TTI VANGUARD
THE ADVANCED TECHNOLOGY CONFERENCE SERIES

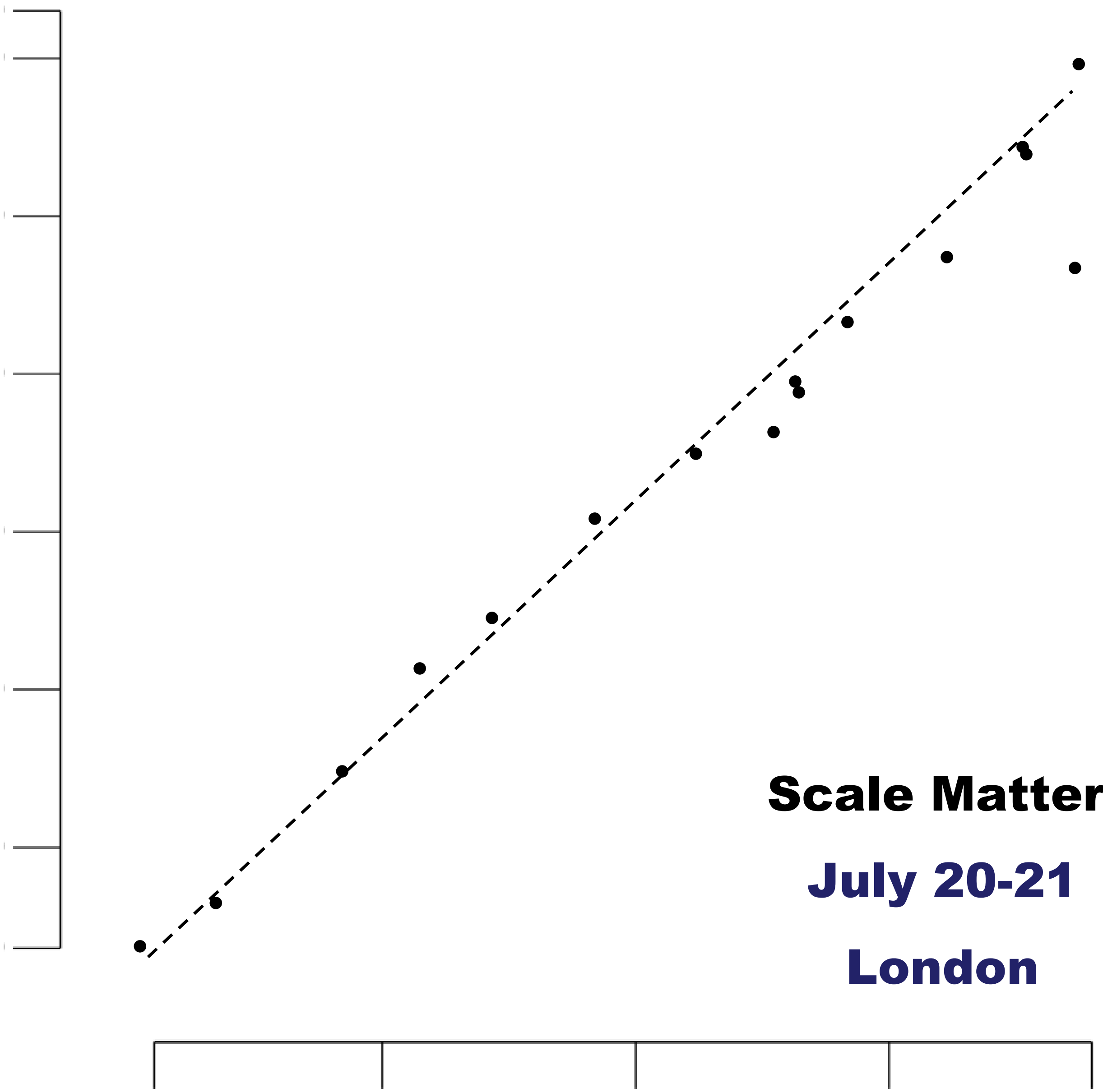
economics, architecture, biology, network design, physics, television production, statistics, gaming, paleontology…

teach us about how scale works in various ways.

Scale Matters

July 20-21

London



Scale Matters

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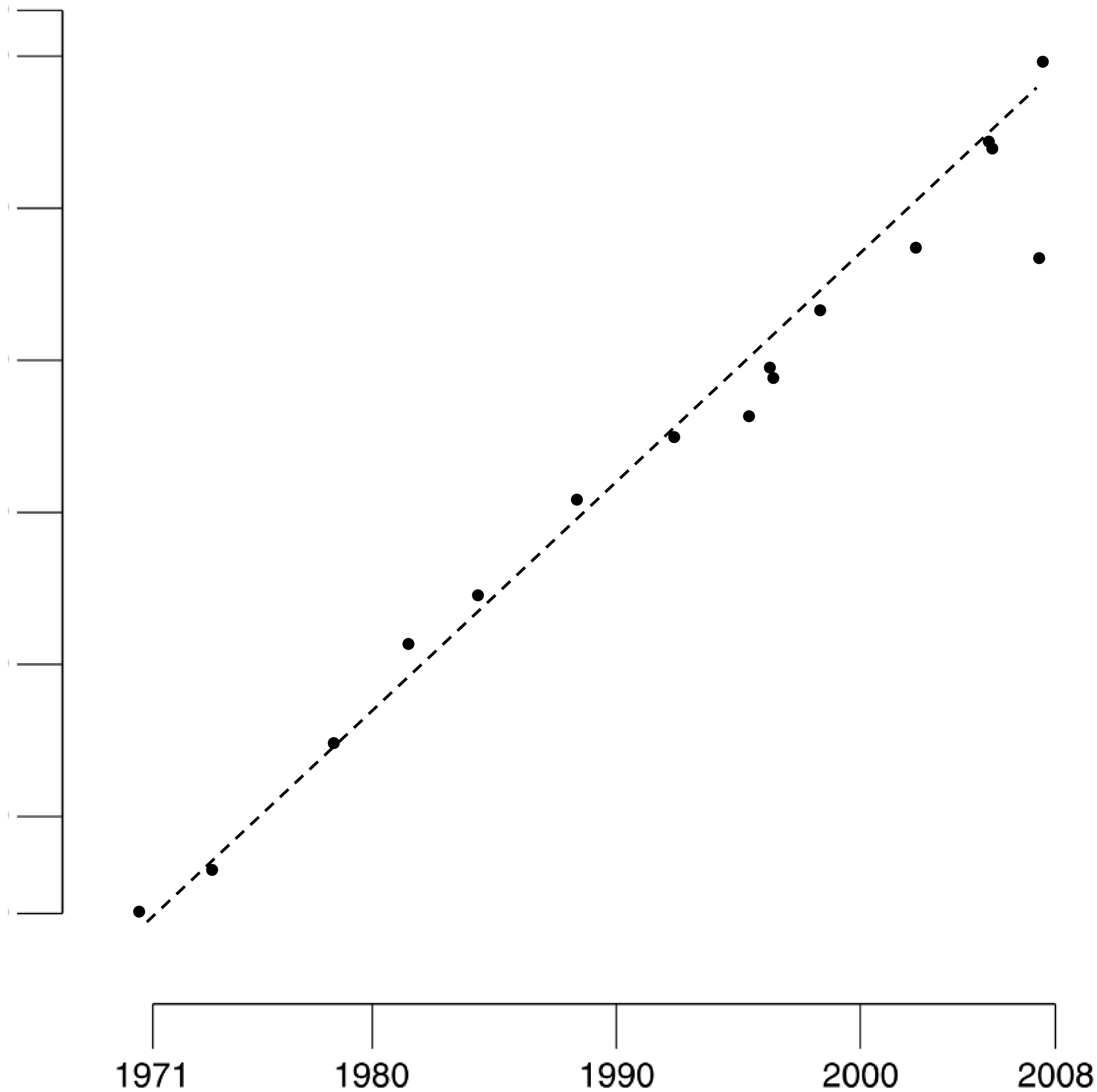
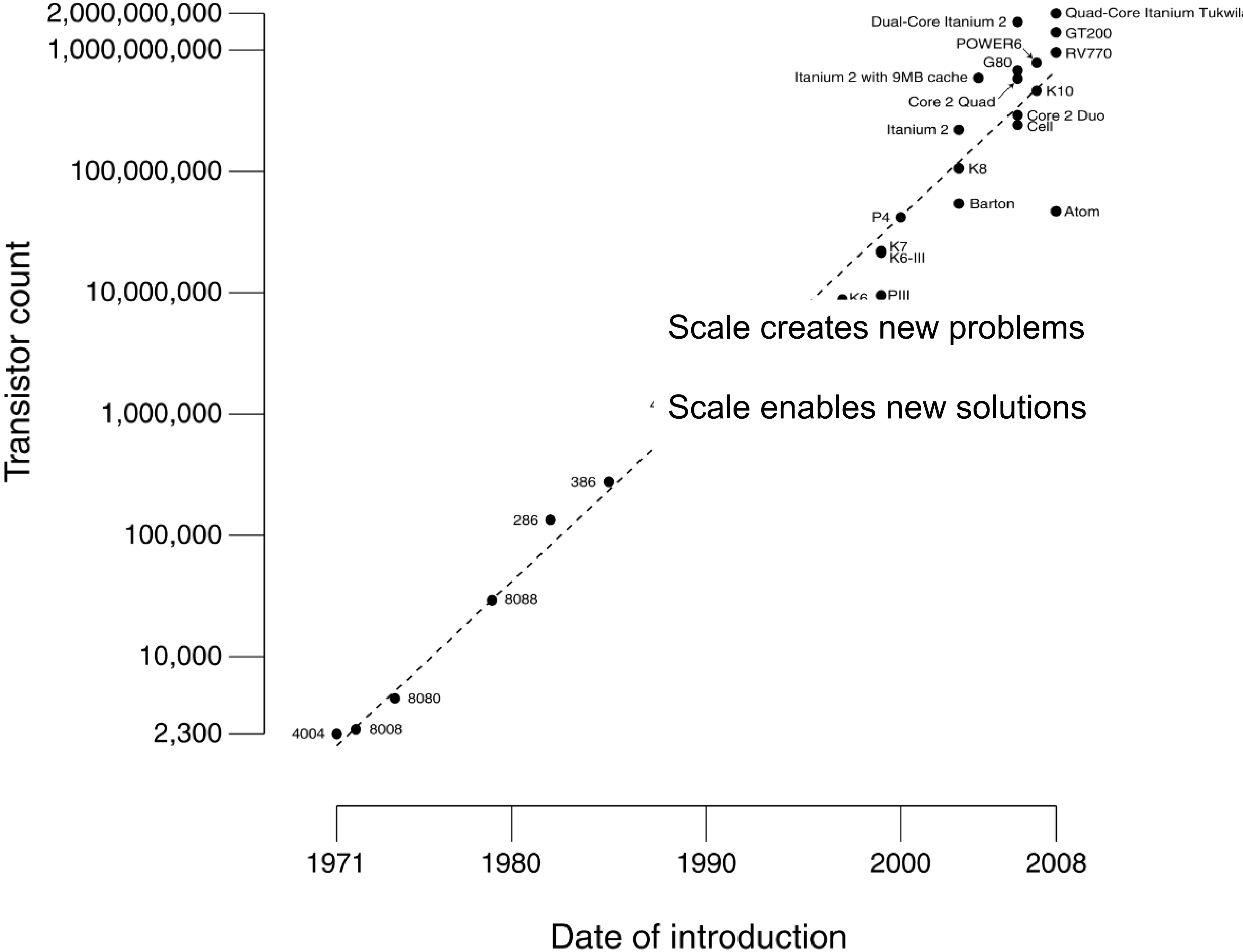
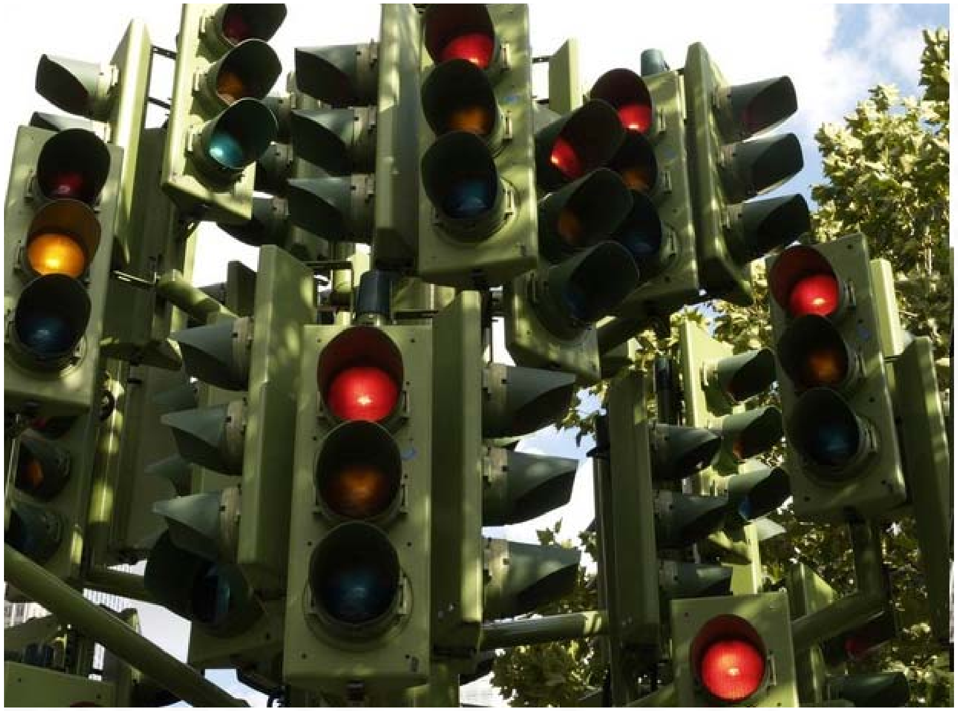


1971
1980
1990
2000
2008



Scale creates new problems

Scale enables new solutions



Scale creates new problems
  (even more when humans are involved)
Scale enables new solutions
  (even more when humans are involved)


UNDERGROUND
SUBWAY

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Physical Space
Phase-Space
Cyberspace

Physical Space

Electron-photomicrograph of a section through a chimpanzee lung cell culture (magnification 40,000)

Photo: Ronald J. Helmke, University of Texas Health Science Center, San Antonio, Texas.

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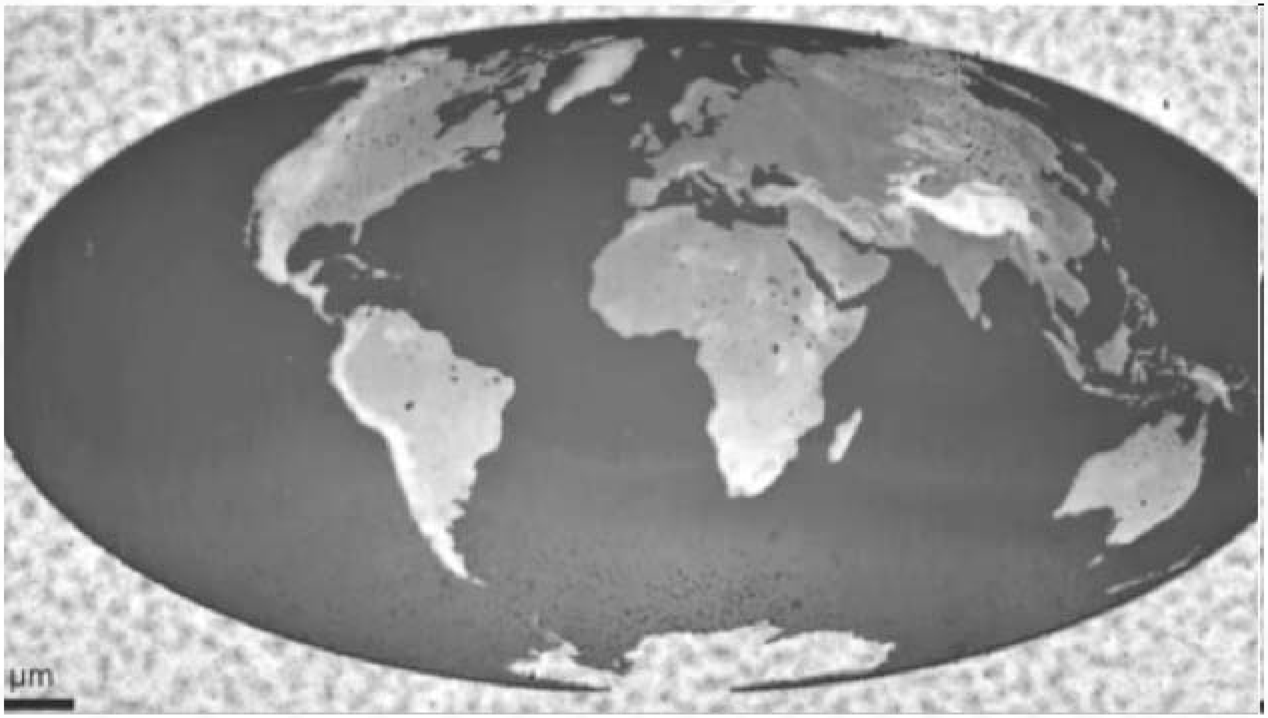
Physical Space



1000 of those maps would fit on a single grain of salt.

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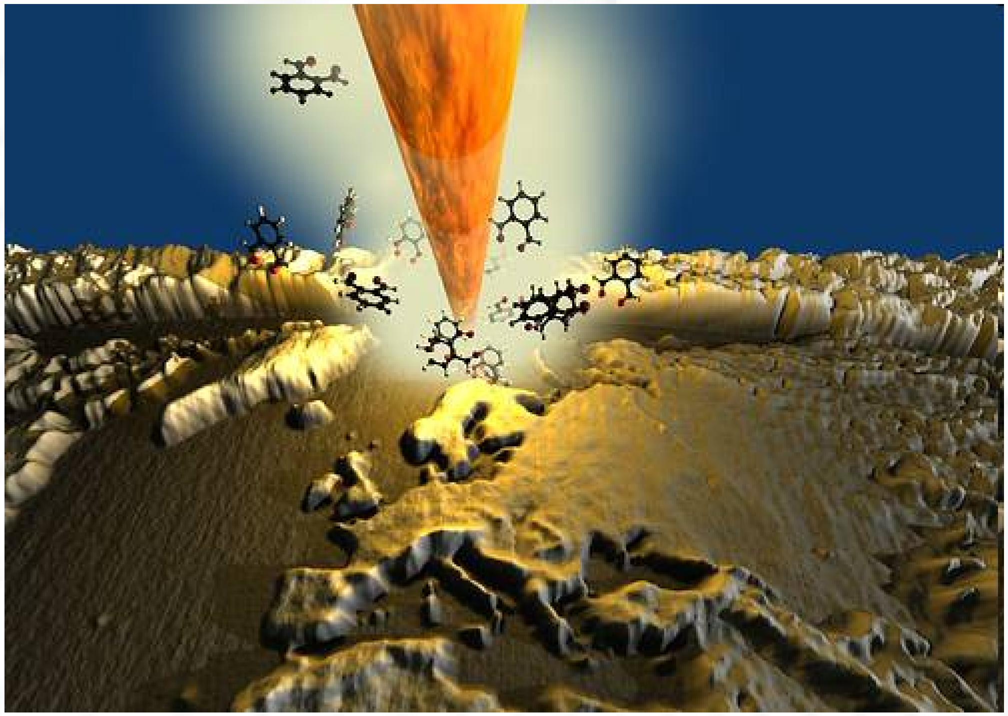
Physical Space

A heated nanoscale silicon tip chisels away material from a substrate to create that nanoscale 3D map of the world.



1000 of those maps would fit on a single grain of salt.

1 : 5,000,000,000 scale physical model of the Matterhorn (25nm high).

"Probe-based 3-D Nanolithography Using Self-Amplified Depolymerization Polymers" , by A. Knoll, D. Pires, O. Coulembier, P. Dubois, J. L. Hedrick, J. Frommer and U. Duerig , ***Advanced Materials***, April 23, 2010, DOI: 10.1002/adma. 200904386

Physical Space

10^{26} m

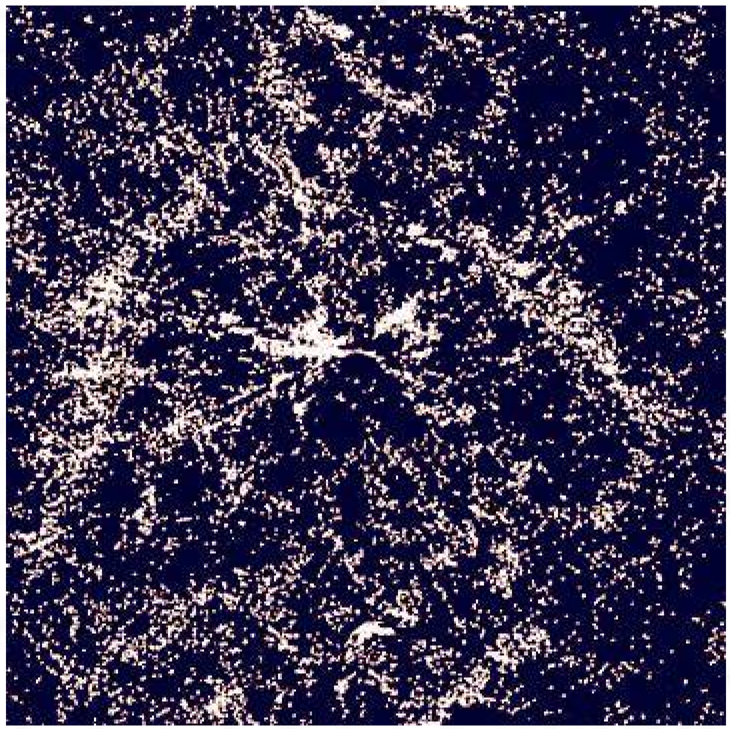


Photo courtesy CERN: http://microcosm.web.cern.ch/microcosm/P10/english/P26.html

Physical Space

Phase-Space

Cyberspace

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Physical Space

Phase-Space

Cyberspace

Physical Space

Phase-Space

Cyberspace

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Physical Space

Phase-Space

Cyberspace

- Internet
- The Web
- Wikipedia
- Google
- Direct Hit

Gary Culliss, Cambridge MA 1998

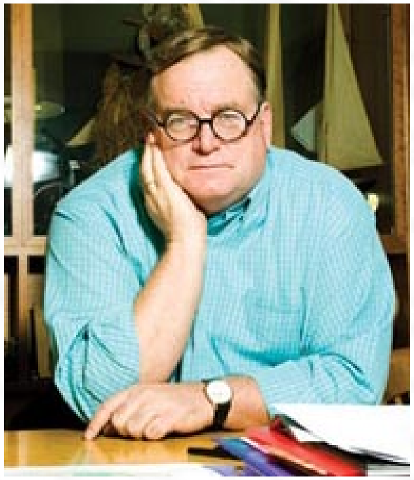
Don’t bother indexing pages’ text (!)

Search terms → Most popular choices

Physical Space
Phase-Space
Cyberspace

Information networks as archetypes for the design of buildings, neighborhoods, cities.

Eric Kuhne
CivicArts



"We convert circulation space into destination space"

"Plotting patterns of information volume, frequency, and velocity is the surest precursor to predicting a real estate boom".

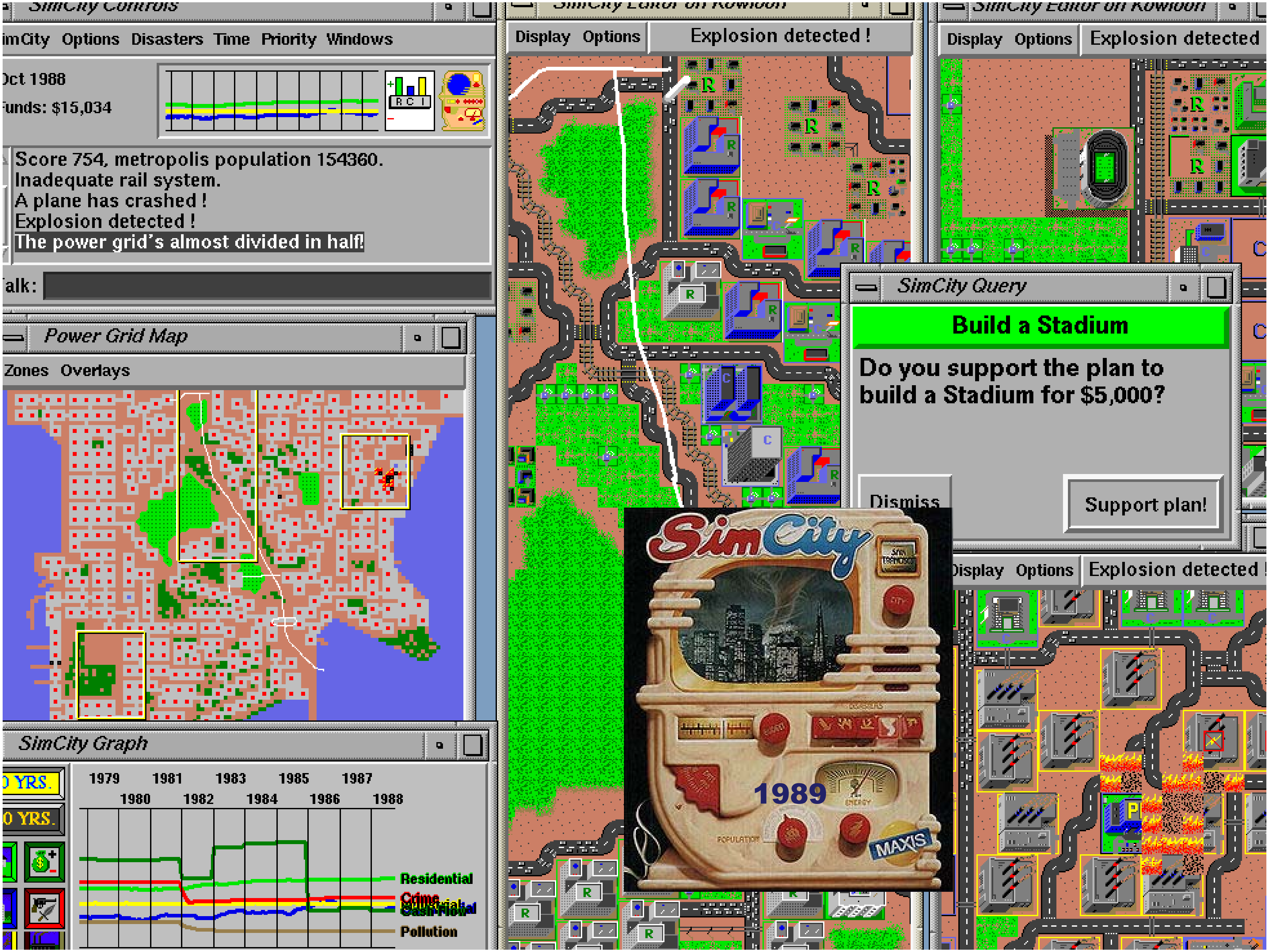
"Contemporary ideas of consumers will ultimately be revealed to be the new 'slavery' "

CIVICARTS

RIC · R · KUHNE · & · ASSOCIATES

"We convert circulation space into destination space"

Mohammed Bin Rashid Gardens



SimCity Controls
Options
Disasters
Time
Priority
Windows
Funds: $15,034
Score 754, metropolis population 154360.
Inadequate rail system.
A plane has crashed !
Explosion detected !
The power grid's almost divided in half!
Power Grid Map
Zones
Overlays
SimCity Graph
1979
1981
1983
1985
1987
1980
1982
1984
1986
1988
Residential
Pollution
Display
Options
Explosion detected !
SimCity Query
Build a Stadium
Do you support the plan to build a Stadium for $5,000?
Dismiss
Support plan!
Explosion detected
SimCity
1989
MAXIS

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Prof. Jonathan Payne,
Dept. of Geological and
Environmental Sciences,
Stanford University

Increasingly complex systems often find the "solution" of increasingly independent functionality.

This has unintended good and bad consequences.

As systems develop further, the lower level components lose their capability to function or even live on their own.

Gerry Pennell,
Chief Information Officer,
London Organizing Committee
for the Olympic Games

Scaling up infrastructure to support the 2012 Olympic Games: predicting and planning for the massive logistic, security, and communication problems.

“A modern event in a really old city!”

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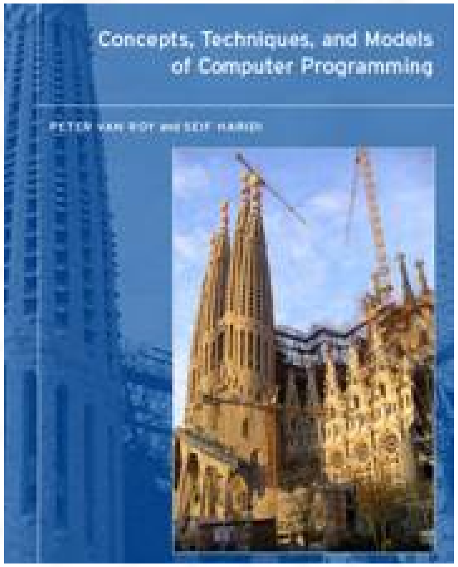
Peter Van Roy
Professor of Computing Science and Engineering,
Université Catholique de Louvain



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Peter Van Roy
Professor of Computing Science and Engineering,
Université Catholique de Louvain

Head of the EU SELFMAN project:
Self Management for Large-Scale Distributed Systems based on structured overlay networks and components

- Built structured peer-to-peer networks that survive in realistically harsh environments (with imperfect failure detection and network partitioning).

Incorporate ***hierarchies*** of feedback loops that monitor and correct for global system properties.
When correctly designed, such feedback structures interact weakly and in a well-defined way.

Inspiration from biological architectural solutions : The human respiratory system

Turning to the future:
Scalability and elasticity of cloud computing
Building large systems with phase transitions to different qualitative behaviors.

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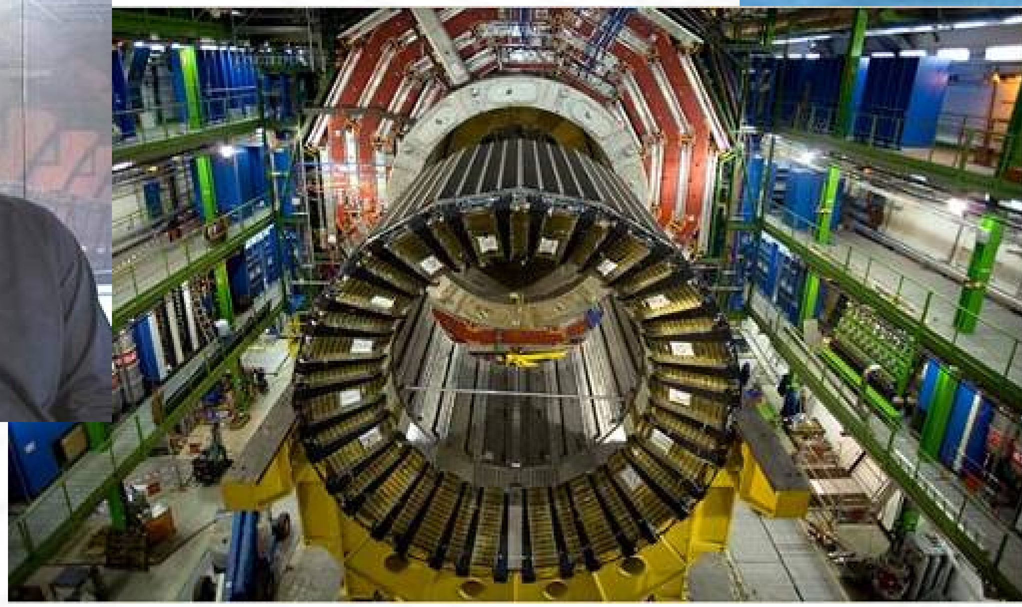
Wolfgang von Rüden,
Head, CERN openlab



Scale in distributed data analysis

In the past, it was bad enough: competing experiments (often competing nationalities) sharing CERN's centralized data services; but with the Large Hadron Collider, it's much worse, since CERN can only take care of 20% of the researchers' data mgmt needs.

Given our loose coupling between the partners and the lack of political will to send money from one country to another, we ended up with a totally distributed solution involving nearly 200 data centers of all sizes and qualities. Scaling problems are therefore bigger than necessary. Anyway, we managed to make it work, by making the global computing infrastructure (grid) into a collaboration as well, one that operates very much like the experiments do.

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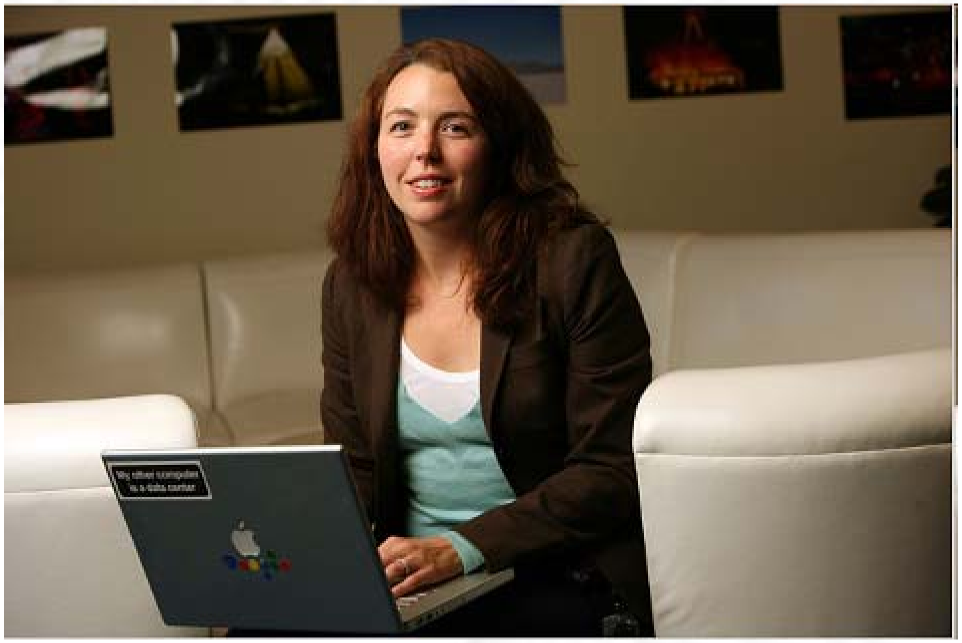


Carrie Grimes Bostock,
Senior Staff Engineer, Search Infrastructure,
Google

How rare event behavior affects scale

"Lot of things that people think about statistics are wrong. Such as the assumption that the more data, the better."

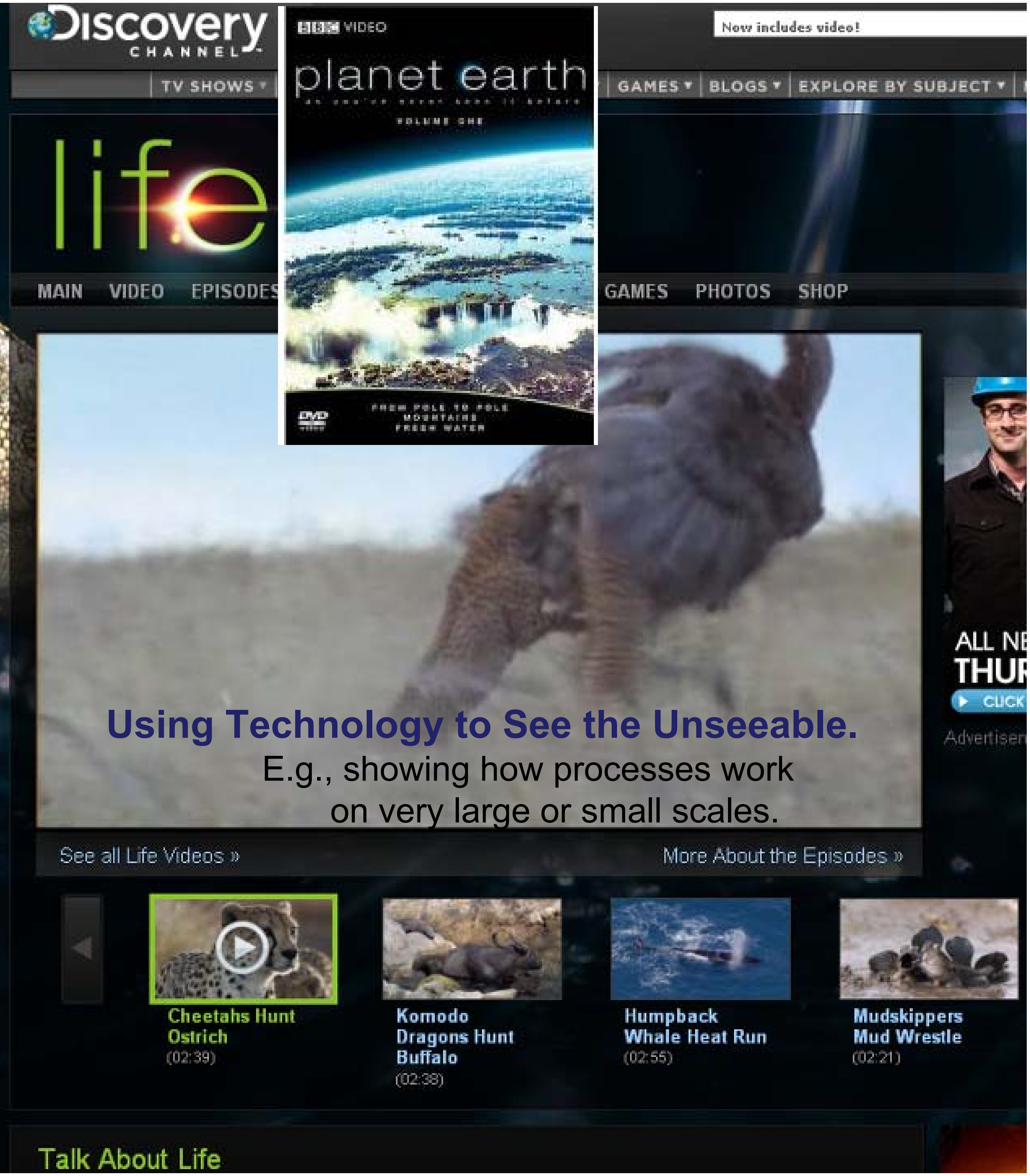
In terms of scaling systems, really rare events matter: user clicks, data corruption, etc. have a very long tail.

As systems scale:

1) brittle system design – one event can cause a strange failure and can kill overall performance of the system.
2) each rare event is, well, rare, but the number of things that fall into that "rare" category can grow quite large.
3) how can we estimate the fraction of rare event ***types*** we have versus haven't seen ***at all*** yet?

With distributed systems in particular, how do we assess the need to plan for rare events, and how do we do it?

Michael Gunton,
Executive Producer,
BBC Natural History Unit



Using Technology to See the Unseeable.

E.g., showing how processes work on very large or small scales.

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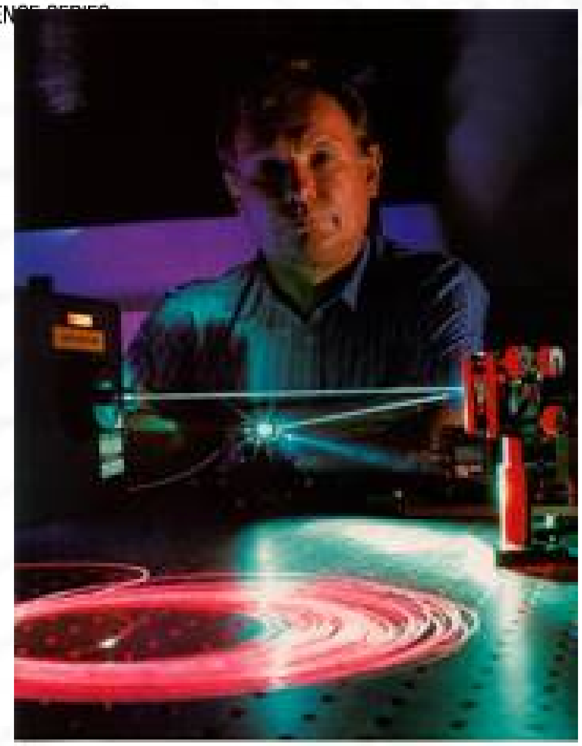
John Beddington
Chief Scientific Adviser, UK Government
Chairman, Defence Scientific Advisory Committee (MoD)
Fellow of the Royal Society
Prof. Applied Population Biology, Imperial College London

The Economics and Biology of global food, water, and energy issues

- Paths and potentials for global food and energy shortages.
- What all that means for world stability.



David Payne
Director, Optoelectronics Research Centre
University of Southampton

Scale and scaling of optical fiber networks and bandwidth

Developed the world's first practical optical amplifier, the Erbium-Doped Fibre Amplifier (EDFA) which forms the backbone of the World Wide Web and has made possible an explosive growth in the internet through its ability to transmit and amplify vast amounts of data.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boingboing
A Directory of Wonderful Things
bbGADGETS
bbVIDEO
ARCHIVES
SUBSCRIBE
MARK
CORY
DAVID
How are you coping with collapse-anxiety?
POSTED BY CORY DOCTOROW, FEBRUARY 17, 2009 11:53
Scroogled
Google
BIG BROTHER IS WATCHING YOU.
WHO'S WATCHING BACK?
LITTLE BROTHER
CORY DOCTOROW
"A rousing tale of techno-geek rebellion."
SCOTT WESTERFELD,
DOWN and OUT in the Magic Kingdom
Cory DOCTOROW
Someone Comes to Town, Someone Leaves Town
CORY DOCTOROW

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Francesco Caio
Vice Chairman, Nomura International

Opportunities for scalable deployment of next generation Internet access

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Dave Cliff
Director, UK Large-Scale Complex IT Systems Initiative

Scale and scaling of software in large, complex IT systems

ZIP: superhuman performance at trading, automated design of market mechanisms.

Factoring a system's life-cycle into discrete phases is often too extreme an over-simplification.

Designing for detecting and ameliorating failures rather than striving to design such events away

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Prof. Raissa D'Souza
Dept. Mechanical Engineering and Computer Science
University of California, Davis

Growth and Phase Transitions In Isolated and Interacting Networks

Some micro-level properties turn out, surprisingly, to cause macro-level network properties such as:

- Preferential attachment (as the network grows, the rich nodes get richer)
- The sudden emergence of large-scale connectivity (a sort of “phase transition”)
- Interactions across ***n*** different types of networks ***catalyze*** those macro-level phase transitions

MATTERS OF SCALE

July 20–21, 2010
London, England

VENUE
Park Plaza Riverbank London
CLICK HERE
FOR HOTEL INFORMATION

FIELD TRIP
IMPERIAL COLLEGE LONDON INSTITUTE FOR BIOMEDICAL ENGINEERING (IBE)
July 22, 2010

TOUR INFORMATION
CLICK HERE FOR INFORMATION ABOUT LONDON TOURS

REGISTER HERE
BY JUNE 14, 2010

TOPICS INCLUDE:
- Quality at scale
- Failure and recovery
- Designed and evolved scalability
- Limits to scale
- Reliability and resilience
- Complex systems
- "Good enough" solutions
- Breaking points and bottlenecks
- Cloudscale

CONFERENCE OVERVIEW

We attempt to conquer issues of scale in surprising ways. Nonetheless, scale breaks down in all systems. The problem of getting to scale is compounded by the need to simultaneously achieve scale in multiple interconnected systems. At this conference, we'll look at the broad context of scale and seek out suitable design methods and measures concerned with scalability and complexity. We'll address the trade-off between designed and evolved systems, and their interplay, limitations, and failure and recovery mechanisms.

What are the components, necessary parameters, and conditions of scale? Can we cope with, measure, model, or even envision large, complex systems? How do we know we have achieved scalability?

Today, we build systems and networks on a scale that rival those of Mother Nature without the wisdom she's honed over 3.5 billion years. We sometimes forget that issues of scale also occur in nano worlds. Saying that a system scales usually means we haven't found its break points or pushed it hard enough. Continued growth and sustainability, combined with reliability and resilience, are at the very core of scale.

In large, deeply intermingled and intertwined systems, we can rarely predict the cascade effects of systemwide or even single-node failure. If the threat of failure is always present, can we develop escape plans, and how do we recover? In system design, we can choose between over-engineering, proportional engineering, or a solution that is "good enough." Can we simulate enough about the behavior of a system to give us the insights we need? Should we look to biology for inspiration? Should we just let systems evolve?

Spanning the movement of people and goods through electronic networks, social networks, and physical systems will add hidden complexity. For very large networked and nonlinear systems, we will need to apply artificial intelligence and artificial life to help us understand the criticalities and implications of potential solutions. What will happen when we include AI and AL, where things negotiate and decide independently, and how will this scale? Our linear brains must be able to deal with the complex,

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