtual Reality, Digital Cinema, HDTV, Synthesis
- Over 1000 Researchers in Two Buildings
  - Linked via Dedicated Optical Networks
  - International Conferences and Testbeds

Richard C. Atkinson Hall Dedication Oct. 28, 2005



www.calit2.net

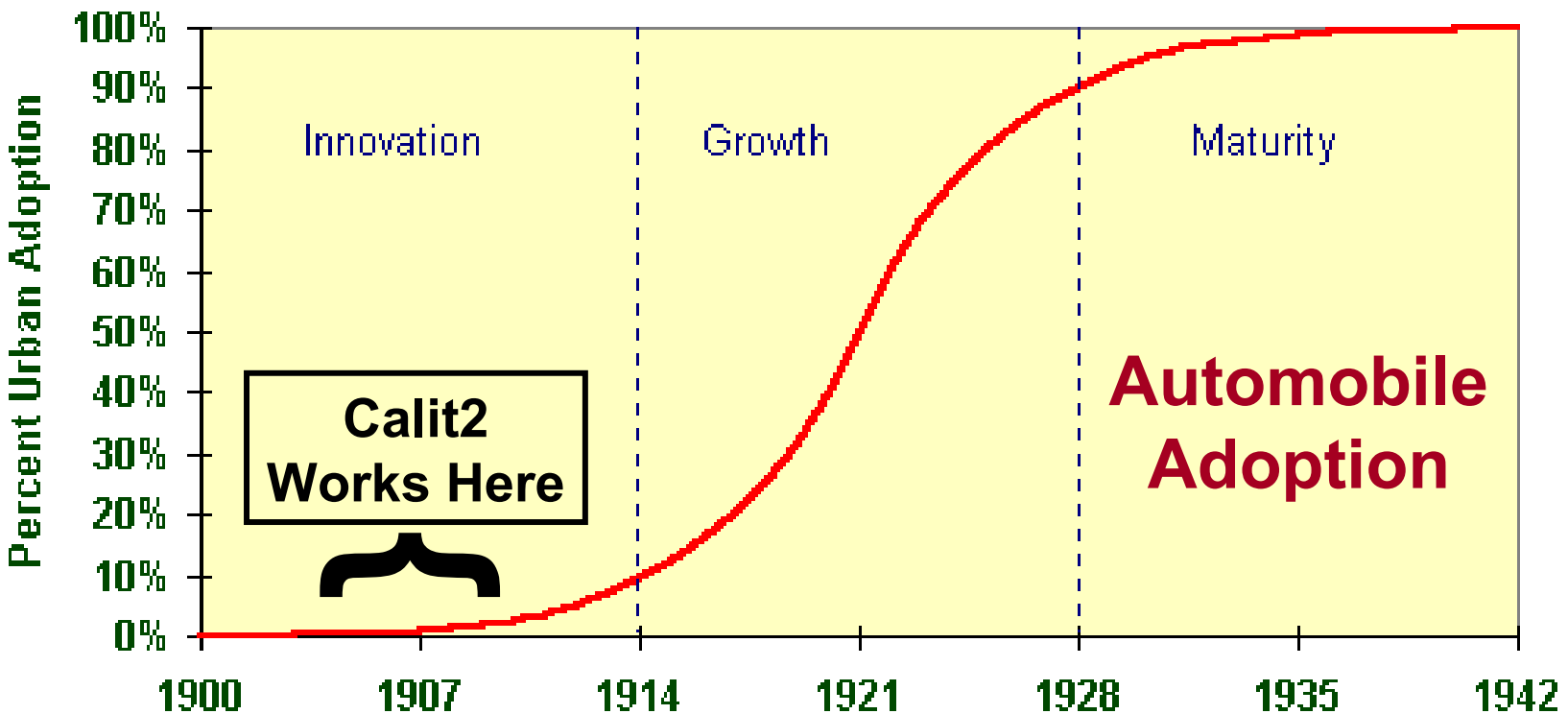
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Preparing for an World in Which Distance Has Been Eliminated…

it²

From Elite Science to the Mass Market

- **Four Examples I Helped "Mid-Wife":**
  - **Scientific Visualization to Movie/Game Special Effects**
  - **CERN Preprints to WWW**
  - **Supercomputers to GigaHertz PCs**
  - **NSFnet to the Commercial Internet**
- **Technologies Diffuse Into Society Following an S-Curve**



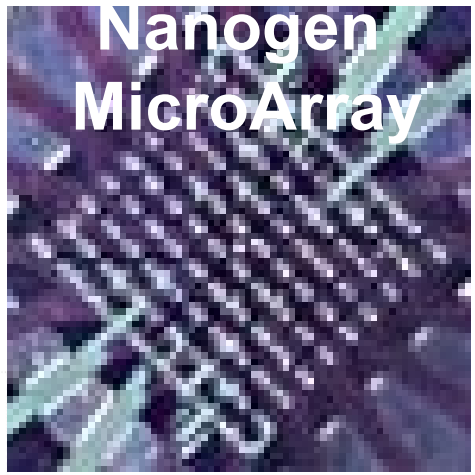
Source: Harry Dent, The Great Boom Ahead

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Accelerator: The Perfect Storm--
Convergence of Engineering with Bio, Physics, & IT

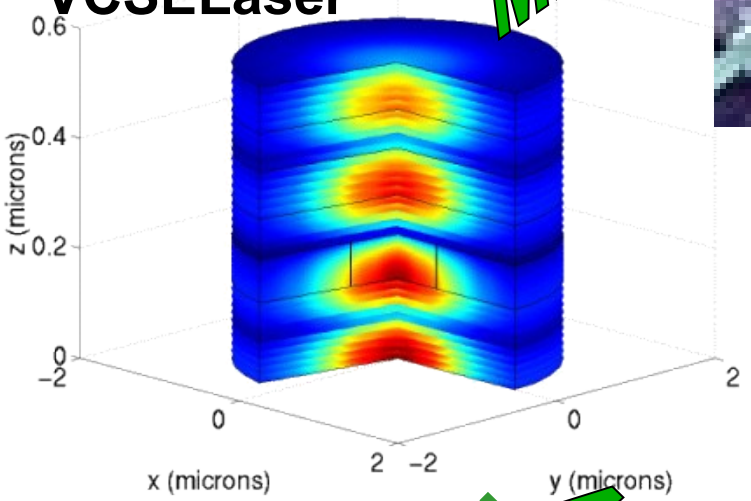
500x Magnification

MEMS



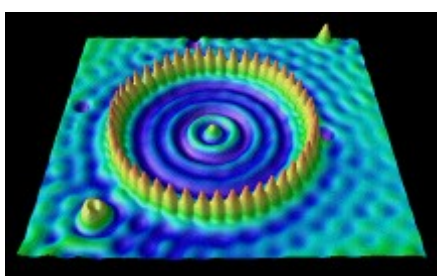
2 mm

VCSELaser

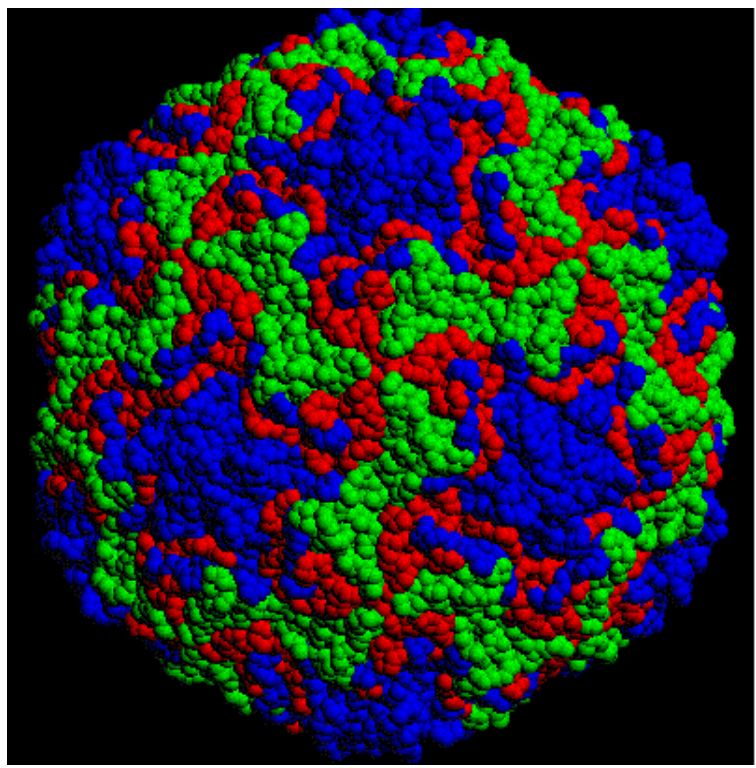


NANO

400x Magnification



IBM Quantum Corral
Iron Atoms on Copper



Human Rhinovirus

5 nanometers

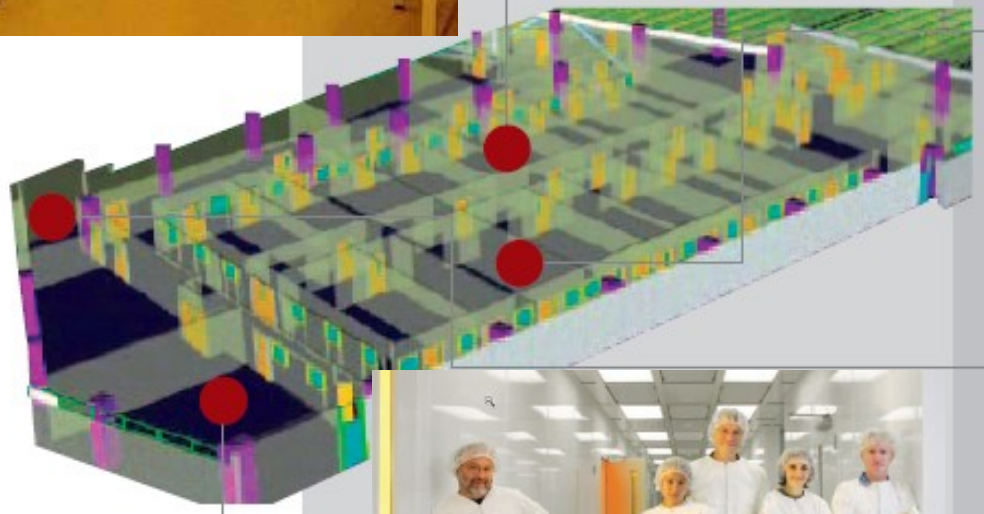
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Nanobioinfotechnology

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Calit2@UCSD Creates a Dozen Shared Clean Rooms for Nanoscience, Nanoengineering, Nanomedicine







Class 100 Clean Room Modules: Nano/microlithography

Areas with no more than 100 particles larger than 0.5 microns per cubic foot of air. Facilities include e-beam lithography and photolithography modules.

Class 1000 Clean Room Modules: Nano/microfabrication

No more than 1,000 particles larger than 0.5 microns per cubic foot of air. Areas include metallization/thin film deposition, advanced dry etching, metrology, thermal and back-end processes.

Advanced Structural Characterization

Techniques include scanning electron microscopy (using electrons rather than light to form an image) and scanning probe microscopy. Ultrahigh vacuum surface analysis. Optical characterization.

OTHER FACILITIES INCLUDE:

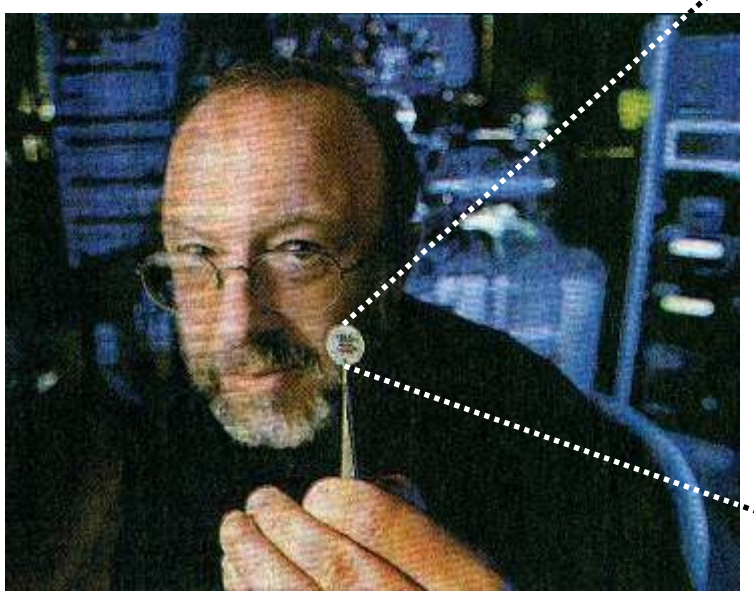
Metal-Organic Chemical Vapor Deposition Facility

MOCVD technique used for thin film growth in advanced, compound semiconductors and nanostructures.

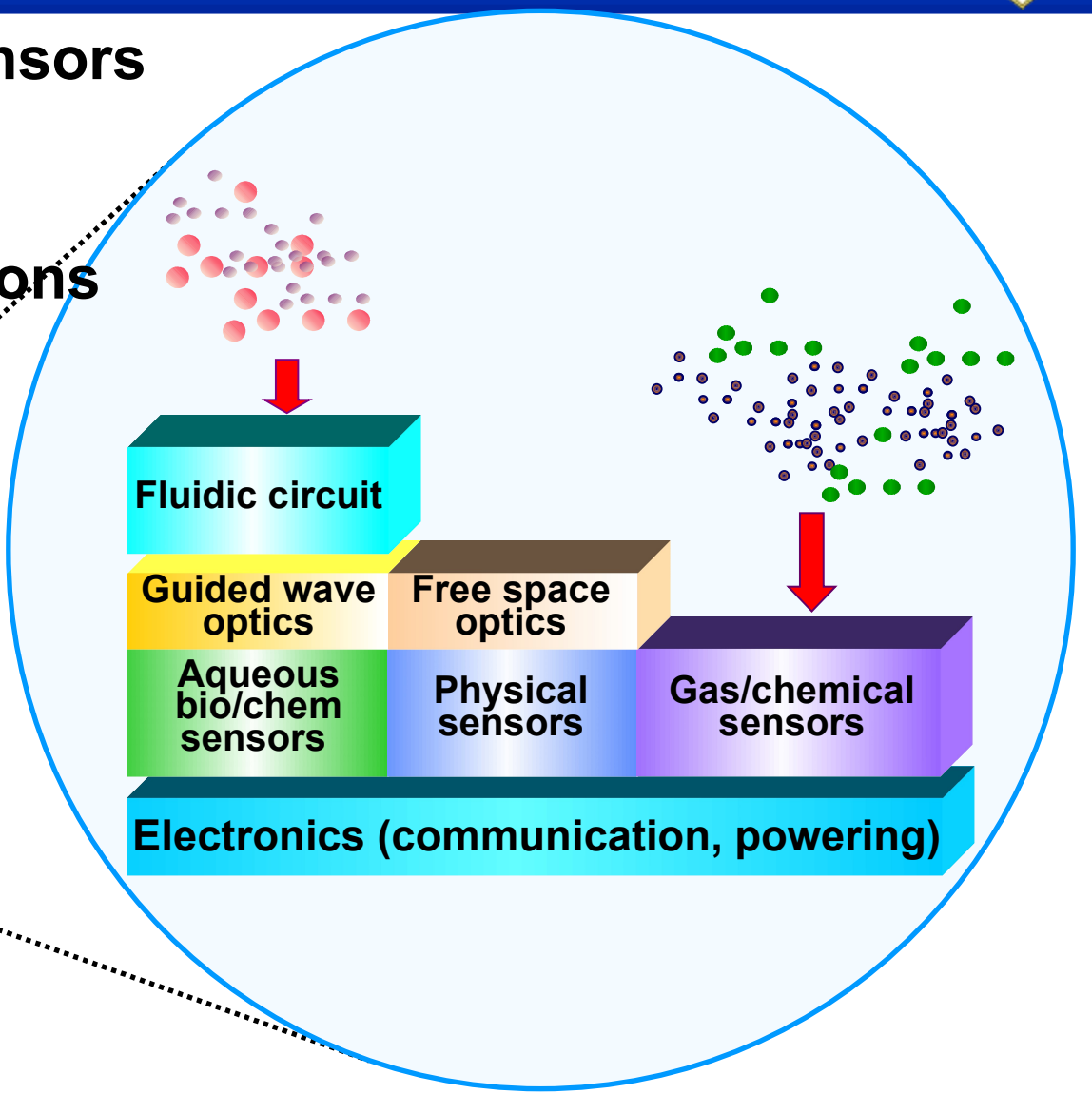
Photo Courtesy of Bernd Fruhberger, Calit2

A World of Distributed Sensors Starts with Integrated Nanosensors

Developing Multiple Nanosensors on a Single Chip, with Local Processing and Wireless Communications



I. K. Schuller holding the first prototype



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I. K. Schuller, A. Kummel, M. Sailor, W. Trogler, Y-H Lo

Global Connections
Between University Research Centers at 10Gbps

Maxine Brown, Tom DeFanti, Co-Chairs

iGrid 2005

THE GLOBAL LAMBDA INTEGRATED FACILITY

www.igrid2005.org



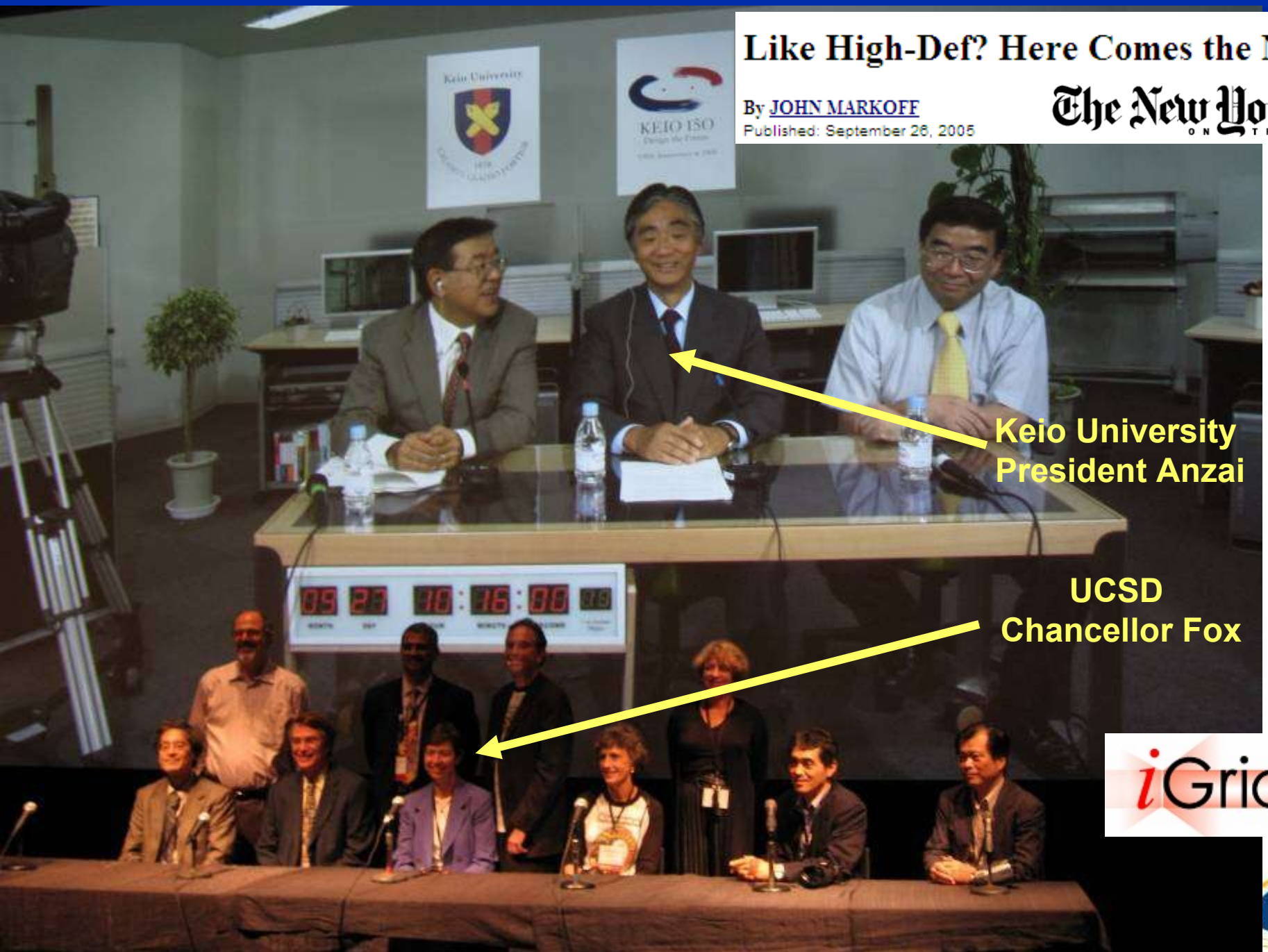
the UC Discovery Grant

September 26-30, 2005
Calit2 @ University of California, San Diego
California Institute for Telecommunications and Information Technology



21 Countries Driving 50 Demonstrations
1 or 10Gbps to Calit2@UCSD Building
Sept 2005

First Trans-Pacific Super High Definition Telepresence Meeting in New Calit2 Digital Cinema Auditorium



Like High-Def? Here Comes the Next Level

By JOHN MARKOFF
Published: September 26, 2005

The New York Times ON THE WEB

Keio University President Anzai

UCSD Chancellor Fox

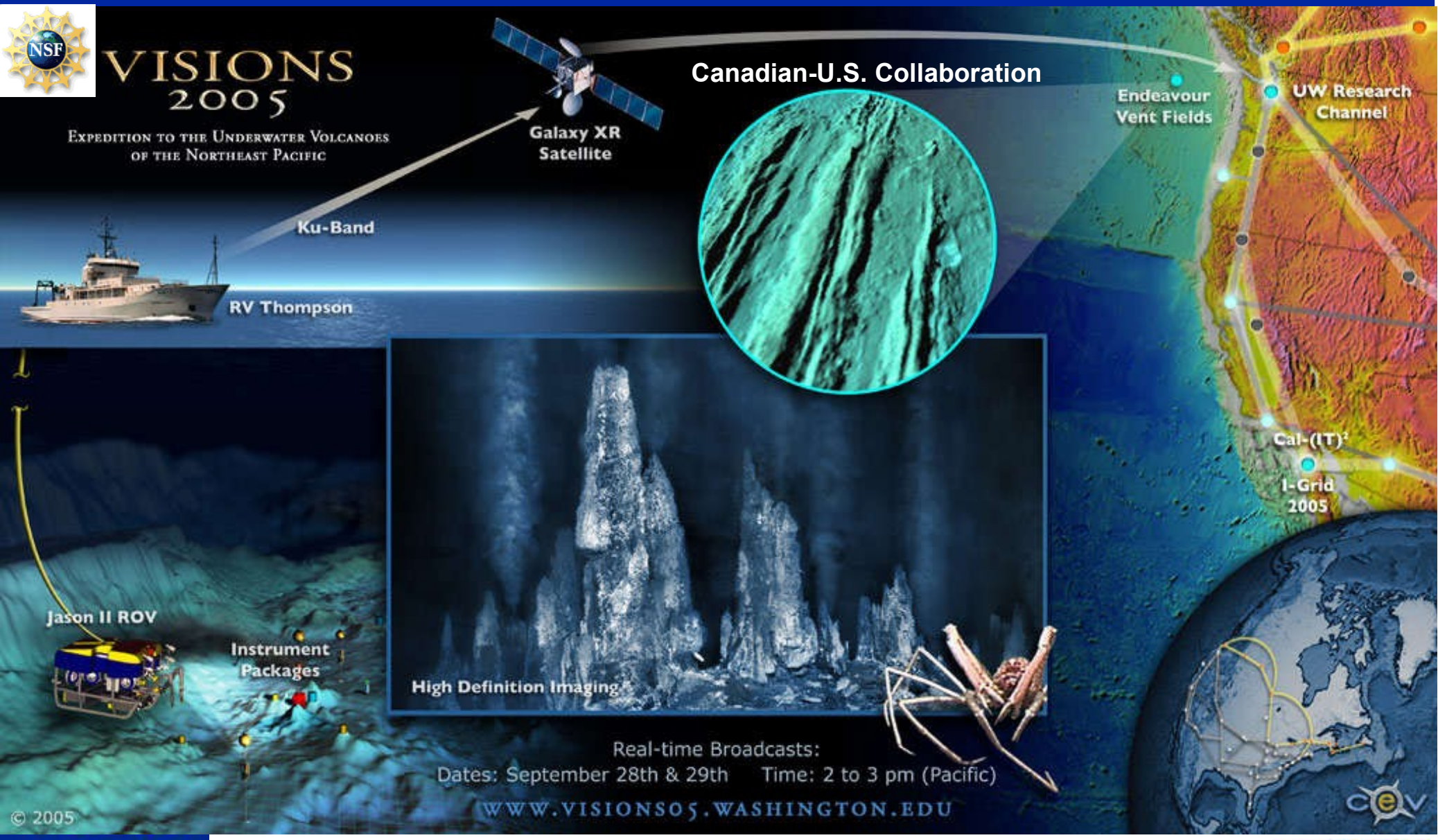
Lays Technical Basis for Global Digital Cinema

Sony
NTT
SGI

iGrid 2005

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First Remote Interactive High Definition Video Exploration of Deep Sea Vents

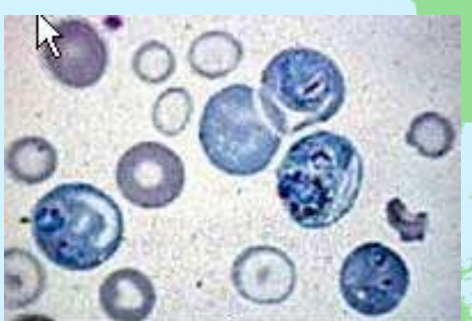


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Source John Delaney & Deborah Kelley, UWash

Marine Genome Sequencing Project
Measuring the Genetic Diversity of Ocean Microbes





Canada
United States
Mexico
Puerto Rico
Honduras
Costa Rica
Panama
Galapagos Islands
x 10 samples
French Polynesia
Vanuatu
Fiji
Tonga
Cook Islands
New Caledonia
x 17 samples
Australia
Cocos-Keeling Is.
Tanzania/ Zanzibar
x 7 samples
Seychelles
Madagascar
South Africa
x 8 samples

Analyzed
Sampled, but not Analyzed

Calit2 will include
All Sorcerer II Metagenomic Data

MARINE MICROBIOLOGY INITIATIVE

Gordon and Betty MOORE FOUNDATION

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J. Craig Venter INSTITUTE

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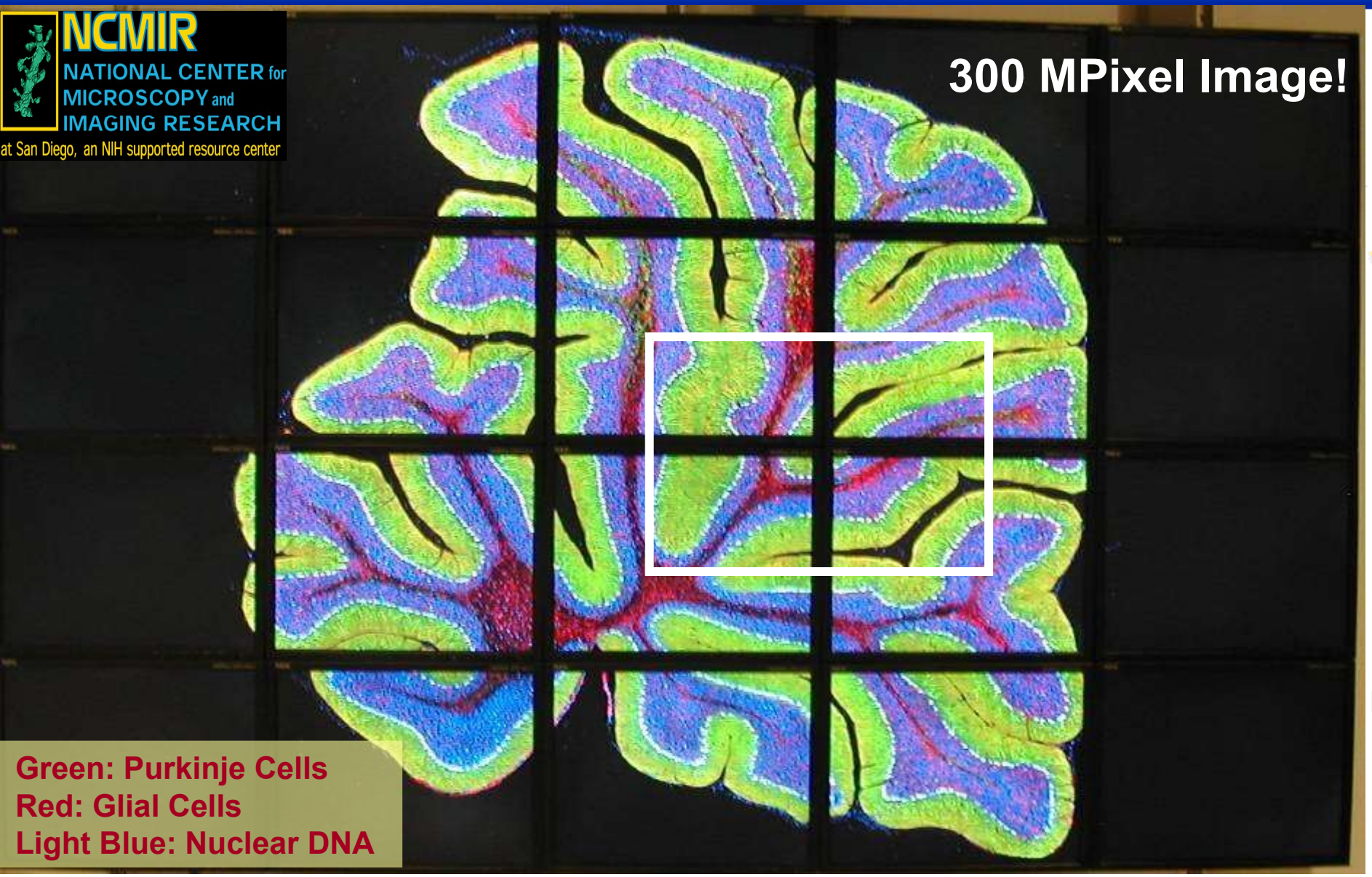
Pacific Rim Undergraduate Experiences PRIME 2005

- **Preparing Students for the Global Workplace of the 21st Century**
  - **14 UCSD Undergrads**
    - **NSF- Funded with Calit2**
  - **Students Work With Researchers During Summer in:**
    - **Australia, Japan, Taiwan, China and Thailand**
  - **Chemistry, Biomedical, Ecology, Networking**



The OptIPuter – Creating High Resolution Portals Over Dedicated Optical Channels to Global Science Data

NCMIR
NATIONAL CENTER for MICROSCOPY and IMAGING RESEARCH
at San Diego, an NIH supported resource center



NSF

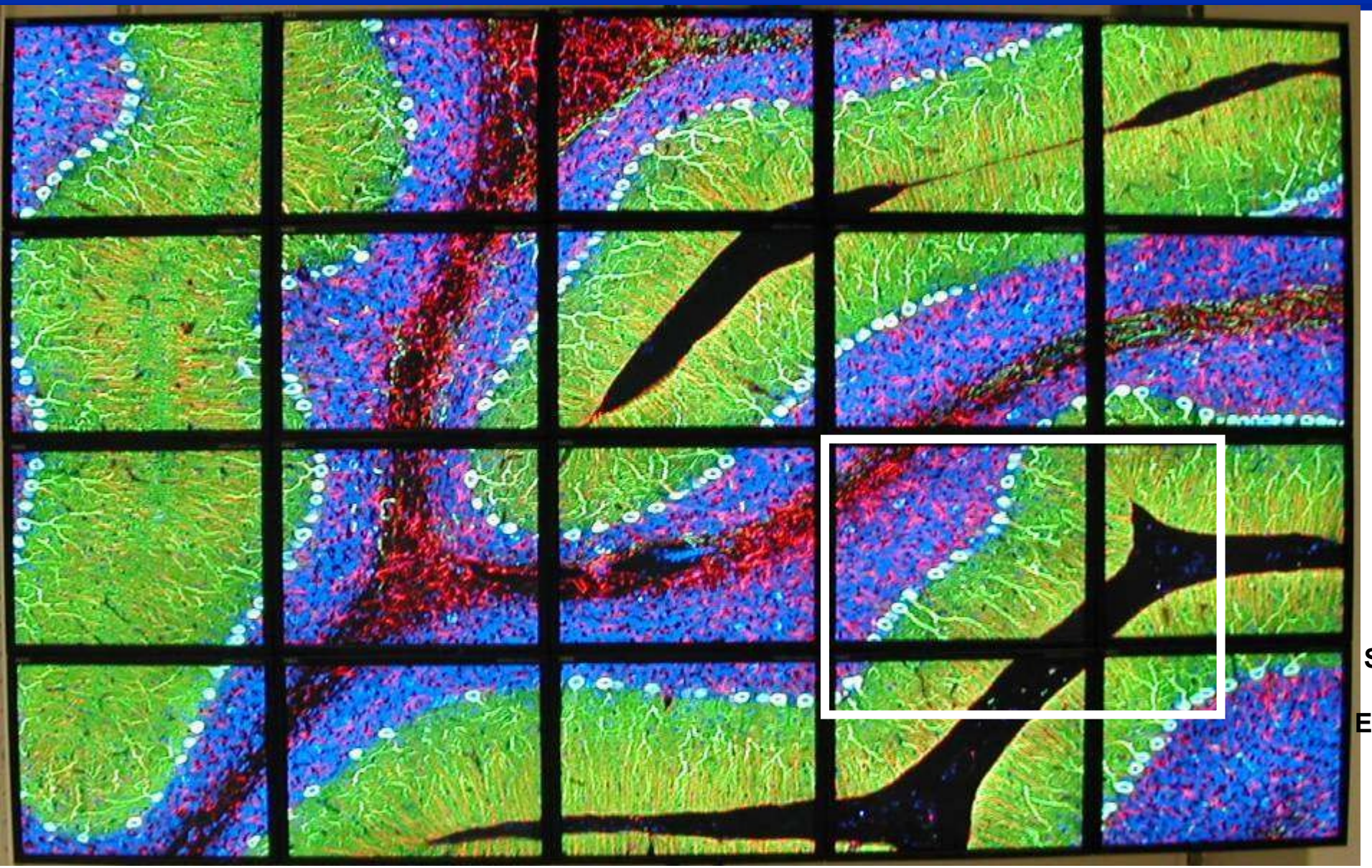
Source: Mark Ellisman, David Lee, Jason Leigh

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Calit2 (UCSD, UCI) and UIC Lead Campuses—Larry Smarr PI
Partners: SDSC, USC, SDSU, NW, TA&M, UvA, SARA, KISTI, AIST

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Scalable Displays Allow Both Global Content and Fine Detail



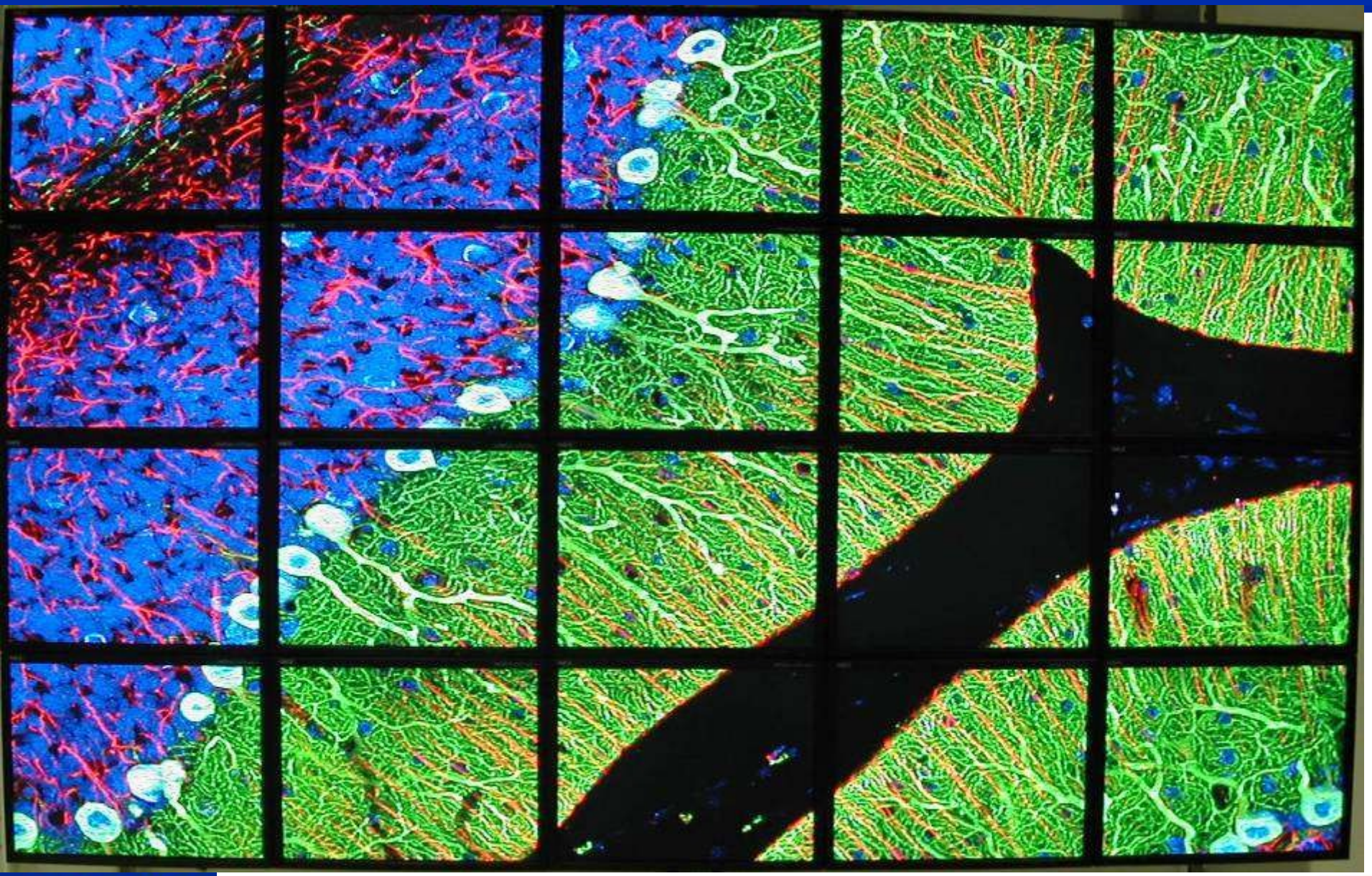
Source: Mark Ellisman, David Lee, Jason Leigh

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30 MPixel SunScreen Display Driven by a 20-node Sun Opteron Visualization Cluster

it²

Allows for Interactive Zooming from Cerebellum to Individual Neurons

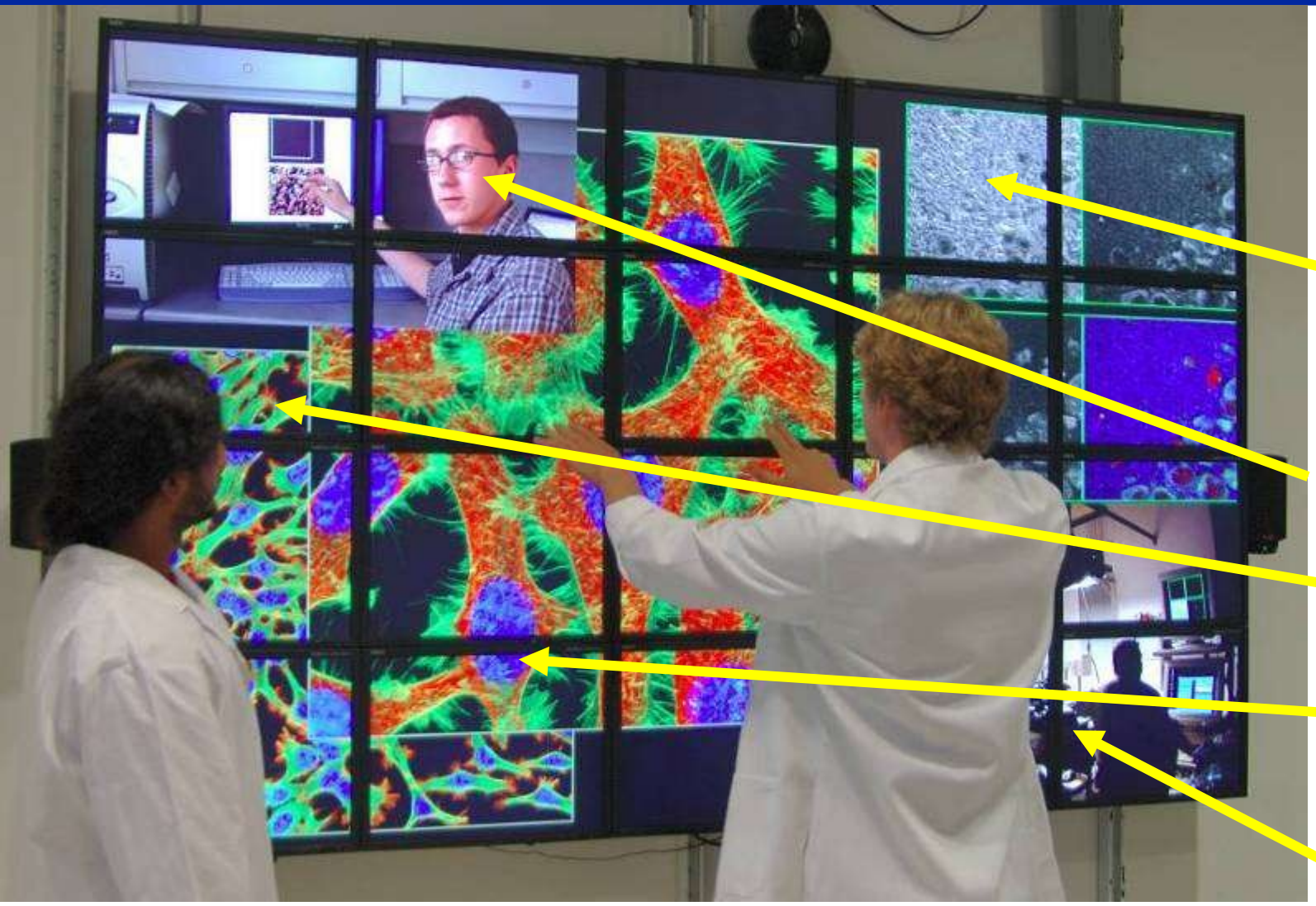


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Source: Mark Ellisman, David Lee, Jason Leigh

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OptIPuter Scalable Adaptive Graphics Environment (SAGE) Allows Integration of HD Streams



SAGE Developed Under Jason Leigh, EVL

- Live Streaming Video of the RTS-2000 Microscope
- HD Video from Remote BIRN Site
- Macro View of Montage Data
- Micro View of Montage Data
- HD Video from the RTS Microscope Room

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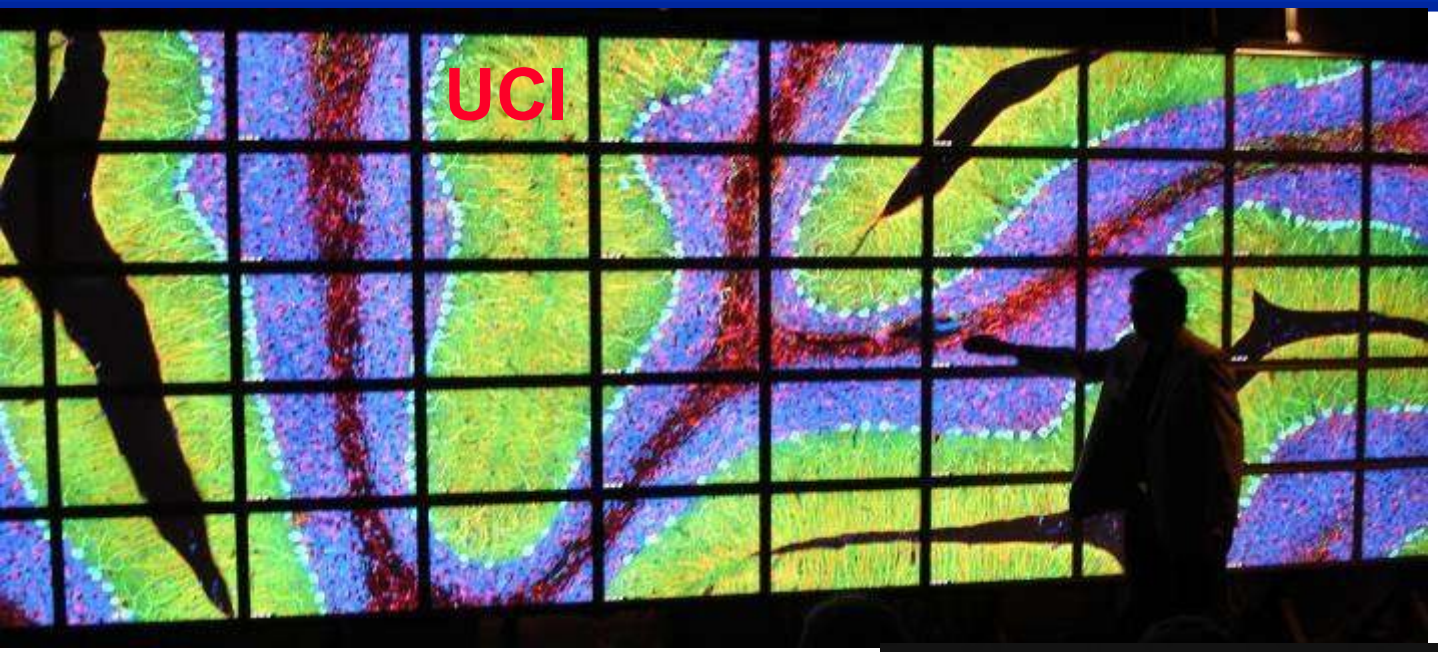
evl electronic visualization laboratory

Source: David Lee, NCMIR, UCSD

NCMIR NATIONAL CENTER for MICROSCOPY and IMAGING RESEARCH at San Diego, an NIH supported resource center

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The OptIPuter Enabled Collaboratory: Remote Researchers Jointly Exploring Complex Data



OptIPuter

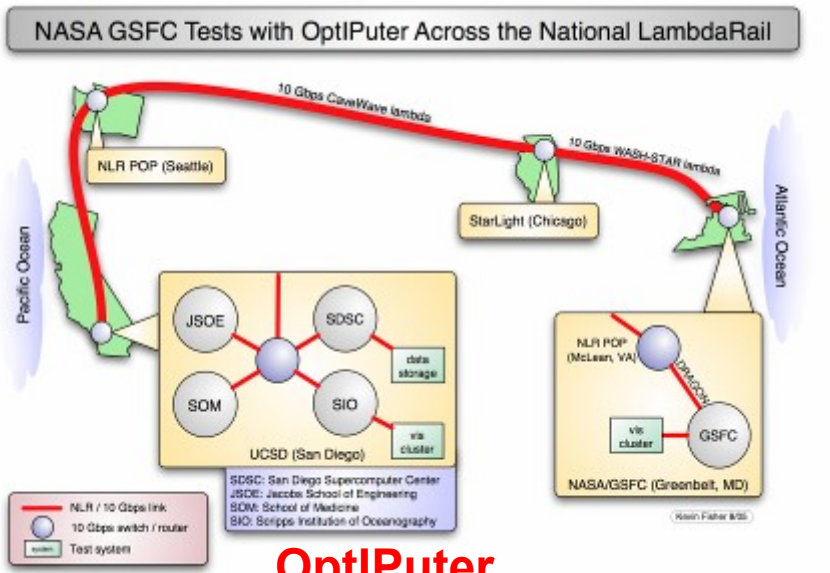
OptIPuter will Connect
The Calit2@UCI
200M-Pixel Wall to
the 100M-Pixel Display
at Calit2@UCSD
With Shared Fast Deep Storage



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Combining Telepresence with Remote Interactive Analysis of Earth Sciences Data Over NLR

Live Demonstration of 21st Century National-Scale Team Science

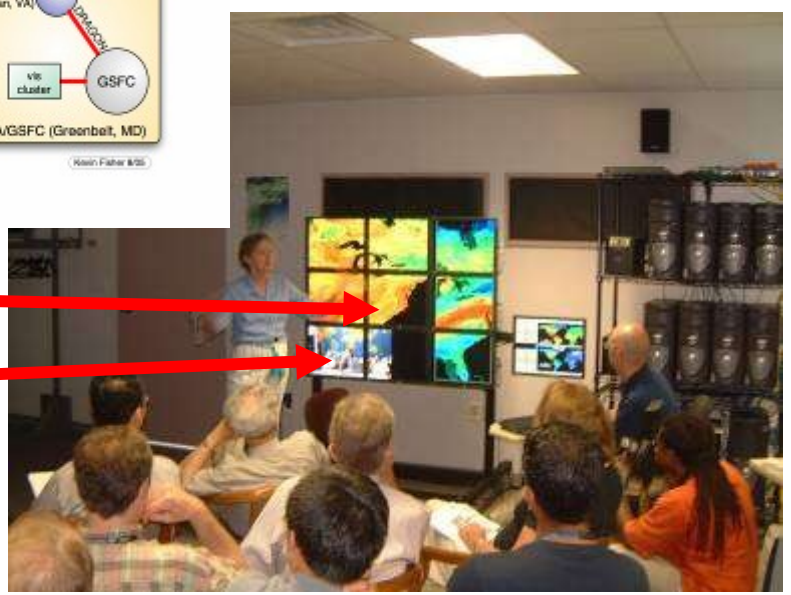


August 8, 2005



OptIPuter Visualized Data

HDTV Over Lambda



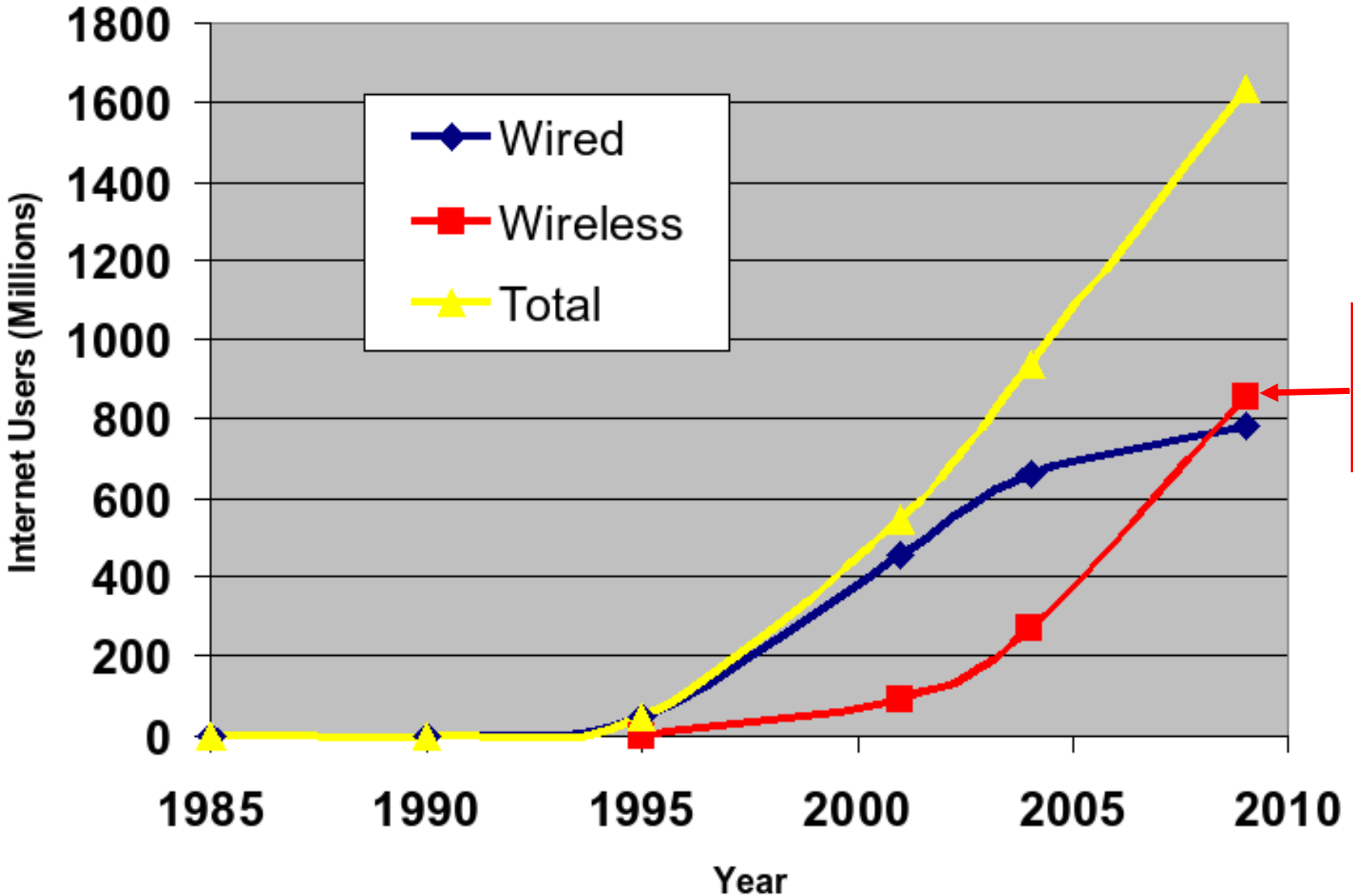
Scripps Institution of Oceanography, UCSD, La Jolla, CA

Goddard Space Flight Center, Maryland

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Transitioning to the "Always-On" Mobile Internet



http://www.etforecasts.com/products/ES_intusersv2.htm

The CWC Provides Calit2 With Deep Research in Many Component Areas



Center for Wireless Communications

Two Dozen ECE and CSE Faculty

LOW-POWERED CIRCUITRY	ANTENNAS AND PROPAGATION	COMMUNICATION THEORY	COMMUNICATION NETWORKS	MULTIMEDIA APPLICATIONS
RF Mixed A/D ASIC Materials	Smart Antennas Adaptive Arrays	Modulation Channel Coding Multiple Access Compression	Architecture Media Access Scheduling End-to-End QoS Hand-Off	Scalable Video Smart Spaces Speech Recognition

Source: UCSD CWC

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Collaborating with City, County, State Agencies
A Classic "One-Institute, Two-Campus" Grant

- **Project RESCUE**
  - Transforming Data Collection, Management, Analysis, Sharing, and Dissemination to Improve Crisis Response
  - Five-Year $12.5 Million Large ITR Award-Started Oct 1, 2003
  - Twenty-Five Researchers and Professors
    - UCI PI: Sharad Mehrotra, ICS
    - UCSD PI: Ramesh Rao, ECE
    - Univ. Maryland, Univ. Of Illinois, BYU, Univ. Colorado, ImageCat
  - Community and Industrial Partners
    - Cities of Los Angeles, Irvine, and San Diego
    - County Partners: of Los Angeles
    - State of California
    - Ericsson, HNS, HP, Intersil, Parity, SAIC, SBC, Symbol, Qualcomm





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www.calit2.net/briefingPapers/unexpectd.html

it²

RESCUE Community Advisory Board

Ellis Stanley – Chair
General Manager, City of Los Angeles
Emergency Preparedness Department

Jim Watkins (retired)
Governor's Office
Emergency Services

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Office of Emergency Mgmt.

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Systems Command
(SPAWAR)

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San Diego Police Department

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City of San Diego

David Rose
Lieutenant Officer
UC San Diego Police Department

Linda Bogue
Emergency Mgmt. Coordinator
Environmental Health and Safety

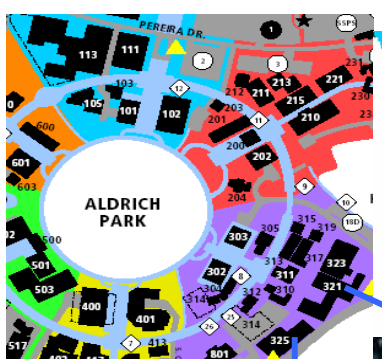


NSF-Funded ResponSphere Establishes Calit2 Project Rescue Testbeds in Irvine and in San Diego

- Localized Site-Specific Disasters Via Crisis Response Drills
- Large Scale Regional Disasters Via Simulations
- Transportation (Simulation) – ImageCat
  - Test & Validate IT and Social Science Research Within the Context of Regional Crisis Response
- CAMAS (*Crisis Assessment, Mitigation, And Analysis*) – UCI Campus
  - Field-Test and Refine Research on Information Collection, Analysis, Sharing, and Dissemination in Controlled yet Realistic Settings
- GLQ (*Gaslamp Quarter*, San Diego/UCSD)
  - Ubiquitous Wireless Coverage in Downtown San Diego
  - Test Network Architecture Enhancement and New Applications

















bren:school information and computer sciences

responsphere

UCSD UCIrvine

PI: Magda El Zarki, ICS, UCI
www.responsphere.org

NSF RESCUE Strongly Coupled with NIH WIISARD Grant

Wireless Internet Information System for Medical Response in Disasters

Calit2 is Working Closely with the First Responder Community



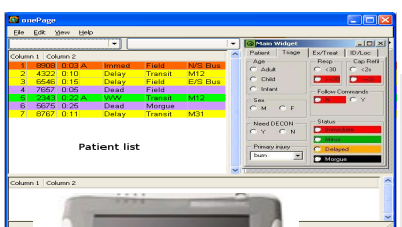




Triage

First Tier





Patient list



Mid Tier



802.11 pulse ox



Wireless Networks



Command Center







Reality Flythrough
Mobile Video