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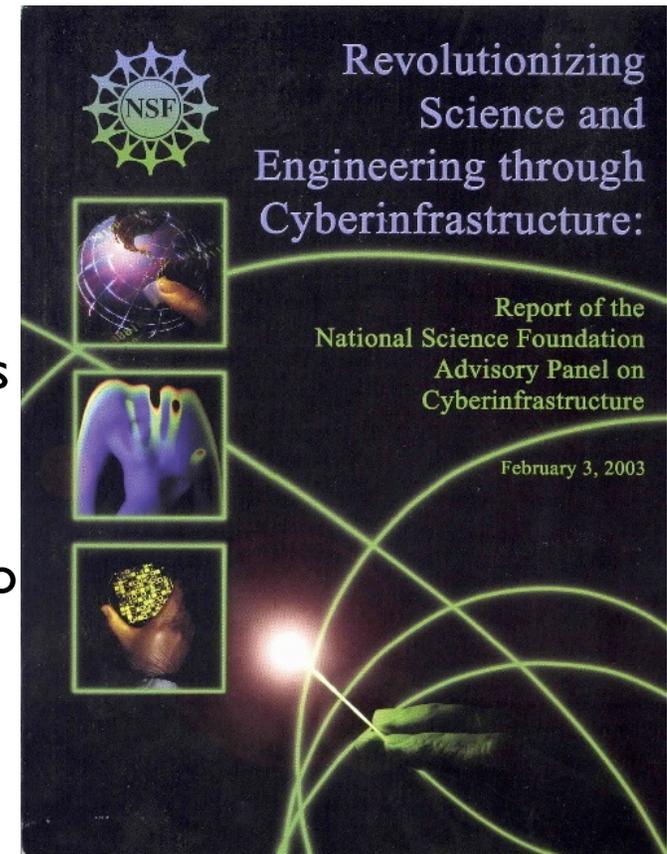
# SI 640 Digital Libraries and Archives

Week 8 – Cyberinfrastructure

Dan Atkins and Paul Conway, contributors

# NSF Blue Ribbon Advisory Panel on Cyberinfrastructure

“a new age has dawned in scientific and engineering research, pushed by continuing progress in computing, information, and communication technology, and pulled by the expanding complexity, scope, and scale of today’s challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive “cyberinfrastructure” on which to build new types of scientific and engineering knowledge environments and organizations and to pursue research in new ways and with increased efficacy.”

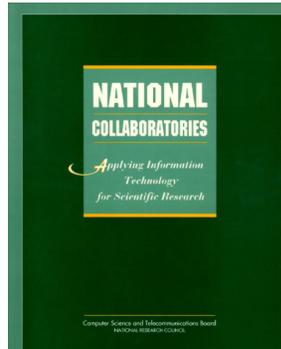


- <http://www.cise.nsf.gov/sci/reports/toc.cfm>

# Terms

- *Cyberinfrastructure*
  - *infrastructure*
  - *cyber*
- *Cyberinfrastructure-enabled*
  - *knowledge communities (CKCs)*
  - *learning, research, engagement*

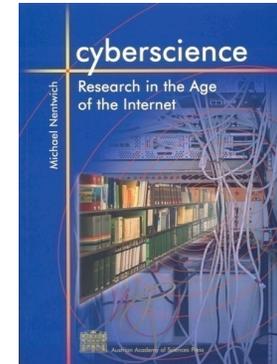
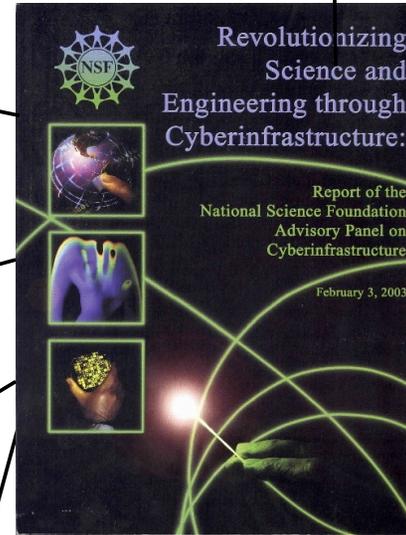
# Converging Streams of Activity



Collaboratories

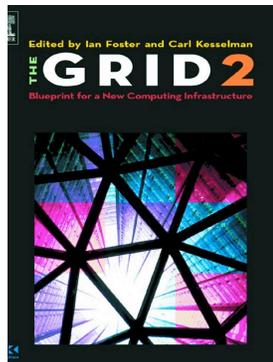
Home Land Security

<http://web.calit2.net/RiskReduction/index.html>



Cyberscience  
ACLS Panel

GRIDS (broadly defined)



2nd Edition  
[www.mkp.com/grid2](http://www.mkp.com/grid2)

Removed logo of  
e-Science  
<http://www.nesc.ac.uk/>



IT & Future of Higher Education

Science-driven pilots (not using above labels)

# Cyberinfrastructure Goals

- More applications, capabilities, efficiency
- Reuse and multiple-use of designs; capture of commonality
- Spread of best practice
- Achieving interoperability
- Provision of tools and services
- Shared facilities
- Assistance and expertise

**Networked Information  
(Knowledge) Society**

**Cyberinfrastructure-Enabled Knowledge  
Communities (CKCs)**

**Global Cyberinfrastructure**

**Global Information Infrastructure**

**Other**

**R&D, Deployment of Digital Libraries**

Institutions:  
Libraries  
Archives  
Museums

Visions &  
Needs of  
Individuals,  
Communities)

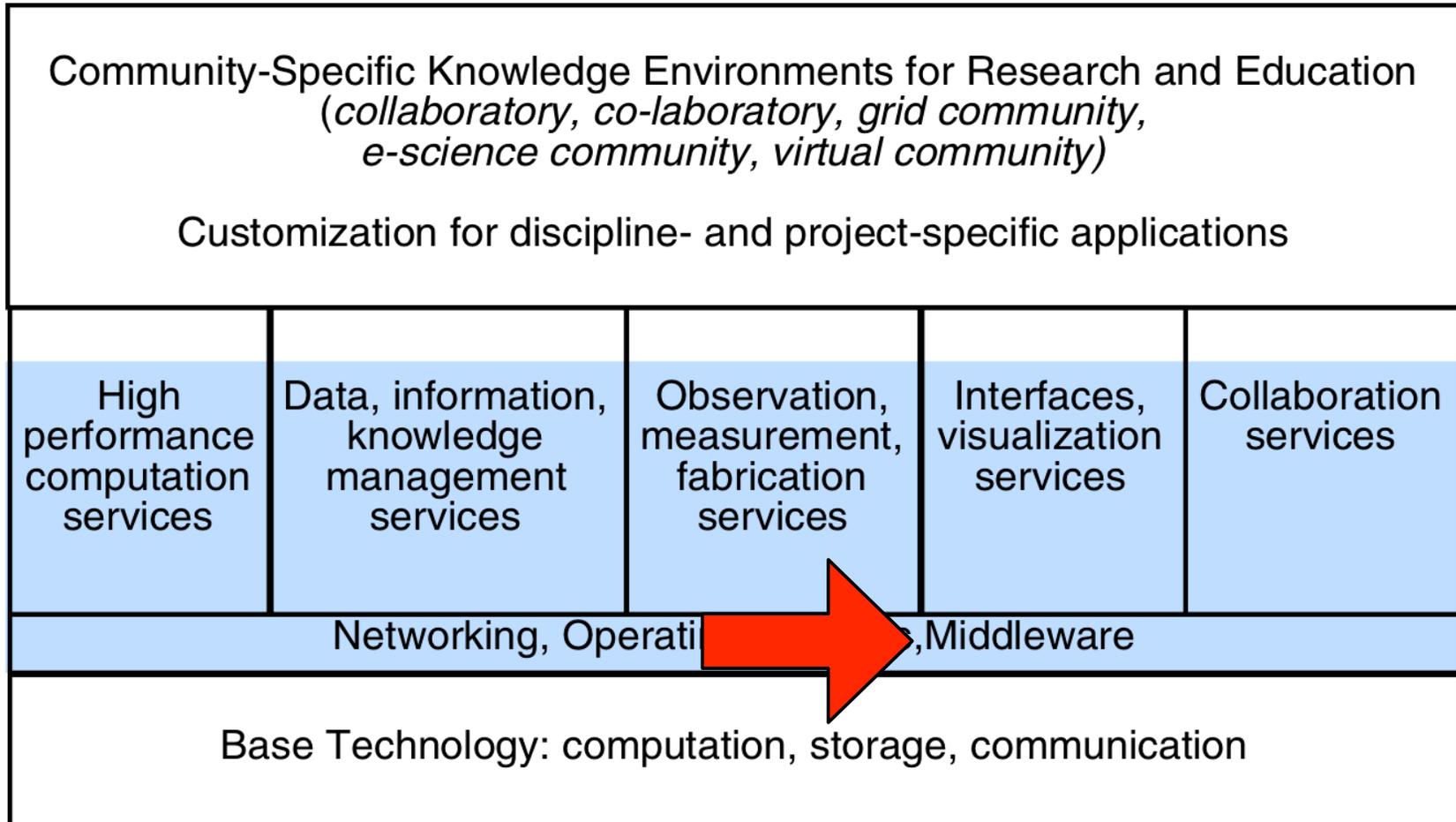
Application of  
Distributed  
Computing

**Digital Information & Communication Technology  
(electro-optical-magnetic)**

# Some Names for CKCs

- Co-laboratory, Collaboratory
- Grid Community
- e-X Community (as in e-science)
- Cyber-X Community (as in cyberscience)
- Community Gateways or Portals
- Virtual Community, Virtual Organizations, e.g. (Inter) National Virtual Observatory

# Cyberinfrastructure

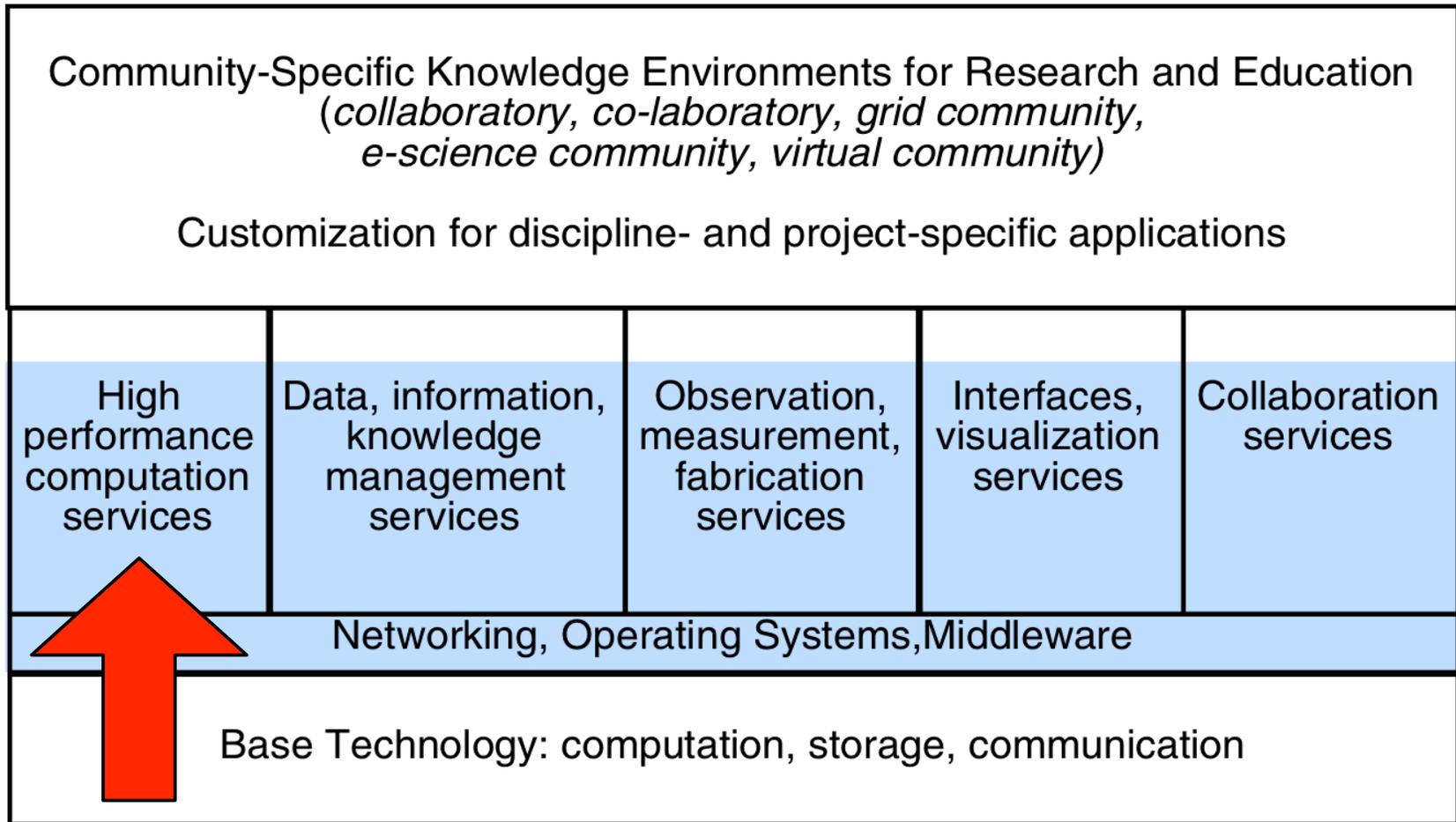


 = cyberinfrastructure: hardware, software, services, personnel, organizations

# Core Middleware

- **Identity and Identifiers** – namespaces, identifier crosswalks, real world levels of assurance, etc.
- **Authentication** – campus technologies and policies, interrealm interoperability via PKI, Kerberos, etc.
- **Directories** – enterprise directory services architectures and tools, standard objectclasses, interrealm and registry services
- **Authorization** – permissions and access controls, delegation, privacy management, etc.
- **Integration Activities** – open management tools, application of virtual, federated and hierarchical trust, enabling common applications with core middleware

# Cyberinfrastructure



 = *cyberinfrastructure: hardware, software, services, personnel, organizations*

# Japanese Earth Simulation Center

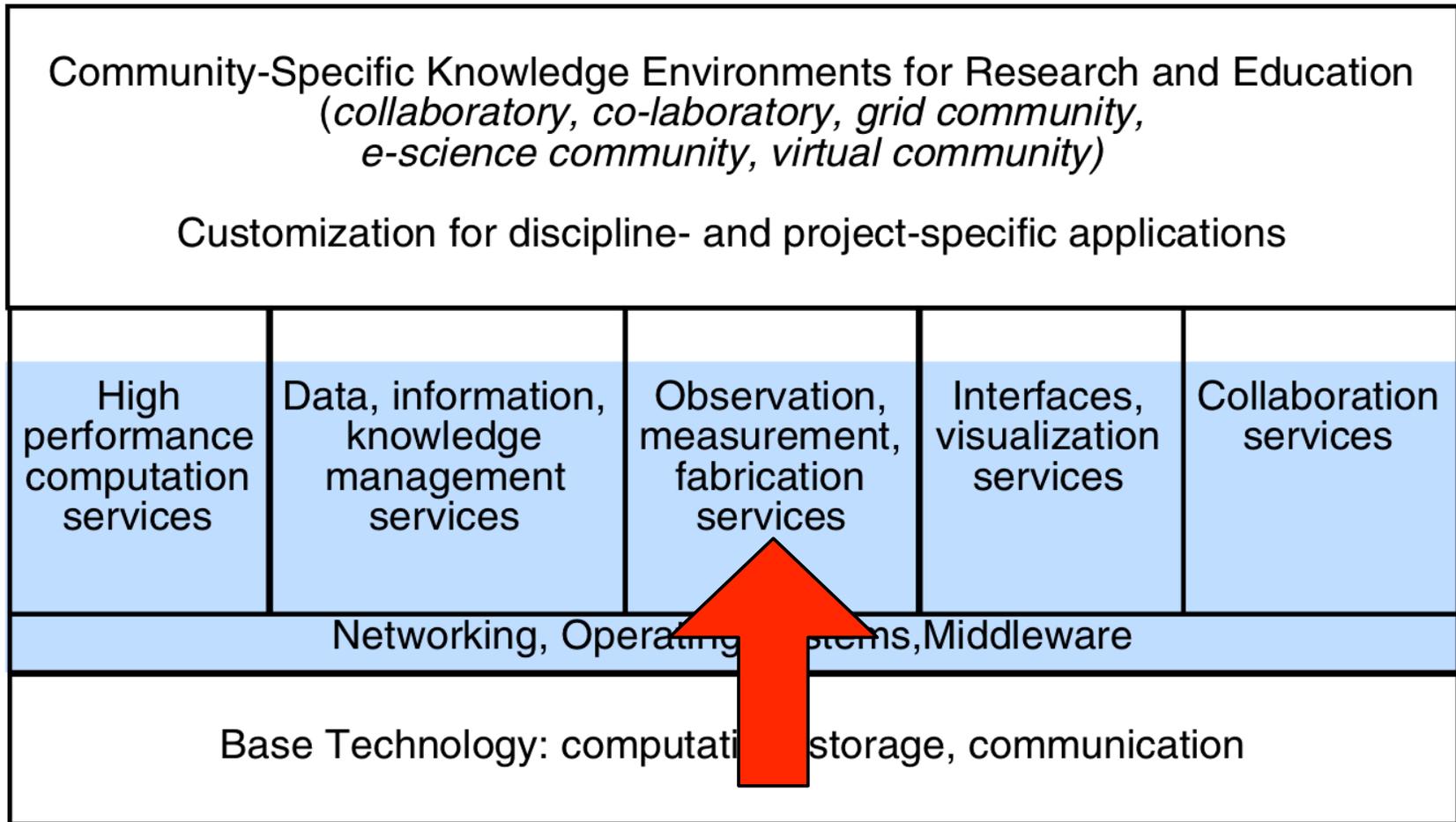
Removed images produced by the  
Japanese Earth Simulation Center

# Virginia Tech Terascale Cluster (1,100 Mac G5s)

Removed images of the  
computer cluster at Virginia Tech

[http://computing.vt.edu/research\\_computing/terascale/](http://computing.vt.edu/research_computing/terascale/)

# Cyberinfrastructure



 = cyberinfrastructure: hardware, software, services, personnel, organizations

# NEESgrid

## Earthquake Engineering Collaboratory

Removed image that represented  
the structure of the grid.

# Embedded Sensors: R&D and Use

Removed trademarked  
logos

**Ocean Research Interactive  
Observatory Networks**

<http://www.cens.ucla.edu/index.html>

**National Ecological  
Observatory Network  
(NEON)**

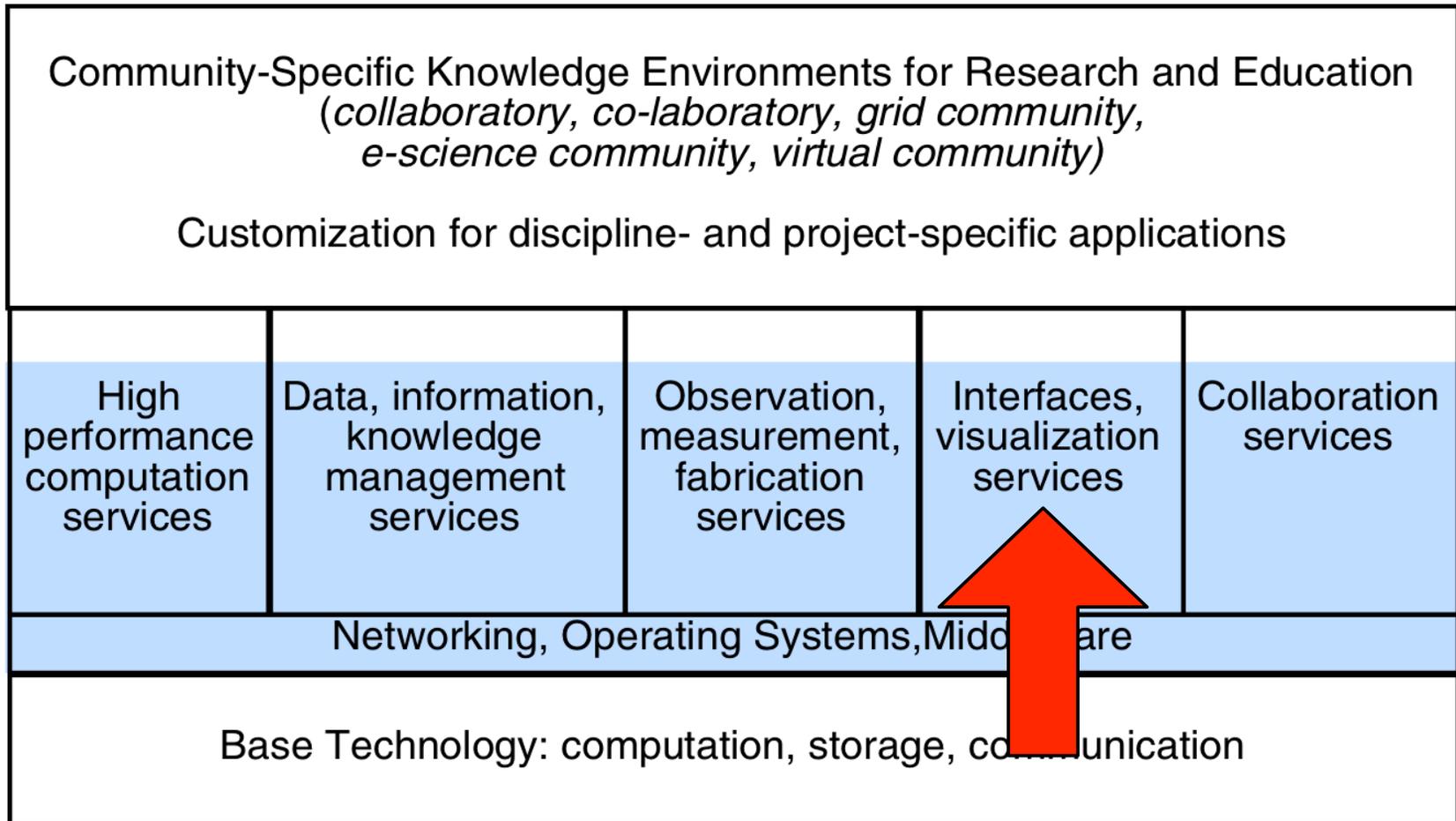
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trademarked  
logos

[http://www.coreocean.org/Dev2Go.web?  
Anchor=orion\\_home\\_page&rnd=17953](http://www.coreocean.org/Dev2Go.web?Anchor=orion_home_page&rnd=17953)

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logos

<http://www.nsf.gov/bio/neon/start.htm>

# Cyberinfrastructure



 = cyberinfrastructure: hardware, software, services, personnel, organizations

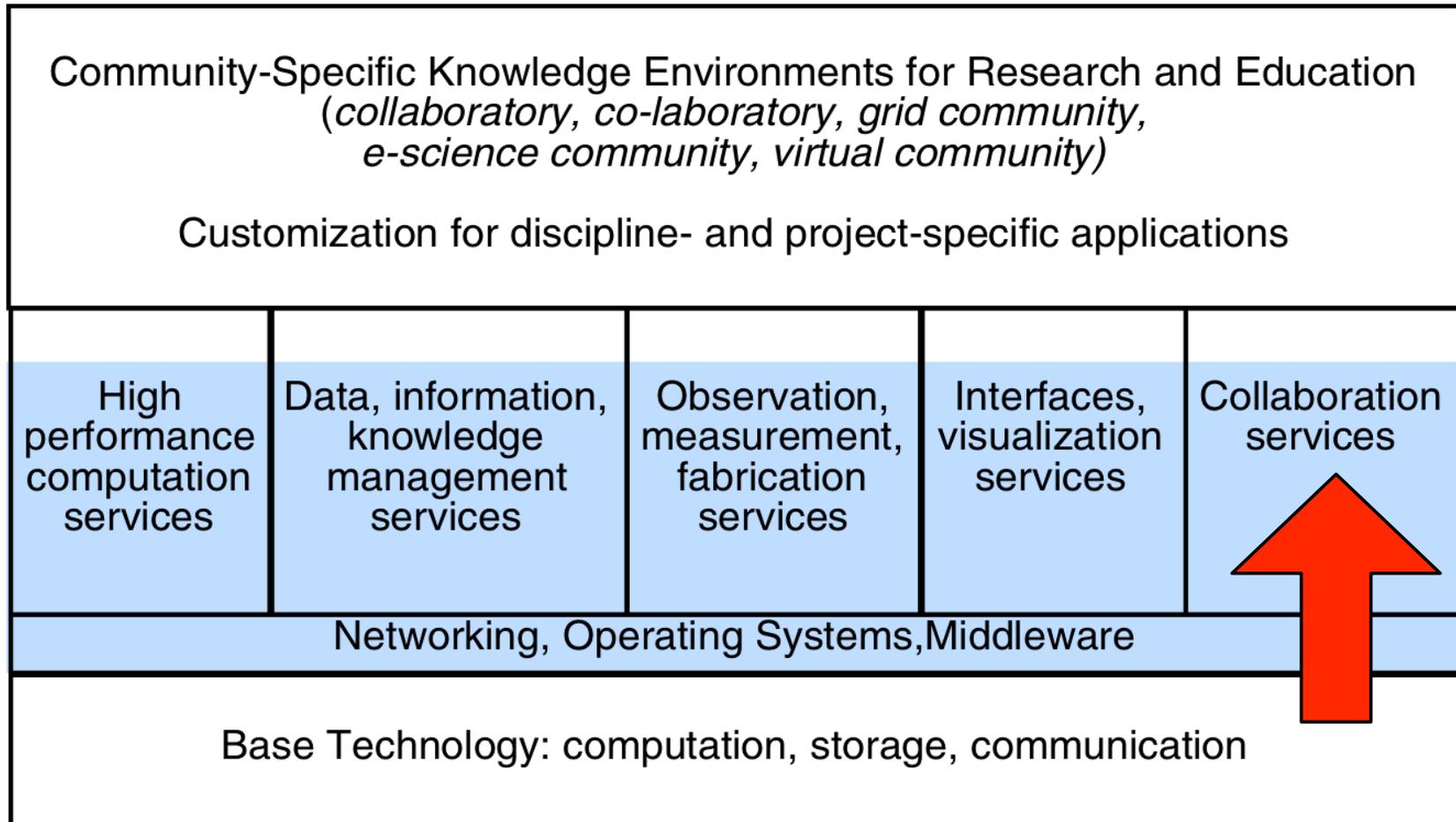
# Electronic Visualization Lab

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Tele-Immersive Collaboration  
in the CAVE Research Network

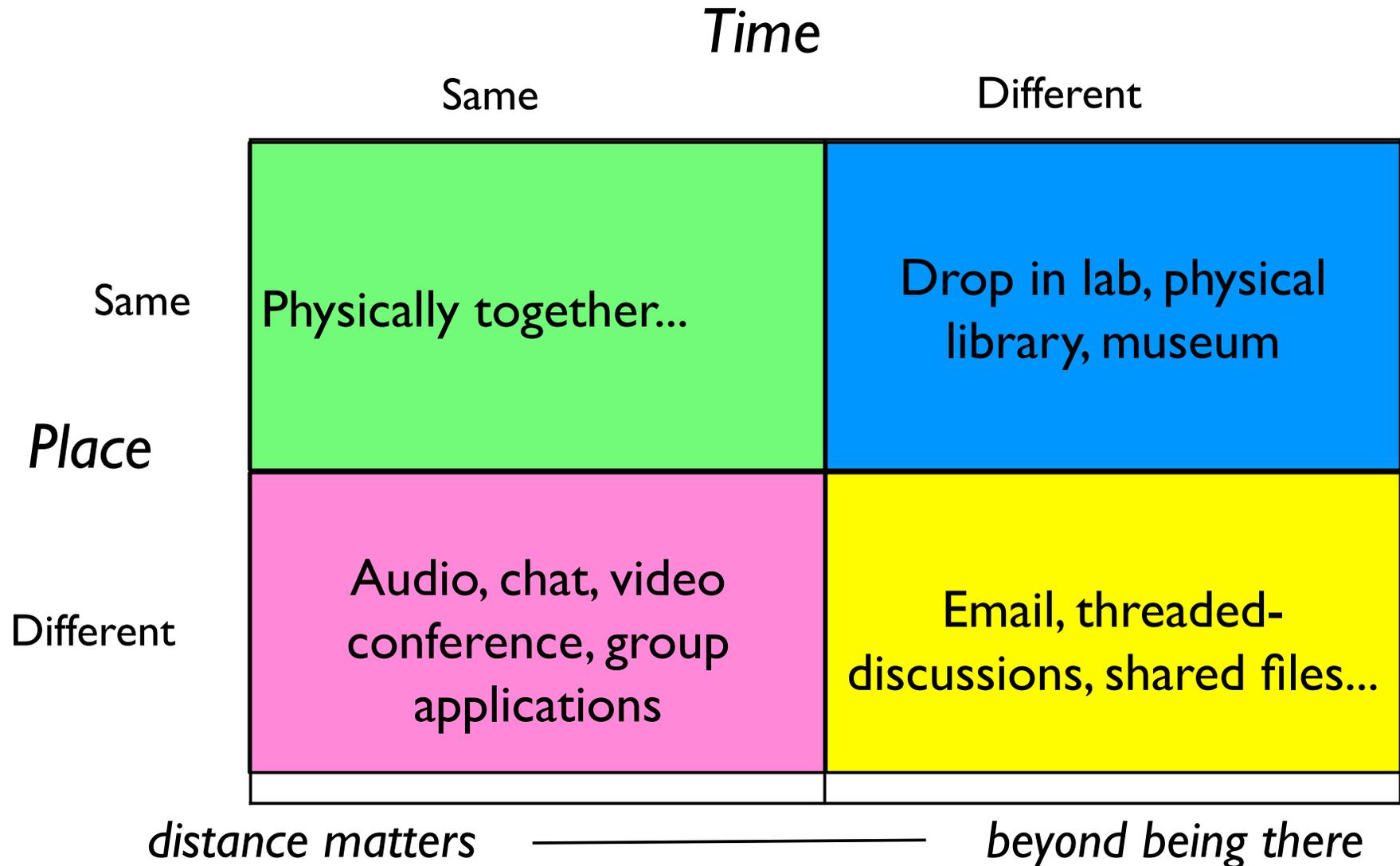
Removed photographs of  
the Lab.

# Cyberinfrastructure

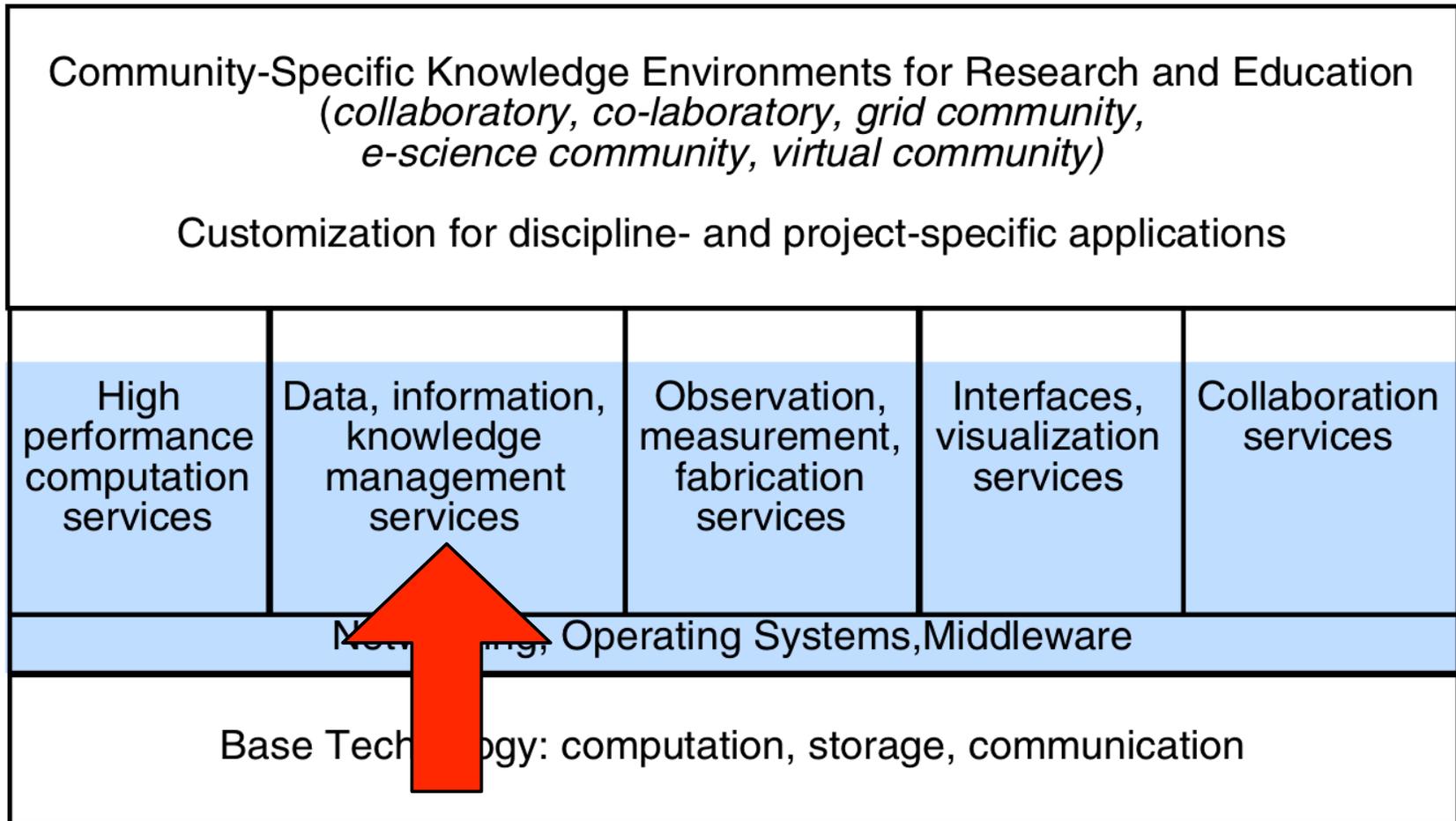


 = cyberinfrastructure: hardware, software, services, personnel, organizations

# Time-Space Collaboration



# Cyberinfrastructure



 = cyberinfrastructure: hardware, software, services, personnel, organizations

# Information Services for CKCs

- Online access to complete credentialled, archival literature.
- Stewardship and curation services for enormous collections of scientific data.
- Digital repositories for diverse digital objects as instructional material and works in progress.
- Digitized special collections.
- More continuous (vs. batch) and open forms of scholarly communication.
- Individual and community customization information services.

# Cyberinfrastructure is a First-Class Tool for Science



Atacama  
Large  
Millimeter/  
submillimeter  
Array

UCIRVINE | UNIVERSITY  
of CALIFORNIA



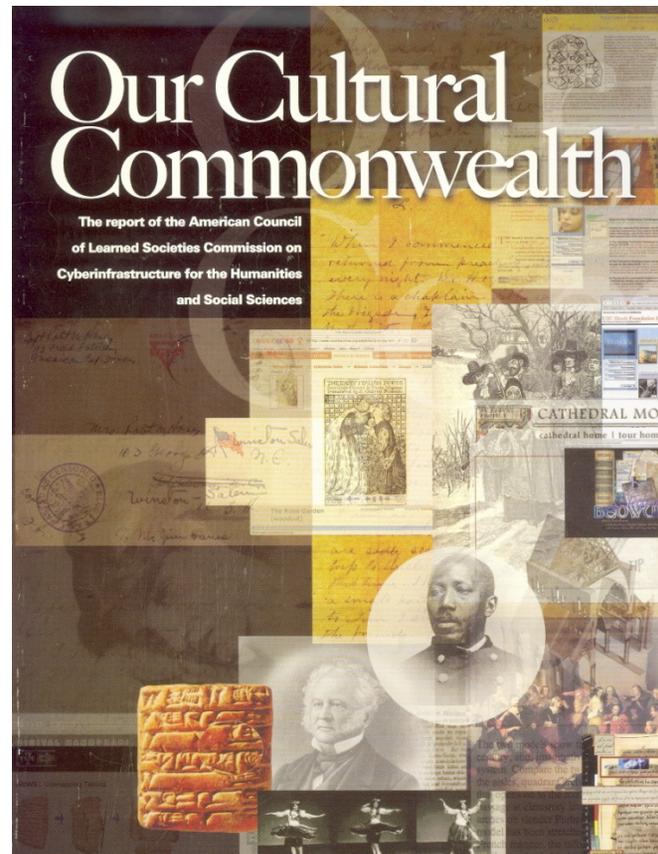
GEON

GriPhyN

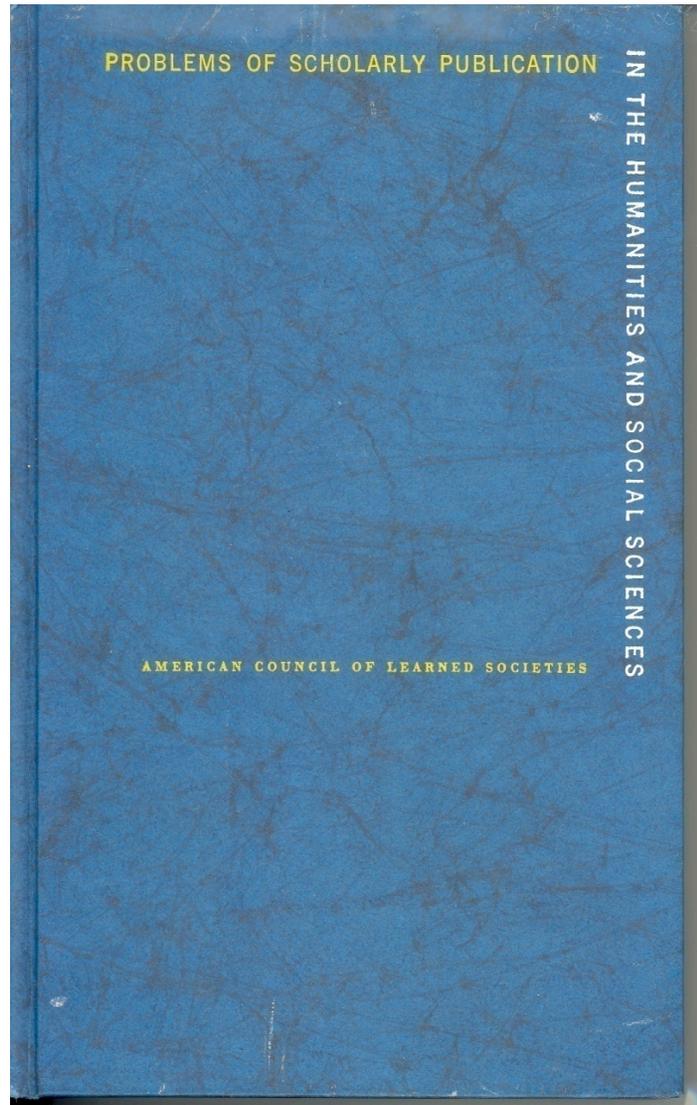


LIGO  
LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY

# *Our Cultural Commonwealth, 2006*



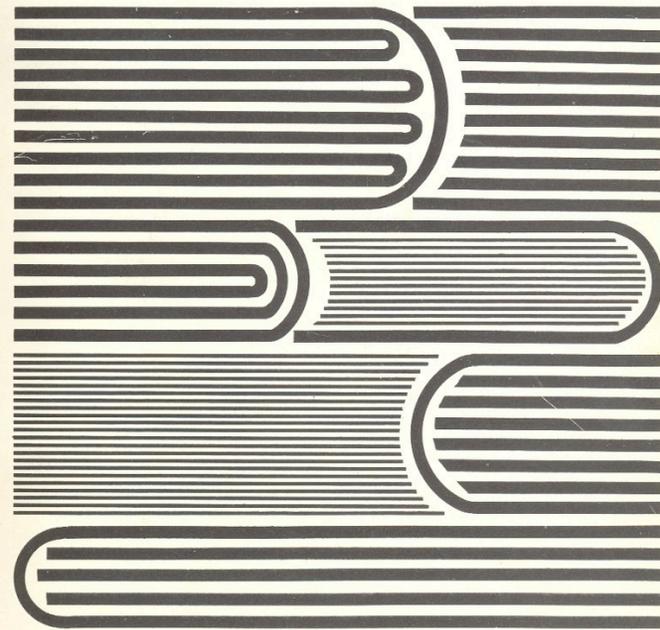
# *Problems of Scholarly Publishing, 1959*



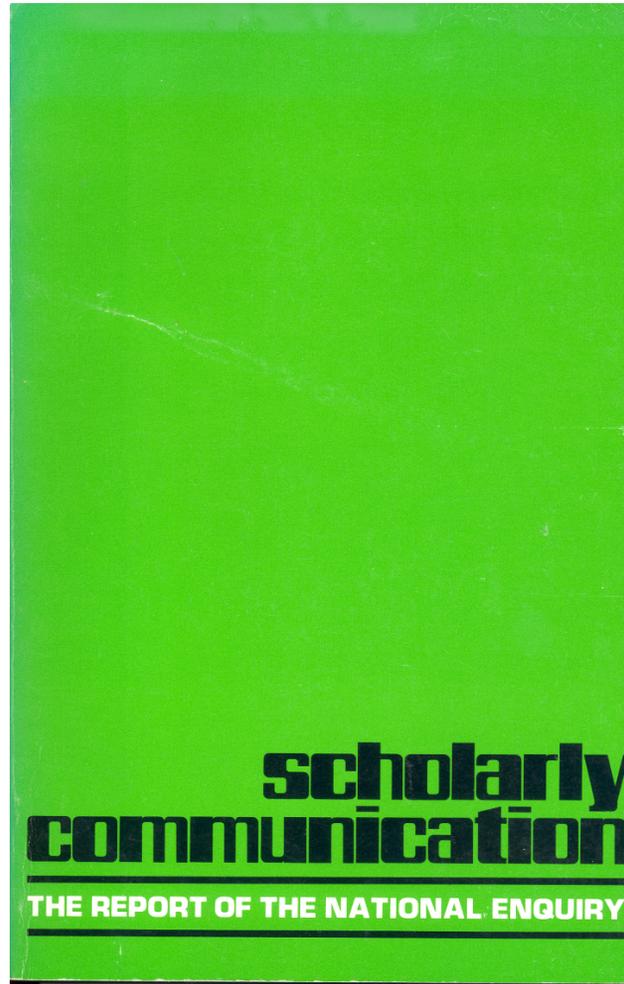
# *On Research Libraries, 1967*

## **On Research Libraries**

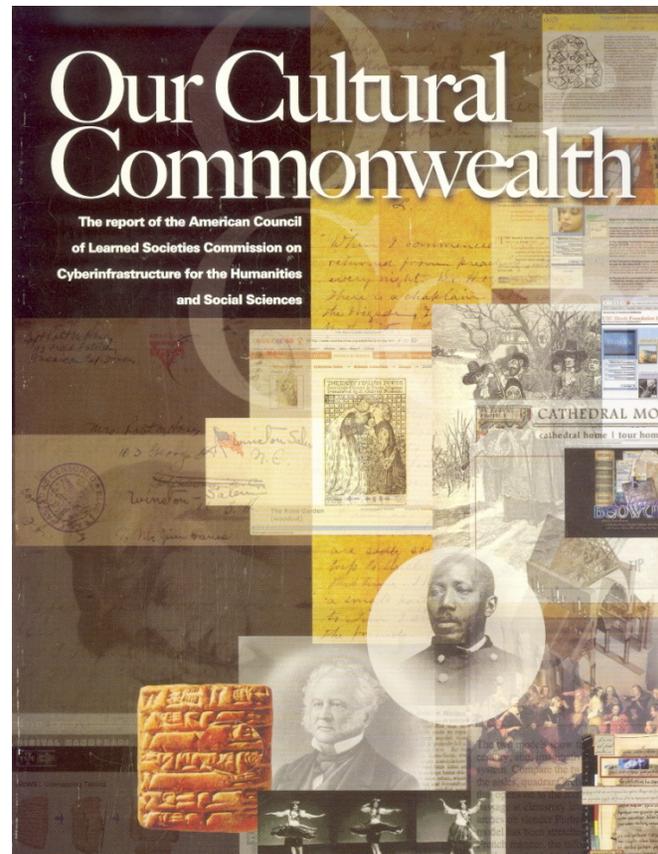
Statement and Recommendations  
of the Committee on Research Libraries  
of the American Council  
of Learned Societies (ACLS)



# *Scholarly Communication, 1979*



[www.acls.org/cyberinfrastructure](http://www.acls.org/cyberinfrastructure)



# Commission Members

Paul Courant  
Provost, Economics  
University of Michigan

Sarah Fraser  
Art History  
Northwestern University

Mike Goodchild  
Geography  
UC Santa Barbara

Margaret Hedstrom  
School of Information  
University of Michigan

Charles Henry  
VP & CIO  
Rice University

Peter B. Kaufman  
VP, Innodata-Isogen  
President, Intelligent Television

Jerome McGann  
English  
University of Virginia

Roy Rosenzweig  
History  
George Mason University

John Unsworth (Chair)  
Library and Information Science  
University of Illinois, Urbana-Champaign

Bruce Zuckerman  
Religion  
University of Southern California

# Potential of Cyberinfrastructure

“New information technologies empower research on traditional objects of study.”

ACLS Report, p. ii

# What is Cyberinfrastructure?

- Discipline-specific software
- Expertise
- Best Practices
- Tools
- Collections
- Policies
- Collaborative environments

ACLS Report, p. 6

# Necessary Characteristics

- Accessible as a public good
- Sustainable
- Interoperable
- Facilitate collaboration
- Support experimentation

# Recommendations

1. Invest in cyberinfrastructure as a strategic priority.
2. Develop public and institutional policies that foster openness and access.
3. Promote cooperation between the public and private sectors.

## Recommendations (cont'd)

4. Cultivate leadership.
5. Encourage digital scholarship.
6. Establish national centers to support scholarship that contributes to and exploits cyberinfrastructure.

## Recommendations (cont'd)

7. Develop and maintain open standards and robust tools.
8. Create extensive and reusable digital collections.