Cloud Polis:
Geopolitical Design in Virtual Spaces

Invited Speaker

Designing Geopolitics 2

Calit2@UCSD

La Jolla, CA

June 2, 2012

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

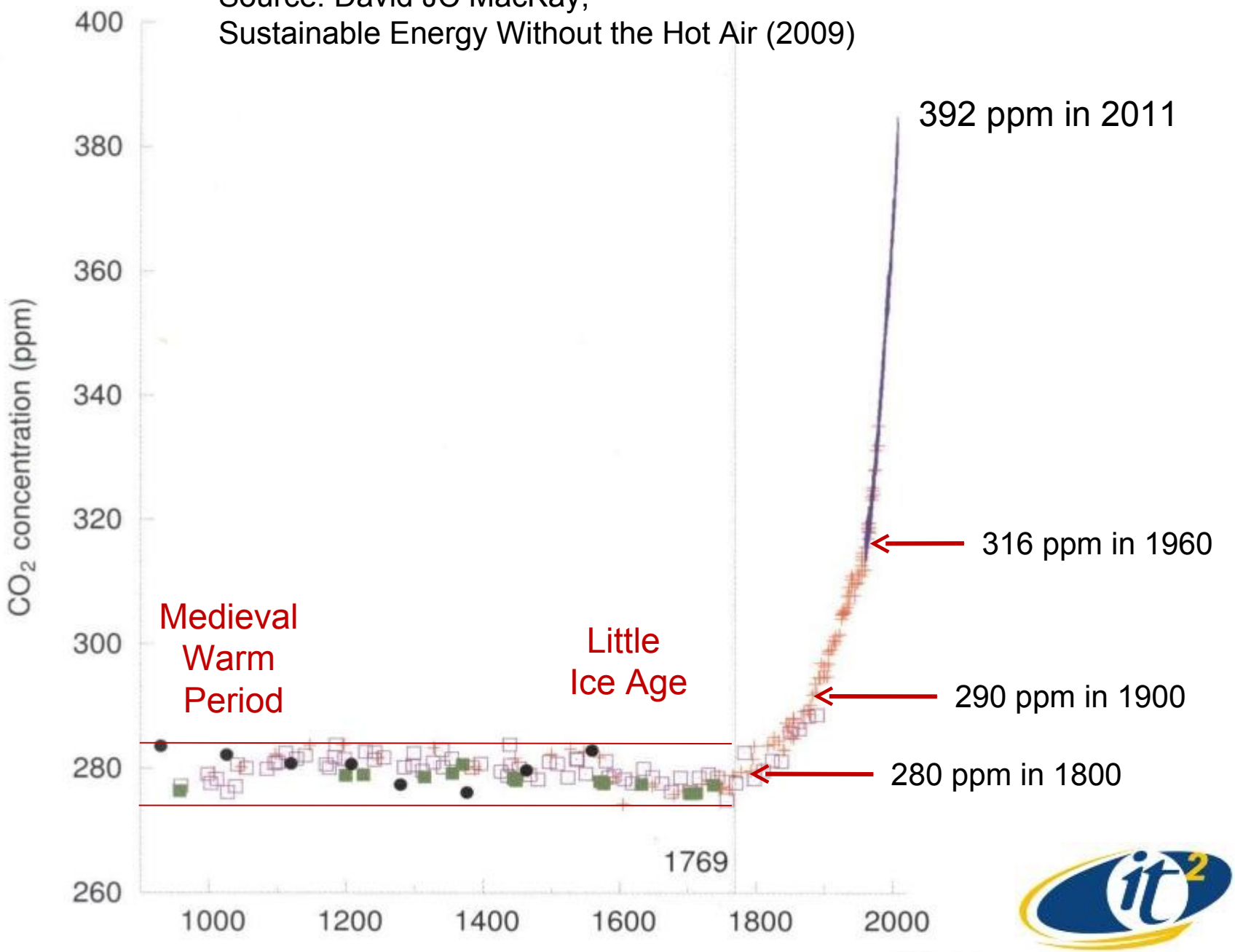
http://lsmarr.calit2.net

UCSD

UCIrvine

Accelerating Increase in the Greenhouse Gas CO_2 Since Industrial Era Began

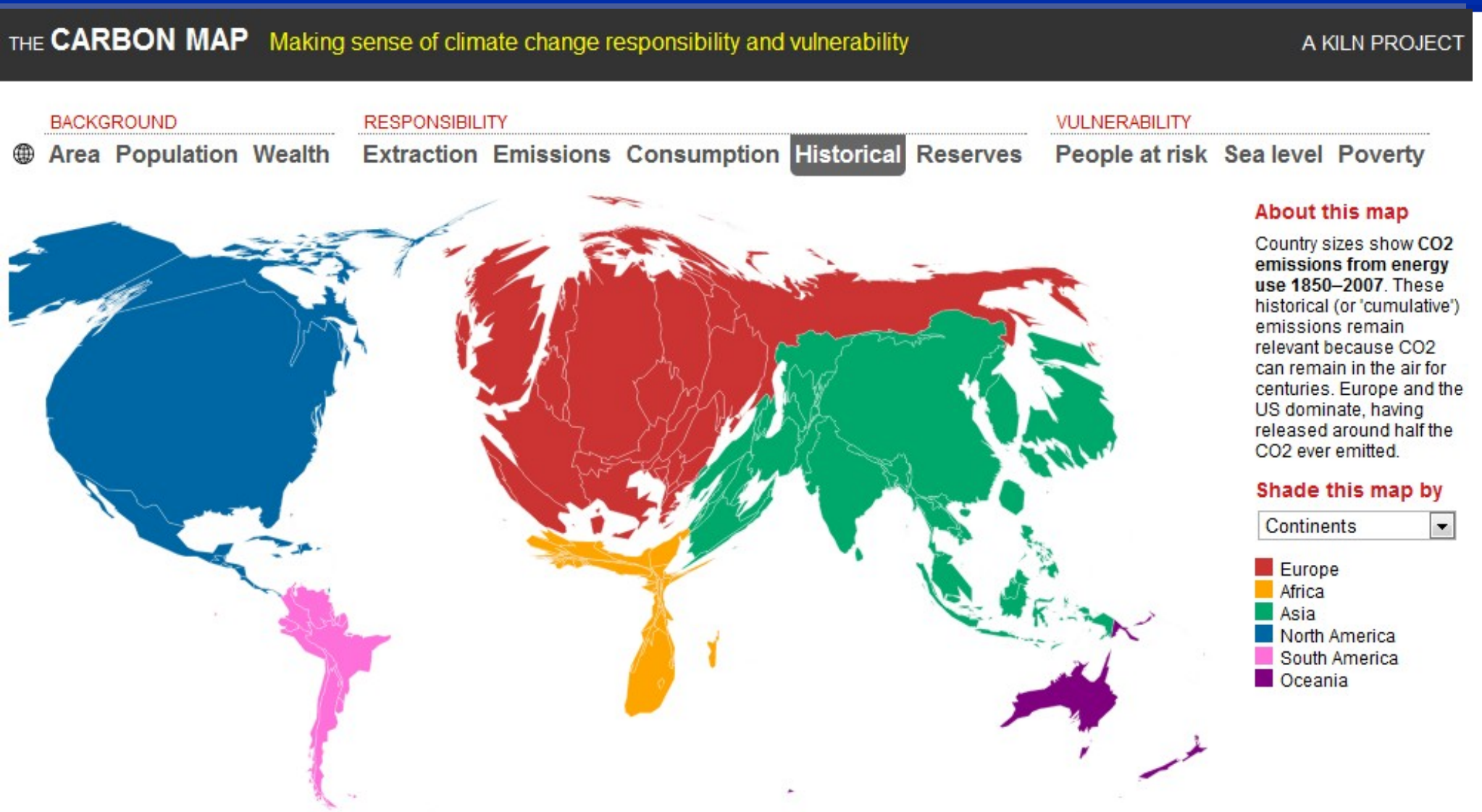
Source: David JC MacKay,
Sustainable Energy Without the Hot Air (2009)



UCSD
UCIrvine

it²

Difficulty of Mapping Carbon Emissions to Nation States

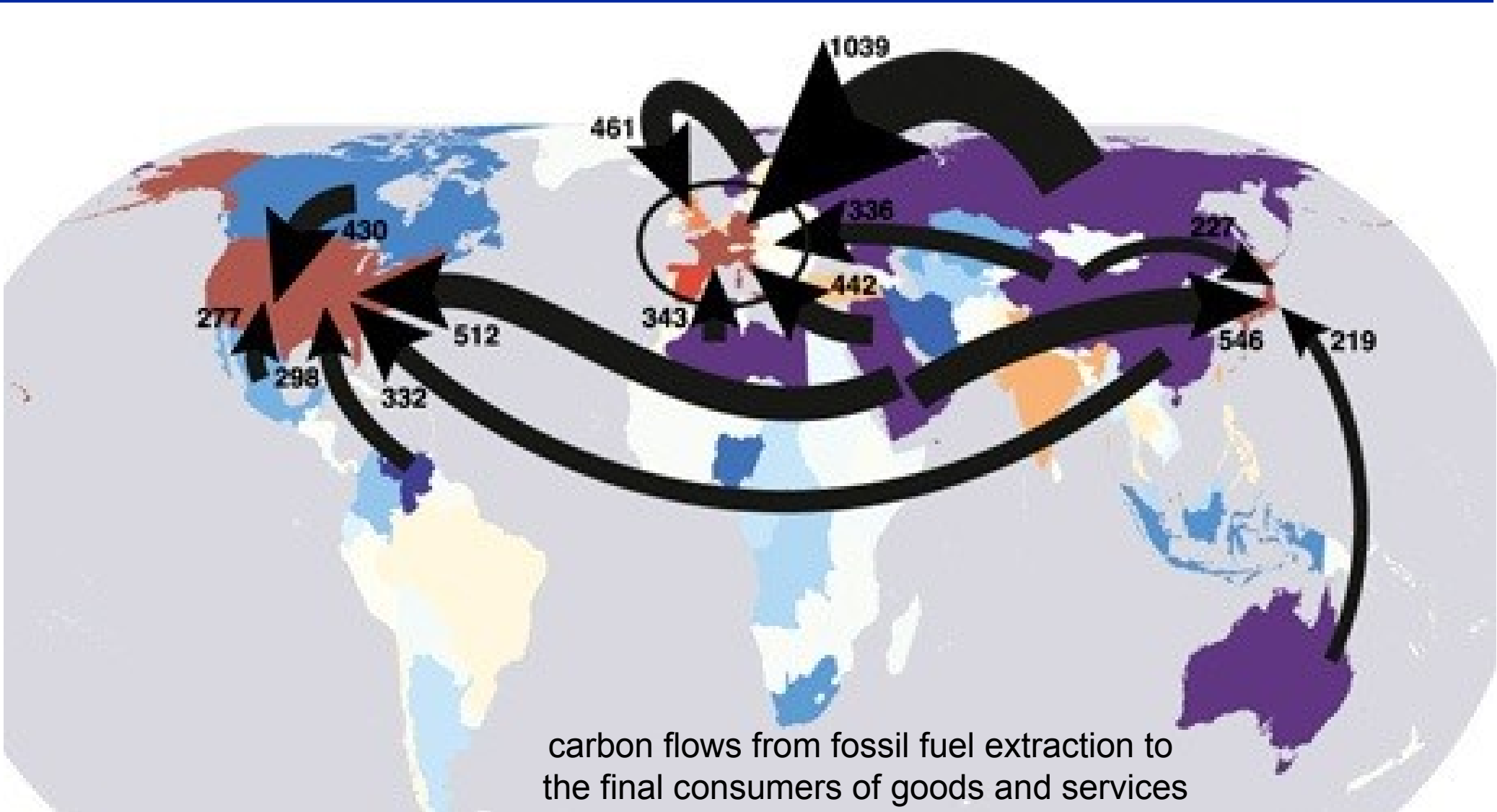


UCSD
UCIrvine

www.carbonmap.org

it²

Carbon Flows
Coupling Energy Extraction to Consumption



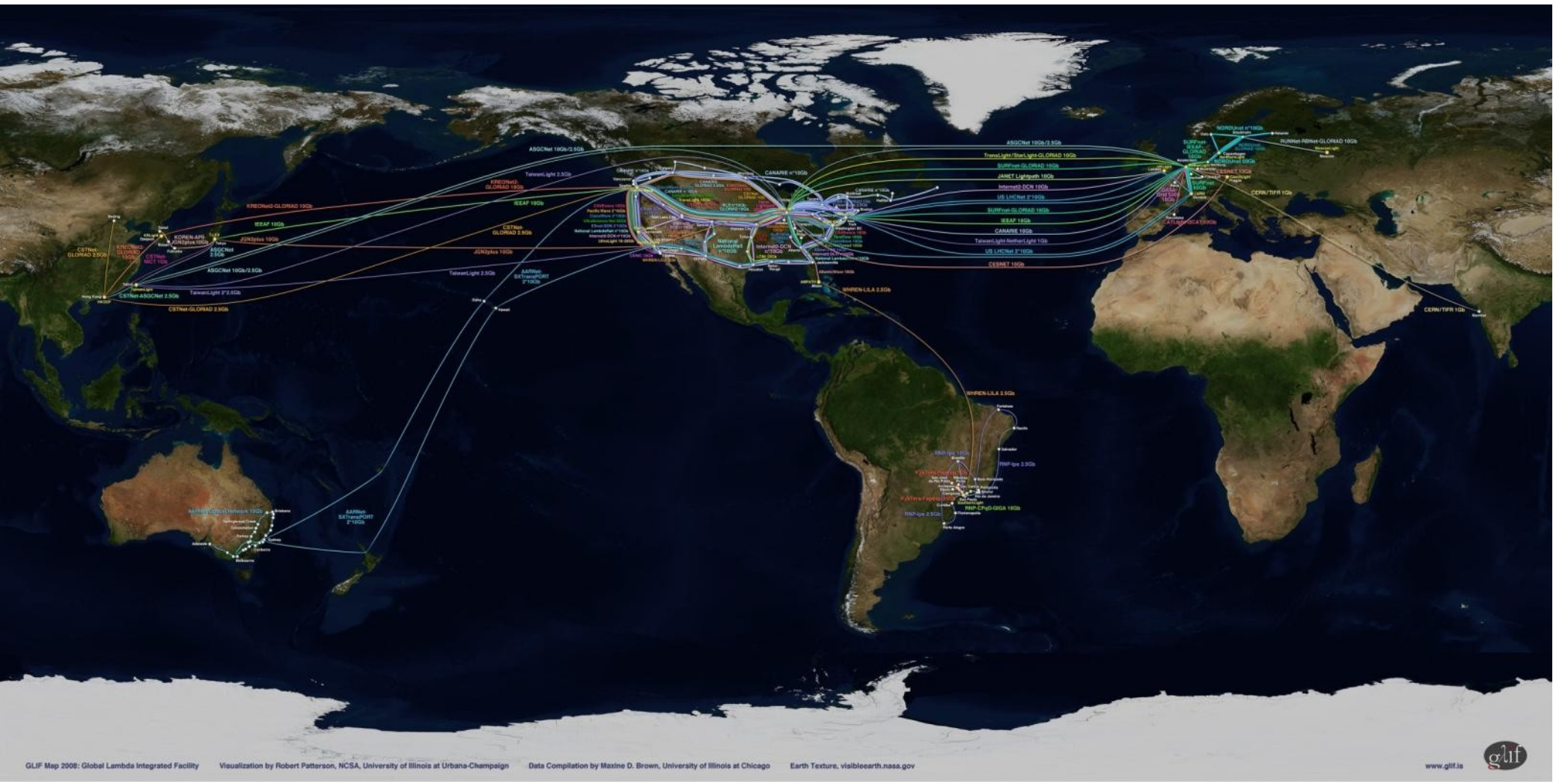
carbon flows from fossil fuel extraction to
the final consumers of goods and services

UCSD
UCIrvine

www.guardian.co.uk/environment/blog/2011/oct/21/data-tracks-carbon-emissions-source

it²

Global Innovation Centers are Being Connected with 10,000 Megabits/sec Clear Channel Lightpaths



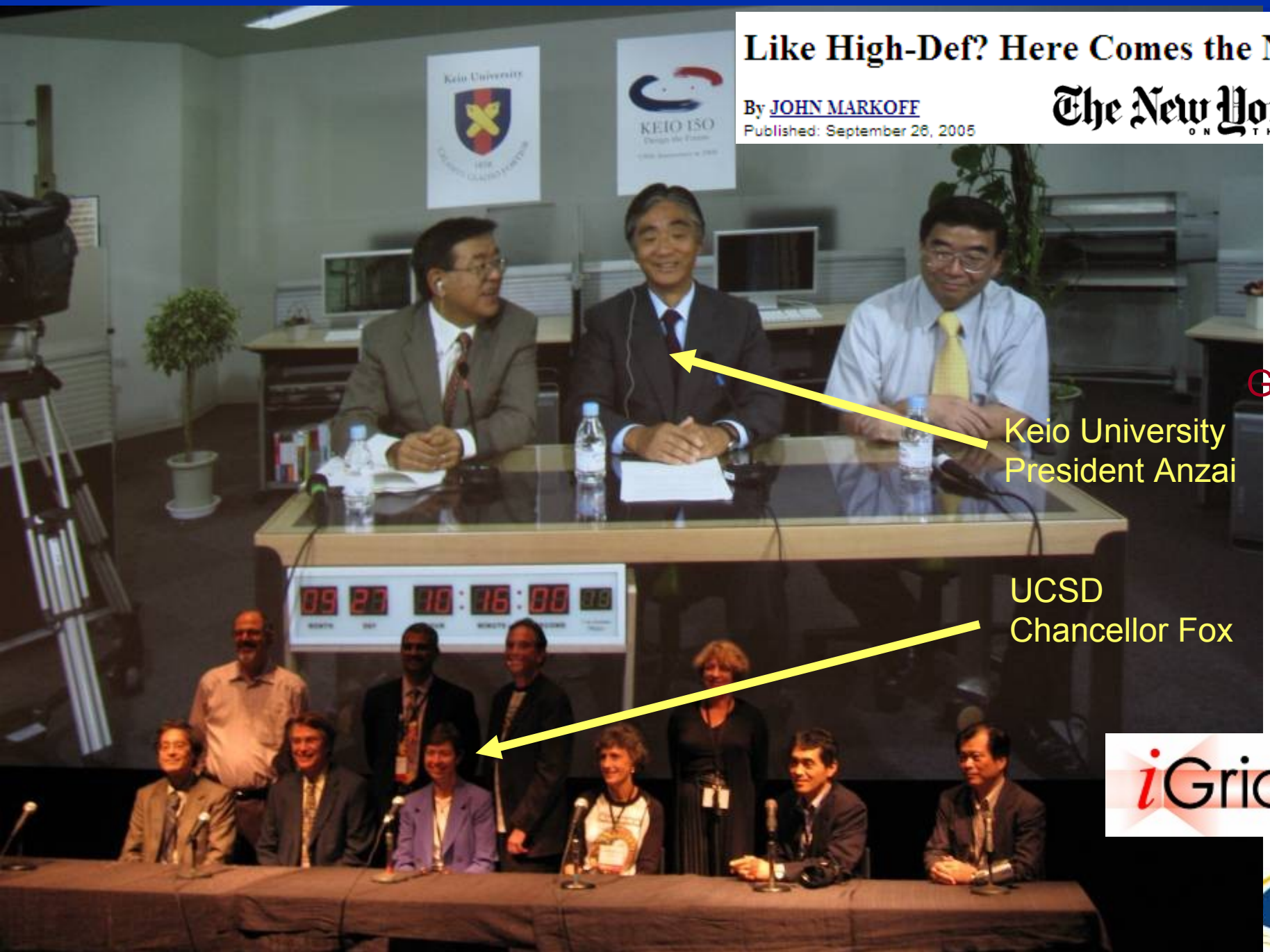
UCSD
UCIrvine

Research on 100 Gbps and 1 Tbps

Source: Maxine Brown, UIC and Robert Patterson, NCSA

it2

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 Digit Cinema

Sony
NTT
SGI

iGrid 2005

it²

Launch of the 100 Megapixel OzIPortal Kicked Off a Rapid Build Out of Australian OptIPortals



No Calit2 Person Physically Flew to Australia to Bring This Up!

UCSD
UCIrvine

Covise, Phil Weber, Jurgen Schulze, Calit2
CGLX, Kai-Uwe Doerr , Calit2
http://www.calit2.net/newsroom/release.php?id=1421

First Tri-Continental Premier of a Streamed 4K Feature Film With Global HD Discussion



CRCA

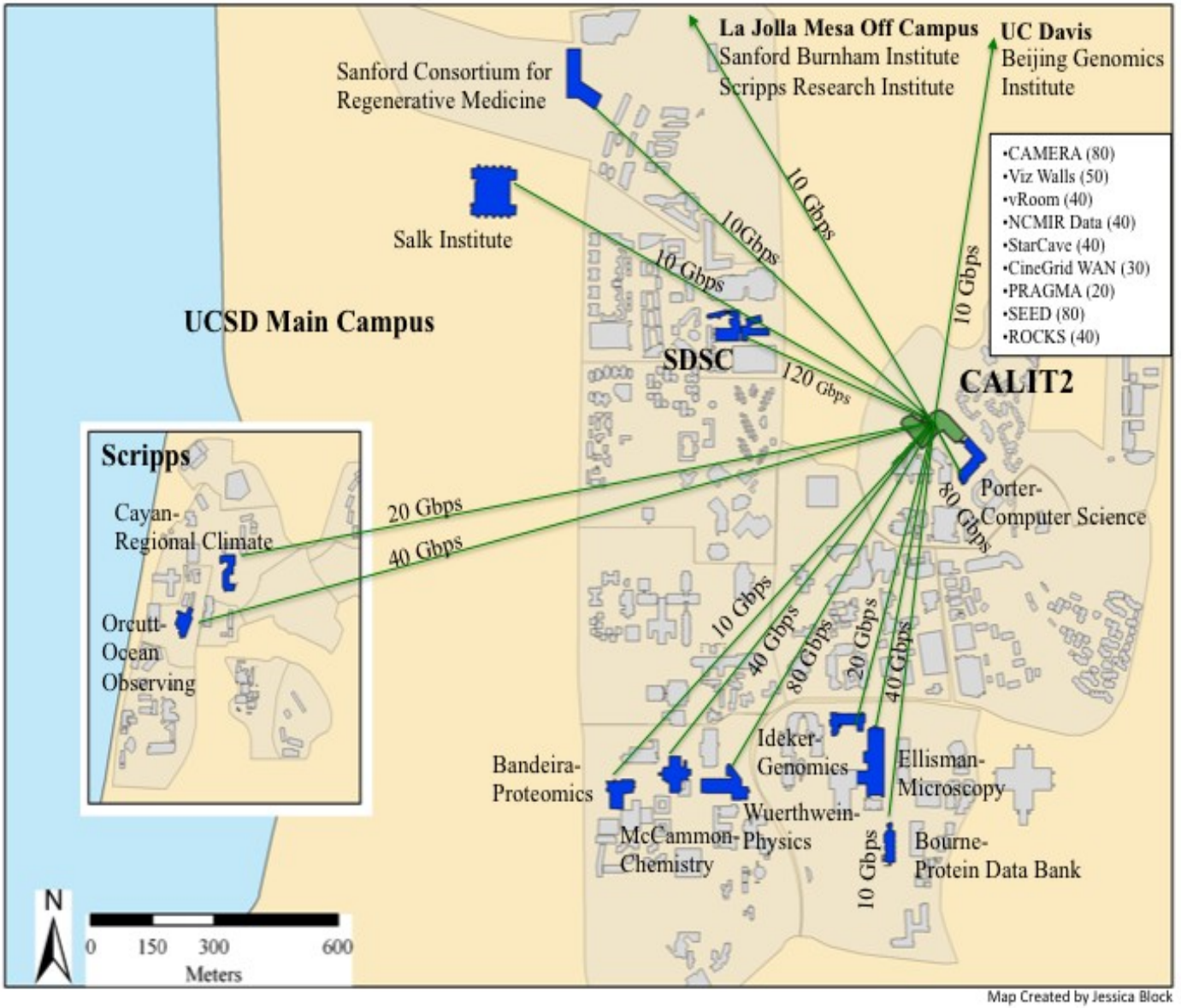
CISCO
C-wave
CineGrid

UCSD
UCIrvine

4K Transmission Over 10Gbps--
4 HD Projections from One 4K Projector

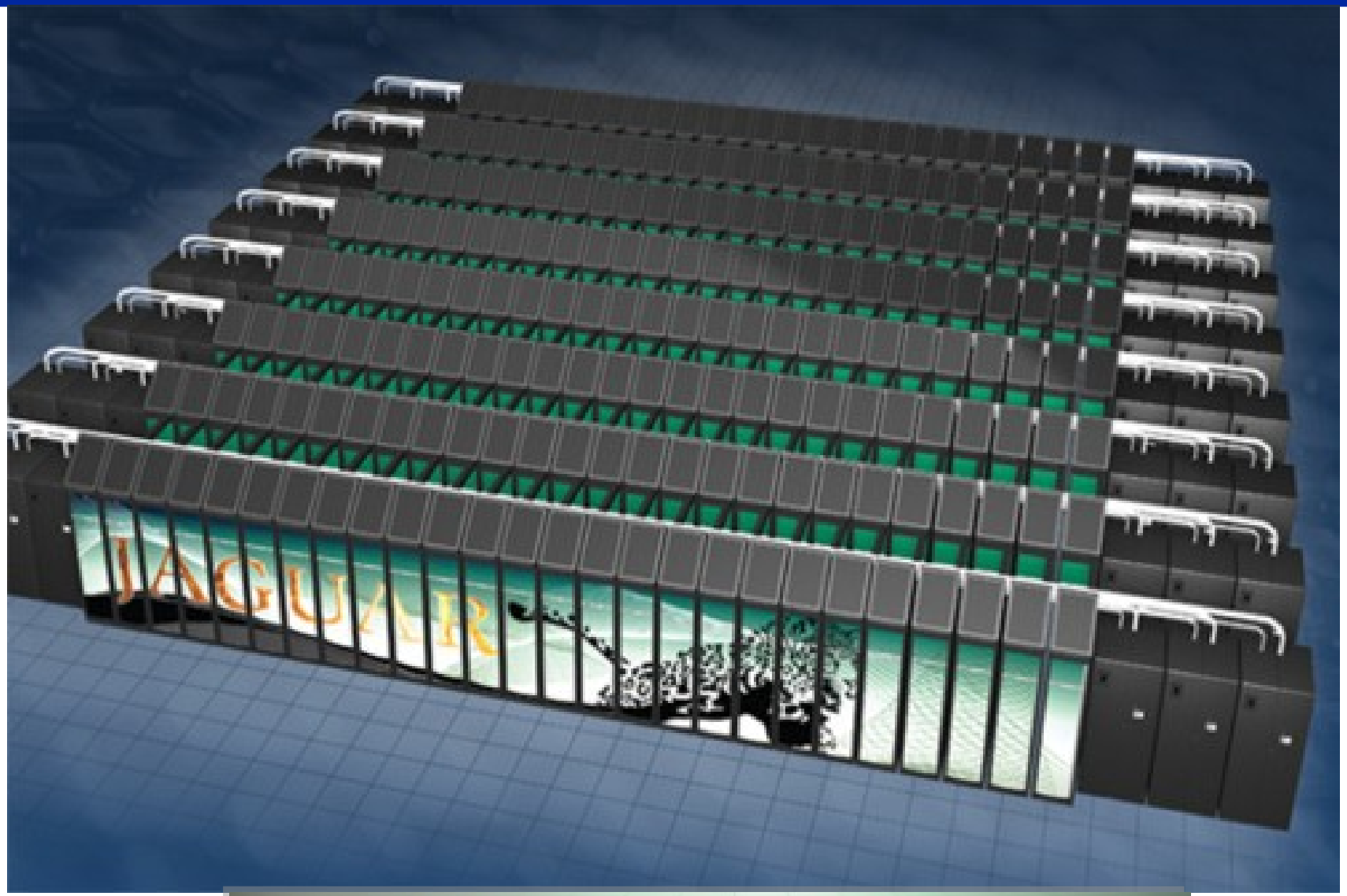
it²

A Cluster Backplane Blown Up to Campus-Scale to Support Big Data



UCSD
UCIrvine

Science Supercomputers - By 2020 One Billion Cores!

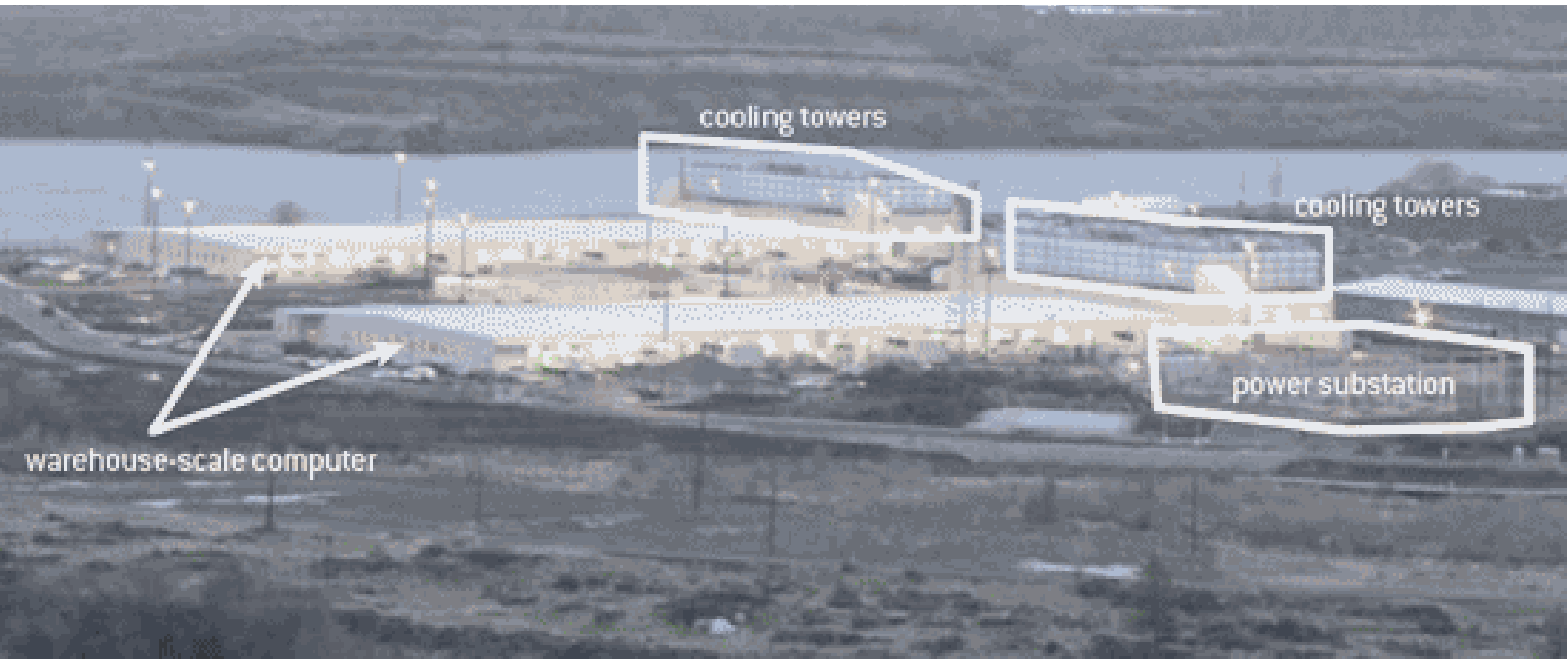


World's Most Powerful Computer For Science!

UCSD
UCIrvine

it²

Warehouse-Scale Data Center



Source: A Guided Tour through Data-center Networking
Dennis Abts, Bob Felderman, Google

UCSD
UCIrvine

Inside Google's First Container Data Center



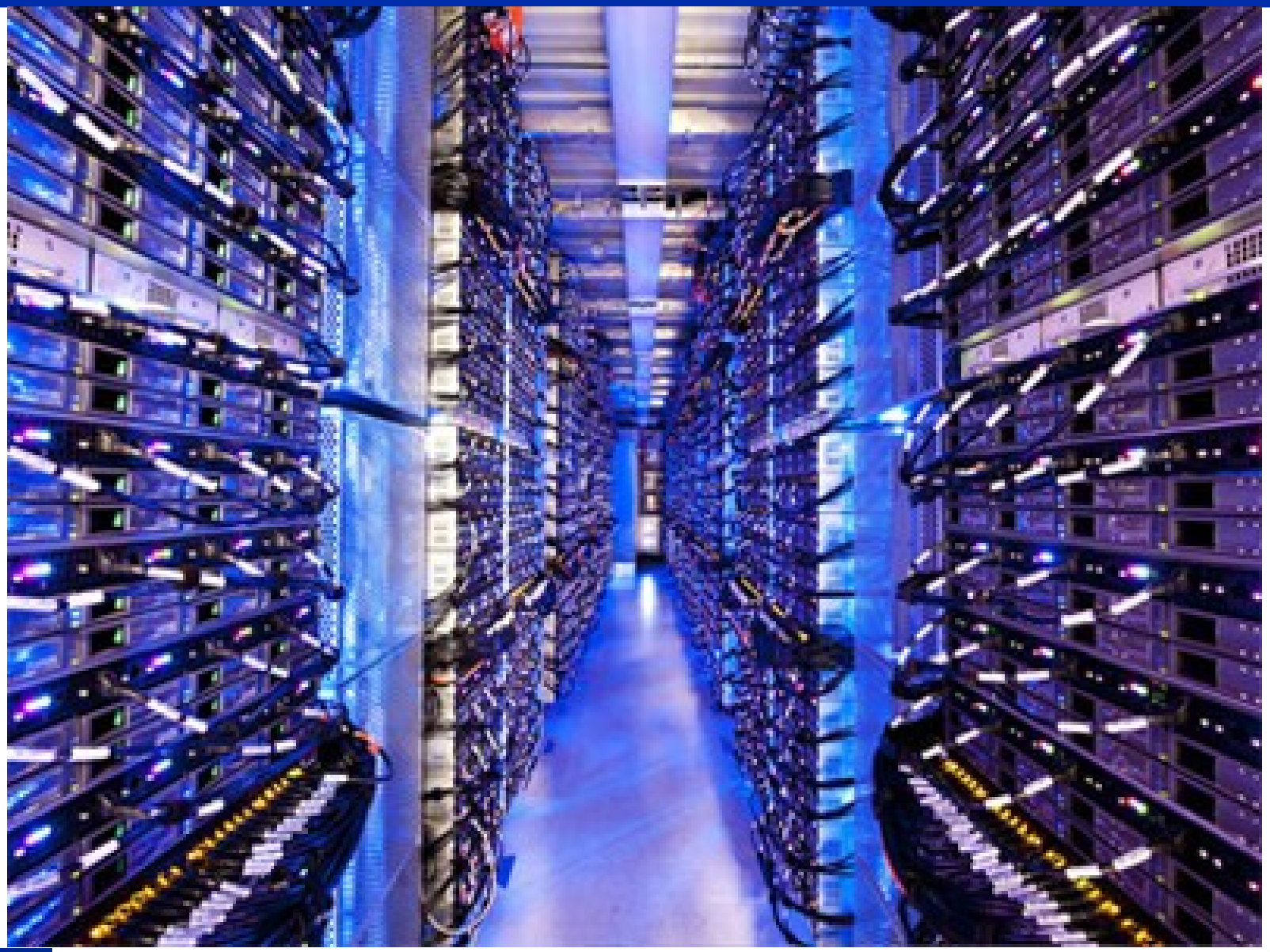
UCSD
UCIrvine

Google container data center tour

www.youtube.com/watch?v=zRwPSFpLX8I&feature=player_embedded

it²

Server containers on an Aisle of Microsoft's Chicago data center



UCSD
UCIrvine

www.informationweek.com/news/infrastructure/remote_access/220300620

it²

Global Facebook Flows
Where's China?

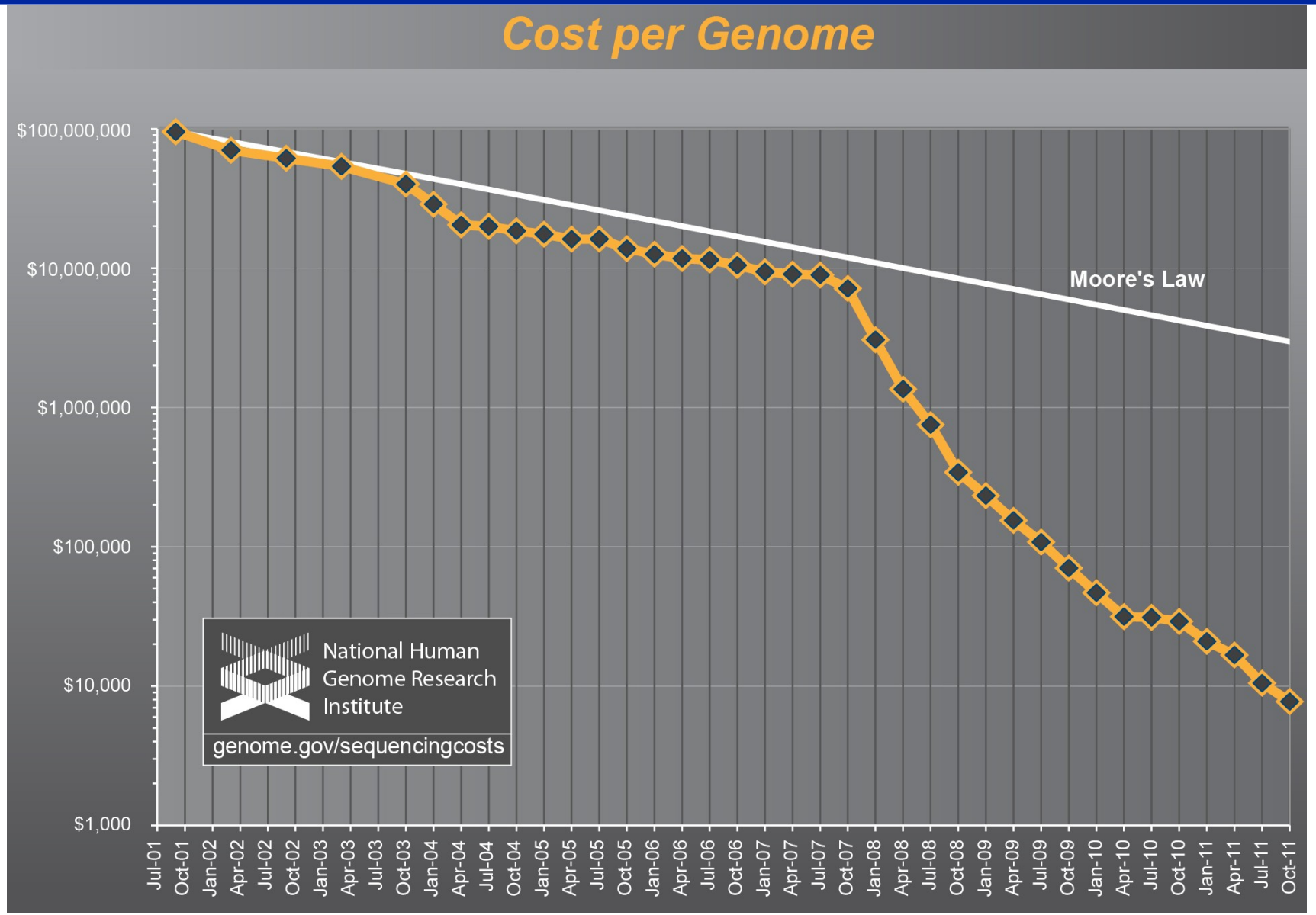


UCSD
UCIrvine

www.facebook.com/note.php?note_id=469716398919

it²

The Cost of Sequencing a Human Genome Has Fallen Over 10,000x in the Last Ten Years!



UCSD
UCIrvine

This Has Enabled Sequencing of
Both Human and Microbial Genomes

it²

BGI—The Beijing Genome Institute is the World's Largest Genomic Institute





- Main Facilities in Shenzhen and Hong Kong, China
  - Branch Facilities in Copenhagen, Boston, UC Davis
- 137 Illumina HiSeq 2000 Next-Gen Sequencing Systems
  - Each Illumina Next Gen Sequencer Generates 25 Gigabases/Day
- Supported by High Performance Computing and Storage
  - ~160TF, 33TB Memory
  - Large-Scale (12PB) Storage

UCSD
UCIrvine

it²

From 10,000 Human Genomes Sequenced in 2011 to 1 Million by 2015 in Less Than 5,000 sq. ft.!

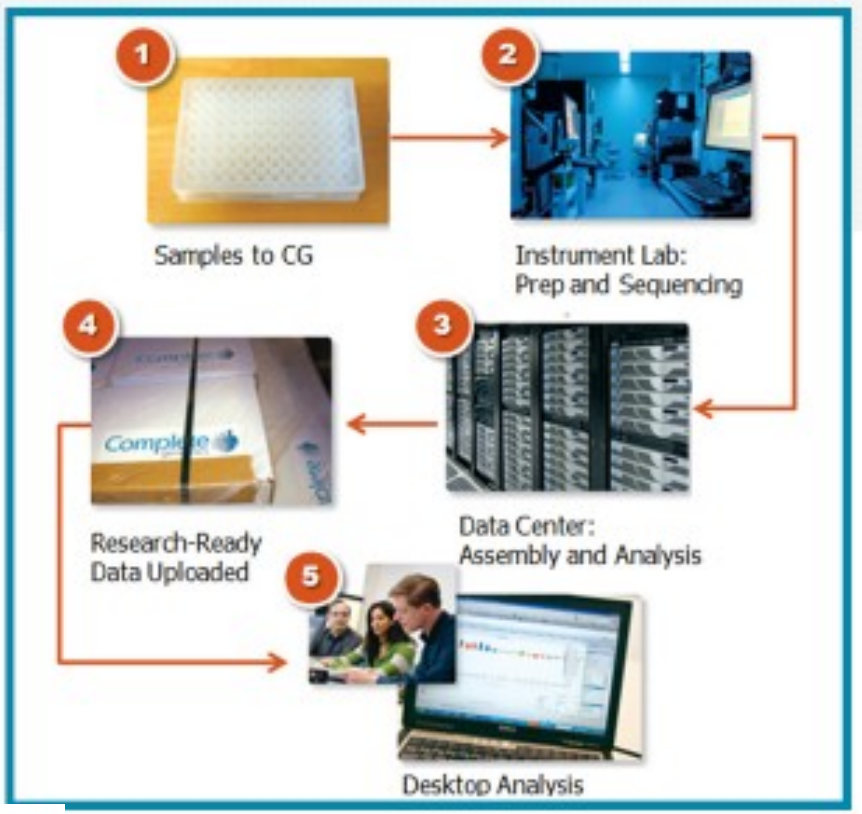
Proprietary Sequencing Technology

Designed and Optimized for Whole Human Genome Sequencing **Quality**, **Cost** and **Scale**



Outsourced Business Model

A Turnkey Service Enabling Customers to **Outsource** WGS – Samples In, **Research Ready Data** Out



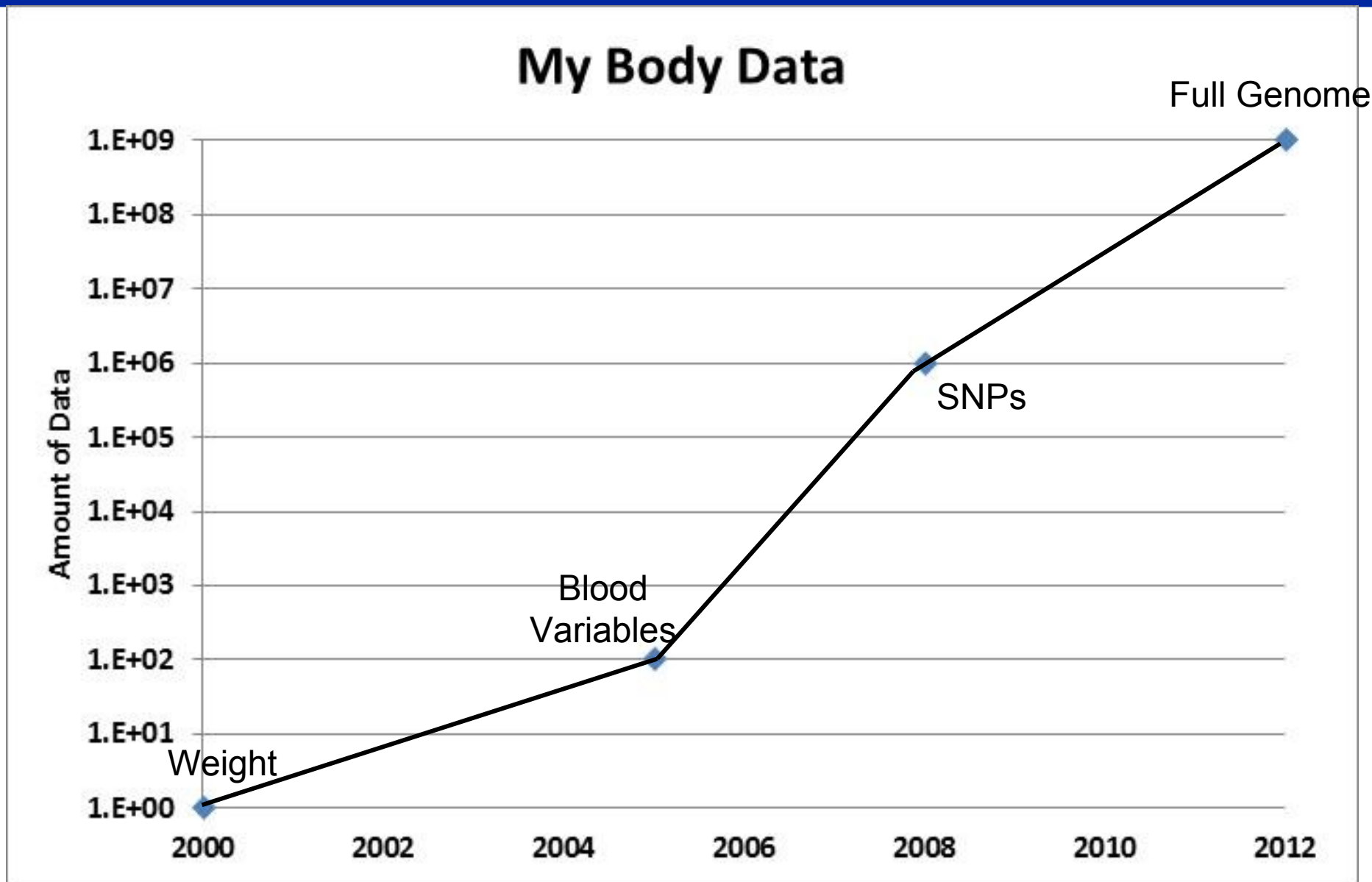
UCSD
UCIrvine

Complete genomics

4 Million Newborns / Year in U.S.

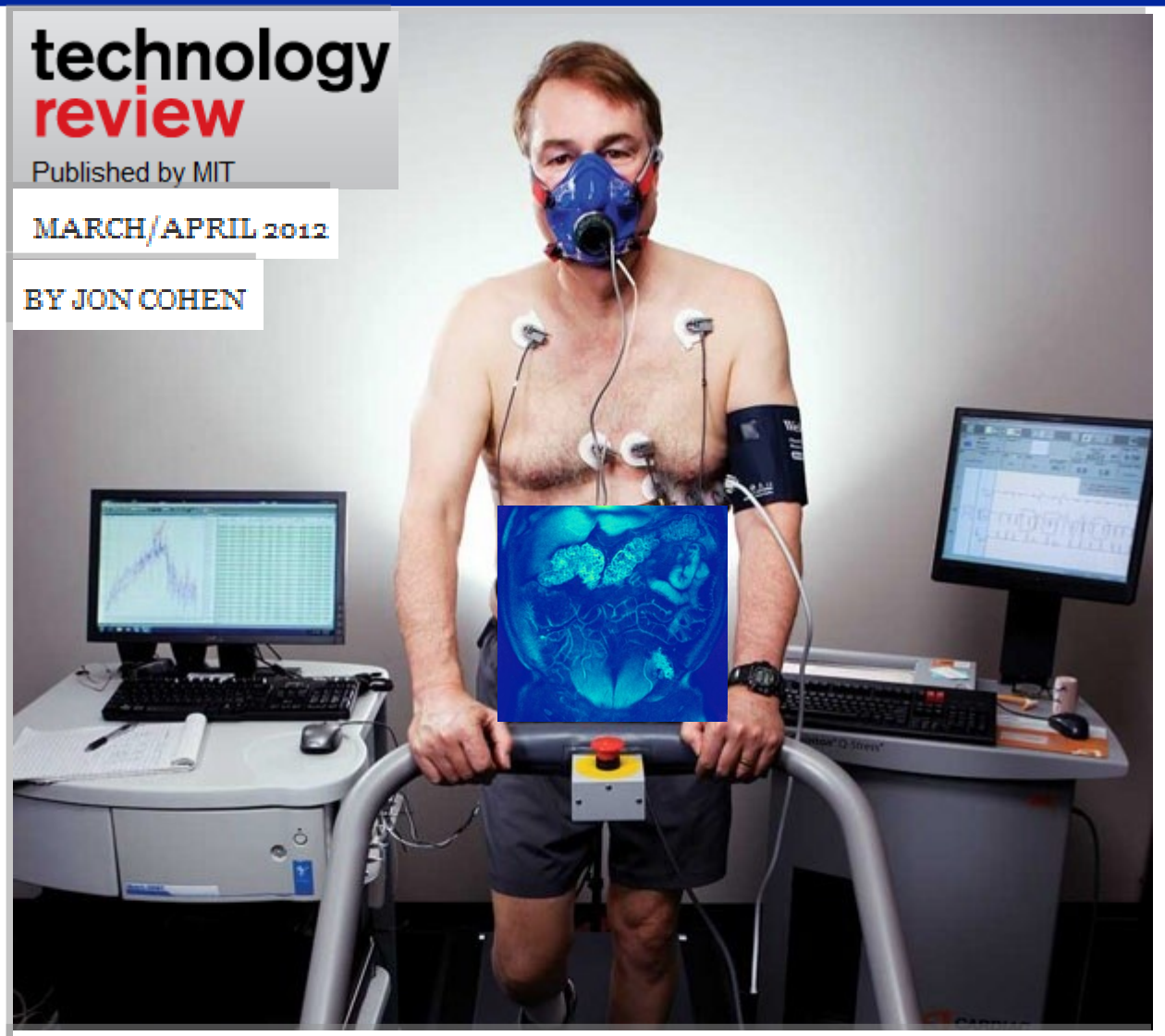
it²

From One to a Billion Data Points Defining Me: The Exponential Rise in Body Data in Just One Decade!



UCSD
UCIrvine

From Measuring Macro-Variables to Measuring Your Internal Variables



www.technologyreview.com/biomedicine/39636

Publically Sharing Your Genome and Medical Records: Is it Crazy or the Future?

World DNA Day: April 25, 2012

GET Genomes Environments Traits CONFERENCE

I Have Been Accepted by PGP and Spoke at GET 2012

Personal Genome Project

Posted 06.01.08 | NOVA scienceNOW

The Personal Genome Project, spearheaded by George Church of Harvard's Center for Computational Genetics, aims to recruit 100,000 people willing to offer up their DNA and personal life histories. It's all in an effort to further knowledge of human genetics and why we get—or don't get—diseases.

UCSD
UCIrvine

it²