“My Remembrances of Mike Norman Over The Last 45 Years”

SDSC Presentation

June 16, 2021

Dr. Larry Smarr

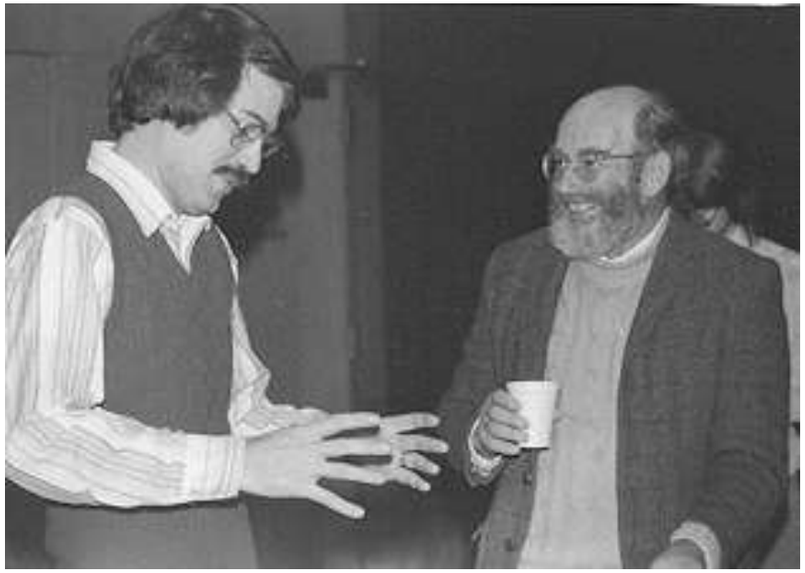
Founding Director Emeritus, California Institute for Telecommunications and Information Technology;

Distinguished Professor Emeritus, Dept. of Computer Science and Engineering

Jacobs School of Engineering, UCSD

http://lsmarr.calit2.net

Jim Wilson –
Our Computational Astrophysics Mentor







1982

The Max-Planck Institute Years
Early 1980s

Physica 12D (1984) 83–106
North-Holland, Amsterdam

1.2. GASES

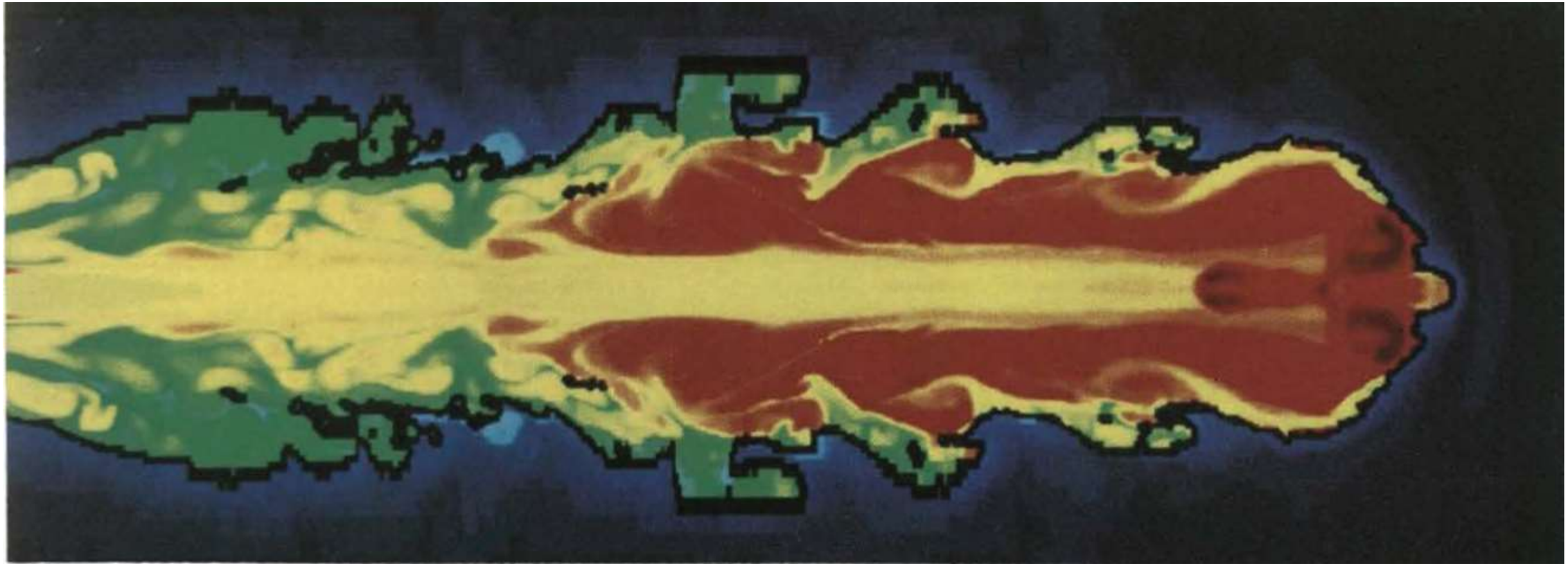
SHOCKS, INTERFACES, AND PATTERNS IN SUPERSONIC JETS

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and

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Max-Planck-Institut für Physik und Astrophysik, Institut für Astrophysik, 8046 Garching bei München, Fed. Rep. Germany

Our Cosmic Jet Simulations



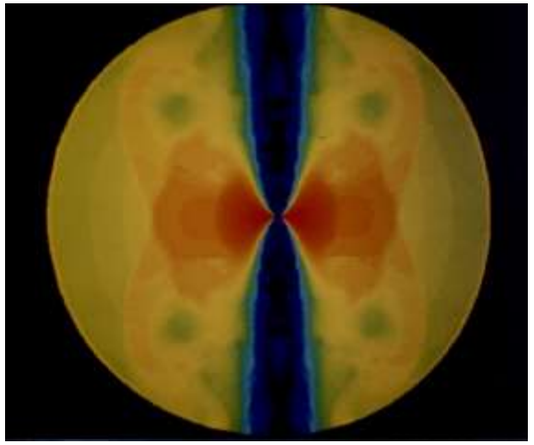
Discussions with Mike and Karl-Heinz in Munich Encouraged Me to Write This Underground Classic in 1982

THE SUPERCOMPUTER FAMINE IN AMERICAN UNIVERSITIES

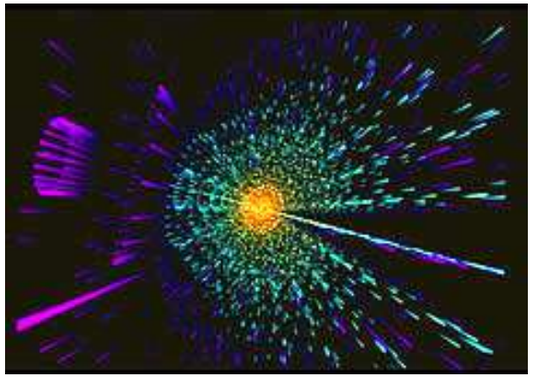
by

Larry L. Smarr

NCSA Numerical Astrophysics Group
Used NCSA Supercomputers to Explain Cosmic Phenomena



Gas Accretion Onto a Black Hole
Creates “Exhaust Channels”



Collision of Neutron Stars

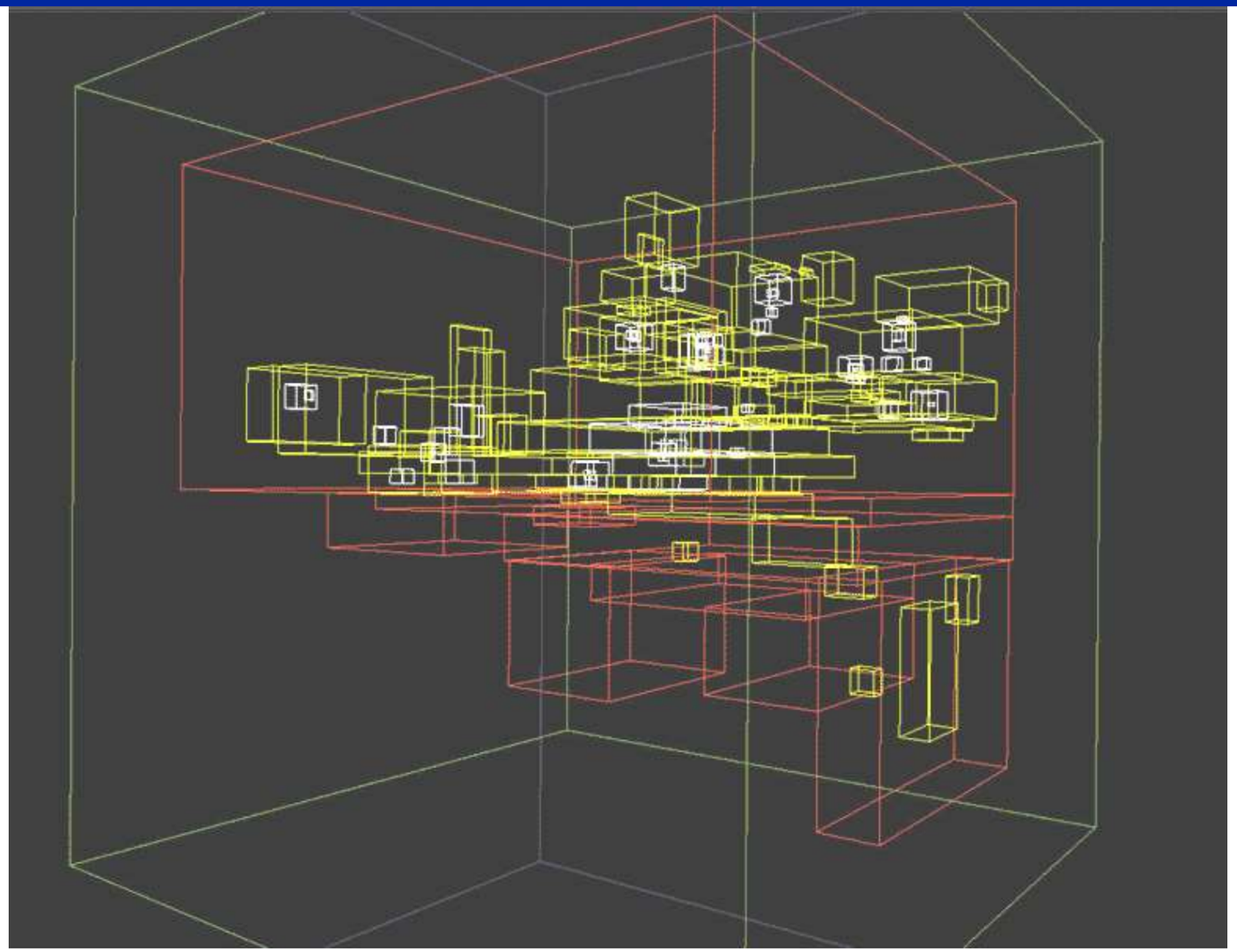


Mike Norman, Charles Evans, Roger Ove, John Hawley,
Dean Sumi, Rob Wolff, Larry Smarr



Cosmic Jets
Emerge from
Galactic Centers

Mike's Use of Shared Memory Adaptive Grids To Achieve Dynamic Load Balancing in the Mid-1990s



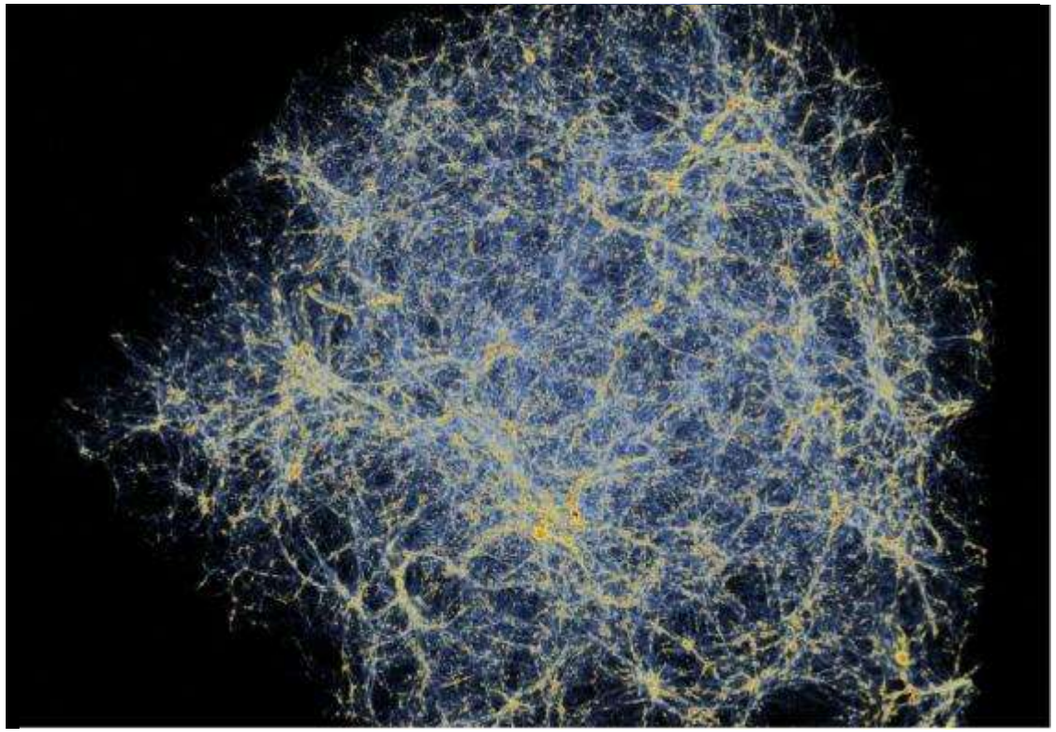
64x64x64 Run with Seven Levels of Adaption on SGI Power Challenge, Locally Equivalent to 8192x8192x8192 Resolution

Source: Greg Bryan, Mike Norman, John Shalf, NCSA

Exploring Cosmology With Supercomputers, Supernetworks, and Supervisualization

Source: Mike Norman, SDSC

Intergalactic Medium on 2 GLyr Scale

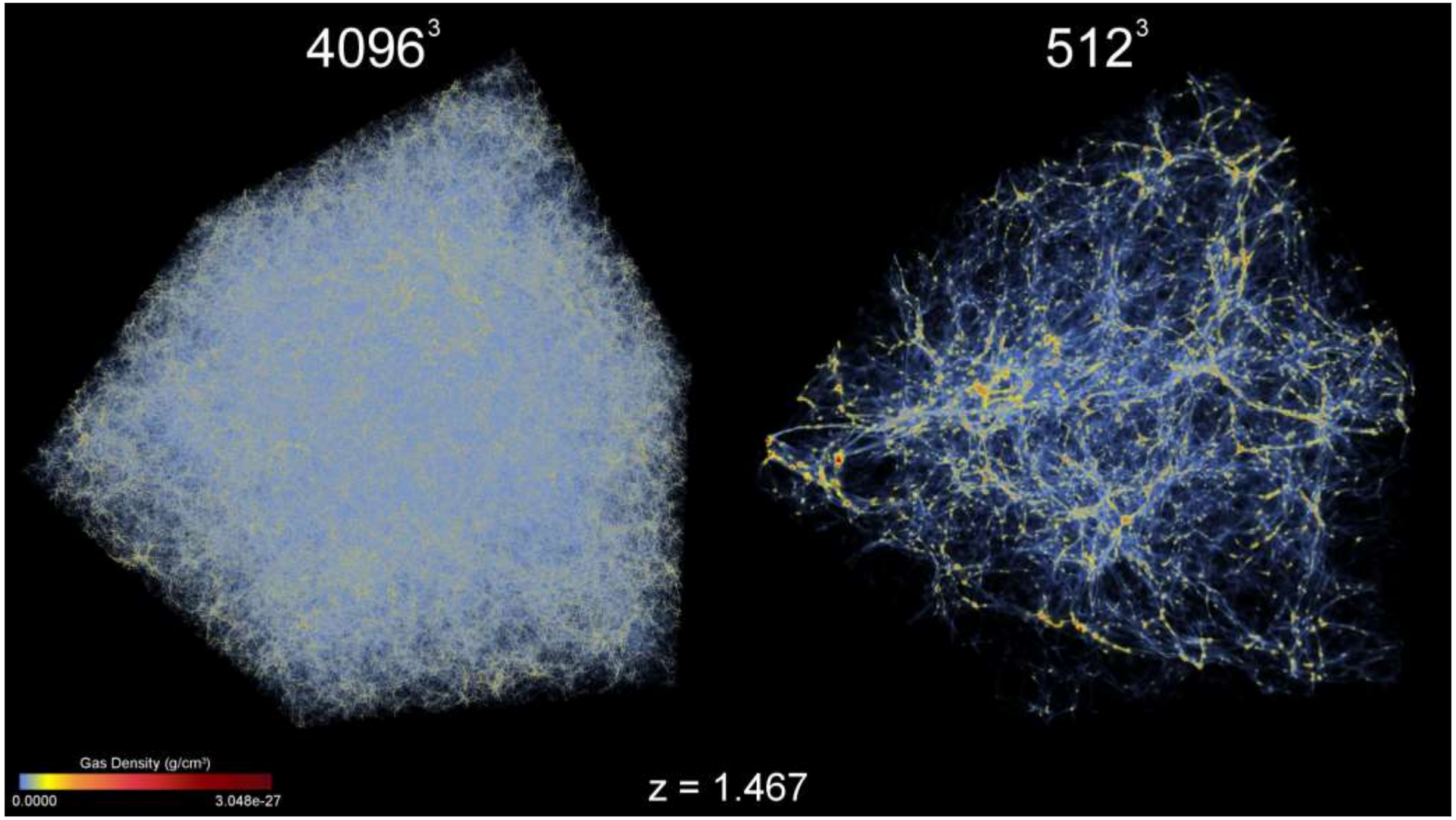


Science: Norman, Harkness,Paschos SDSC
Visualization: Insley, ANL; Wagner SDSC

- **4096^3 Particle/Cell Hydrodynamic Cosmology Simulation**
- **NICS Kraken (XT5)**
  - **16,384 cores**
- **Output**
  - **148 TB Movie Output (0.25 TB/file)**
  - **80 TB Diagnostic Dumps (8 TB/file)**

- **ANL * Calit2 * LBNL * NICS * ORNL * SDSC**

Enormous Detail in Simulation:
Full Simulation with Blowup of a 1/512 Subcube



Using Supernetworks to Couple End User to Remote Supercomputers and Visualization Servers

Source: Mike Norman, Rick Wagner, SDSC

Demoed SC09

Argonne NL

DOE Eureka
100 Dual Quad Core Xeon Servers
200 NVIDIA Quadro FX GPUs in 50 Quadro Plex S4 1U enclosures
3.2 TB RAM



Real-Time Interactive Volume Rendering Streamed from ANL to SDSC

ESnet
10 Gb/s fiber optic network

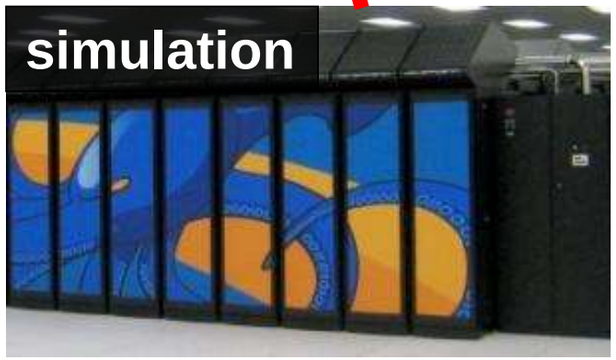
SDSC



Calit2/SDSC OptIPortal1
20 30” (2560 x 1600 pixel) LCD panels
10 NVIDIA Quadro FX 4600 graphics cards > 80 megapixels
10 Gb/s network throughout

NICS ORNL

NSF TeraGrid Kraken
Cray XT5
8,256 Compute Nodes
99,072 Compute Cores
129 TB RAM



*ANL * Calit2 * LBNL * NICS * ORNL * SDSC
www.calit2.net/newsroom/release.php?id=1624

Interactive Analysis of Time Evolving Cubes of Data: Cosmological Supercomputer Simulations

SDSC
SAN DIEGO SUPERCOMPUTER CENTER

- **Create an "End-to-End" 10Gbps Workflow**
- **Explore Use of OptIPortals as Petascale Supercomputer "Scalable Workstations"**
- **Exploit Dynamic 10Gbps Circuits on ESnet**
- **Connect Hardware Resources at ORNL, ANL, SDSC**

- **ANL * Calit2 * LBNL * NICS * ORNL * SDSC**

