“Collaborations Between Calit2, SIO, and the Venter Institute—a Beginning"

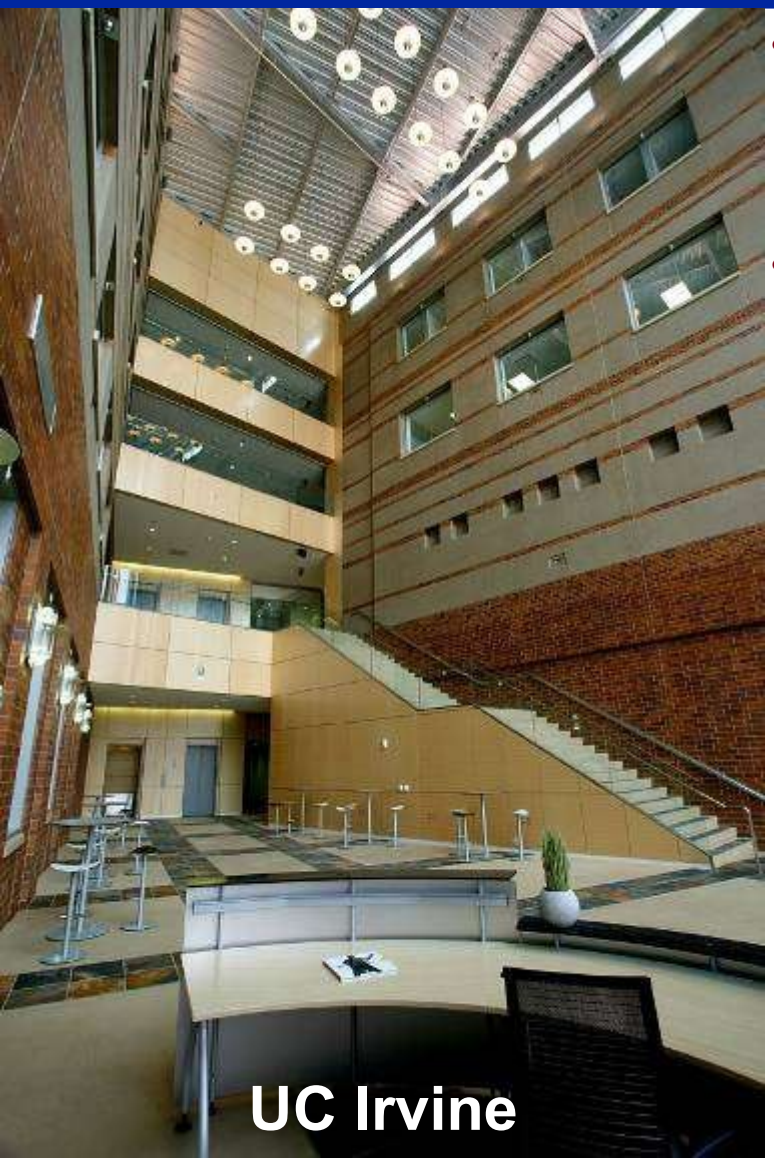
Talk to the
UCSD Representative Assembly
La Jolla, CA
November 29, 2005

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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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



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www.calit2.net

it2

Calit2 is Partnering with SIO to Prototype a Digital Environment Research Systems

- Viewing and Analyzing Earth Satellite Data Sets
- Earth Topography
- Atmospheric Brown Clouds
- Climate Modeling
- Coastal Zone Data Assimilation
- Surface, Subsurface, and Ocean Floor Observatories
- Ocean Environmental Metagenomics

Smarr March 2005 Talk to SIO Council
Led to Calit2 Discussions with Craig Venter

John Orcutt, Director CEOA
Deputy Director, SIO

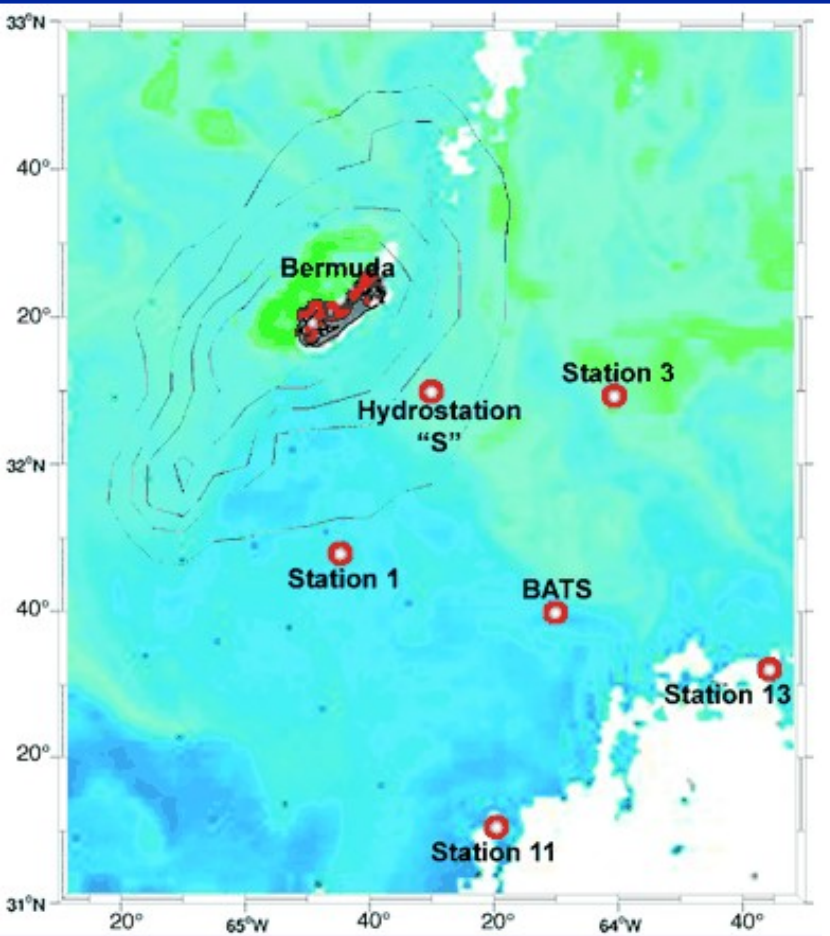






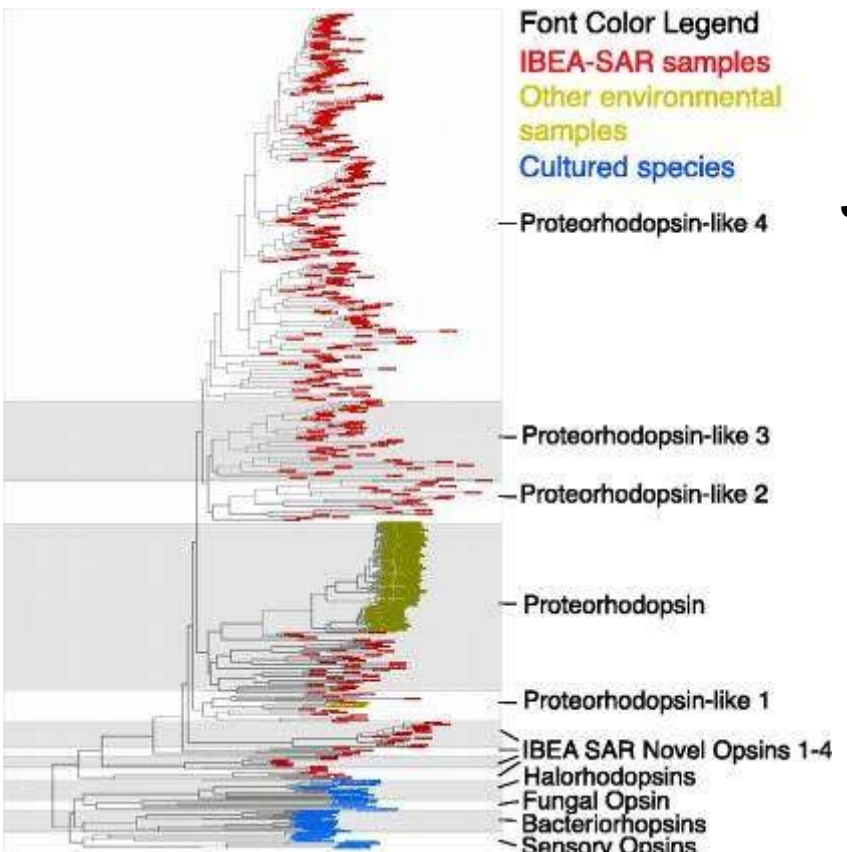


The Sargasso Sea Experiment
The Power of Environmental Metagenomics



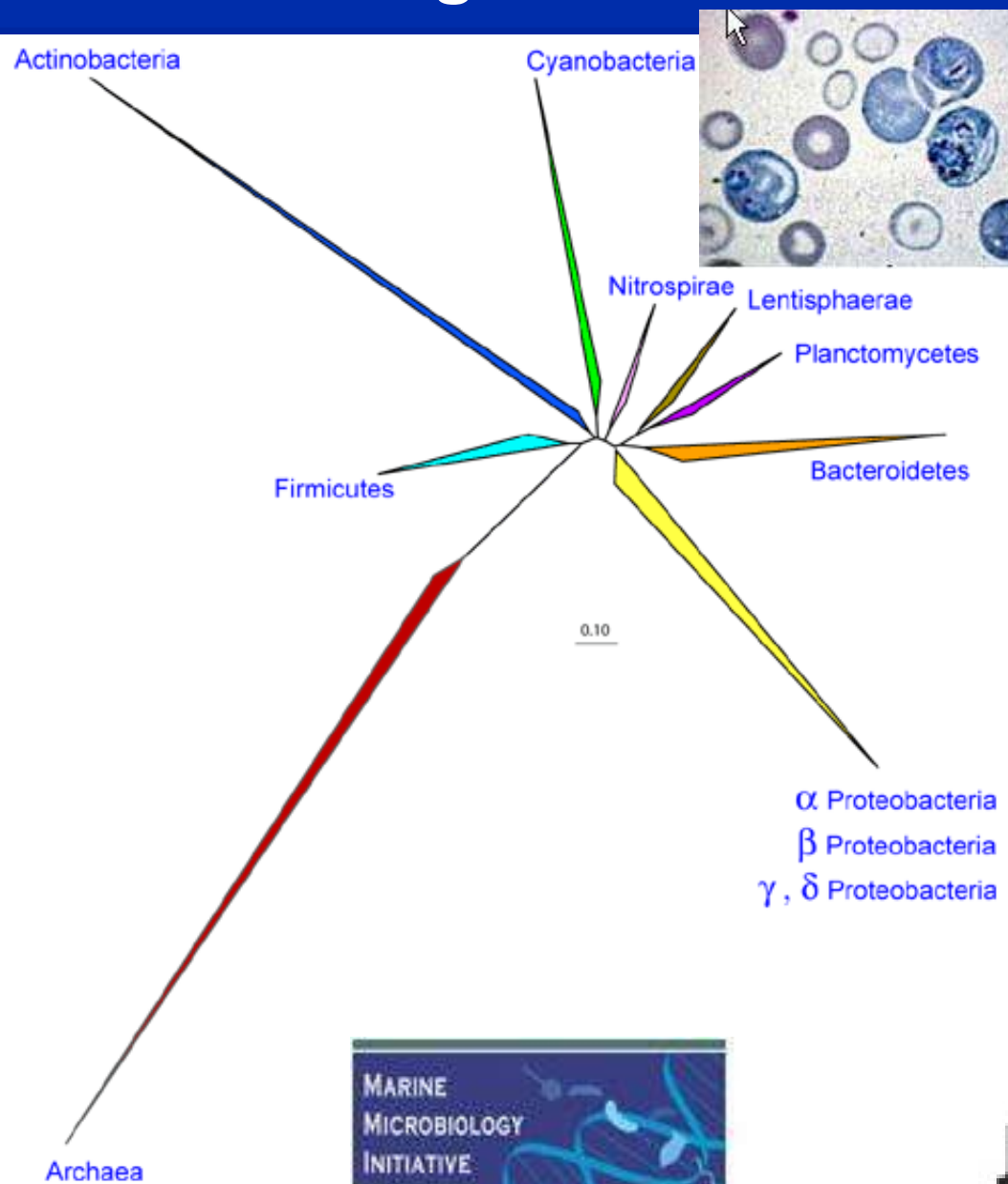
MODIS-Aqua satellite image of ocean chlorophyll in the Sargasso Sea grid about the BATS site from 22 February 2003

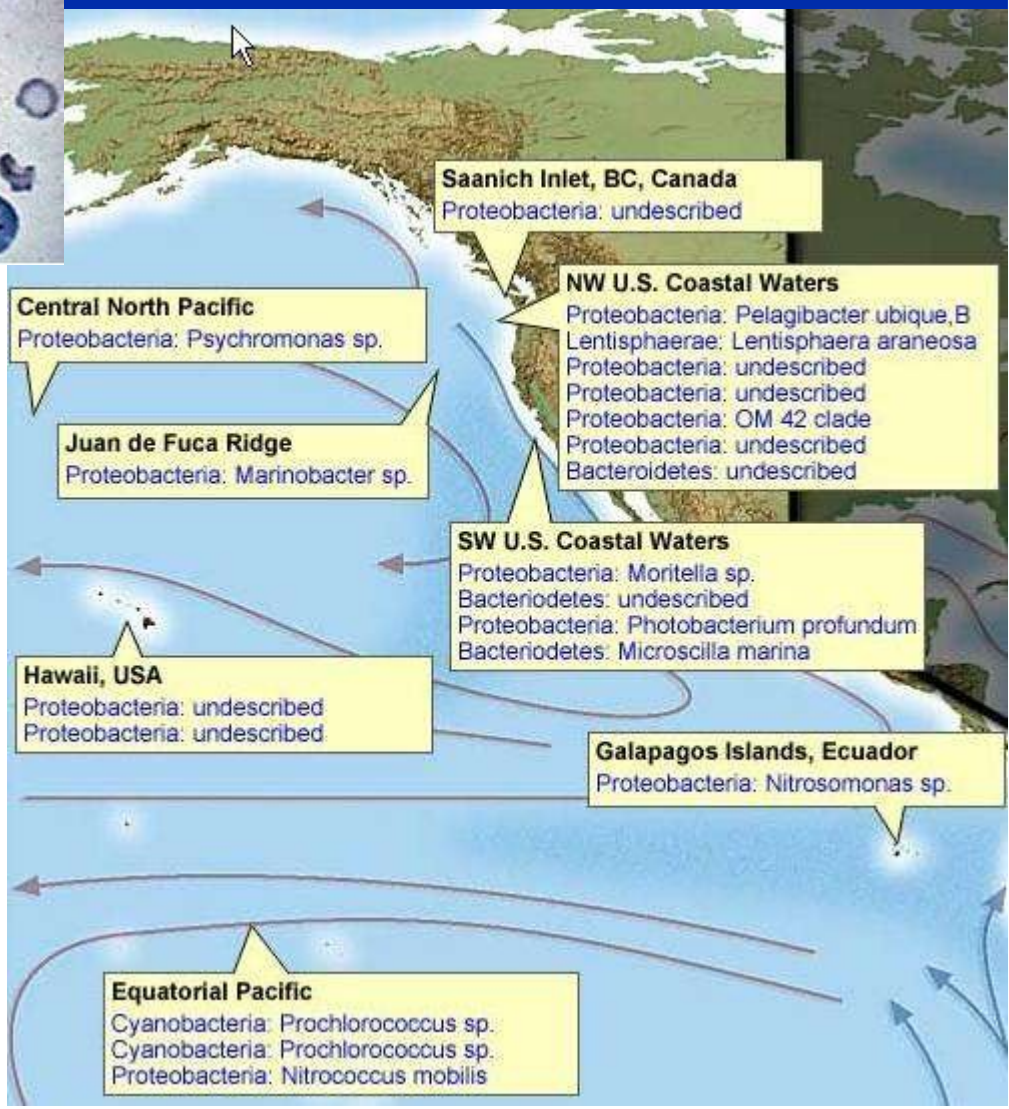
- Yielded a Total of Over 1 billion Base Pairs of Non-Redundant Sequence
- Displayed the Gene Content, Diversity, & Relative Abundance of the Organisms
- Sequences from at Least 1800 Genomic Species, including 148 Previously Unknown
- Identified over 1.2 Million Unknown Genes



J. Craig Venter, et al.
Science
2 April 2004:
Vol. 304.
pp. 66 - 74

Marine Genome Sequencing Project
Measuring the Genetic Diversity of Ocean Microbes





MARINE MICROBIOLOGY INITIATIVE

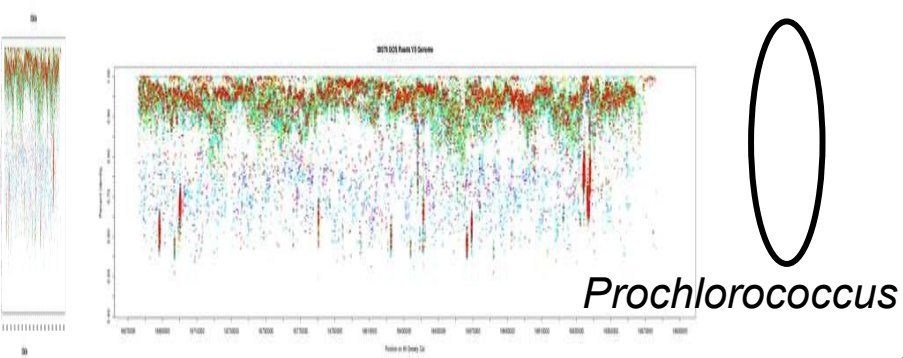
Gordon and Betty MOORE FOUNDATION

J. Craig Venter INSTITUTE

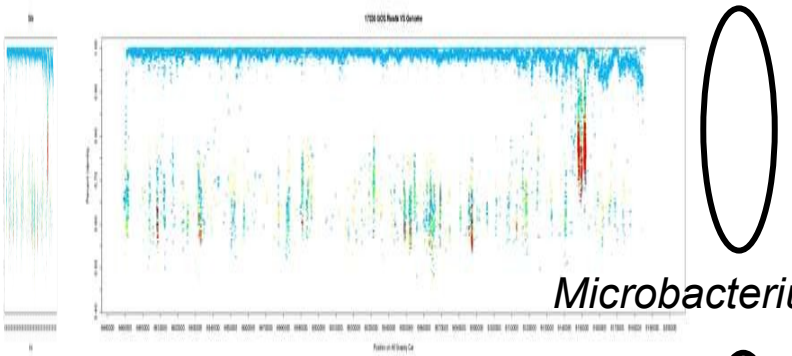
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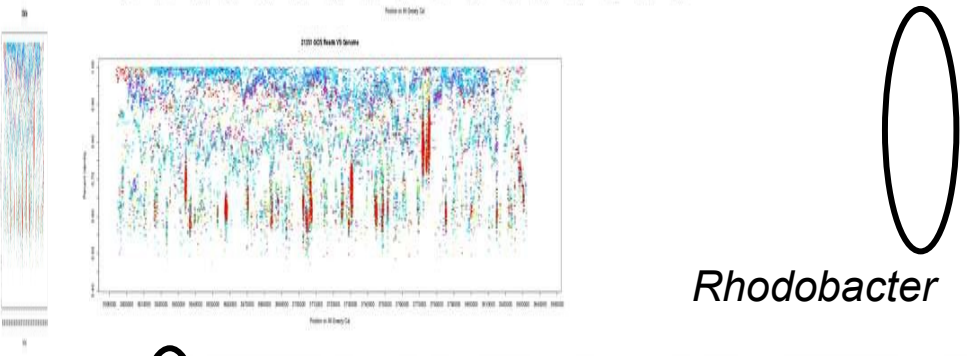
Metagenomics "Extreme Assembly" Requires Large Amount of Pixel Real Estate



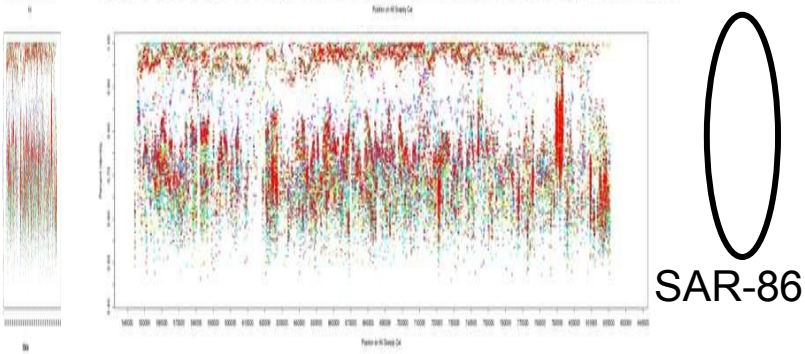
Prochlorococcus



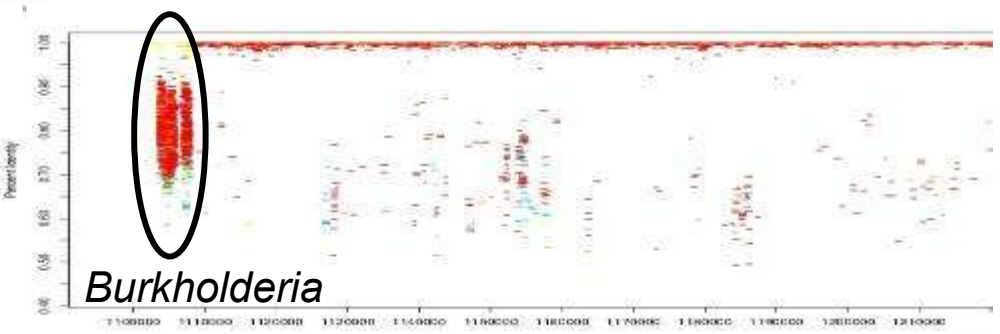
Microbacterium



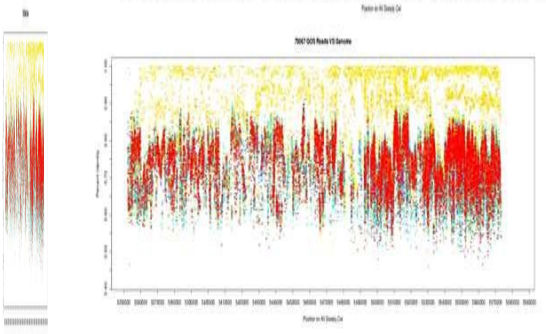
Rhodobacter



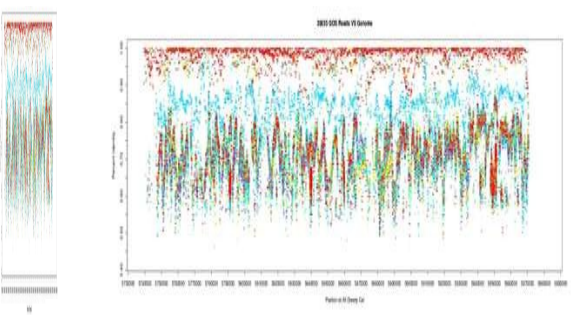
SAR-86



Burkholderia



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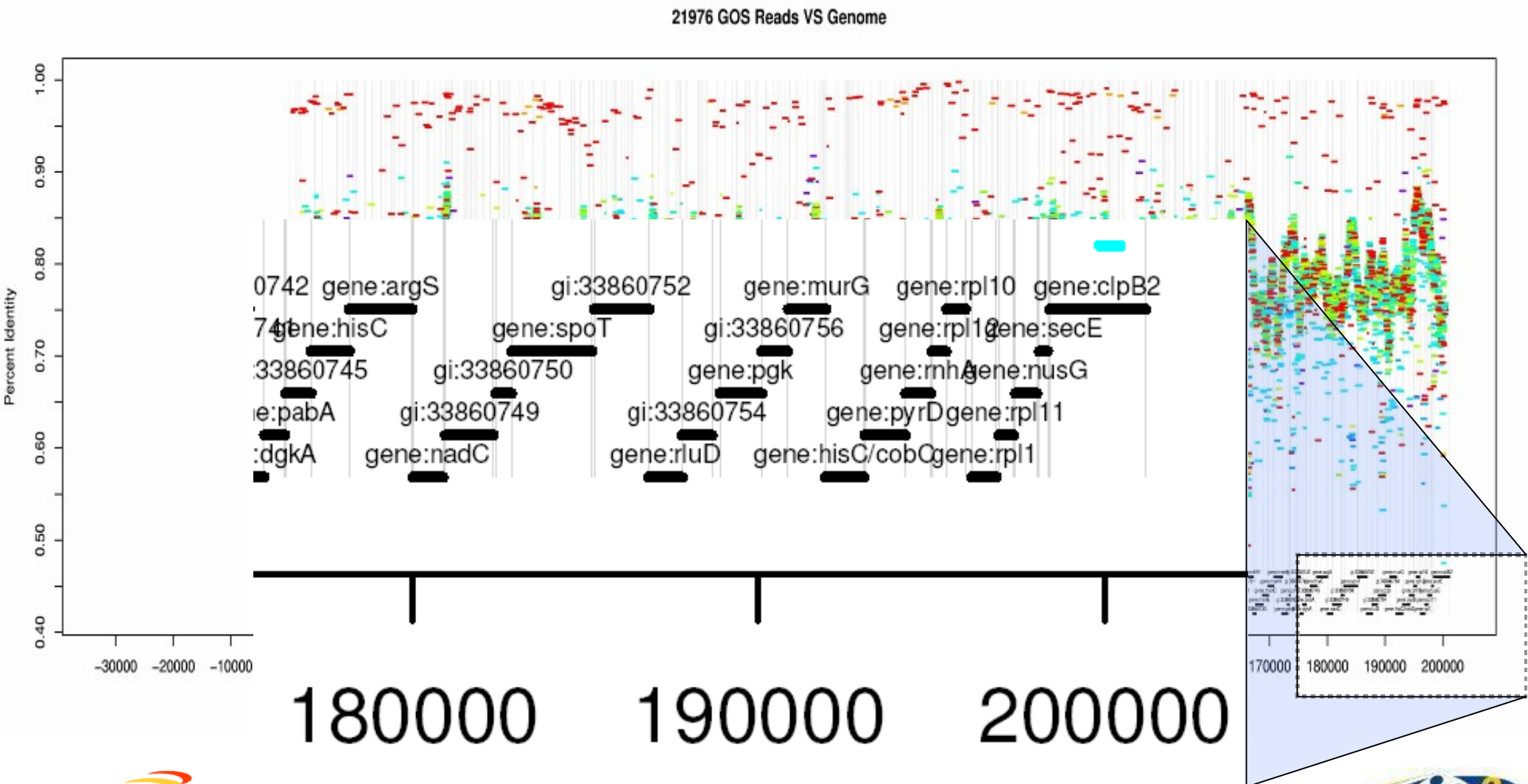


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Source: Karin Remington
J. Craig Venter Institute

Metagenomics Requires a Global View of Data and the Ability to Zoom Into Detail Interactively

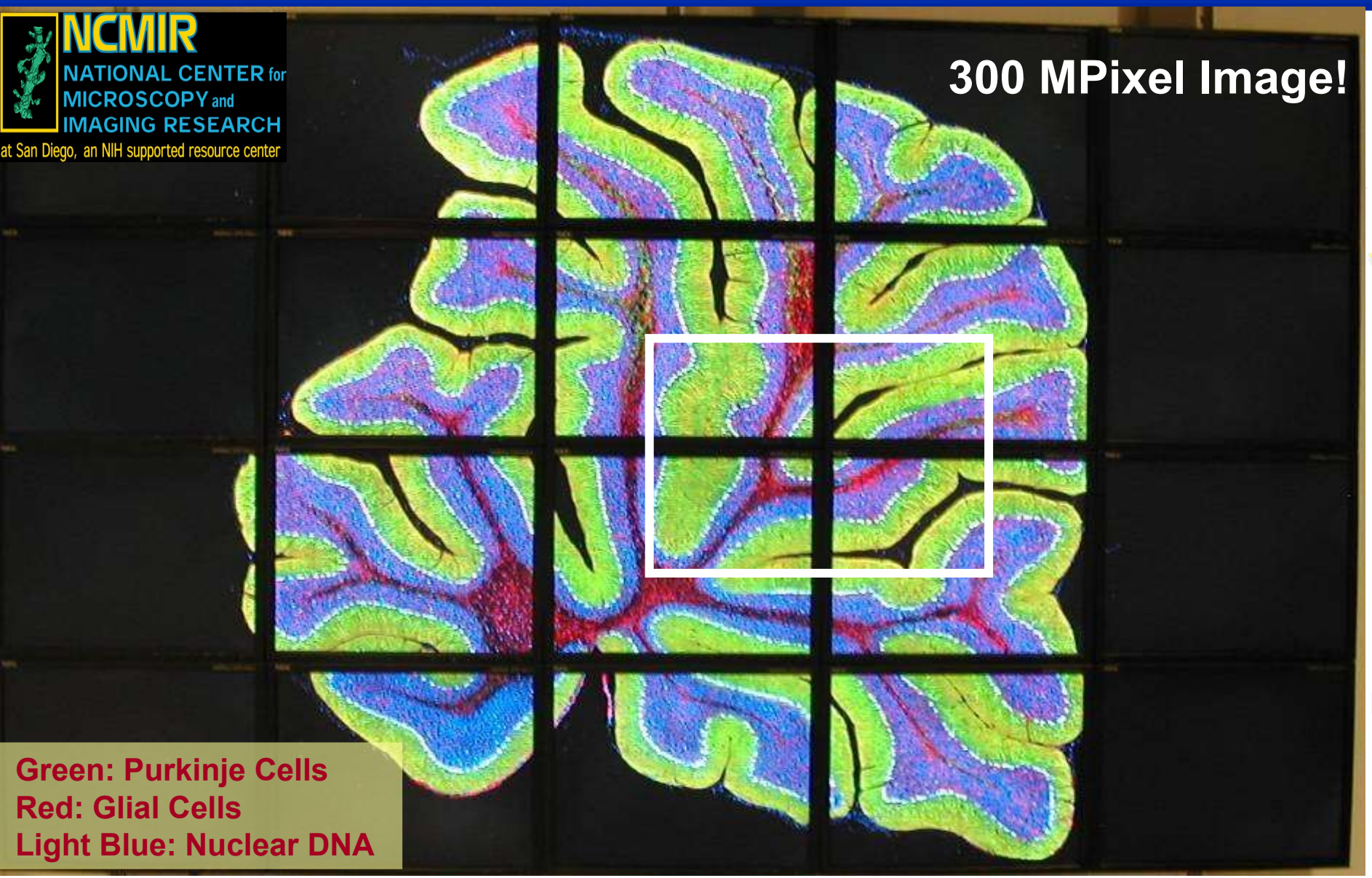
Overlay of Metagenomics Data onto Sequenced Reference Genomes (This Image: Prochloroccocus marinus MED4)



Source: Karin Remington
J. Craig Venter Institute

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

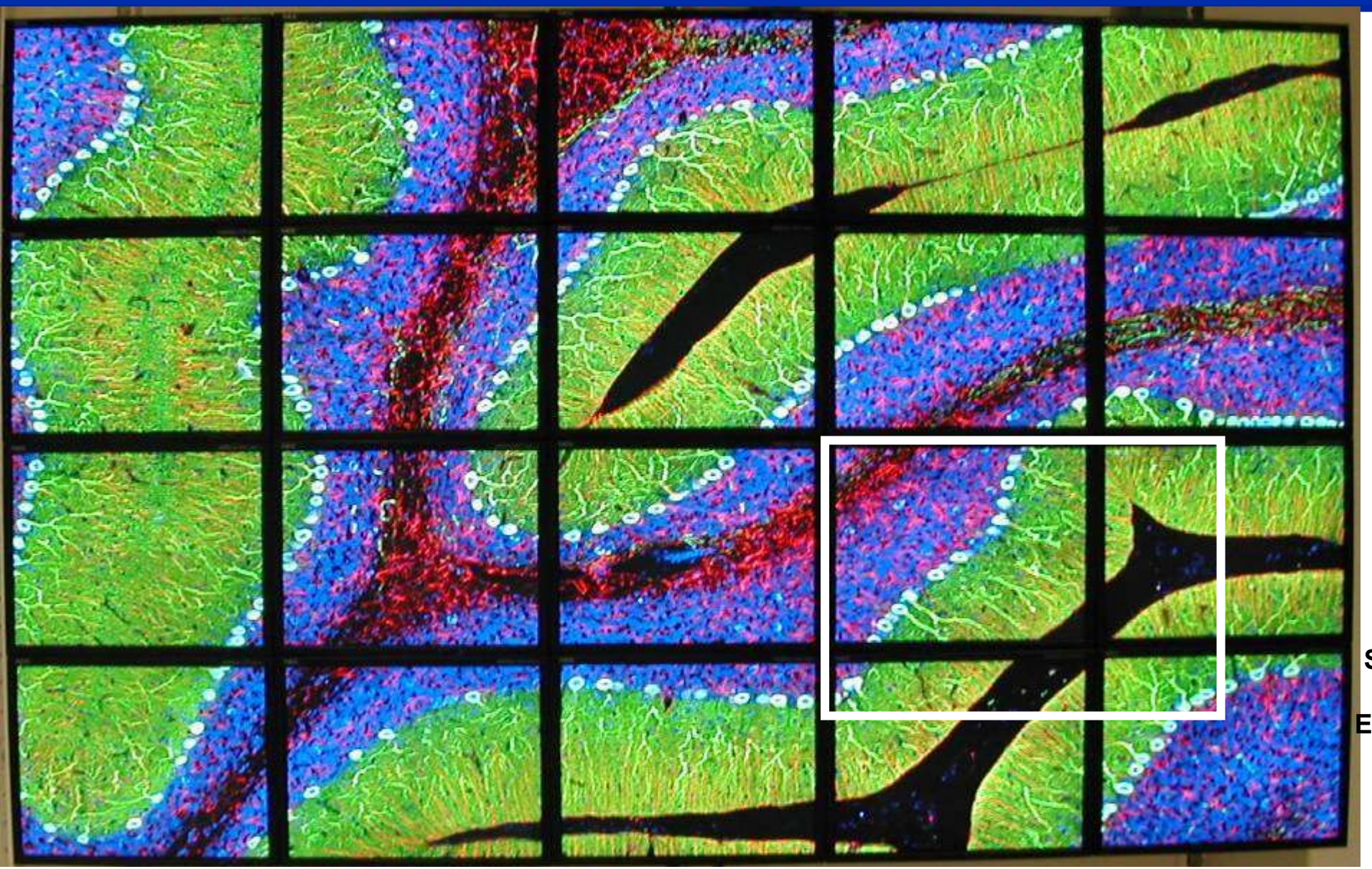


Source: Mark Ellisman, David Lee, Jason Leigh

OptIPuter

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

Scalable Displays Allow Both Global Content and Fine Detail



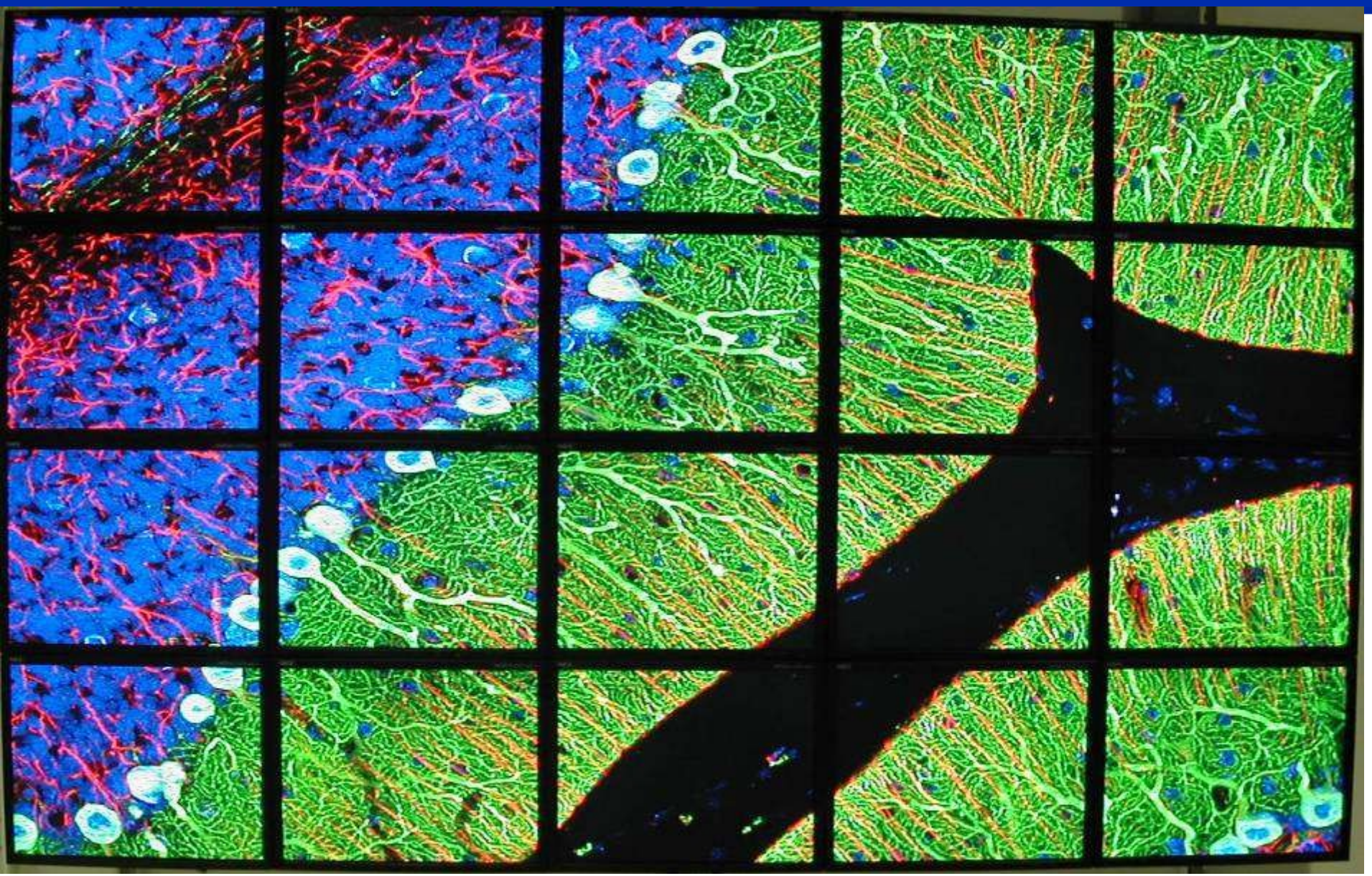
Source: Mark Ellisman, David Lee, Jason Leigh

OptIPuter

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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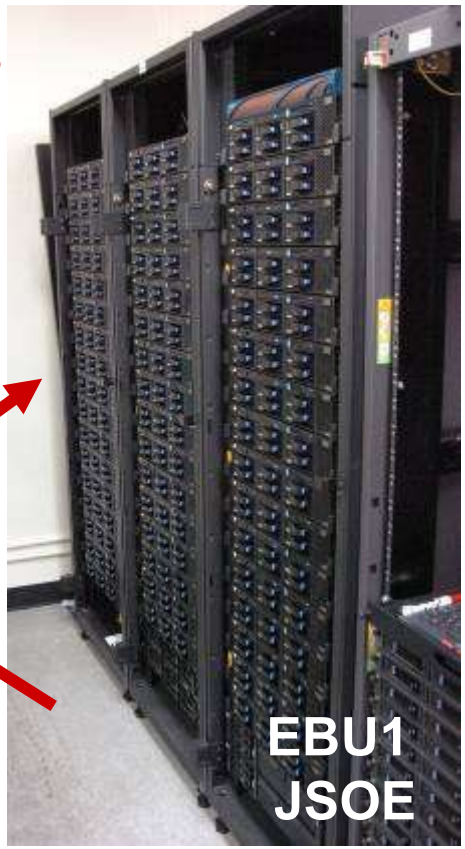
UCSD and UCI are Prototyping Fiber Infrastructure to End-User Laboratories & Large Rotating Data Stores

SIO Ocean Supercomputer



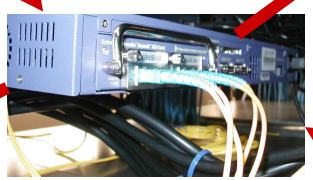
IBM Storage Cluster

UCSD Campus LambdaStore Architecture



Streaming Microscope





2 Ten Gbps Campus Lambda Raceway

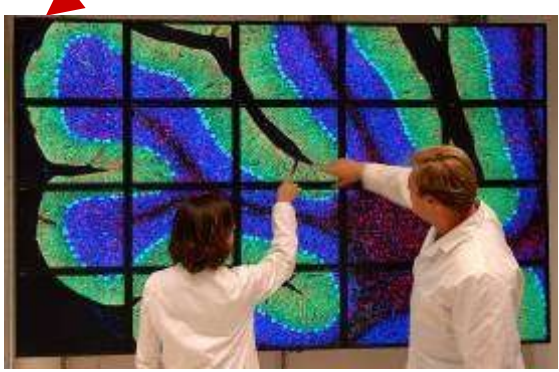






EBU1 JSOE

Global Optical Grid



NCMIR, SOM

OptIPuter

Source: Phil Papadopoulos, SDSC, Calit2

Calit2@UCSD Is Connected to the World at 10,000 Mbps

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



50 Demonstrations, 20 Counties, 10 Gbps/Demo

First Remote Interactive High Definition Video Exploration of Deep Sea Vents



Source John Delaney & Deborah Kelley, UWash

A Near Future Metagenomics Fiber Optic-Enabled Data Generator



Source John Delaney, UWash

Marine Microbial Metagenomics
From Species Genomes to Ecological Genomes

- Each Sequence is a Part of an Entire Biological Community
- Sequences, Genes and Gene Families, Coupled With Environmental Metadata
  - Tremendous Potential to Better Understand the Functioning of Natural Ecosystems
- Challenge
  - Much More Powerful Information Infrastructure Required to Support Metagenomics

Birch Aquarium

SEA OF GENES Now Open

J. Craig Venter INSTITUTE

Dr. Terry Gaasterland



Scripps Genome Center

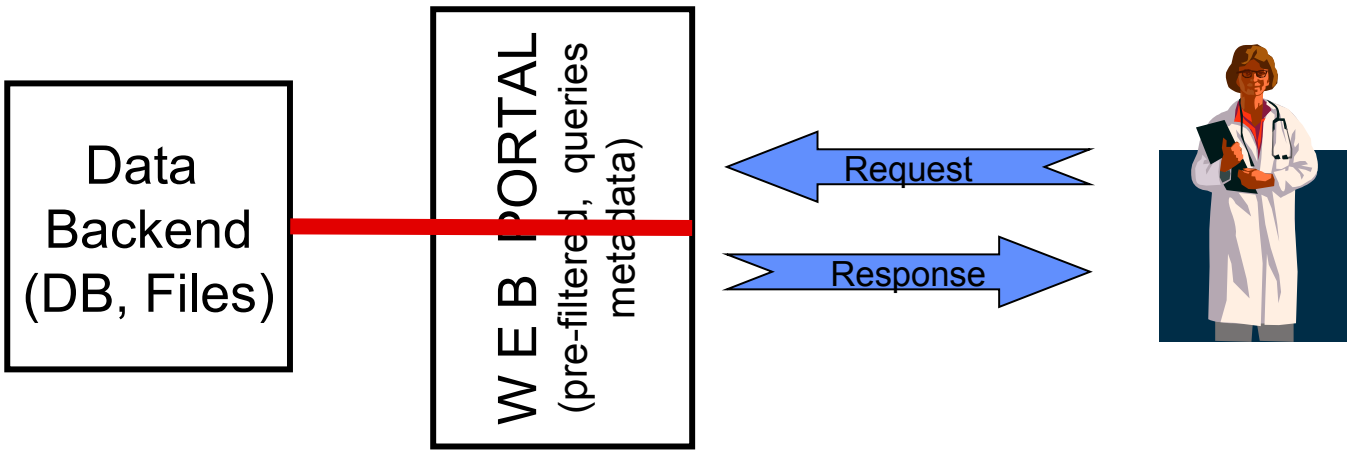
CENTER FOR EARTH OBSERVATIONS & APPLICATIONS

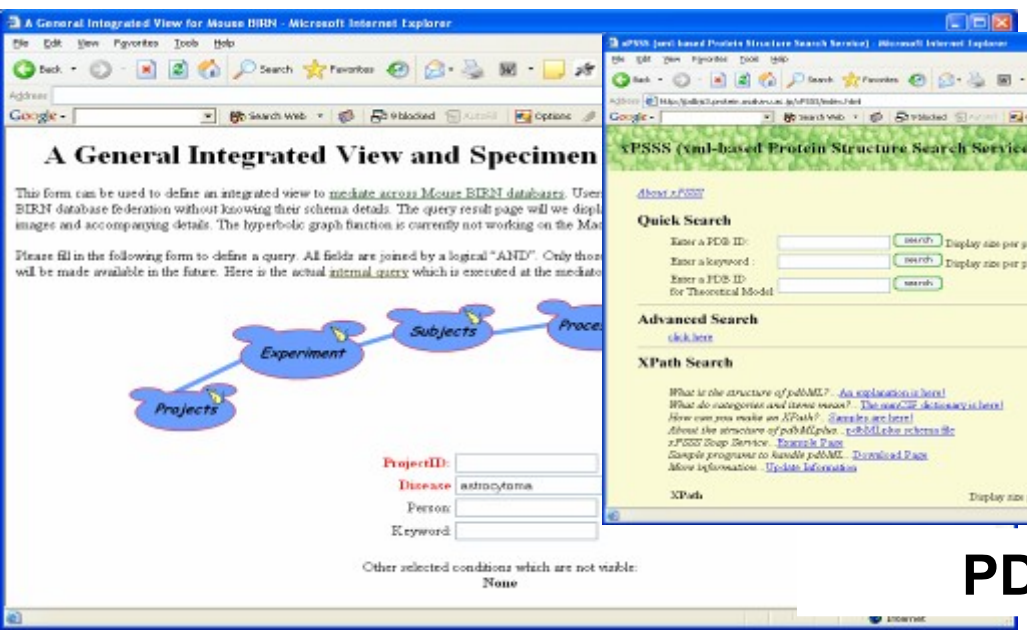
SDSC SAN DIEGO SUPERCOMPUTER CENTER

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it2

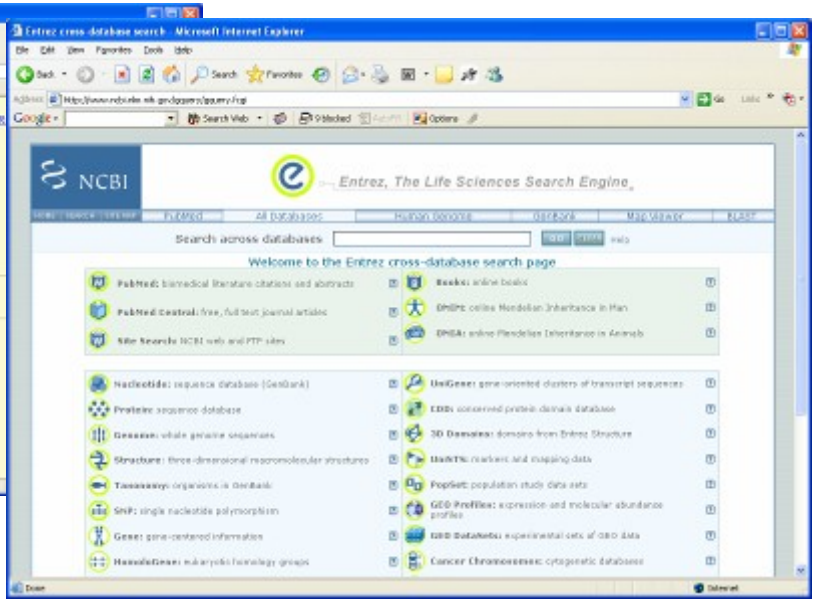
Calit2 Intends to Jump Beyond Traditional Web-Accessible Databases





BIRN

PDB

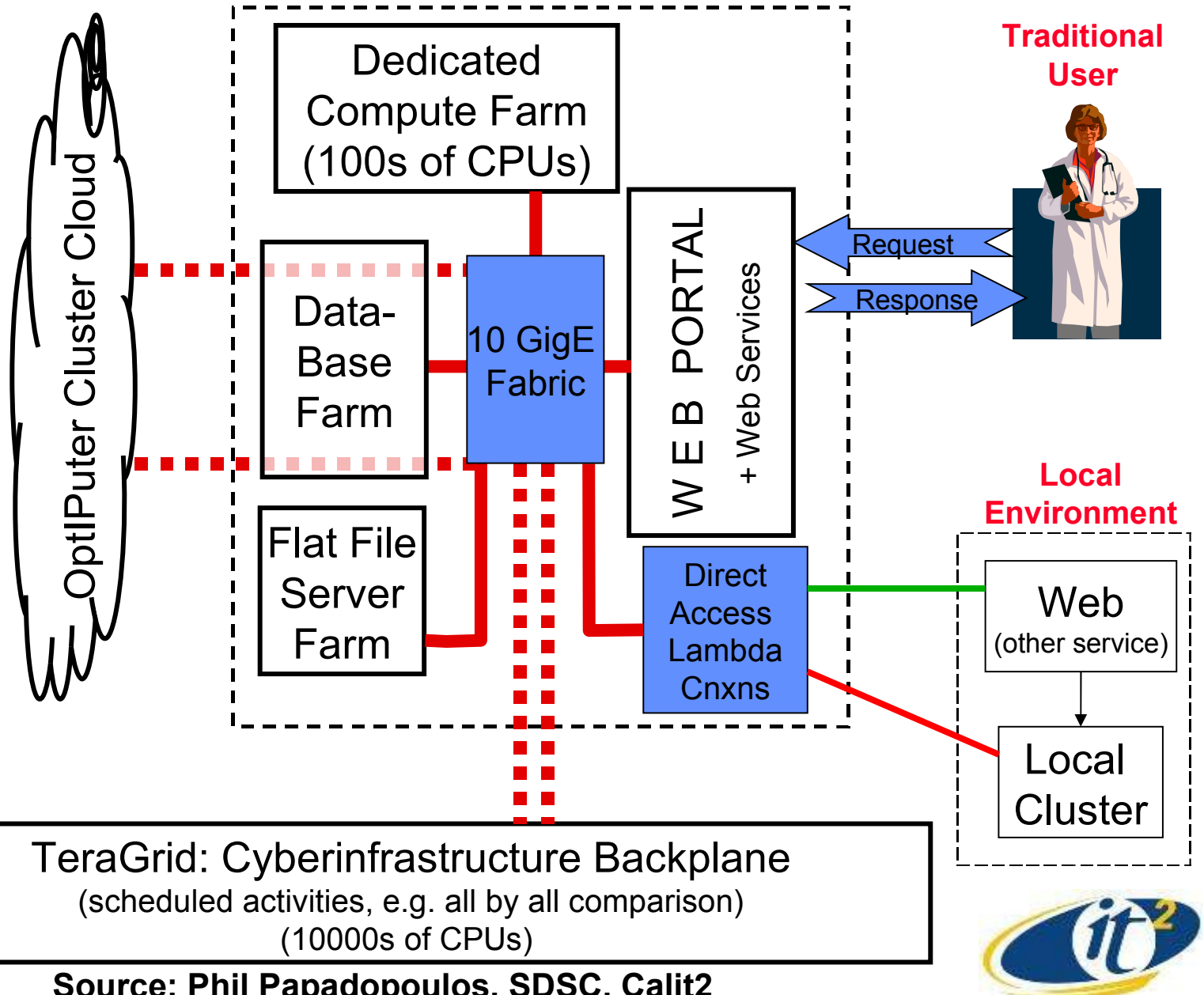


NCBI Genbank

+ many others

Source: Phil Papadopoulos, SDSC, Calit2

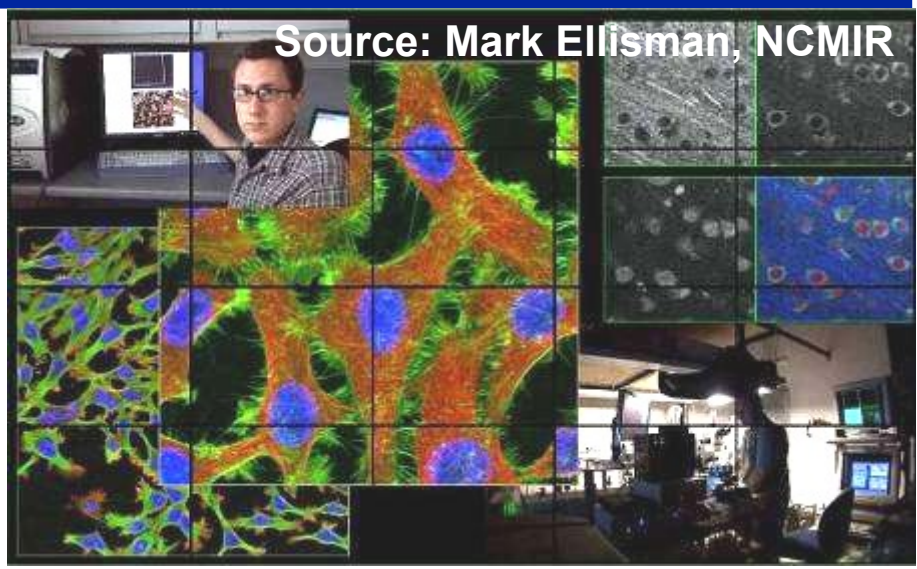
Calit2's Direct Access Core Architecture Will Create Next Generation Metagenomics Server



Source: Phil Papadopoulos, SDSC, Calit2

The OptIPuter Enabled Collaboratory: Remote Researchers Jointly Exploring Complex Data

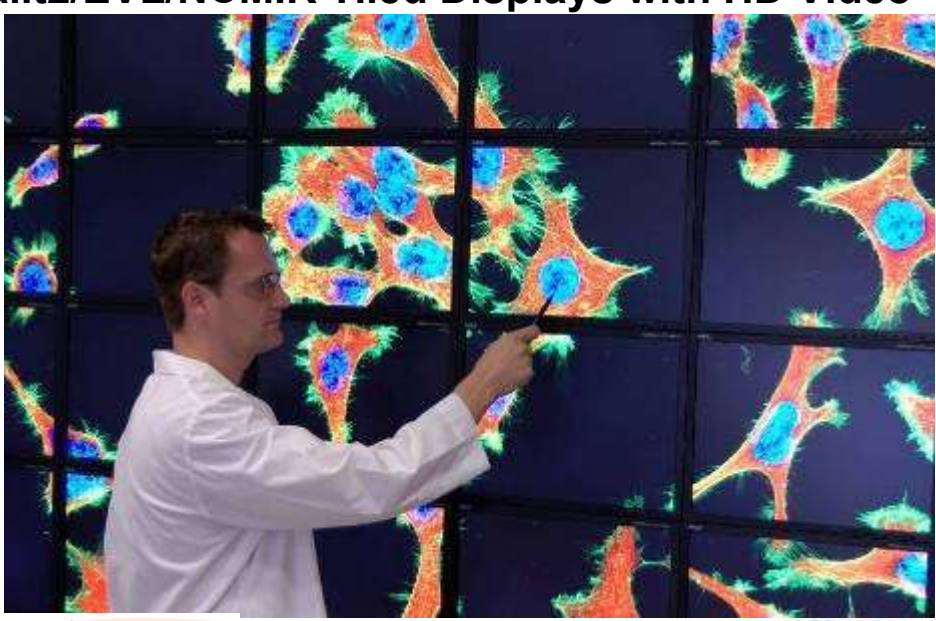




Calit2/EVL/NCMIR Tiled Displays with HD Video

New Home of SDSC/Calit2 Synthesis Center





OptIPuter

SDSC
SAN DIEGO SUPERCOMPUTER CENTER

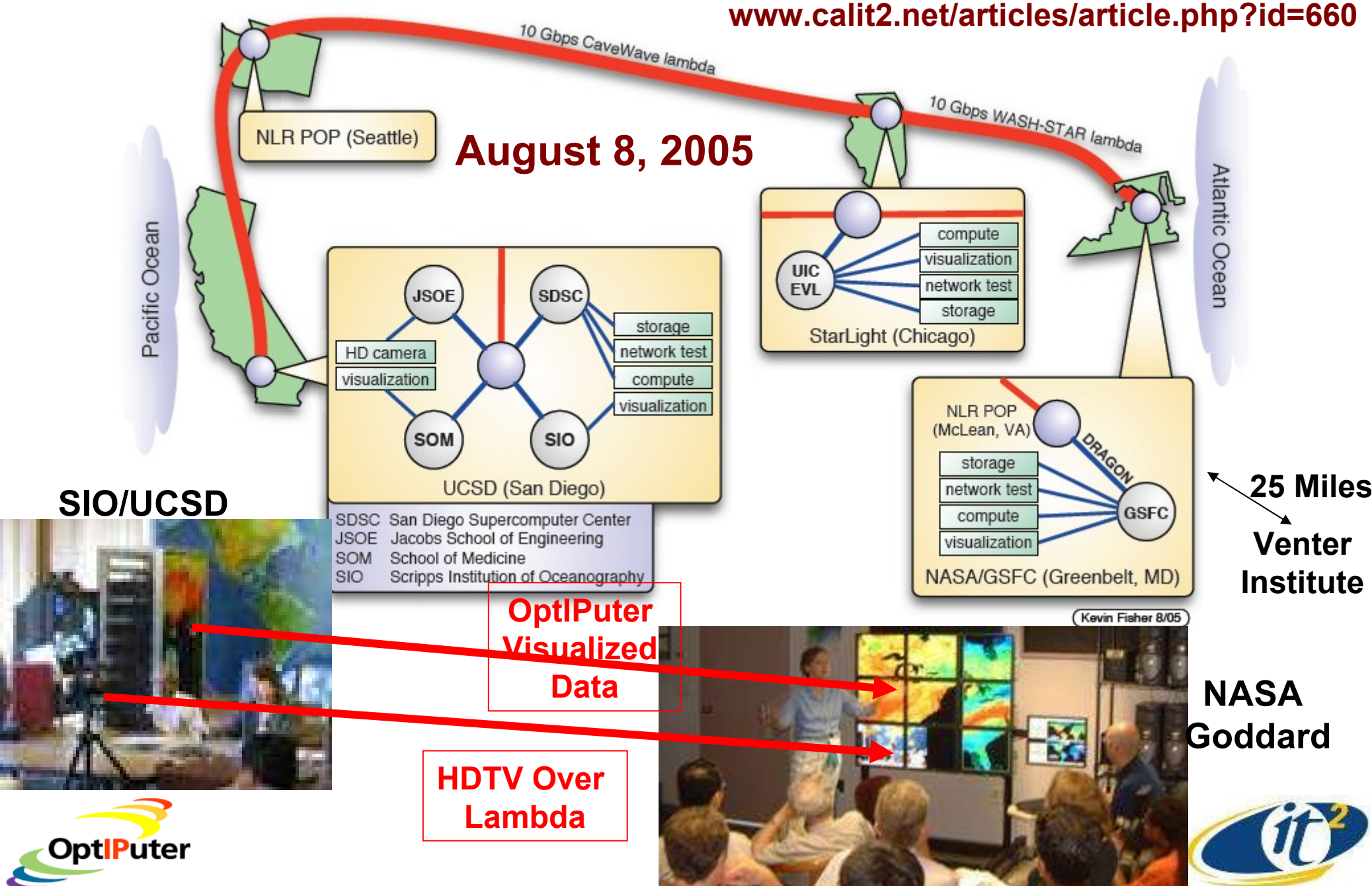
evl electronic visualization laboratory

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

it2

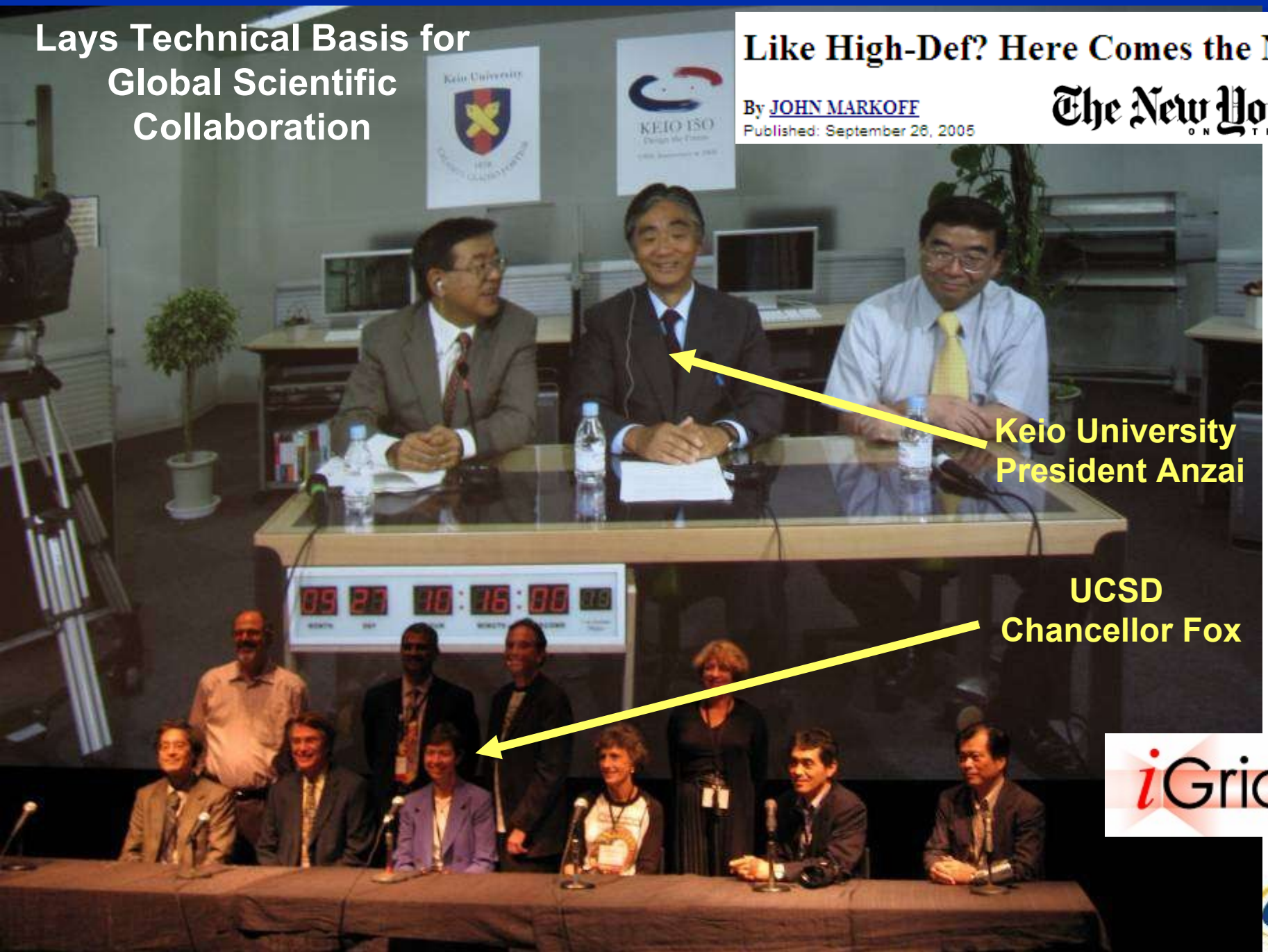
Extending Telepresence with Remote Interactive Analysis of Data Over NLR

www.calit2.net/articles/article.php?id=660



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

Lays Technical Basis for Global Scientific Collaboration



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

Sony
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