Cross-Disciplinary Biomedical Research at Calit2

Briefing for Pfizer
Calit2 @ UCSD
La Jolla, CA
April 21, 2007

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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Calit2 Continues to Pursue Its Initial Mission:

Envisioning How the Extension of Innovative Telecommunications and Information Technologies Throughout the Physical World will Transform Critical Applications Important to the California Economy and its Citizens' Quality Of Life.

Two New Calit2 Buildings Provide New Laboratories for "Living in the Future"



- "Convergence" Laboratory Facilities
  - Nanotech, BioMEMS, Chips, Radio, Photonics
  - Virtual Reality, Digital Cinema, HDTV, Gaming
- Over 1000 Researchers in Two Buildings
  - Linked via Dedicated Optical Networks



Preparing for a World in Which Distance is Eliminated…

www.calit2.net

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$100M From State for New Facilities

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Calit2--A Systems Approach to the Future of the Internet and its Transformation of Our Society

Calit2 Has Assembled a Complex Social Network
of Over 350 UC San Diego & UC Irvine Faculty
From Two Dozen Departments
Working in Multidisciplinary Teams
With Staff, Students, Industry, and the Community



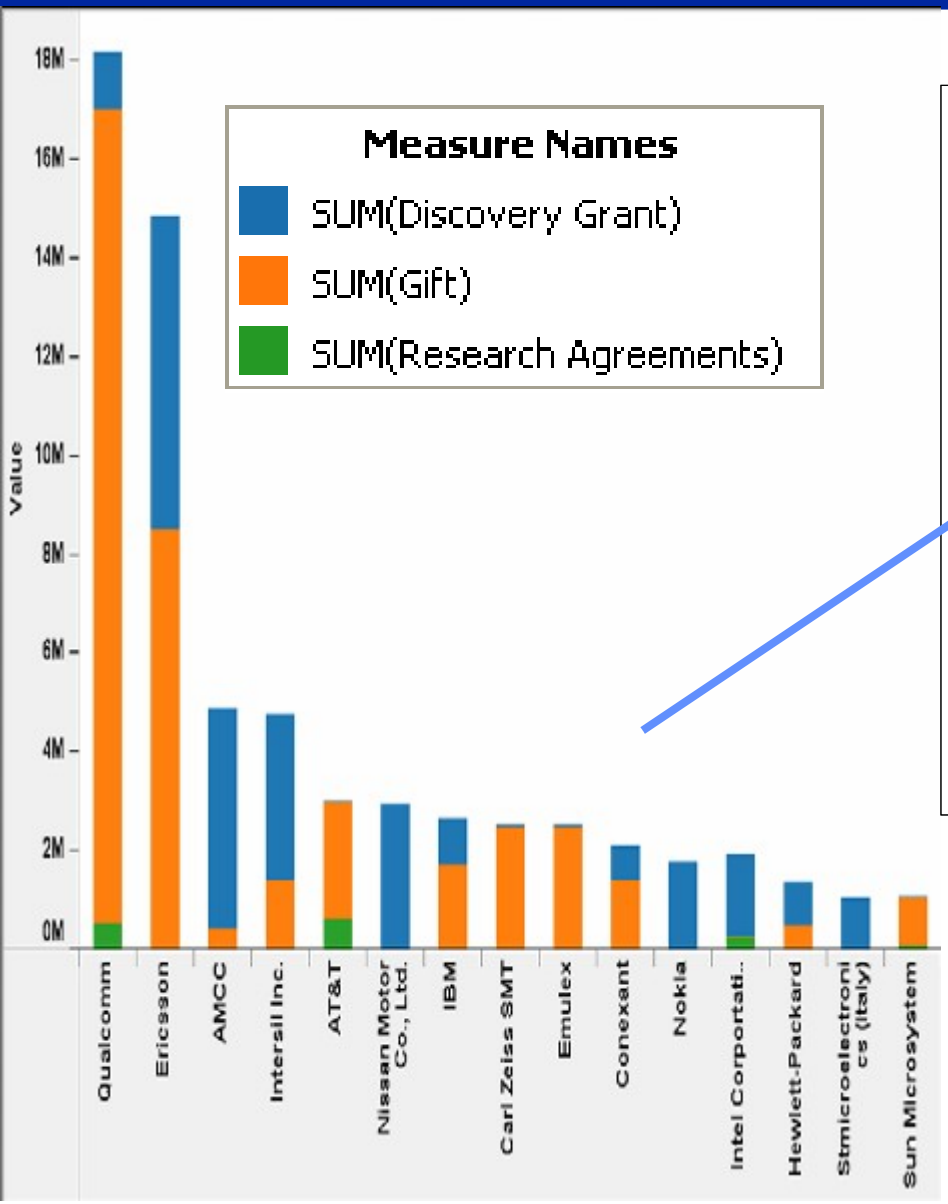
Integrating Technology Consumers and Producers
Into "Living Laboratories"

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www.calit2.net

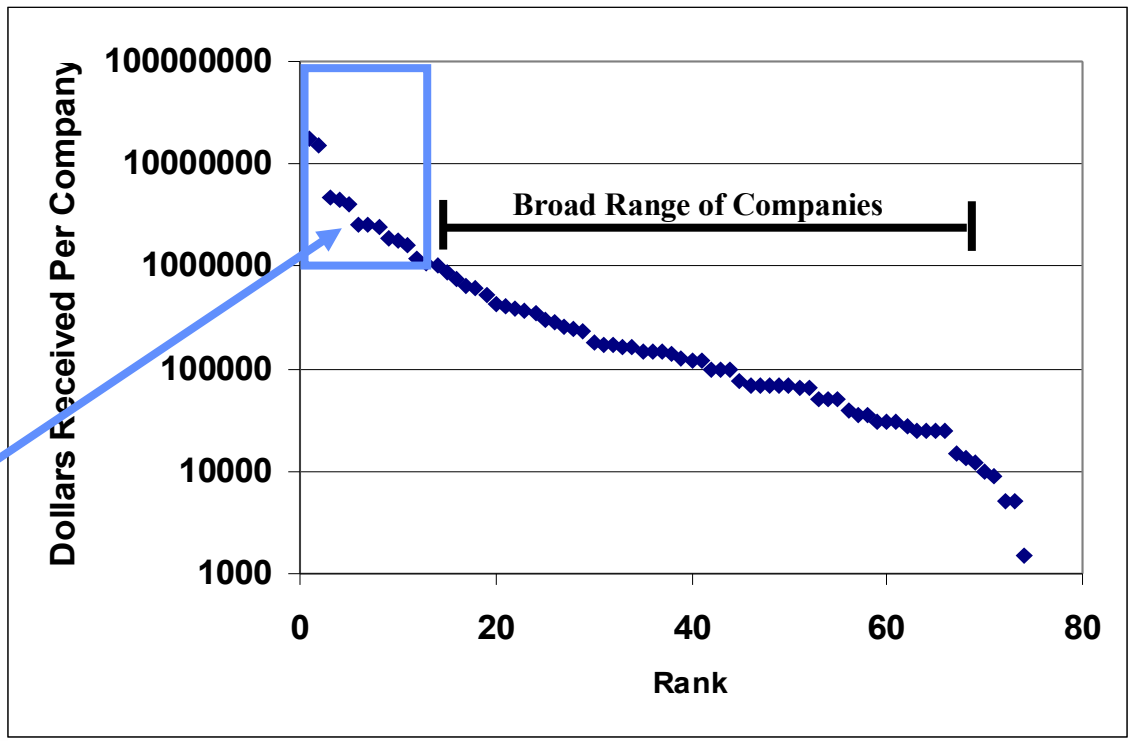
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In Spite of the Bubble Bursting, Calit2 Has Partnered with over 130 Companies



Industrial Partners > $1 Million

More Than 80 Have Provided Funds or In-kind



$85 Million from Industrial Partners in Matching Funds

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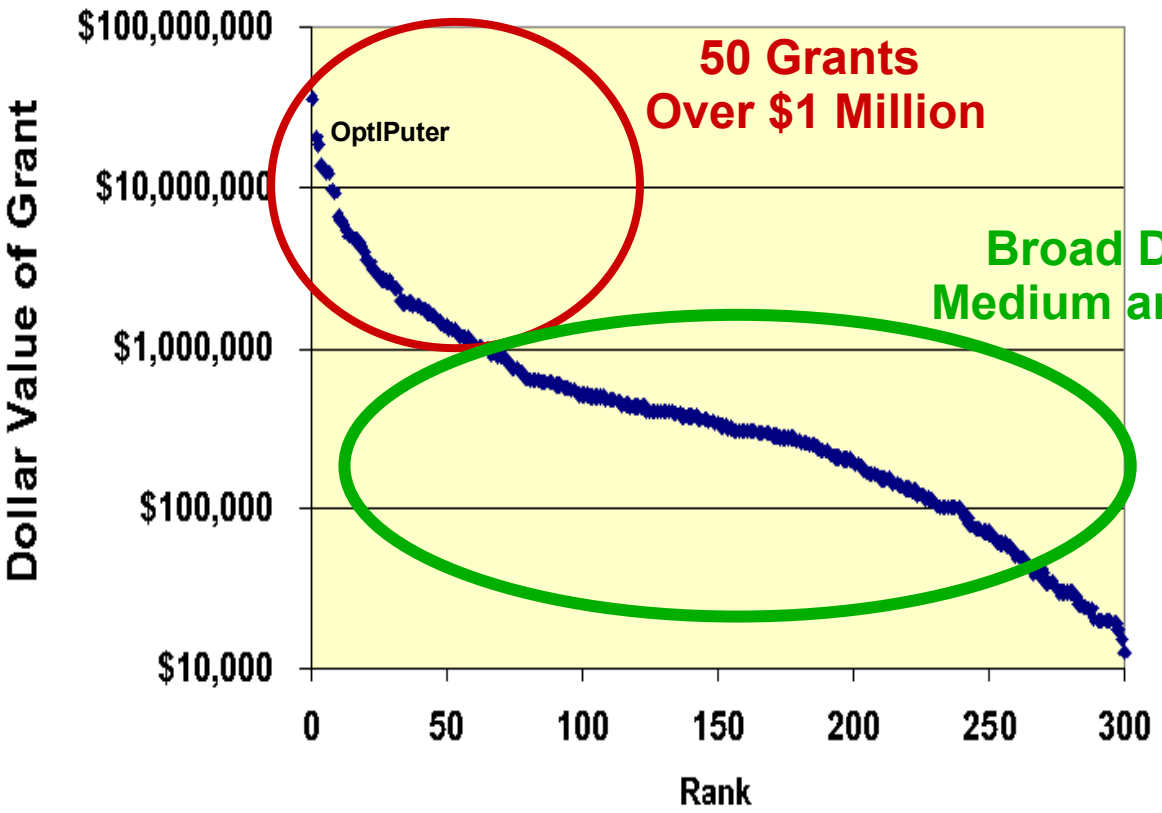
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Calit2 Industrial Partners
Team with Academic Research and Education

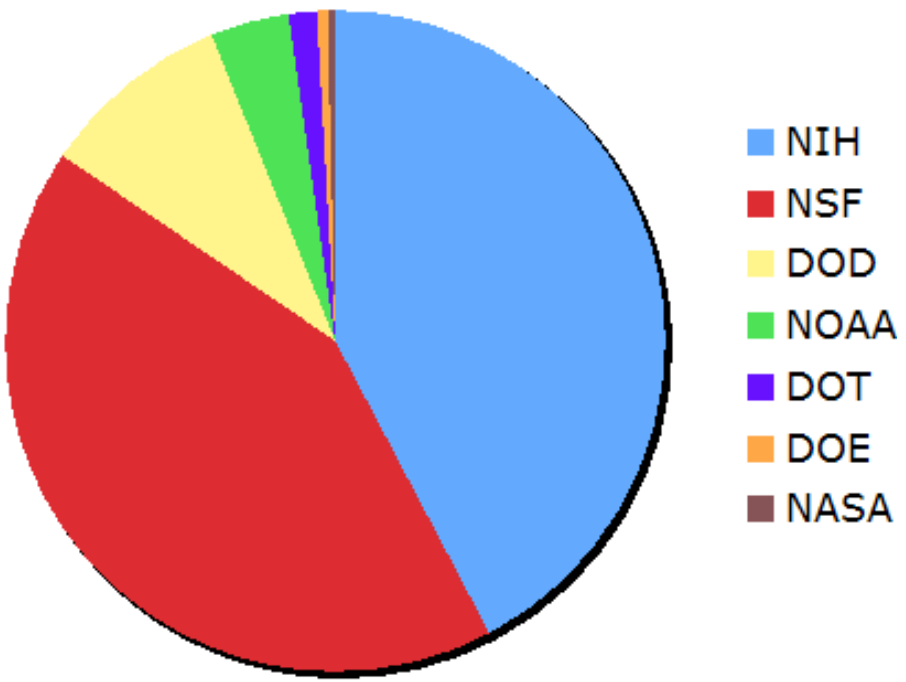
- Funding Joint Research Projects
- Endowing Chaired Professorships
- Sending Staff to Live at Calit2
- Supporting Graduate/Undergraduate Fellows
- Providing Equipment to Calit2 Projects
- Joining on Federal Grants
- Granting Access to Industry Facilities
- Using Calit2 Facilities
- Commercialization of Faculty/Staff/Student Research
- Co-Sponsoring Workshops/Conferences
- Hosting Seminars or Lectures

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Federal Agencies Have Funded $350 Million to Over 300 Calit2 Affiliated Grants



Creating a Rich Ecology of Basic Research



Federal Agency Source of Funds

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Calit2 Review Report p.4,21

Calit2 Brings Computer Scientists and Engineers Together with Biomedical Researchers

- **Some Areas of Concentration:**
  - Algorithmic and System Biology
  - Bioinformatics
  - Metagenomics
  - Cancer Genomics
  - Human Genomic Variation and Disease
  - Proteomics
  - Mitochondrial Evolution
  - Biomedical Instruments
  - Multi-Scale Cellular Imaging
  - Information Theory and Biological Systems
  - Telemedicine

CASB

INSTITUTE FOR GENOMICS AND BIOINFORMATICS
University of California, Irvine

NanoTumor Center

camera
Marine Microbial Ecology

ICSI

JCSG
Joint Center for Structural Genomics

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

NBCR
National Biomedical Computation Resource
an NIH supported resource center

BIOMEDICAL INFORMATICS RESEARCH NETWORK

WISARD

lifechips
university of california, irvine
www.lifechips.org

Information Theory and Applications

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Southern California Telemedicine Learning Center (TLC)

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Tri-Conference at the Center for Algorithmic and Systems Biology

CASB http://casb.ucsd.edu

UCSD, November 30-December 3, 2006, San Diego, CA, USA

algorithmic biology
systems biology
computational proteomics

UC San Diego and the California Institute for Telecommunications and Information Technology (Calit2) will host three conferences devoted to the disciplines of algorithmic biology, systems biology and computational proteomics. In partnership with the International Society for Computational Biology, the RECOMB Satellite Conferences on Systems Biology and Computational Proteomics will provide a forum for new methods that broadly address either or both of these areas. Algorithmic Biology will feature leaders in the field of computational biology who will discuss the emerging challenges at the interface of biology and computer science.

ALGORITHMIC BIOLOGY
NOVEMBER 30, 2006


PAVEL PEVZNER
UCSD (CHAIR)


SERAFIM BATZOGLOU
STANFORD


DAVID HAUSSLER
UC SANTA CRUZ


MANOLIS KELLIS
MIT


RON SHAMIR
TEL AVIV UNIV


MICHAEL WATERMAN
USC


CALIT2 AUDITORIUM
ATKINSON HALL, UCSD
LA JOLLA, CALIFORNIA

SYSTEMS BIOLOGY
DECEMBER 1-2, 2006


TREY IDEKER
UCSD (CHAIR)


MARTHA BULYK
HARVARD MEDICAL


ERIC DAVIDSON
CALTECH


DAVID EISENBERG
UCLA


ANNE-CLAUDE GAVIN
EMBL HEIDELBERG


MARK GERSTEIN
YALE


DAPHNE KOLLER
STANFORD


BING REN
UCSD


RON SHAMIR
TEL AVIV UNIV

Calit2 the UC Discovery Grant

COMPUTATIONAL PROTEOMICS
DECEMBER 2-3, 2006


VINEET BAFNA
UCSD (CHAIR)


MARSHALL BERN
XEROX PARC


STEVE BRIGGS
UCSD


NEIL KELLEHER
UNIV OF ILLINOIS


NEVAN KROGAN
UCSF


FOREST WHITE
MIT


RICHARD SMITH
PACIFIC NORTHWEST NATIONAL LAB

UCSD SPONSORS

ISCB molecular systems biology

Calit2 Facilitated Formation of the Center for Algorithmic and Systems Biology

CASB

CASB Brings Together Faculties from Scripps, Burnham, GNF and Five UCSD Departments







http://casb.ucsd.edu/

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Center for Algorithmic and Systems Biology Goals

- **Bioinformatics**
  - Meetings (Conferences And Tutorials)
  - Exploring New Approaches to Bioinformatics Education
- **Research:**
  - Postdocs in Residence Advised by Faculties in Different Departments
    - Rather than Postdocs Being Attached to Individual PIs
  - Hosting Long and Short Term Visitors
    - Leaders in The Field
    - Young Researchers
  - Conducting High Impact Projects
- **Interacting with San Diego Biotech Industry**

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Center for Algorithmic and Systems Biology@Calit2: Bringing World-Class Speakers to Conferences

CASB Center for Algorithmic and Systems Biology

Fifth Annual RECOMB Satellite Workshop on

Comparative Genomics
September 16-18, 2007

First RECOMB Satellite Workshop on

Computational Cancer Biology
September 18-20, 2007

The RECOMB Satellite Workshop on Comparative Genomics features mathematical/computational approaches and novel experimental results in comparative genomics. The new RECOMB Satellite Worskhop on Computational Cancer Biology focuses on algorithmic and statistical challenges in cancer research, particularly resulting from high-throughput assays of tumors. Hosted by UC San Diego and California Institute for Telecommunications and Information Technology.



Francesca Ciccarelli
(European Institute of Oncology)
Gene Structure Modifications in Primate-Specific Duplicates



Michael B. Eisen
(University of California, Berkeley)



Matthew Hahn
(Indiana University)
Quantifying Gene Gain and Loss in Mammals



Katherine S. Pollard
(University of California, Davis)
Accelerated and Biased Nucleotide Evolution in the Human Genome



Oliver A. Ryder
(Zoological Society of San Diego)
Genomics and Bioinformatics: Applications to Conservation Efforts for Endagered Species



Ajit Varki
(University of California, San Diego)
Multiple Genetic Differences in Sialic Acid Biology Between Humans and Great Apes



Donna G. Albertson
(University of California, San Francisco)



Anne-Lise Børresen-Dale
(Institute for Cancer Research, Norwegian Radium Hospital)



Colin Collins
(University of California, San Francisco)



Paul Meltzer
(National Cancer Institute)



Paul Spellman
(Lawrence Berkeley National Laboratory)
Systematic Analysis of Breast Cancer Cell Lines



Rick Wilson
(Washington University, St. Louis)



Barbara J. Trask
(Fred Hutchinson Cancer Research Center)
Dynamic Duplications in the Human Genome

CHAIRS



Glenn Tesler
(University of California, San Diego)



Dannie Durand
(Carnegie Mellon University)



Ben Raphael
(Brown University)



Michael Hallett
(McGill University)

Calit2 UCSanDiego UC Discovery Grant McGill Cancer Centre Centre of Bioinformatics

NSF MORRISON | FOERSTER Brown Center for Computational Molecular Biology University of California, San Diego Medical Center Moores Cancer Center

http://casb.ucsd.edu/recombcg07/ http://casb.ucsd.edu/recombccb07/

LA JOLLA BIOINFORMATICS CONFERENCE 2008

Interfacing Industry and Academia

April 4, 8:30am - 4:30pm, Calit2 Auditorium, Atkinson Hall, UC San Diego

The Center of Algorithmic and Systems Biology (CASB) aims to bring together researchers from the biological and computational communities, from both academia and industry, to discuss the current trends and the future directions in bioinformatics.

Free Registration!
with
Complimentary Breakfast and Lunch

Registration required by March 31st, 2008
Please register on our website: http://casb.calit2.net/bioinfo/

Speakers



Ruben Abagyan
Professor of Molecular Biology, The Scripps Research Institute
Title: Computational structural proteomics for drug discovery



Howard Asher
President and CEO, Global Life Sciences, Inc.
Title: The Role of Information Technology in Pharmacy and Pharmaceutical Sciences.



Philip E. Bourne
Professor of Pharmacology, UCSD
Panel moderator



Steven Burley
CSO, SGX Pharmaceuticals, Inc.
Title: Discovery and development of selective, orally bioavailable tyrosine kinase inhibitors for targeted treatment of human cancer.



Gary Fogel
Vice President, Natural Selection, Inc.
Title: Computational Intelligence Methods in Bioinformatics



Steven Hofstadler
Vice President of Research, Ibis Bioscience, Inc.
Title: Using Information Derived from High Throughput Mass Spectrometry in the Biotechnology Arena: from Drug Discovery to Pathogen Detection and Strain Typing



Trey Ideker
Associate Professor of Bioengineering, UCSD
Title: Gaining power in gene association studies with Cytoscape: Mapping gene regulatory pathways by assembly of physical and genetic interactions



Tobias Mann
Bioinformatics Scientist, Illumina, Inc.
Title: Visualizing High Throughput Sequencing Experiments



Gerard Manning
Director, Razavi-Newman Center for Bioinformatics, Salk Institute
Title: Comparative Kinomics: How genome sequences and a billion years of evolution can help us understand protein kinase function, cell signaling and human disease



Bernhard Palsson
Professor of Bioengineering, UCSD

CASB Calit2 UCSanDiego UCSD Jacobs School of Engineering The UC Discovery Grant

For More Info Please Visit *http://casb.calit2.net/bioinfo/*

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Interactions with Pfizer in Computational Mass Spectrometry (Bafna and Pevzner Labs)

- **Pfizer MS Group Visit to UCSD**
  - Stone Shi and Bill Farrell (Fall 2007)
- **Bafna and Pevzner Seminar at Pfizer (Winter 2008)**
  - "Computational Mass Spectrometry Center at UCSD"
- **Our Students Installed Inspect and MS-Alignment Software Tools at Pfizer in Spring 2008**
  - Currently Being Beta-Tested by Stone Shi

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CAMB

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Terry Gaasterland's Laboratory for Computational Genomics



- **Goal:**
  - Integrate, Analyze, and Visualize the Output of High Throughput Molecular Biology Experiments in the Context of Complete Genome Sequence Data
- **Methods:**
  - Automated Annotation of Eukaryotic and Microbial Genome Sequence Data
    - Genomes, Chromosomes, Contigs, and cDNA Clones
  - The Semi-Automated Annotation of Gene Expression Data
  - Integration of Gene Expression and Genome Sequence Analysis
- **Apply These Tools To Specific Biological Questions**
  - In Collaboration with Experimental Biologists
  - To The Problem Of Structural Genomics Target Selection

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Gaasterland/Pfizer - Past Collaboration (Rockefeller, UCSD, Groton)



- **Goal: Identify *Staphylococcus aureus* Resistance Mechanisms**
- **Tools:**
  - **MSSA vs. MRSA vs. VISA strains**
    - **Known and Unknown Resistance Mechanisms**
  - **6+ Genomes (2 USA, 2 UK, 2 Japan) with 3 MLST Backgrounds**
- **Approach:**
  - **Executed 6-Way Comparison and Alignment of Genes and Proteins**
  - **Designed an Affymetrix Chip to Probe Shared and Unique Coding Regions**
  - **For Genes and Insertions Unique to or Absent from Resistance Strains**
    - **Scanned Coding Sequences For Tandem Repeats**
    - **Scanned Promoters For Putative DNA Binding Sites**
- **Status:**
  - **Chip is Publicly Available**
    - **Used by Multiple *S.Aureus* Research Groups Worldwide**
  - **Chip is in Use in Groton (Infectious Disease)**
  - **Joint Publication in J. Bacteriology, 2007**

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Gaasterland / Pfizer – Future Collaboration?

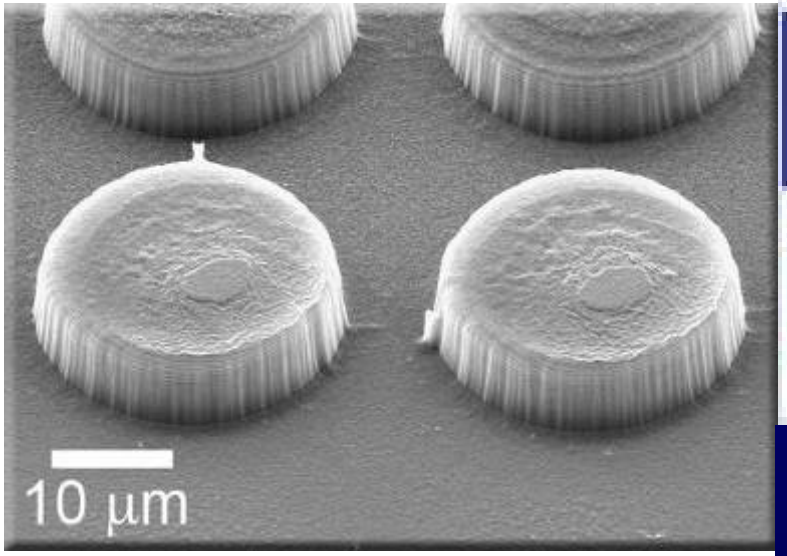
- **Improved Automated Function Analysis for Sets of Proteins**
  - **Integrate Dynamic Medline Abstract Retrieval with Protein-Interaction Networks**
- **Approach:**
  - **Protein Function Annotation Tool**
    - **Developed a Statistical Approach to Rank Words and Phrases in Functional Descriptions of Multiply Aligned Proteins**
    - **Used for *S.Aureus* with Pfizer and for Multiple Whole Genomes**
  - **Protein Interaction Annotation Tool**
    - **Developing a Visualization Tool to Weight and Label Protein Interactions According to Numbers of Abstracts that Contain Protein Pairs and Verbs in Protein Pair Sentences**
    - **Developing for Microarray Cluster Annotation and Biomarker Analysis**

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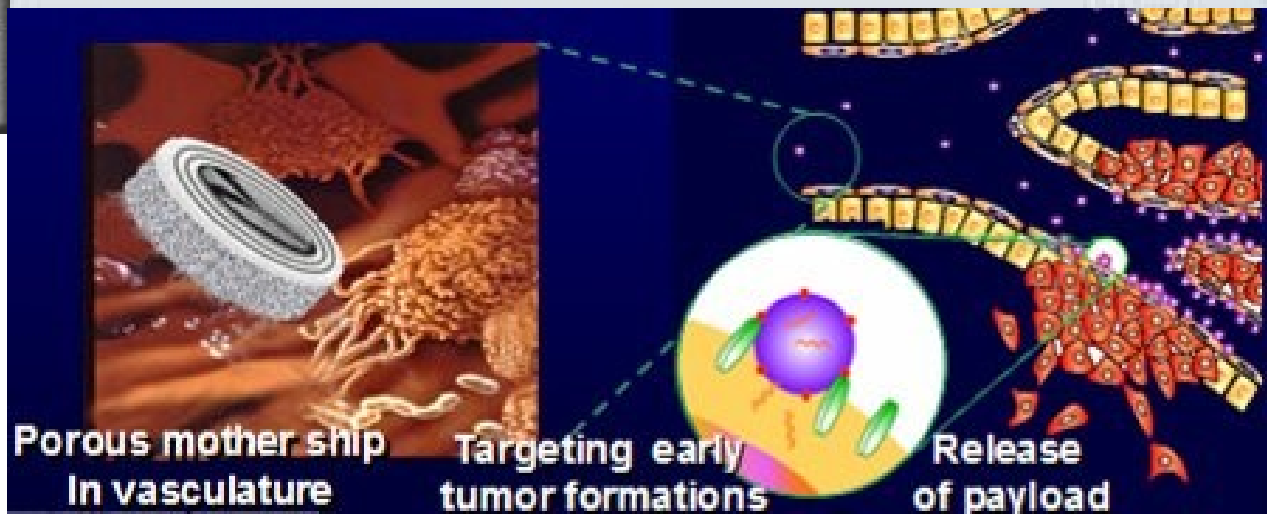
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Nano-Structured Porous Silicon Applied to Cancer Treatment

Nanodevices for In-vivo Detection & Treatment of Cancerous Tumors



Nanostructured “Mother Ships”
for Delivery of Cancer Therapeutics

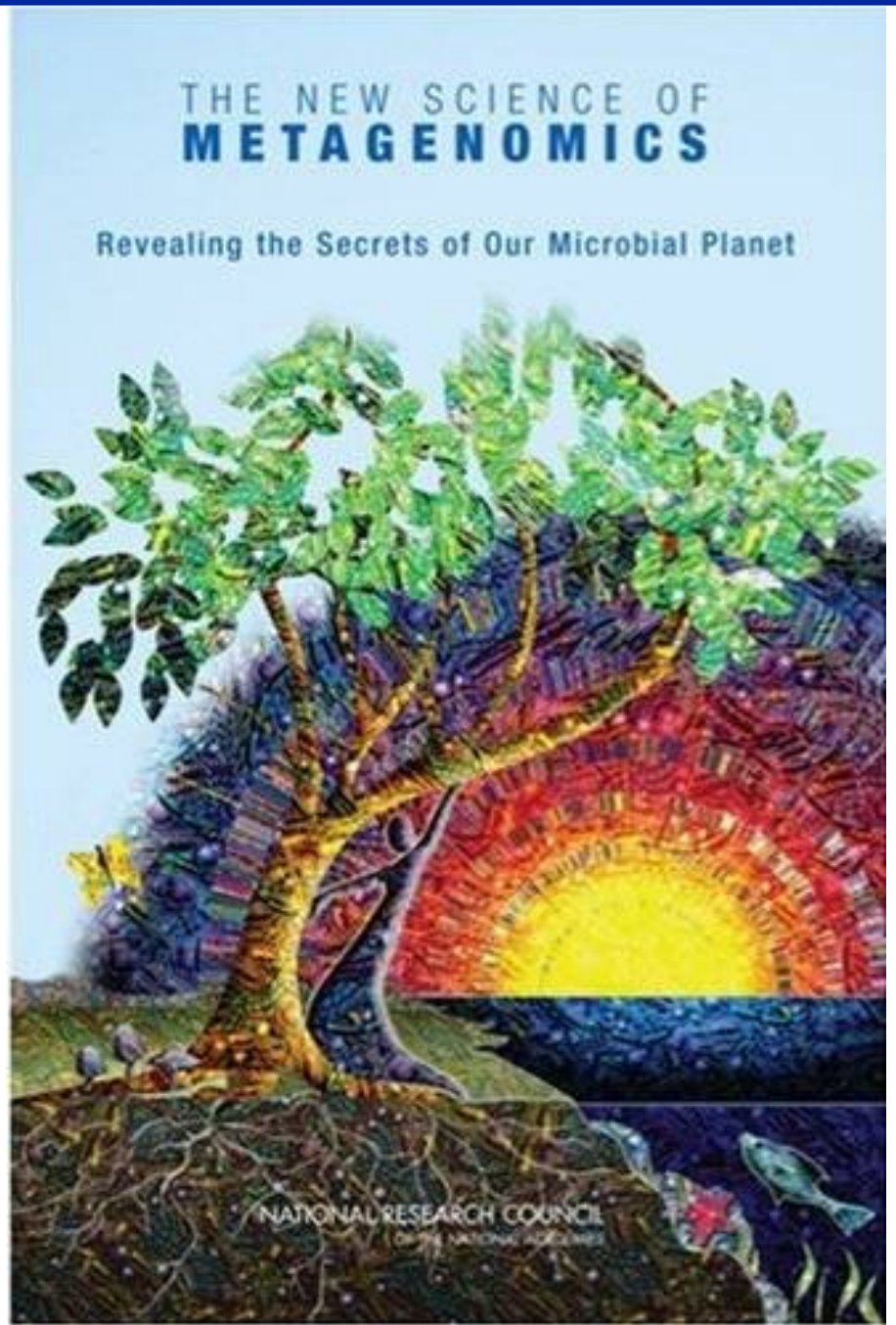


Michael J. Sailor Research Group
Chemistry and Biochemistry

The New Science of Metagenomics

NRC Report:

Metagenomic data should be made publicly available in international archives as rapidly as possible.



"The emerging field of metagenomics, where the DNA of entire communities of microbes is studied simultaneously, presents the greatest opportunity -- perhaps since the invention of the microscope – to revolutionize understanding of the microbial world." –

National Research Council
March 27, 2007

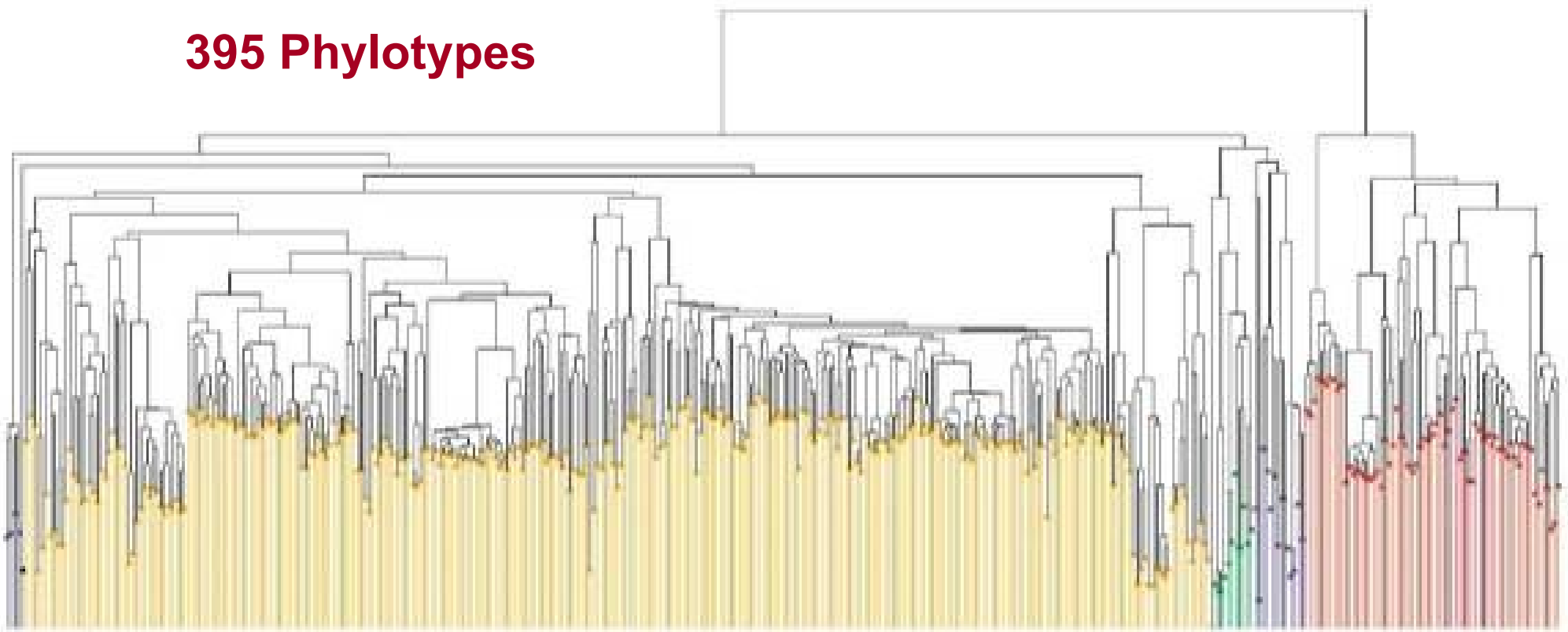
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The Human Microbiome is the Next Large NIH Drive to Understand Human Health and Disease

- "A majority of the bacterial sequences corresponded to uncultivated species and novel microorganisms."
- "We discovered significant inter-subject variability."
- "Characterization of this immensely diverse ecosystem is the first step in elucidating its role in health and disease."

395 Phylotypes



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"Diversity of the Human Intestinal Microbial Flora"
Paul B. Eckburg, et al *Science* (10 June 2005)

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Community Cyberinfrastructure for Advanced Marine Microbial Ecology Research and Analysis



http://camera.calit2.net/

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CAMERA's Global Microbial Metagenomics CyberCommunity—Can We Employ Social Network Software?

Over 1850 Registered Users From Over 50 Countries



camera
Marine Microbial Ecology

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Marine Genome Sequencing Project – Measuring the Genetic Diversity of Ocean Microbes

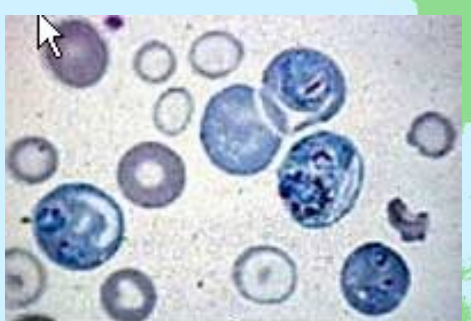


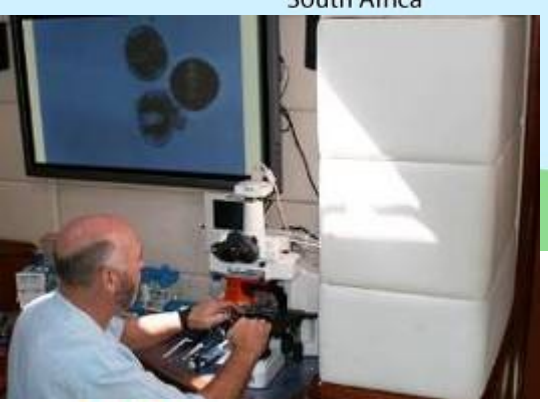
Each Sample ~2000 Microbial Species

Specify Ocean Data

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





Sorcerer II Data Will Double Number of Proteins in GenBank!

camera
Marine Microbial Ecology

Marine Microbiology Initiative

Gordon and Betty MOORE FOUNDATION

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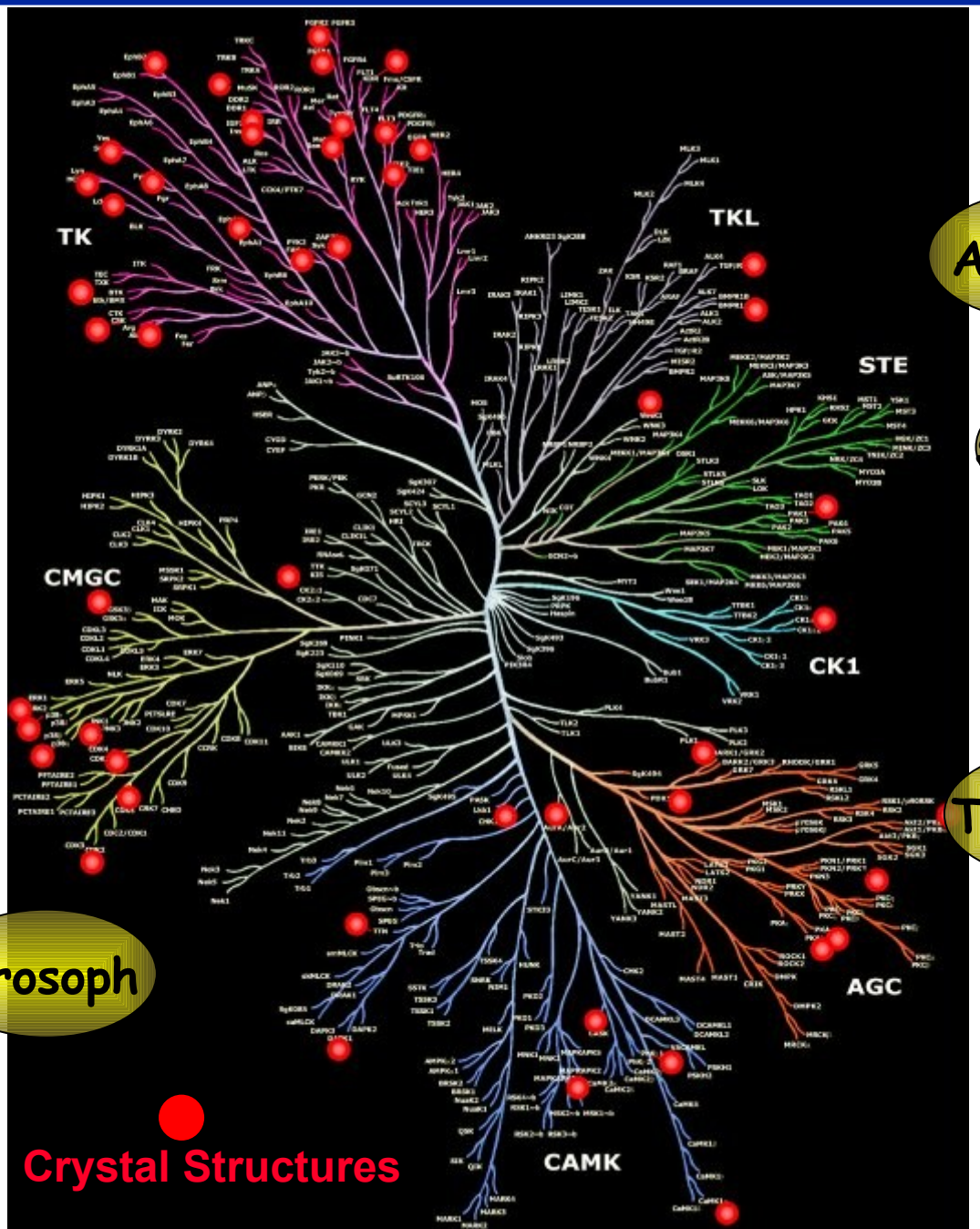
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The Human Kinome: A Protein Family Implicated In Many Human Diseases

EPKs

Over 500 Protein Kinases
2% of the Human Genome

Many splice variants



YEAST

Mouse

C.elegans

Drosoph

Arabid.

Sea Urchin

Dicty.

Tetrahy.

Source: Susan Taylor, SOM, UCSD

Manning, et al (2002)
Science 298:1912

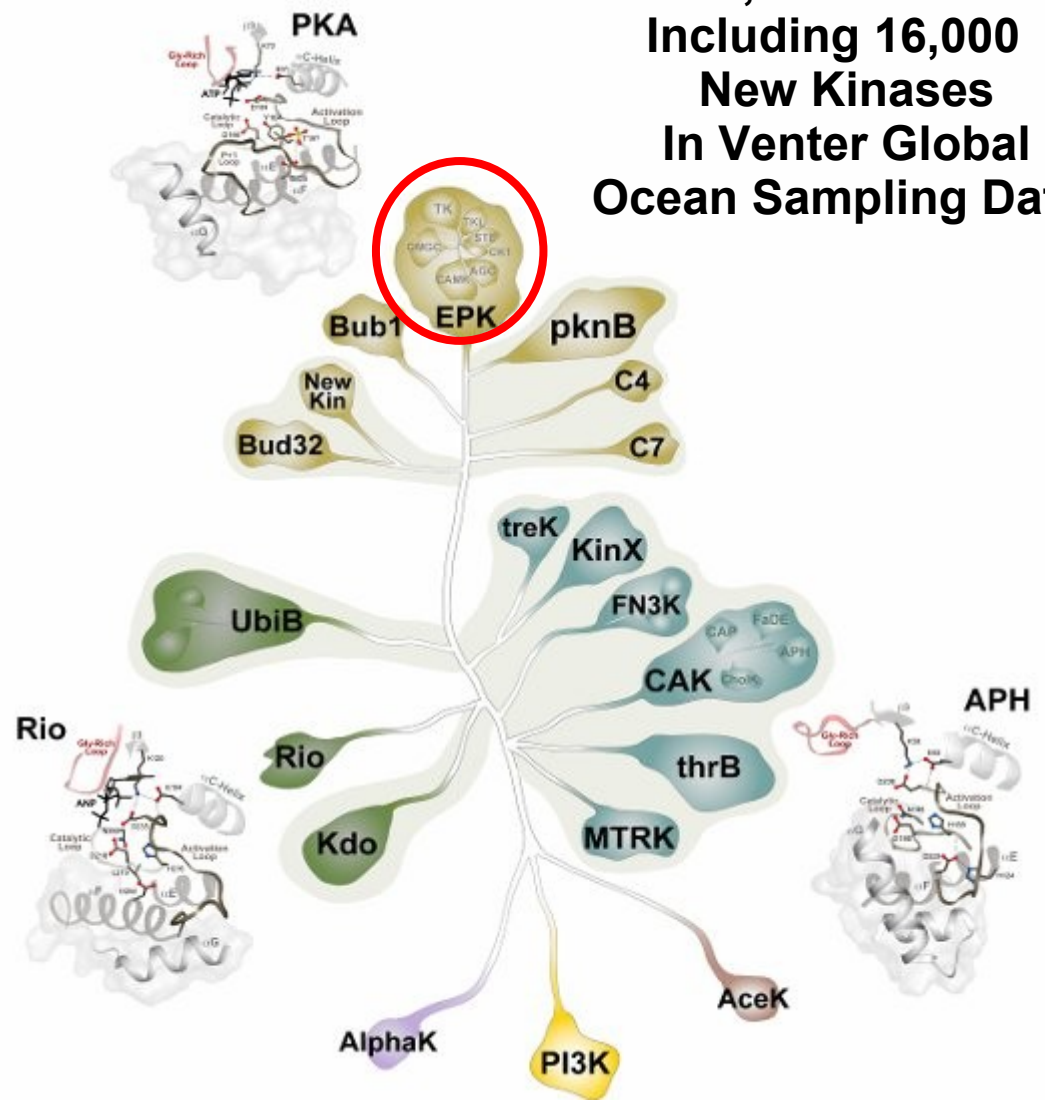
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From Microbial Genomes To Human Disease

- Microbes Have a Much Simpler Genome Than Humans
- However, Microbes Share Many of the Core Components of the Molecular Signaling Machinery Used by Humans
- Understand Both the Evolution and Regulation of Signaling Systems, First in Microbes and Then in Humans
- This is a Rich Source for Mapping the Origins of EPKs

>24,000 Kinases Including 16,000 New Kinases In Venter Global Ocean Sampling Data!



Source: Susan Taylor, SOM, UCSD

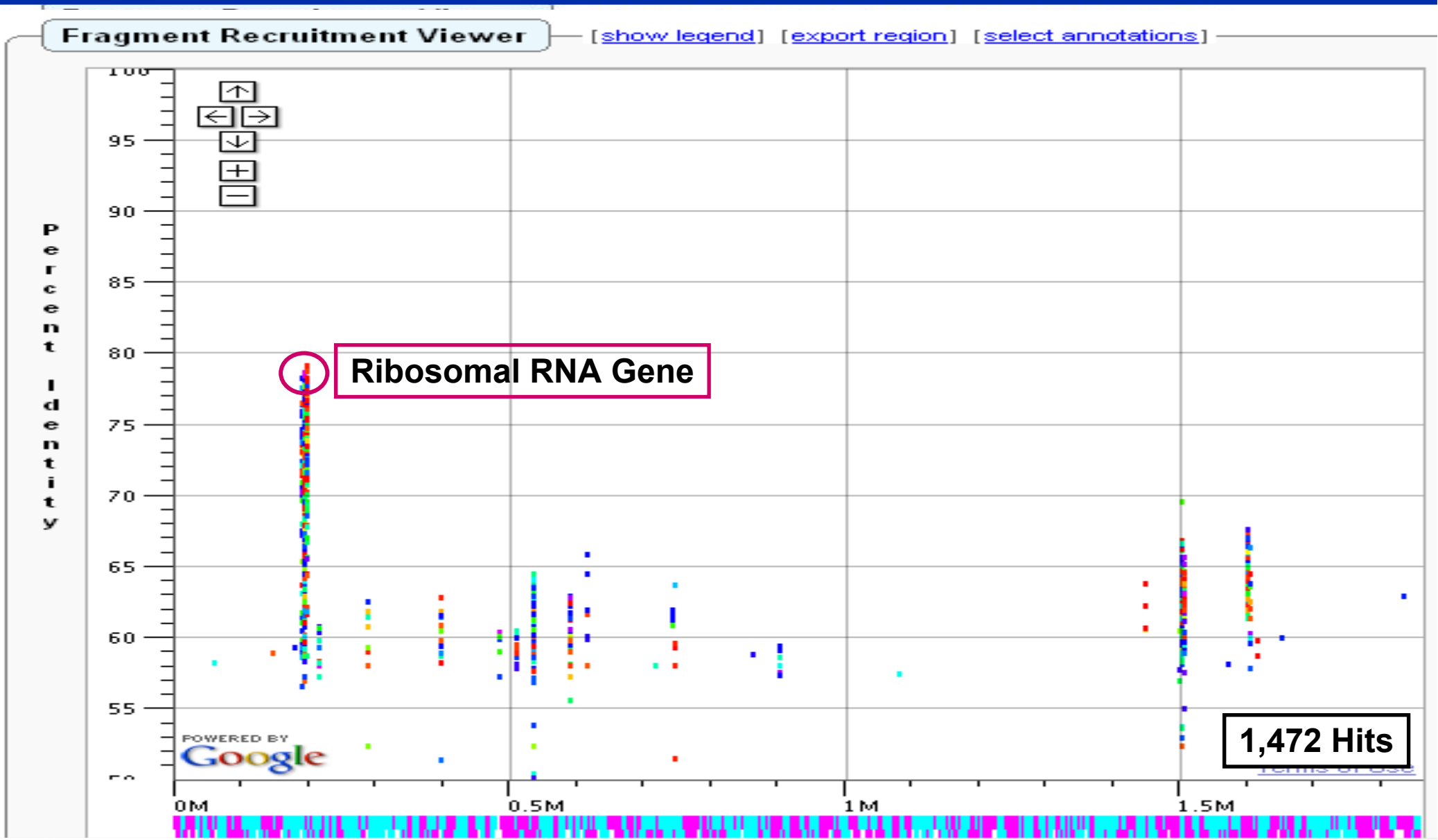
CAMERA Fragment Recruitment Viewer Compares Candidate Genome Against GOS Sites



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CAMERA Fragment Recruitment Viewer Visualizes Overlap of GOS with Reference Microbial Genome

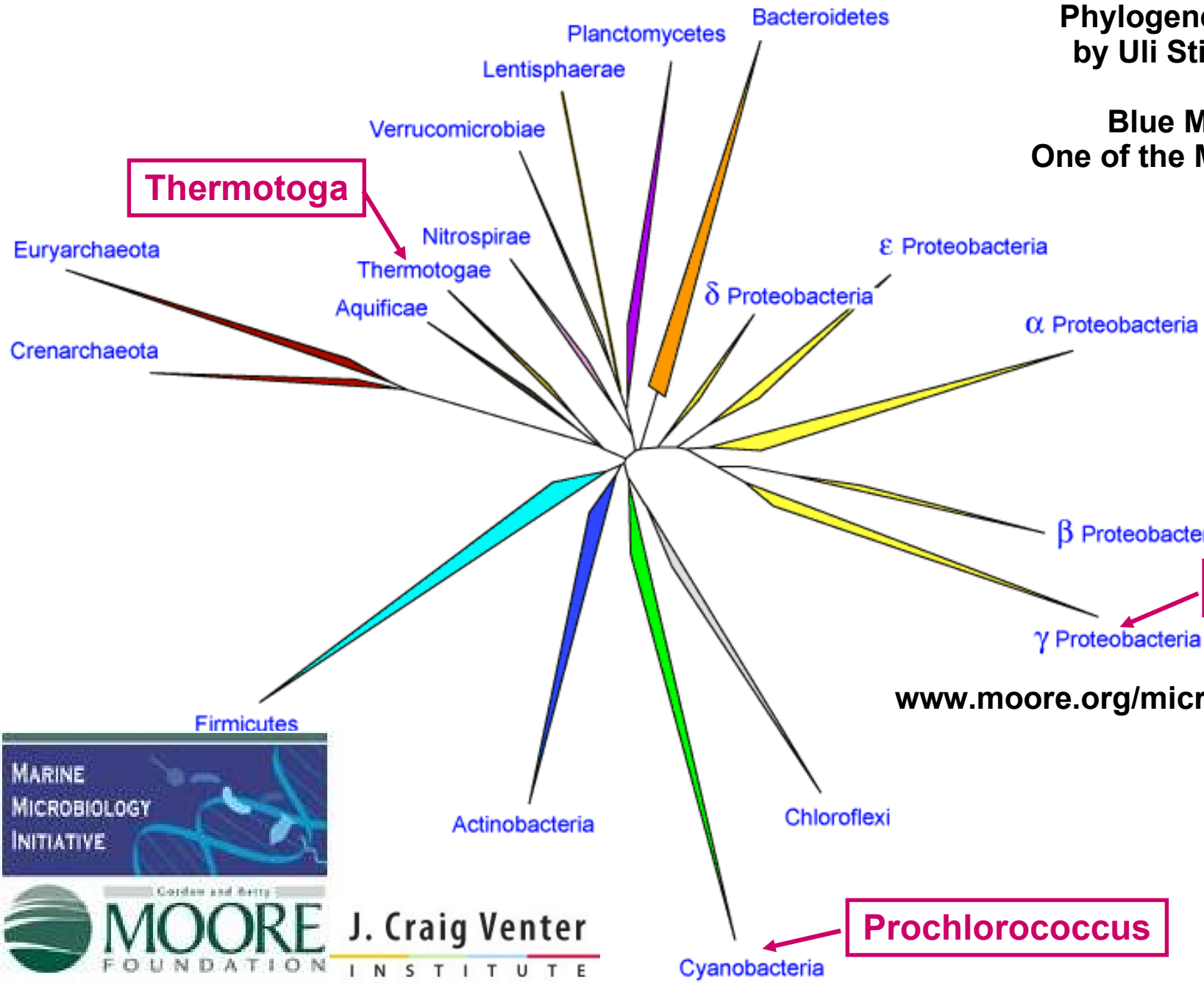


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***Thermotoga maritima MSB8*, complete genome**
Thrives at 80°C—1/4 of Genome is Archaeal

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Moore Foundation Funded the Venter Institute to Provide the Full Genome Sequence of 155+ Marine Microbes



Phylogenetic Trees Created by Uli Stingl, Oregon State

Blue Means Contains One of the Moore 155 Genomes

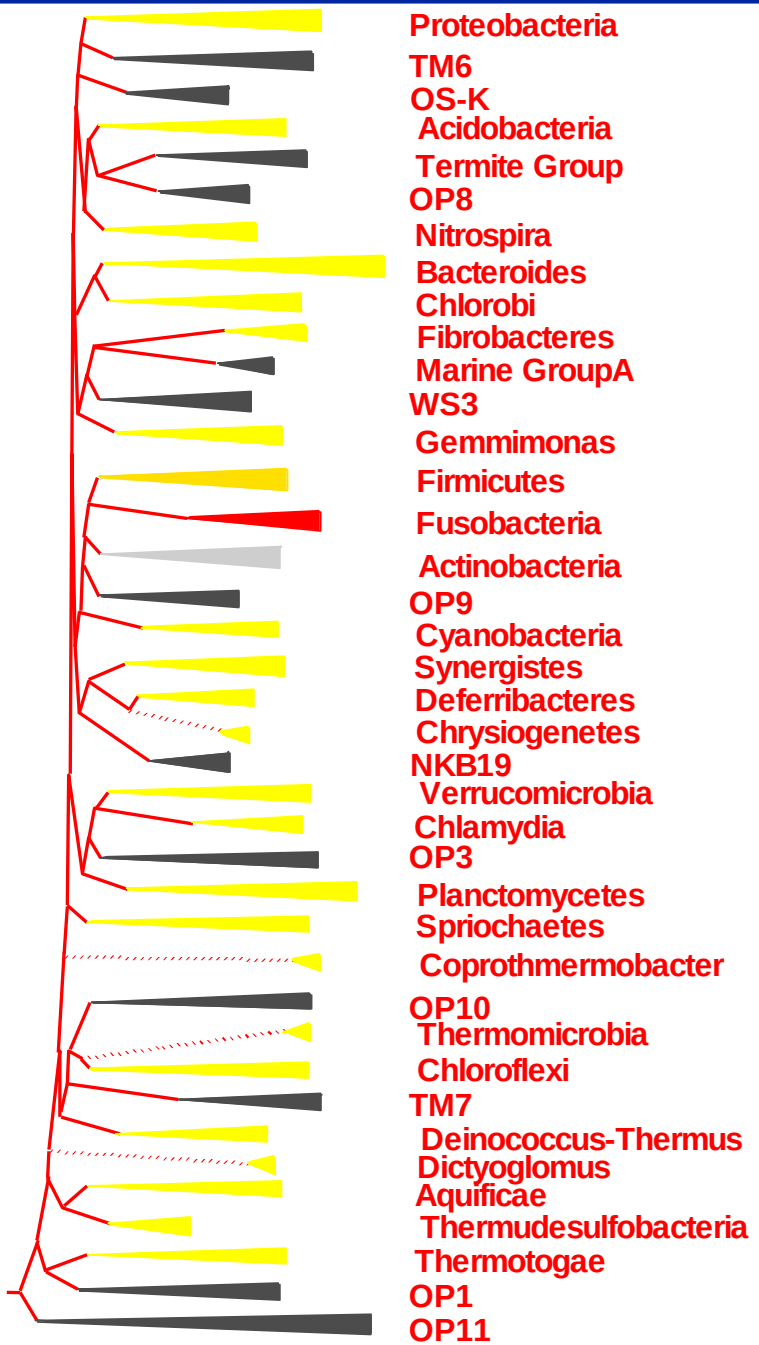
www.moore.org/microgenome/trees.aspx

MARINE MICROBIOLOGY INITIATIVE

MOORE FOUNDATION

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DOE Genomic Encyclopedia of Bacteria and Archaea (GEBA) / Bergey Solution: Deep Sampling Across Phyla



2007 Goal: Finish ~100 Bacterial and Archaeal Genomes from Culture Collections
Project Lead -- Jonathan Eisen (JGI/UC Davis)

Well sampled phyla

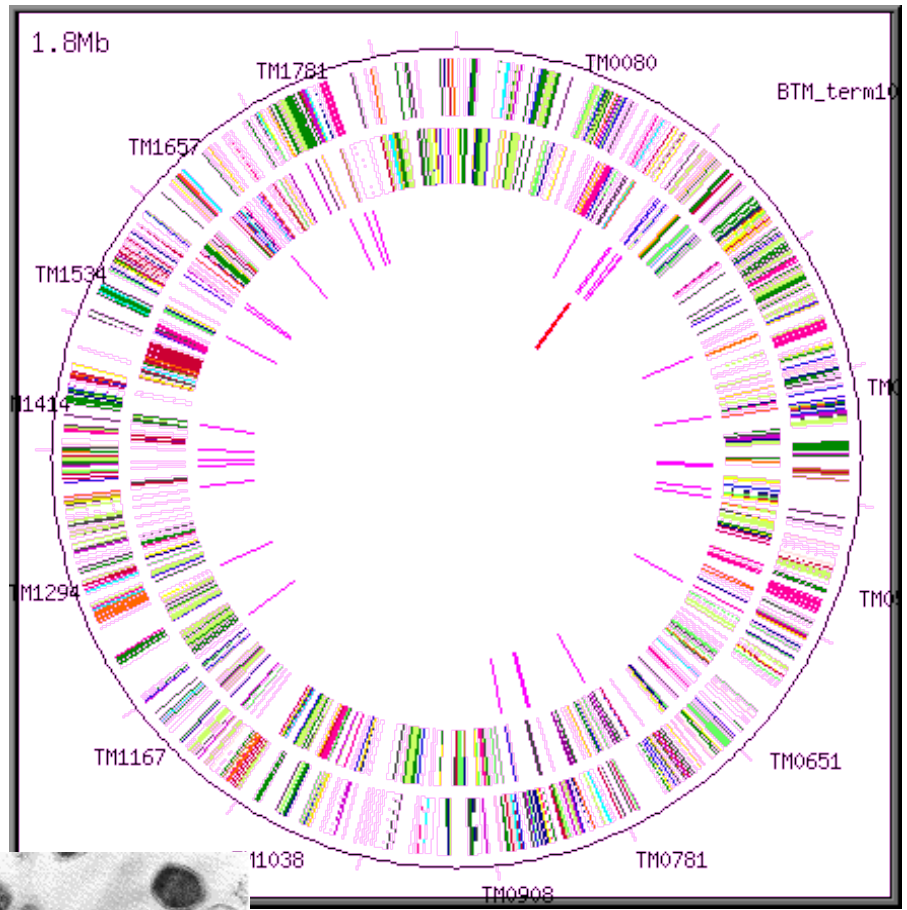
No cultured taxa

Source: Eddie Rubin, DOE JGI

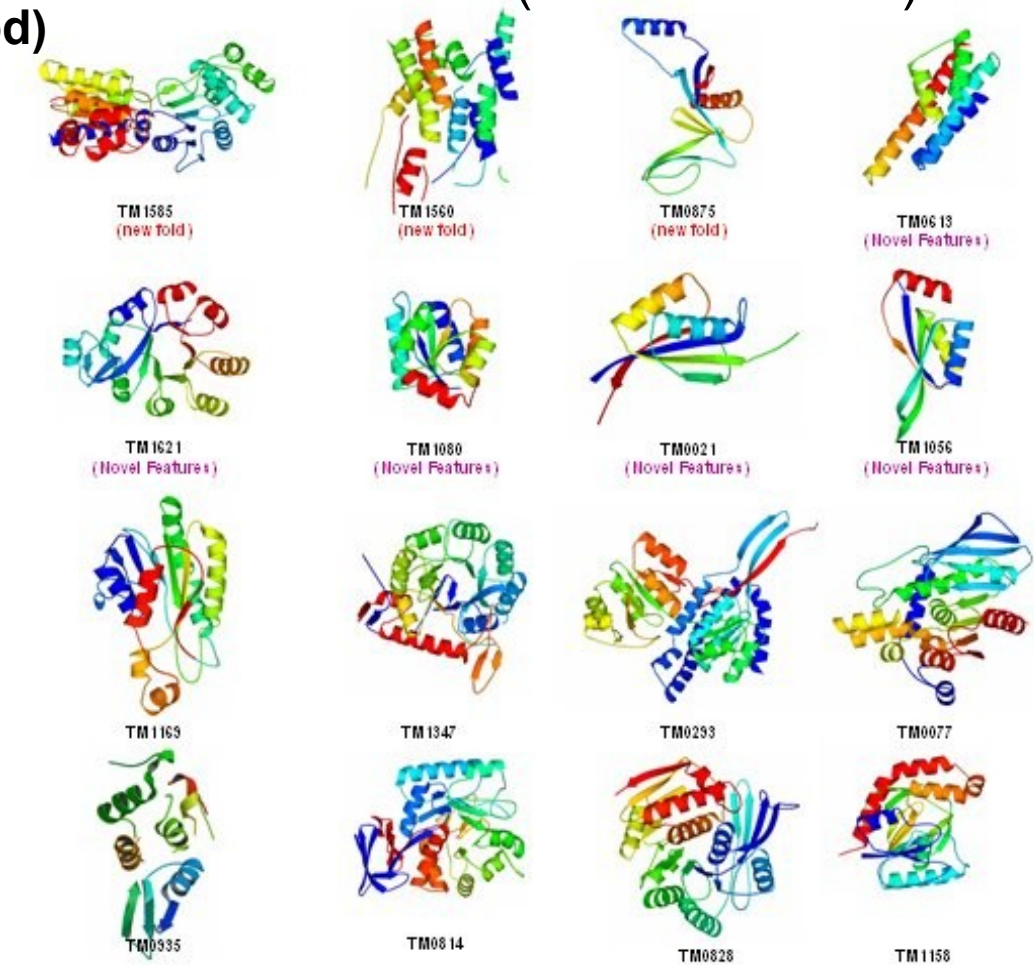
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The Bioinformatics Core of the Joint Center for Structural Genomics is Housed in the Calit2@UCSD Building

Extremely Thermostable -- Useful for Many Industrial Processes (e.g. Chemical and Food)



173 Structures (122 from JCSG)





- Determining the Protein Structures of the Thermotoga Maritima Genome
- 122 T.M. Structures Solved by JCSG (75 Unique In The PDB)
- Direct Structural Coverage of 25% of the Expressed Soluble Proteins
- Probably Represents the Highest Structural Coverage of Any Organism

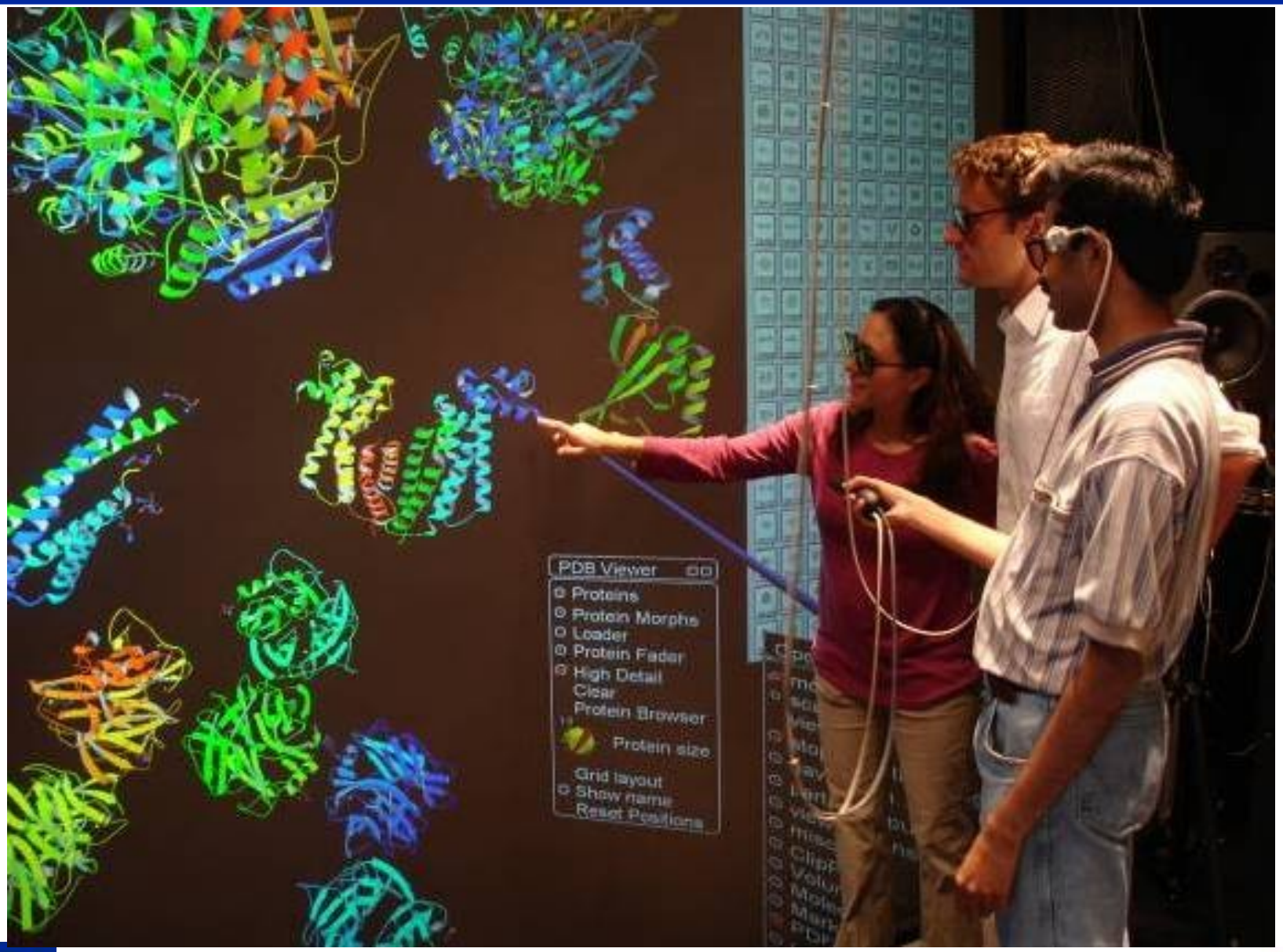
Source: John Wooley, UCSD

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JCSG Joint Center for Structural Genomics

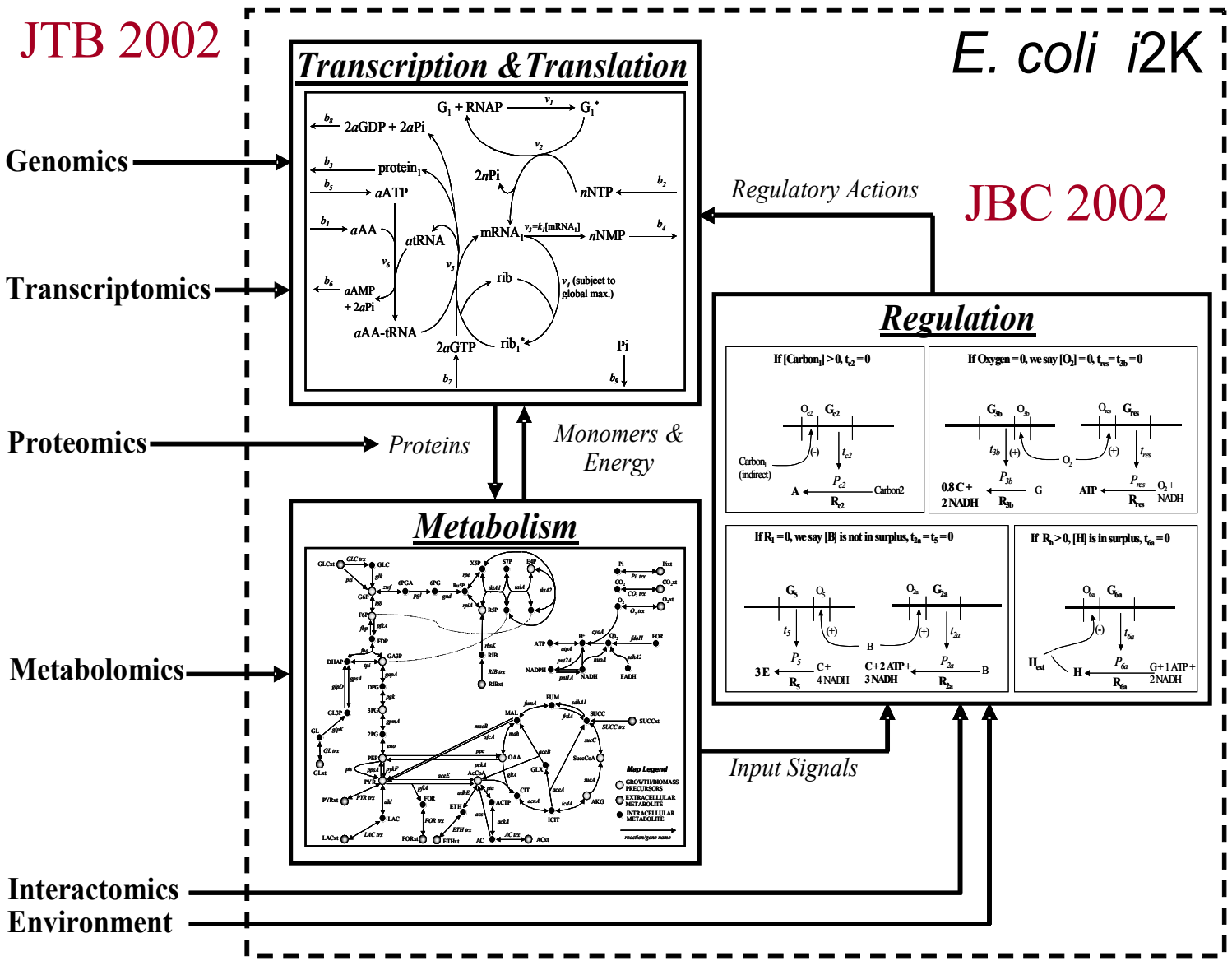
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Interactive Exploration of the Proteins of the Marine Microbe Thermatoga



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Building Genome-Scale Models of Living Organisms



- **E. Coli**
  - **Has 4300 Genes**
  - **Model Has 2000!**

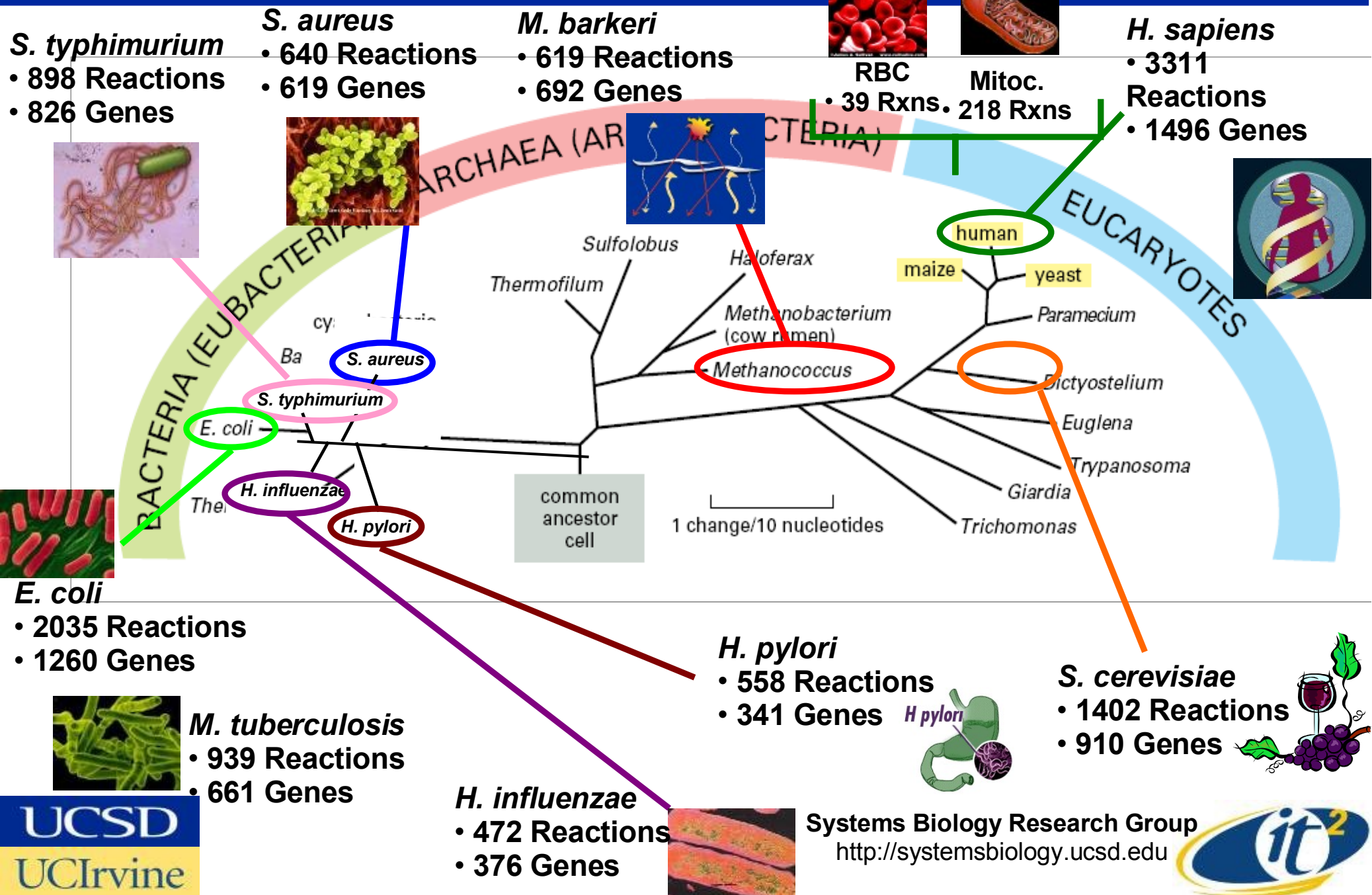
***in Silico* Organisms Now Available 2007:**

- Escherichia coli
- Haemophilus influenzae
- Helicobacter pylori
- Homo sapiens Build 1
- Human red blood cell
- Human cardiac mitochondria
- Methanosarcina barkeri
- Mouse Cardiomyocyte
- Mycobacterium tuberculosis
- Saccharomyces cerevisiae
- Staphylococcus aureus

Source: Bernhard Palsson
UCSD Genetic Circuits Research Group
http://gcrg.ucsd.edu

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Biochemically, Genetically and Genomically (BiGG) Genome-Scale Metabolic Reconstructions

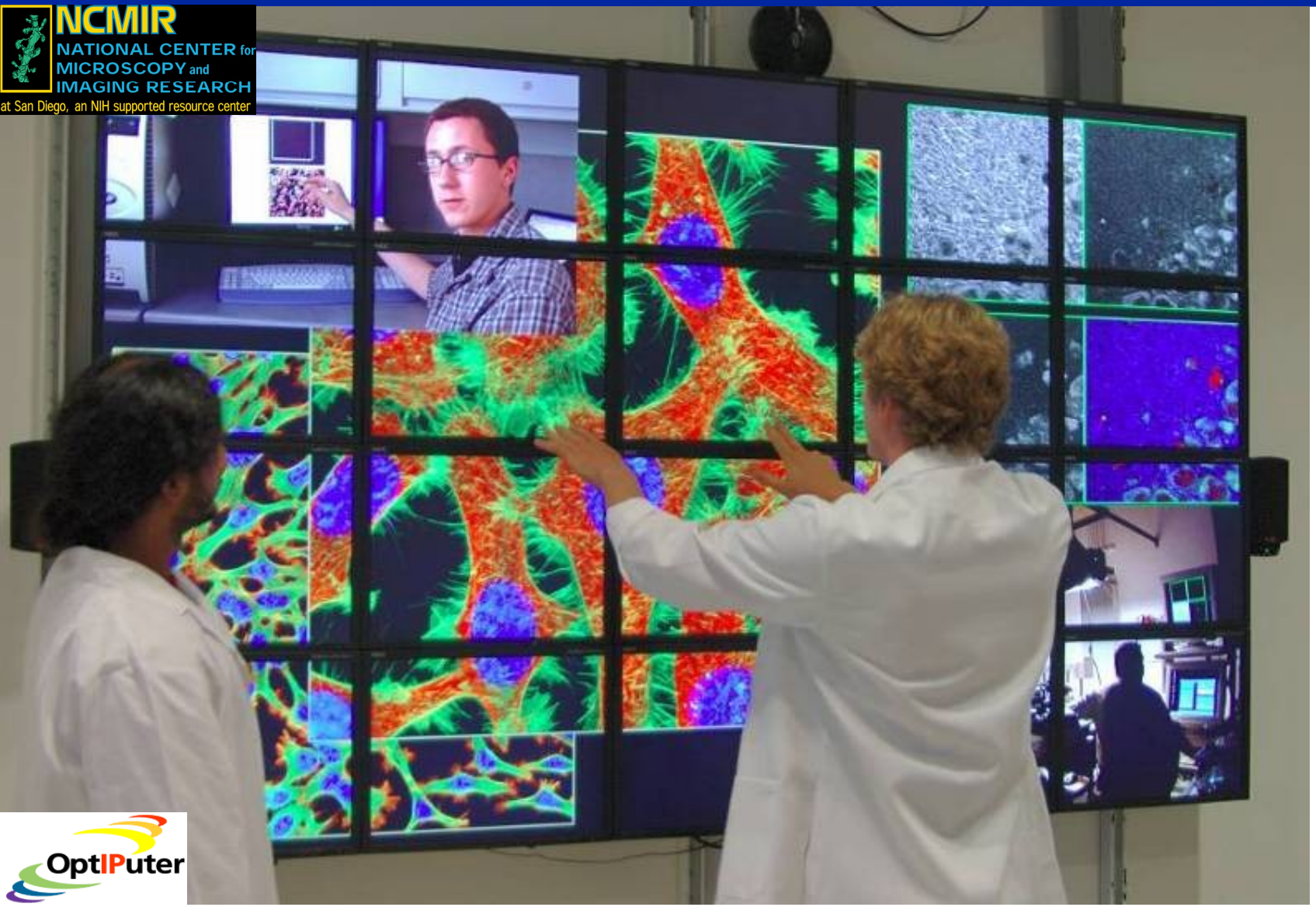


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Systems Biology Research Group
http://systemsbiology.ucsd.edu

The OptIPuter Project: 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



Scalable Adaptive Graphics Environment (SAGE)

evl electronic visualization laboratory

NSF

$13.5M Over Five Years

Picture Source: Mark Ellisman, David Lee, Jason Leigh

OptIPuter

UCSD
UCIrvine

Calit2 (UCSD, UCI) and UIC Lead Campuses—Larry Smarr PI
Univ. Partners: SDSC, USC, SDSU, NW, TA&M, UvA, SARA, KISTI, AIST
Industry: IBM, Sun, Telcordia, Chiaro, Calient, Glimmerglass, Lucent

it2

My OptIPortal™ – Affordable Termination Device for the OptIPuter Global Backplane

- 20 Dual CPU Nodes, 20 24” Monitors, ~$50,000
- 1/4 Teraflop, 5 Terabyte Storage, 45 Mega Pixels--Nice PC!
- Scalable Adaptive Graphics Environment (SAGE) Jason Leigh, EVL-UIC

evl electronic visualization laboratory





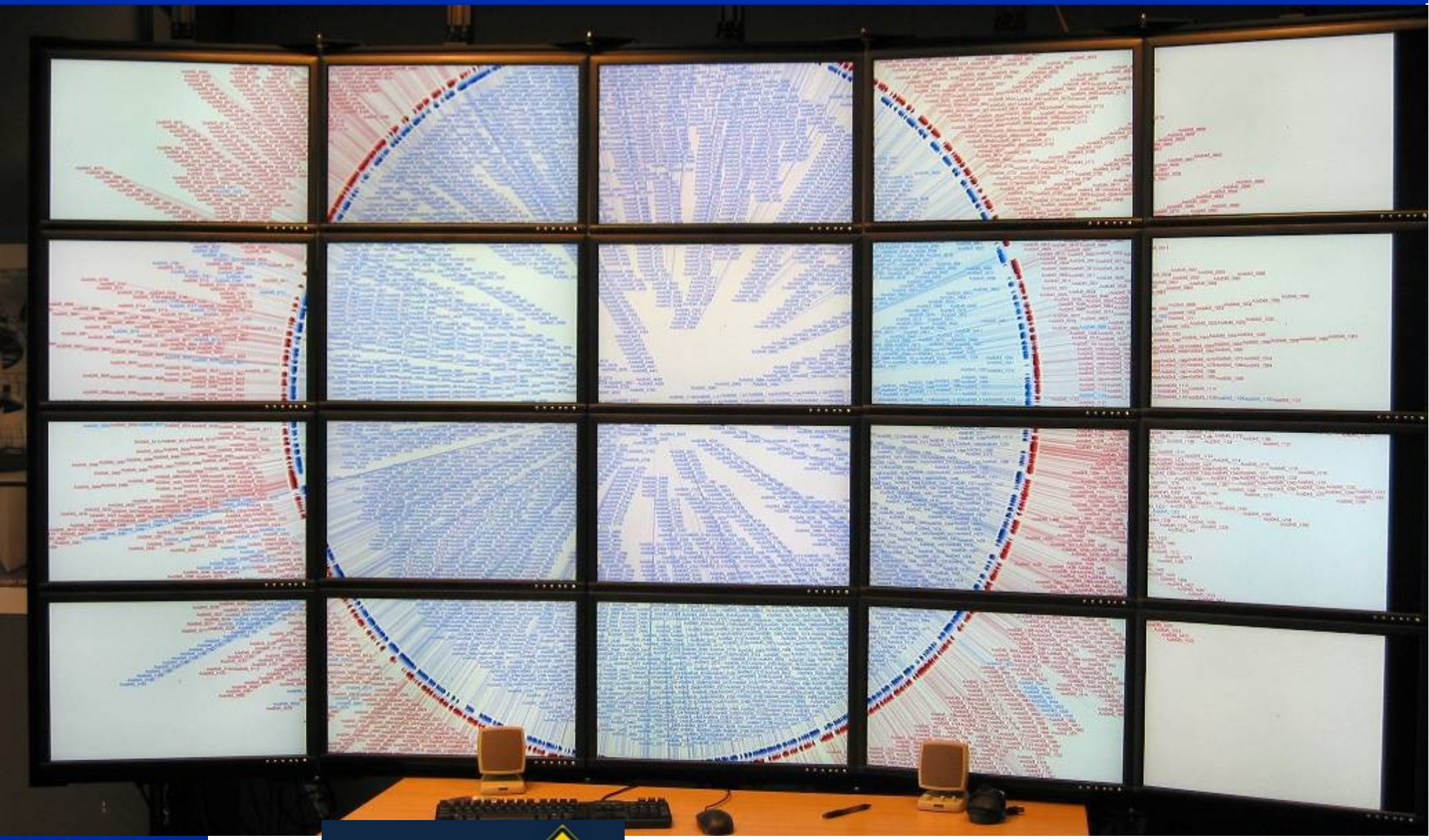
UCSD UCIrvine

Powered by Rocks ROCKS

Source: Phil Papadopoulos SDSC, Calit2

it²

Use of Tiled Display Wall OptIPortal to Interactively View Microbial Genome



UCSD
UCIrvine

Powered by Rocks

ROCKS

Acidobacteria bacterium Ellin345
Soil Bacterium 5.6 Mb

it2

Use of Tiled Display Wall OptIPortal to Interactively View Microbial Genome



UCSD
UCIrvine

Source: Raj Singh, UCSD

it²

Use of Tiled Display Wall OptIPortal to Interactively View Microbial Genome



UCSD
UCIrvine

Source: Raj Singh, UCSD

it²

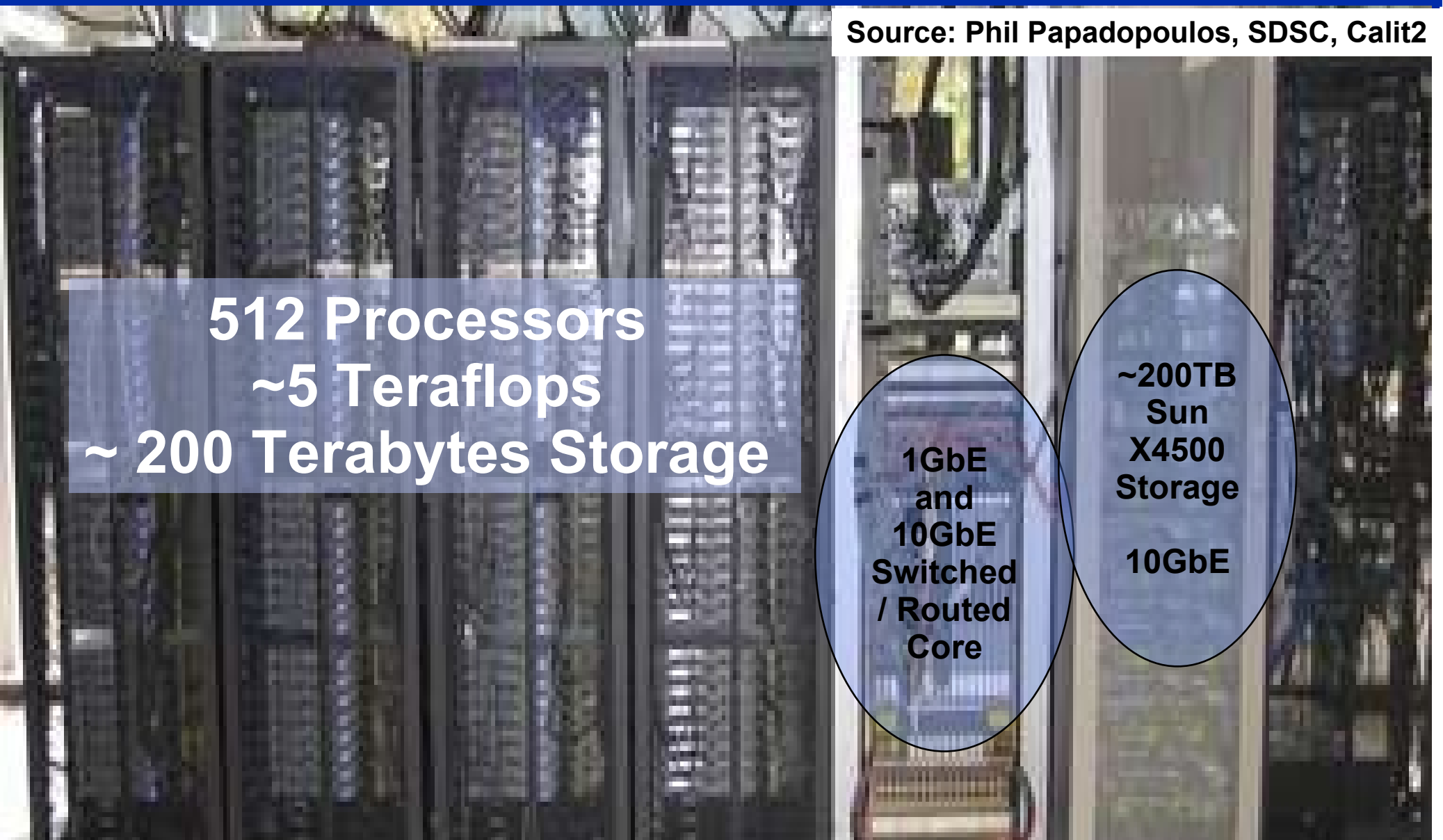
Interactive Exploration of Marine Genomes Using 100 Million Pixels



Ginger Armburst (UW), Terry Gaasterland (UCSD SIO)

Calit2 Microbial Metagenomics Cluster- Next Generation Optically Linked Science Data Server

Source: Phil Papadopoulos, SDSC, Calit2



UCSD UCIrvine SDSC ROCKS camera Marine Microbial Ecology J. Craig Venter INSTITUTE it2

OptIPlanet Collaboratory Persistent Infrastructure Supporting Microbial Research



OptIPuter

Ginger Armbrust's Diatoms: Micrographs, Chromosomes, Genetic Assembly

ROCKS







UW's Research Channel Michael Wellings

it2

Genome and Medical Biosciences Building
First 10Gbps OptIPortal End Point at UC Davis



~70 Faculty
~25+ new
~700 people

Six floors
225,000 sq ft
$98M

Molecular Medicine
Genomics & Bioinformatics
Pharmacology
Biomedical Engineering
Enabling Genomics Facility
Imaging & Vivarium

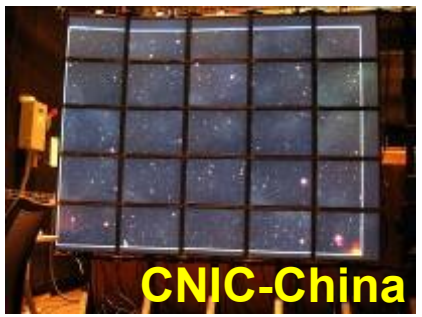
Jonathan Eisen

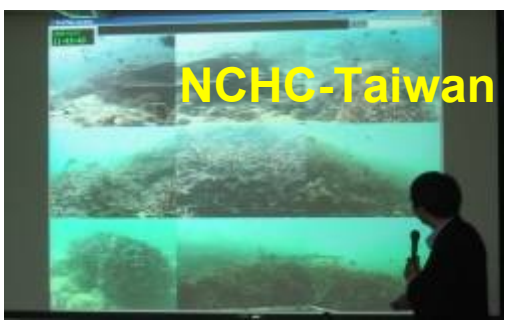
OptIPortals
Are Being Adopted Globally


AIST-Japan


Osaka U-Japan


KISTI-Korea


CNIC-China


NCHC-Taiwan


UZurich


SARA- Netherlands



Brno-Czech Republic


EVL@UIC


Calit2@UCSD


Calit2@UCI



U. Melbourne, Australia

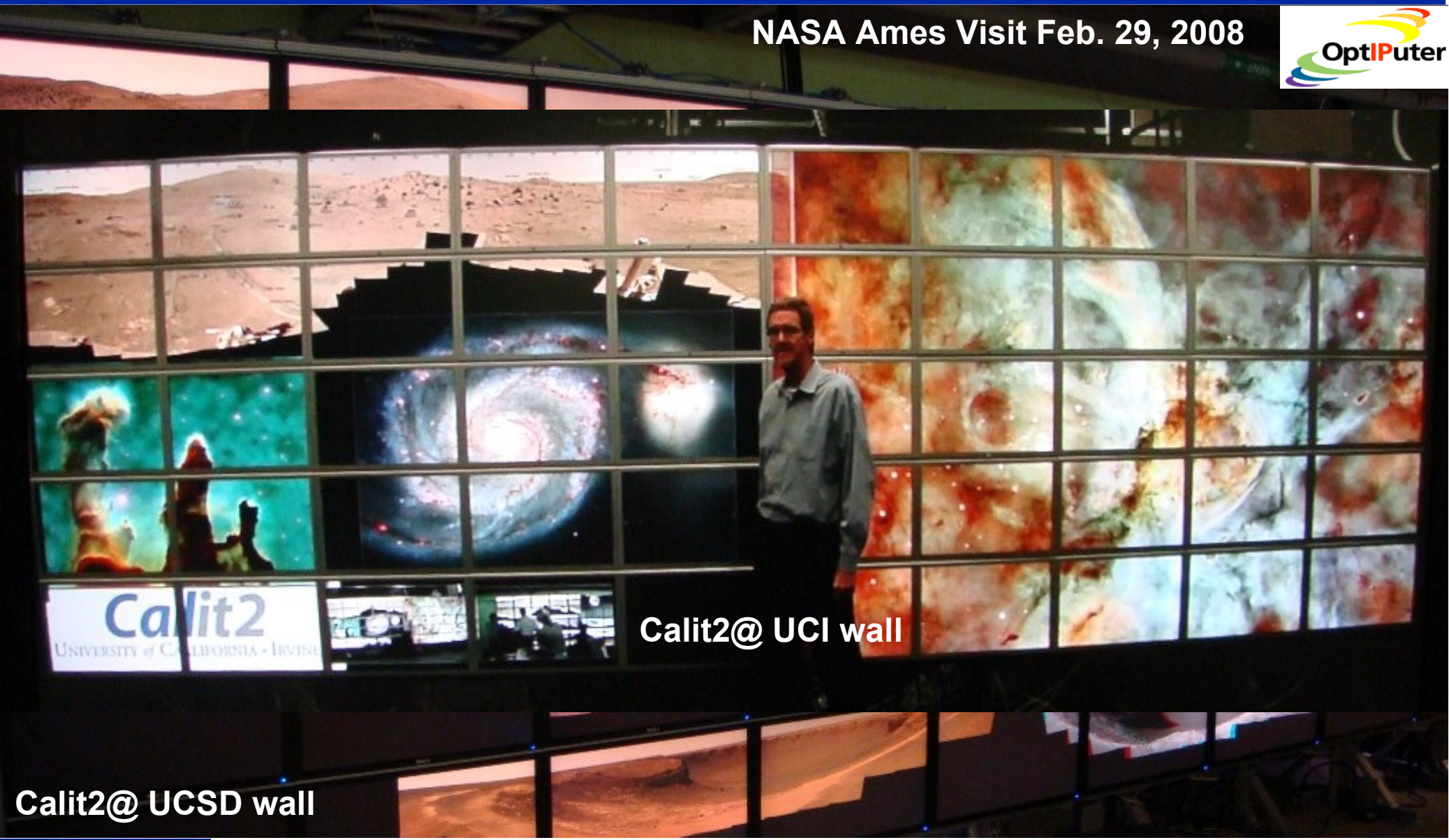
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Powered by Rocks ROCKS

evl electronic visualization laboratory

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The Calit2 200 Megapixel OptIPortals at UCSD and UCI Are Now a Gbit/s HD Collaboratory

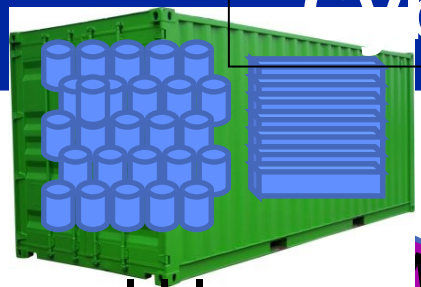


UCSD
UCIrvine

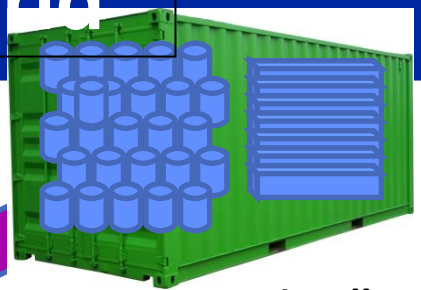
NASA Ames is Completing a 245 Mpixel Hyperwall as Project Columbia Interface

it2

Planned UCSD Research Cyberinfrastructure LambdaGrid



Active Data Replication



Eco-Friendly
Storage and Compute

V x 10 Gbit

N x 10 Gbit

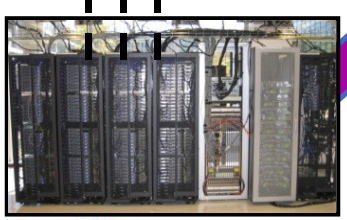


10 Gigabit
L2/L3 Switch

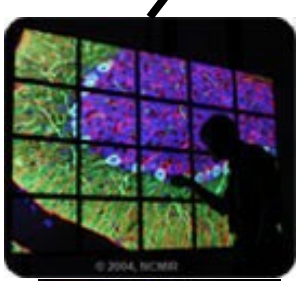
"Network in a box"
- > 200 Connections
- DWDM or Gray Optics

Wide-Area 10G
- Cenic/HPR
- NLR Cavewave
- Cinegrid
- …

On-Demand Physical Connections

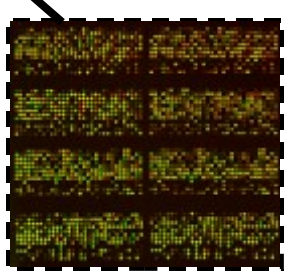


camera
Marine Microbial Ecology



NCMIR
NATIONAL CENTER for MICROSCOPY and IMAGING RESEARCH

Mass Spec



Microarray

Your Lab Here

OptIPuter

UCSD
UCIrvine

ROCKS

Source:Phil Papadopoulos, SDSC/Calit2

it2

NCMIR FACILITIES

Internal Imaging Instruments

Electron Microscopes


Jeol 4000#1


Jeol 4000 #2


Jeol 3200

Light Microscopes



Nikon Custom High Speed 2 photon Systems


BioRad/Zeiss Radiance



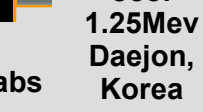
Olympus Co-development Systems

External Imaging Instruments


Jeol 200 KV Fully Corrected Oxford, U.K.

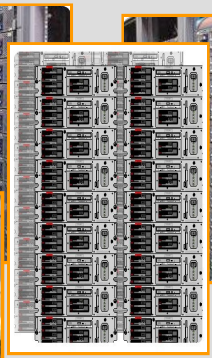

4Pi Microscope Bar Harbor, Jackson Labs

Hitachi 3Mev Osaka, Japan

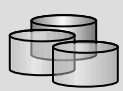
Jeol 1.25Mev Daejon, Korea

Computation and Storage Resources

Clusters


Storage






BIRN Rack


Optical Networking





Vizualization/Collaboration & Data Exploration


Calit2


NCMIR

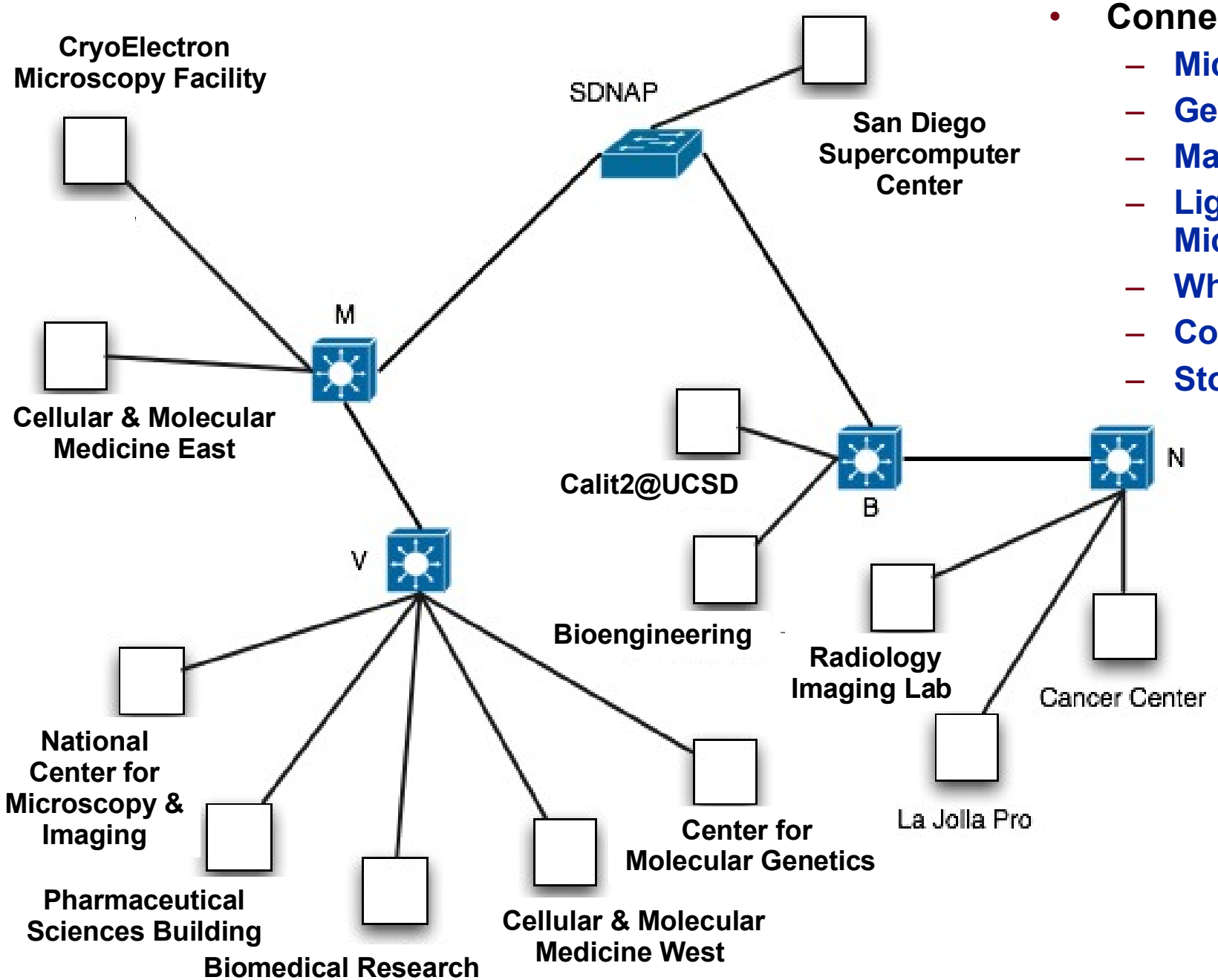


EVL

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TransPAC | evl electronic visualization laboratory | INTERNET2 | BIRN | NCMIR | it2

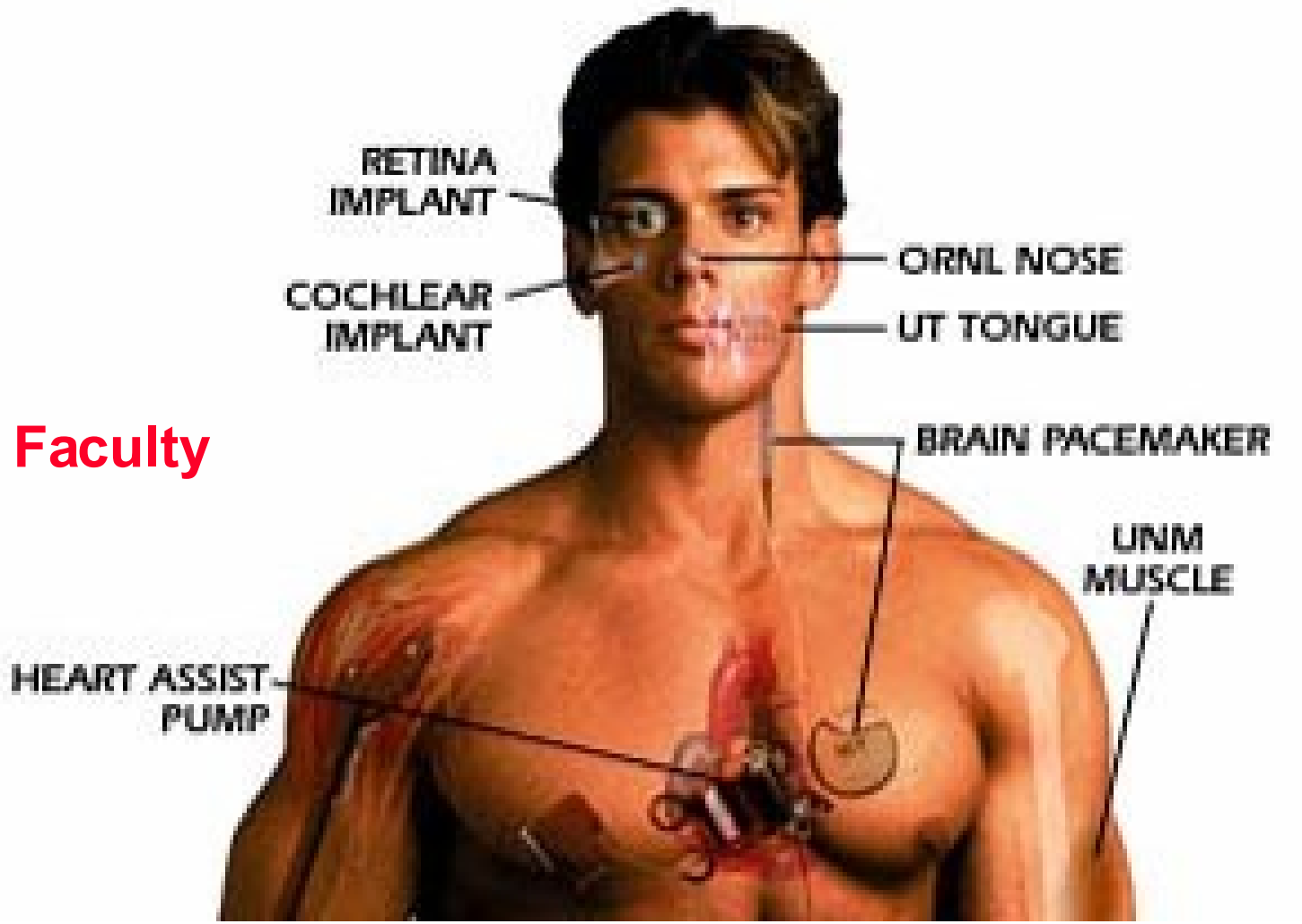
UCSD Planned Optical Networked Biomedical Researchers and Instruments



- **Connects at 10 Gbps :**
  - **Microarrays**
  - **Genome Sequencers**
  - **Mass Spectrometry**
  - **Light and Electron Microscopes**
  - **Whole Body Imagers**
  - **Computing**
  - **Storage**

Lifechips--Merging Two Major Industries: Microelectronic Chips & Life Sciences

65 UCI Faculty



UCSD
UCIrvine

lifechips
university of california, irvine
www.lifechips.org

it²

A SmartPhone Based System to Enhance Preventive Healthcare

- Diabetes
- Congestive Heart Failure (CHF)
- Cardiac
- Hypertension
- Asthmatics
- Congestive Obstructive Pulmonary Disease(COPD)
- Obesity
- Infection

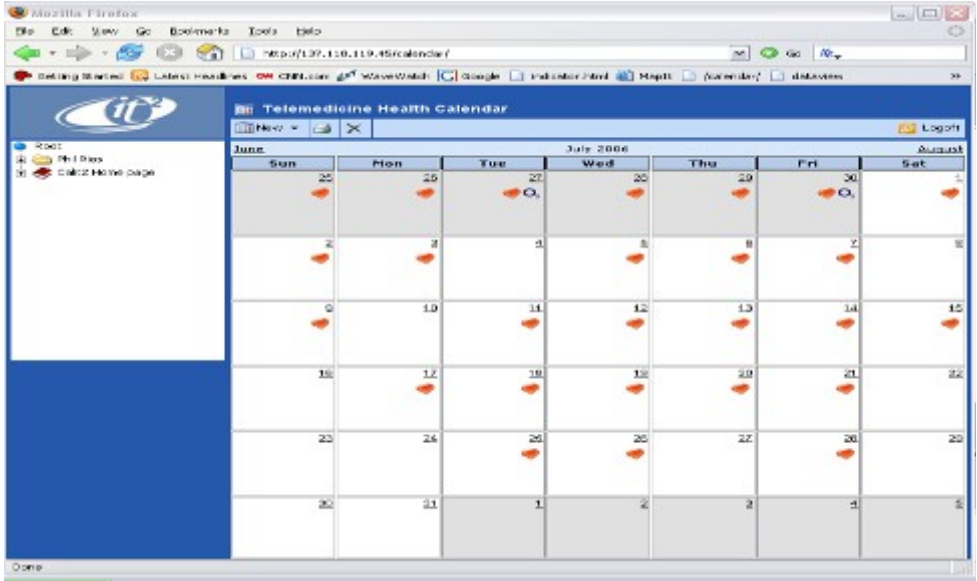
- …Any chronic illness.

- Blood Glucose
- Body Weight and Blood Pressure
- EKG / heart rhythms
- BP (Blood Pressure)
- Respiration
- Respiration & Blood Oxygenation
- Weight & Caloric intake
- Temperature

Can be easily measured / monitored
And therefore controlled before effects are catastrophic







UCSD
UCIrvine

Source: Paul Blair, Calit2