



Work in Progress: Status Report on the Office of Cyberinfrastructure

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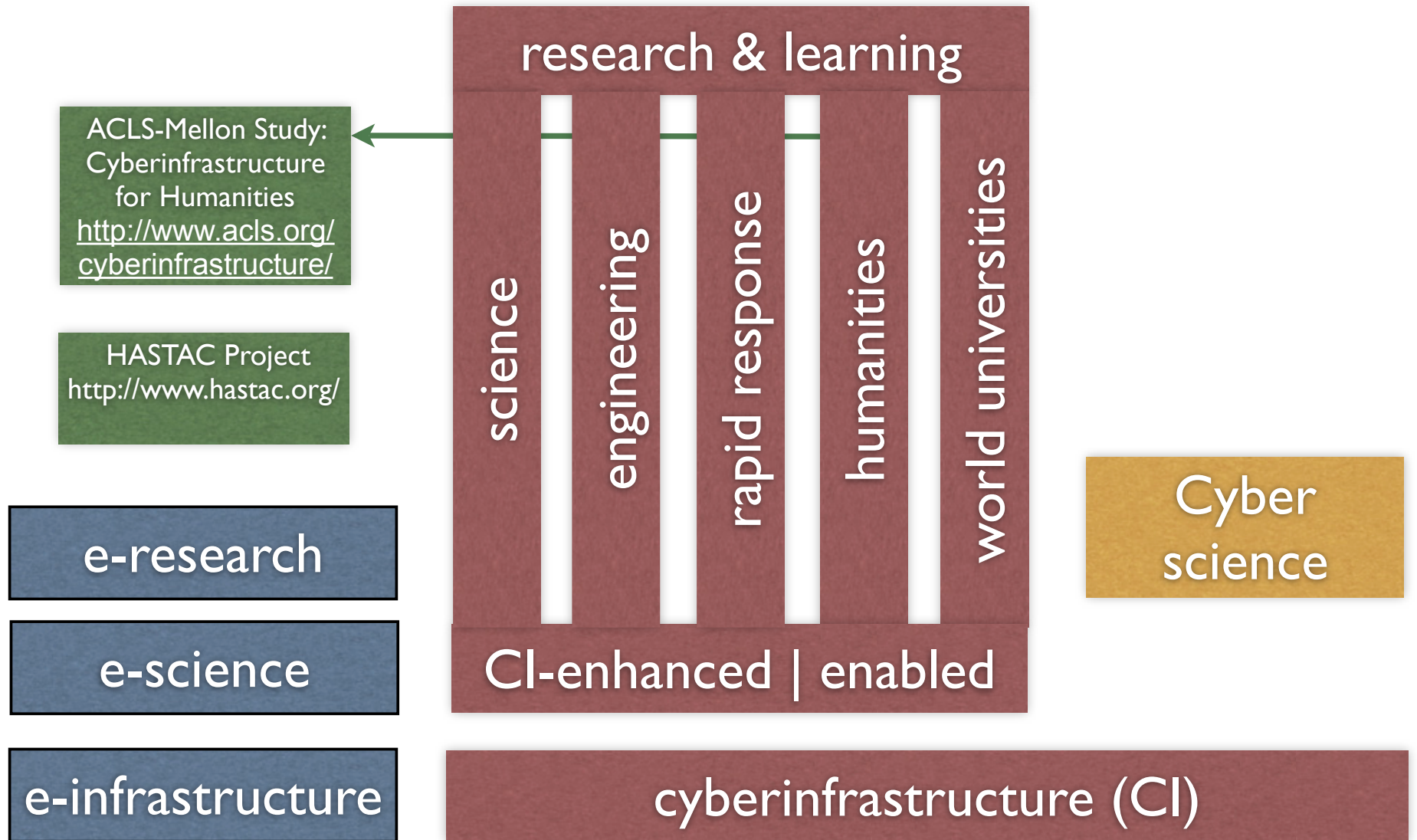


Office of
Cyberinfrastructure

D. E. Atkins



Nomenclature



Office of
Cyberinfrastructure

e = electronic | enhanced | enabled

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Dualities

cyberinfrastructure

enables

research &
development

CI is both an object and means for R&D

collaboration

enables

CI
environments

Multi-stakeholder collaboration required to create, provision, and apply CI; CI supports collaborations across time and distance (geographic, disciplinary, institutional)

learning | education

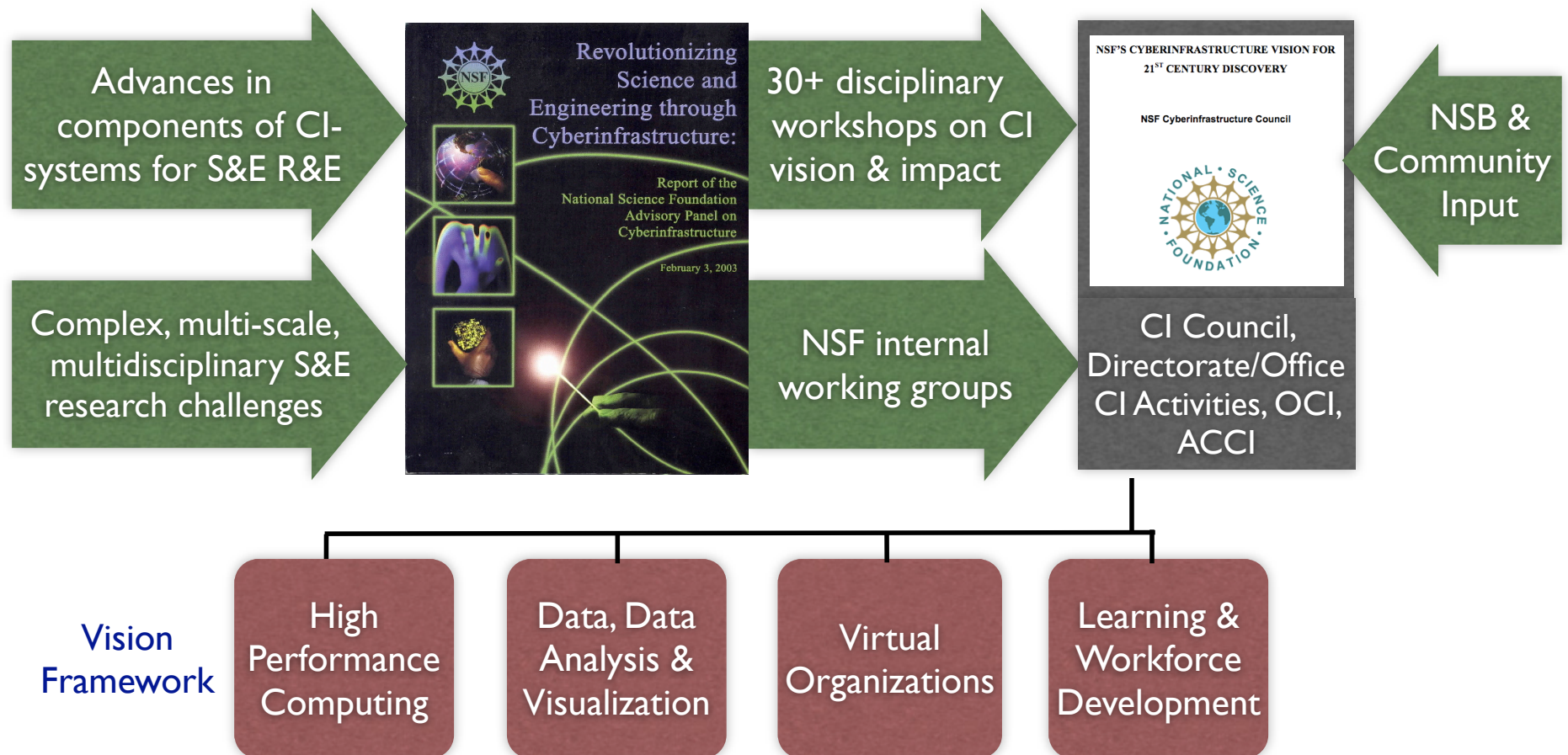
enables

CI
environments

Learning and workforce development initiatives required to create and use CI; CI enables/enhances learning/education



Vision and Activities Based on Broad and Diverse Community Engagement



- *All directorates and offices support cyberinfrastructure.*
- *Science-driven partnerships between creation, provisioning and use of CI*
- *Supports integrated research and education and broadened access and participation.*



Some Science Drivers

- Inherent **complexity and multi-scale** nature of today's frontier science challenges.
- Requirement for **multi-disciplinary, multi-investigator, multi-institutional** approach (often international).
- High **data intensity** from simulations, digital instruments, sensor nets, observatories.
- Increased value of data and demand for data **curation & preservation** of access.
- Exploiting infrastructure **sharing** to achieve better stewardship of research funding.
- Strategic need for **engaging more students** in high quality, authentic science and engineering education.





NSF CI FY07 Budget Request

Total of \$600M in CI Funding with \$182M in OCI

Cyberinfrastructure Funding

(Dollars in Millions)

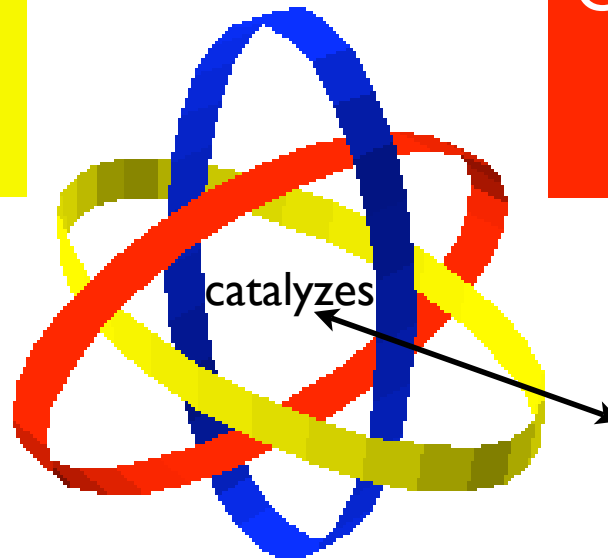
	FY 2005 Actuals	FY 2006	FY 2007 Request	Change over FY 2006	
		Current Plan		Amount	Percent
Biological Sciences	\$77.00	\$84.00	\$90.50	\$6.50	7.7%
Computer and Information Science and Engineering	45.32	63.00	68.00	5.00	7.9%
Engineering	52.00	52.00	54.00	2.00	3.8%
Geosciences	71.35	71.35	75.00	3.65	5.1%
Mathematical and Physical Sciences	56.52	59.30	63.56	4.26	7.2%
Social, Behavioral and Economic Sciences	20.39	20.54	20.54	-	-
Office of Cyberinfrastructure	123.28	127.12	182.42	55.30	43.5%
Office of International Science and Engineering	0.22	1.00	1.05	0.05	5.0%
Office of Polar Programs	25.38	26.24	26.24	-	-
Subtotal, Research and Related Activities	471.47	504.55	581.31	76.76	15.2%
Education and Human Resources	20.27	15.02	15.52	0.50	3.3%
Total, Cyberinfrastructure Funding	\$491.74	\$519.57	\$596.83	\$77.26	14.9%

Totals may not add due to rounding.

Achieving the NSF CI (e-science) Vision requires synergy between 3 types of activities

Transformative Application - to enhance discovery & learning

Borromean Ring: The three rings taken together are inseparable, but remove any one ring and the other two fall apart. See www.liv.ac.uk/~spm02/rings/



Provisioning - Creation, deployment and operation of advanced CI

provides shared and connecting CI

Office of Cyberinfrastructure

R&D to enhance technical and *social* effectiveness of future CI environments



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Draft Mission of OCI

The mission of the OCI is to enhance significantly the ability of the NSF community to create, provision, and use the comprehensive *cyberinfrastructure essential to 21st century advances in science and engineering*. This goal is implicit in many areas of the new NSF Strategic Plan and is being pursued within the context of the evolving *Cyberinfrastructure Vision for 21st Century Discovery*.

OCI will serve the Foundation and the NSF community in its mission through three types of synergistic activity:

1. provisioning of cyberinfrastructure together with mechanisms for flexible, secure, coordinated sharing among collections of individuals, institutions, and resources;
2. partnerships with others in science/engineering-driven, transformative use of CI in research and education; and
3. partnerships with others in the transfer of the fruits of relevant R&D into the next generation of CI.

OCI is a cross-cutting enterprise that builds mutually beneficial partnerships will all parts of the NSF, with other Federal agencies, and with the large and growing CI/e-science initiatives in other countries. OCI is also the lead in supporting the Advisory Committee for CI (ACCI) for the Foundation.



Borromean Ring:
Symbol of peer-to-peer synergy. The three rings taken together are inseparable, but remove any one ring and the other two fall apart. See www.liv.ac.uk/~spmr02/rings/



New NSF Strategic Plan

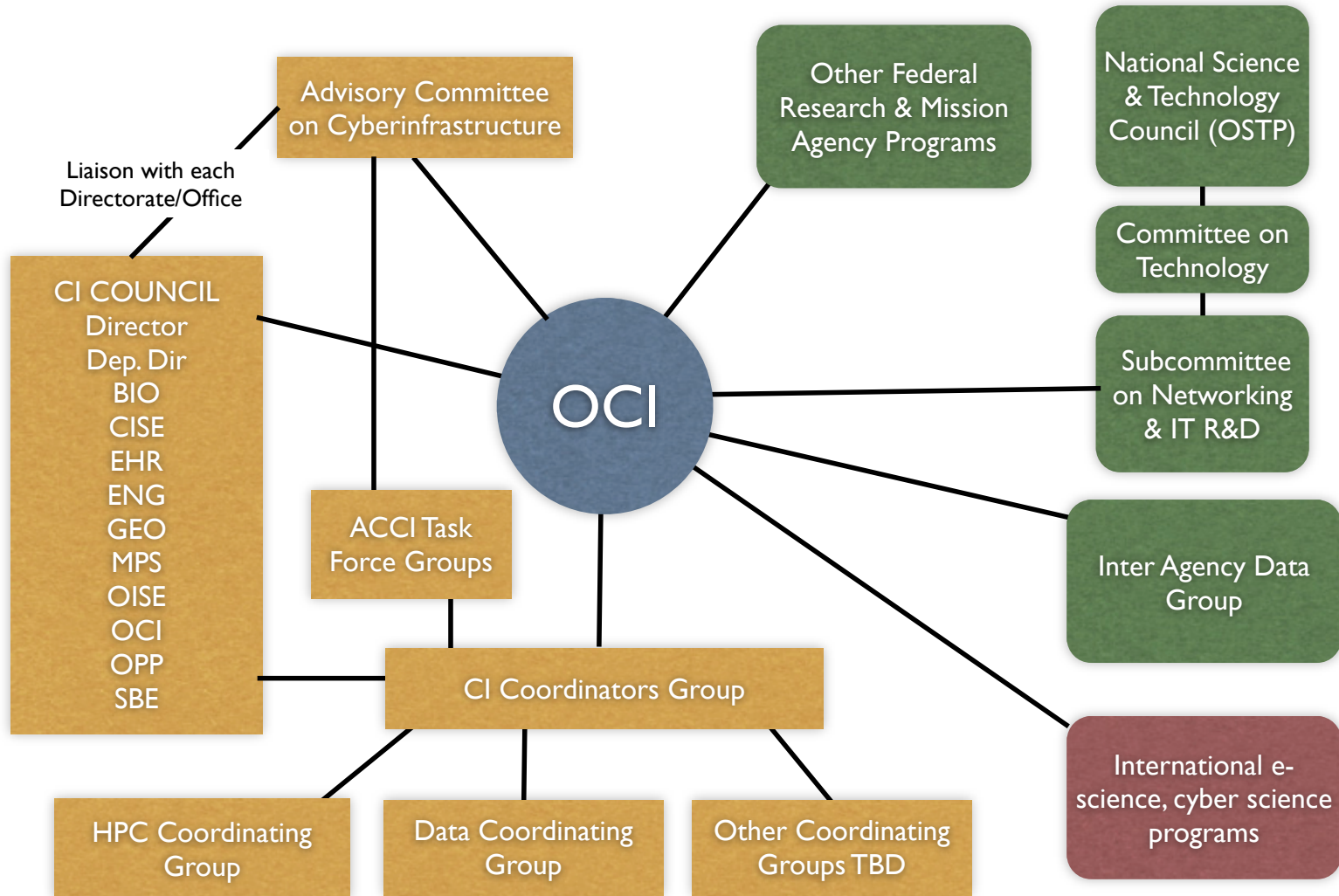


Includes many imperatives for innovation in provisioning and transformative application of cyberinfrastructure to discovery and learning.

Available at
<http://www.nsf.gov/pubs/2006/nsf0648/nsf0648.jsp>



Emerging CI Coordination Structure



Additional linkage within NSF through joint appointments and every OCI Program Officer having a liaison role with another Directorate or Office

Proposed ACCI Task Force Groups

- Digital Data
- Integration of the NSF CI Portfolio & Alignment with S&E Needs
- CI and Competitiveness
- CI-enhanced Learning, Discovery, and Broadened Participation



www.nsf.gov/oci/

HOME | FUNDING | AWARDS | DISCOVERIES | NEWS | PUBLICATIONS | STATISTICS | ABOUT | FastLane

National Science Foundation
OFFICE OF
Cyberinfrastructure

SEARCH
NSF Web Site

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Cyberinfrastructure - stimulating advances in 21st century science and engineering

About OCI
View OCI Staff Directory
Search OCI Staff Directory
General Information About OCI
Career Opportunities
Advisory Committee
Budget Excerpt

How to Prepare Your Proposal
Grant Proposal Guide
Frequently Asked Questions
Other Types of Proposals
Regional Grants Conferences

How to Manage Your Award
Grant Policy Manual
Grant General Conditions
Cooperative Agreement Conditions
Special Conditions
Federal Demonstration Partnership
Policy Office Website

Special Announcements

- **Career Opportunities - Dear Colleague Letter**
The Office of Cyberinfrastructure (OCI) announces a nationwide search to fill a number of Program Director positions. For more information, click on the link
http://www.nsf.gov/publications/vacancy.jsp?org=OCI&nsf_org=OCI
- **Petascale Acquisition Forum, Mar 24, '06**
NSF Invites Prospective Proposing Institutions and Vendors to a Discussion of Plans for a Petascale HPC Acquisition

As Indicated in the President's FY 2007 Budget Request, NSF is planning for the acquisition of a petascale high-performance computing (HPC) system. Subject to the availability of funds, NSF expects to begin funding the resulting multi-year acquisition project in FY07. The petascale HPC system to be acquired will permit science and engineering communities to address some of their most computationally challenging research needs.

HPC system vendors and potential resource provider organizations (organizations who, either separately or in collaboration with others, wish to propose to manage the development, deployment, and operation of a petascale system on behalf of the science and engineering research community) are invited to meet with each other and with NSF staff to discuss the time-line and strategy for this petascale system acquisition on Friday, March 24, 2006, from 9:00a.m. - 11:00a.m., at the National Science Foundation, 4201 Wilson Blvd., Arlington, VA, 22230. Those interested in attending this meeting should send email with their name and affiliation to HPC-Input@nsf.gov, no later than March, 20, 2006. Space is

Quick Links
Reports and Workshops Relating to Cyberinfrastructure and Its Impacts
Publications [See All](#)
Report of Blue-Ribbon Advisory Panel on Cyberinfrastructure
Other Site Features
Special Reports
Research Overviews
Multimedia Gallery
Classroom Resources
NSF-Wide Investments

NSF'S CYBERINFRASTRUCTURE VISION FOR 21ST CENTURY DISCOVERY

NSF Cyberinfrastructure Council



Several Active Solicitations Posted
Seeking more program officers.

[www.nsf.gov/od/
oci/ci-v7.pdf](http://www.nsf.gov/od/oci/ci-v7.pdf)

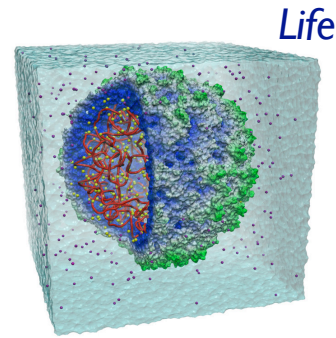
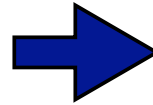


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High Performance Computing

increasingly important tool for understanding



Life



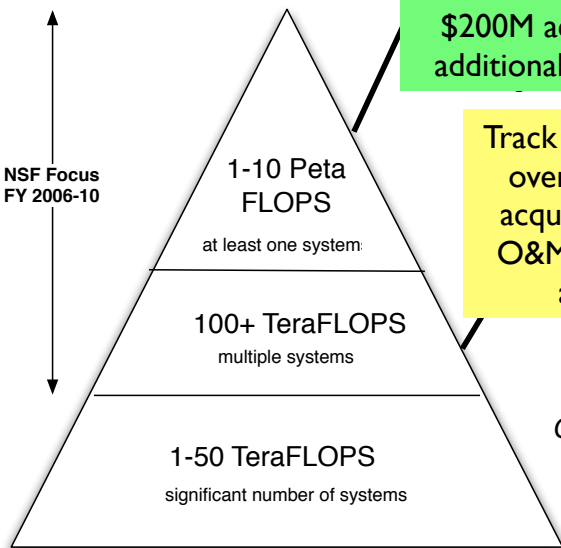
Satellite tobacco mosaic virus, P. Freddolino et al.

Aldehyde dehydrogenase, T. Wymore and S. Brown

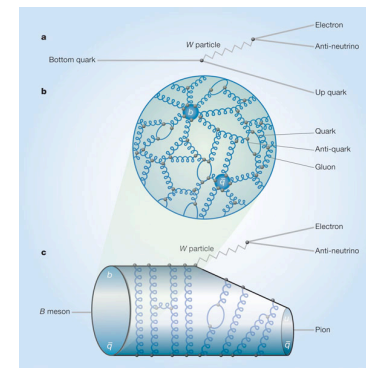
Track 1: One solicitation funded over 4 years: \$200M acquisition + additional O&M cost.

Track 2: Four solicitations over 4 years: \$30M/yr acquisition + additional O&M cost. First track 1 approved 8-07

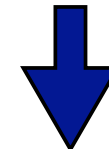
NSF Focus FY 2006-10



Campus Level



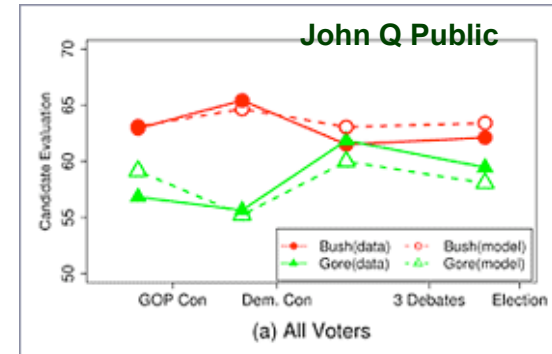
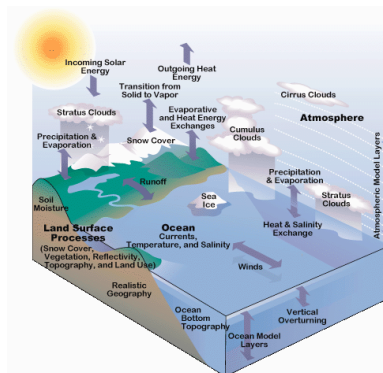
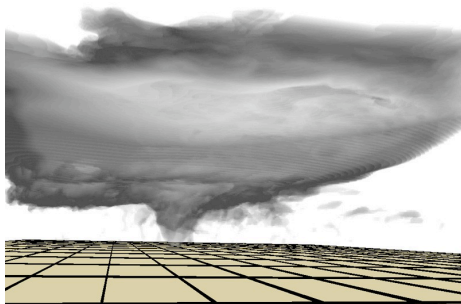
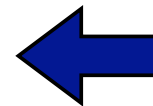
Matter



Society

I. Shipsey

The Environment

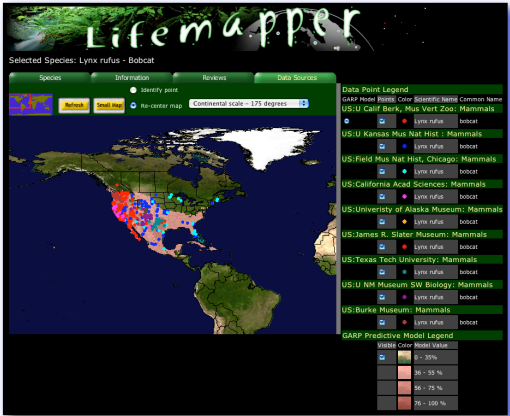
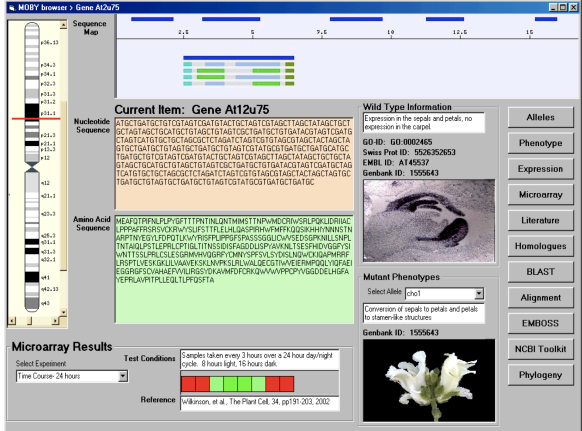
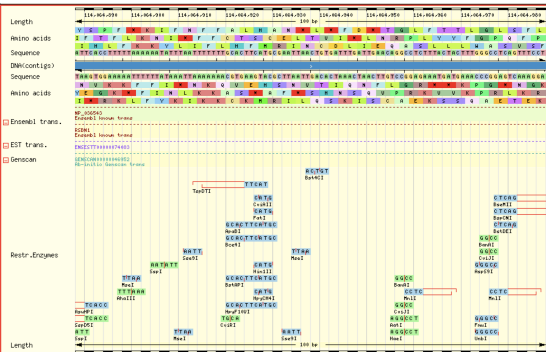
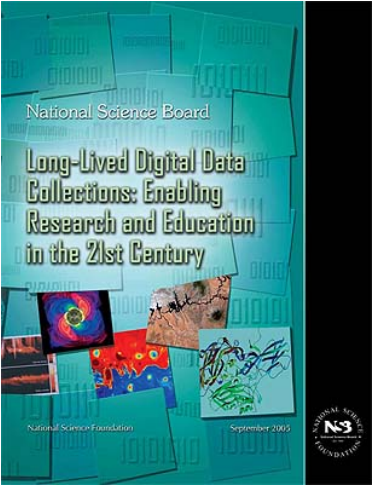


S.-Y. Kim, M. Lodge, C. Taber.



Data, Data Analysis & Visualization

- Challenges: **increased scale, heterogeneity, and re-use value** of digital scientific information and data. Inadequate digital preservation strategy of long-lived data.
- Taking initial steps to **catalyze the development** of a federated, global system of science and engineering data collections that is open, extensible, evolvable, (and appropriately curated and long-lived.)
- Complemented by a **new generation of tools and services** to facilitate data mining, integration, analysis, visualization essential to transforming data into knowledge.
- NSF Leadership for OSTP/Interagency Working Group on Digital Data



Instances of Virtual Organizations (VOs)

People

People

People

Interfaces for interaction, workflow, visualization and collaboration for individuals & distributed teams

Mechanisms for flexible secure, coordinated resource/services sharing among dynamic collections of individuals, institutions, and resources (the Grid or service layer problem)

Distributed, heterogeneous services for:

Computation

Data,
information
management

Sensing,
observation,
activation in
the world

Alternate Names for Instances of VOs:

- Co-laboratory
- Collaboratory
- Grid (community)
- Network
- Portal
- Gateway
- Hub
- Virtual Research Environment (VRE)
- Cyberinfrastructure Collaborative
- Other?



Virtual Organizations: Goals

- To catalyze the development, implementation and evolution of a functionally-complete national cyberinfrastructure that integrates both physical and cyberinfrastructure assets and services.
- To promote and support the establishment of world-class VOs that are secure, efficient, reliable, accessible, usable, pervasive, persistent and interoperable, and that are able to exploit the full range of research and education tools available at any given time
- To support the development of common cyberinfrastructure resources, services, and tools that enable the effective, efficient creation and operation of end-to-end cyberinfrastructure systems for and across all science and engineering fields, nationally and internationally.



Virtual Organizations



NVO



LEAD



iVDgL



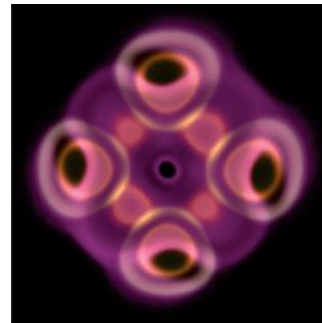
TeraGrid™



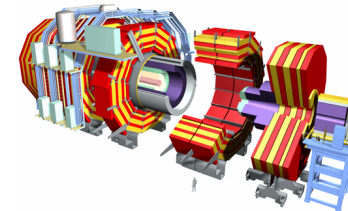
- Distributed virtual organizations are **based upon CI** that provides flexible, secure, coordinated resource sharing among dynamic collections of individuals, institutions, and resources.
- **Resources and services** include HPC, data/information management, sensor-nets/observatories, linked through global networking and middleware, and accessed by people through web portals and workflow environments.
- Increasing numbers of **virtual organizations are required** by S&E research and education communities. Referred to by many names, e.g. *collaboratory, co-laboratory, grid, gateway, portal, hub, ...*
- **Challenges** being address include tools for more rapid building and ease of use, interoperability/middleware, high performance, end-to-end networking, and dynamic reconfiguration, social issues, assessment of impact, and economic and technical sustainability.



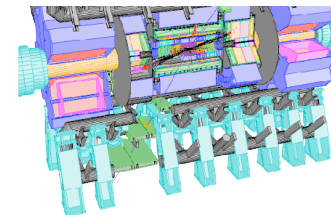
NEES



NanoHub



CMS

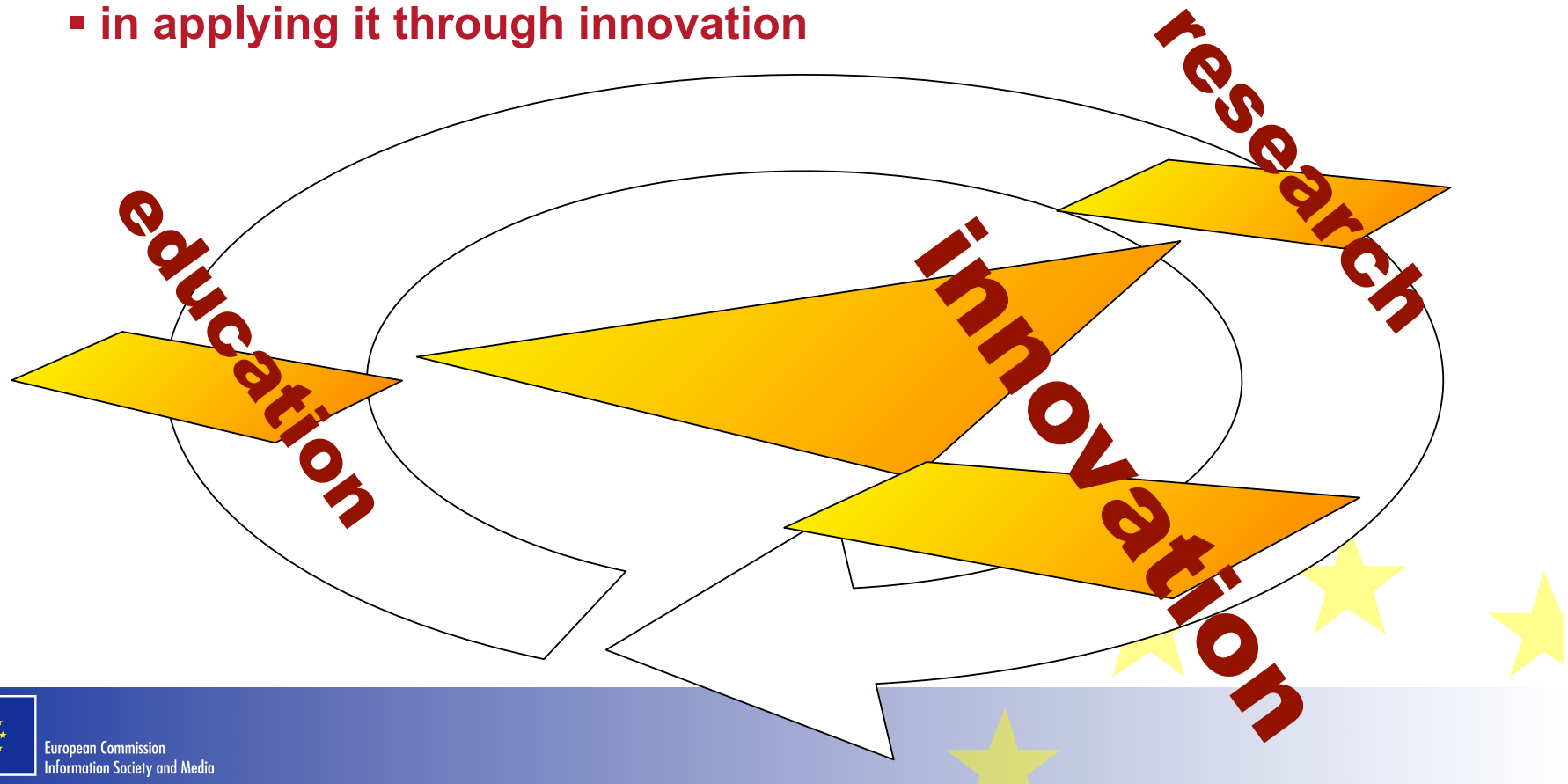


ATLAS

FP7 - Putting the knowledge triangle at work

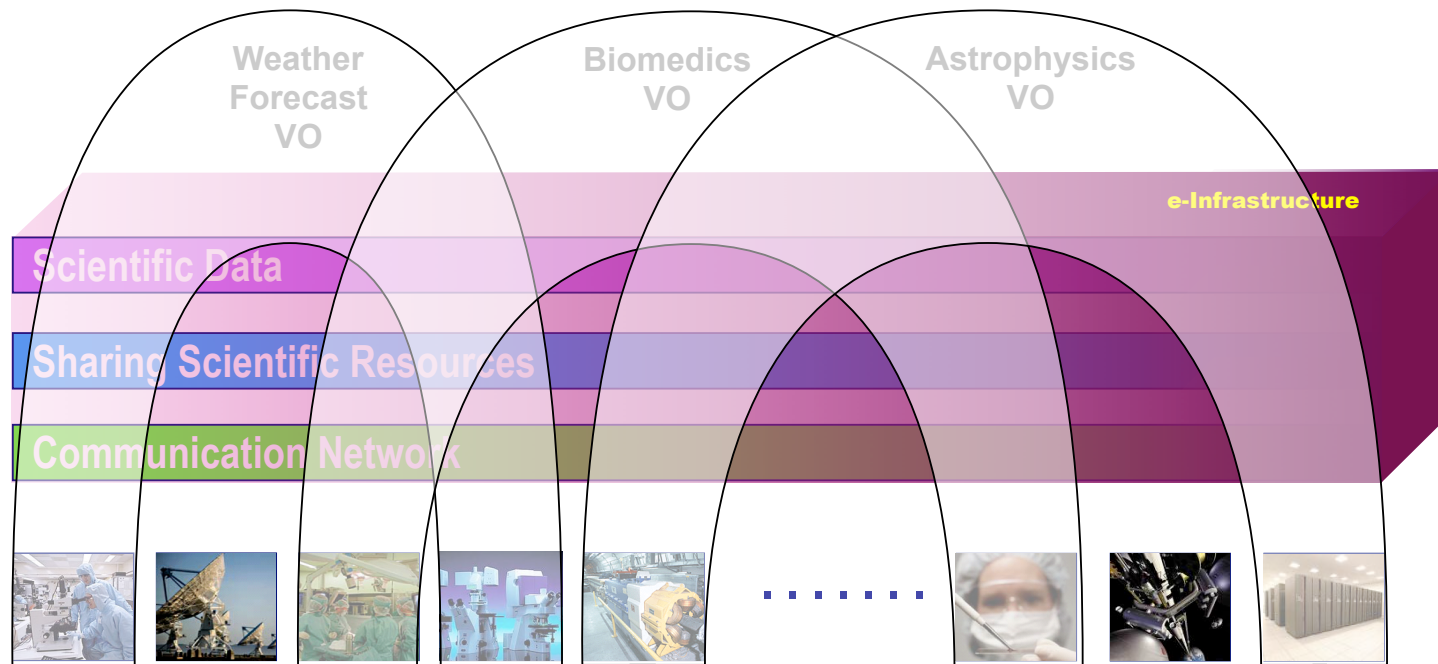
To be a genuinely competitive knowledge economy, Europe must be better

- in producing knowledge through research
- in diffusing it through education
- in applying it through innovation

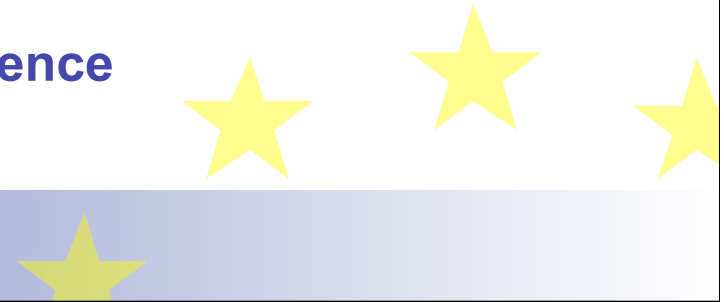


e-Infrastructures in FP7 - strategy - Virtual Organizations (VO)

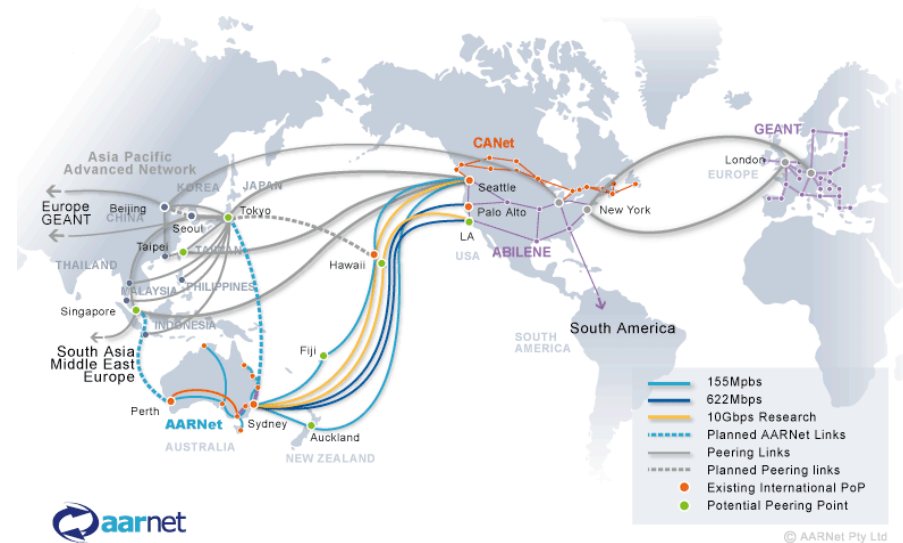
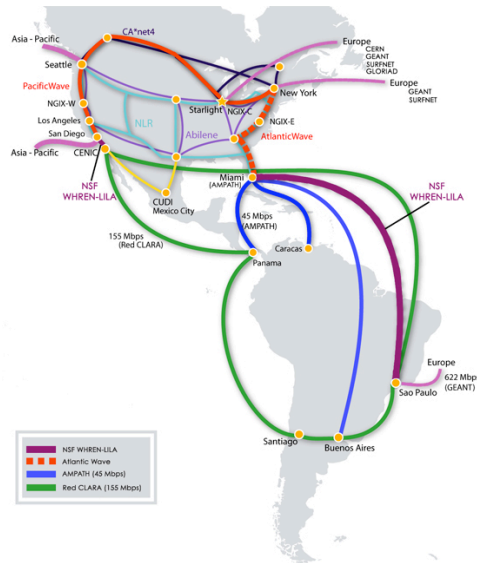
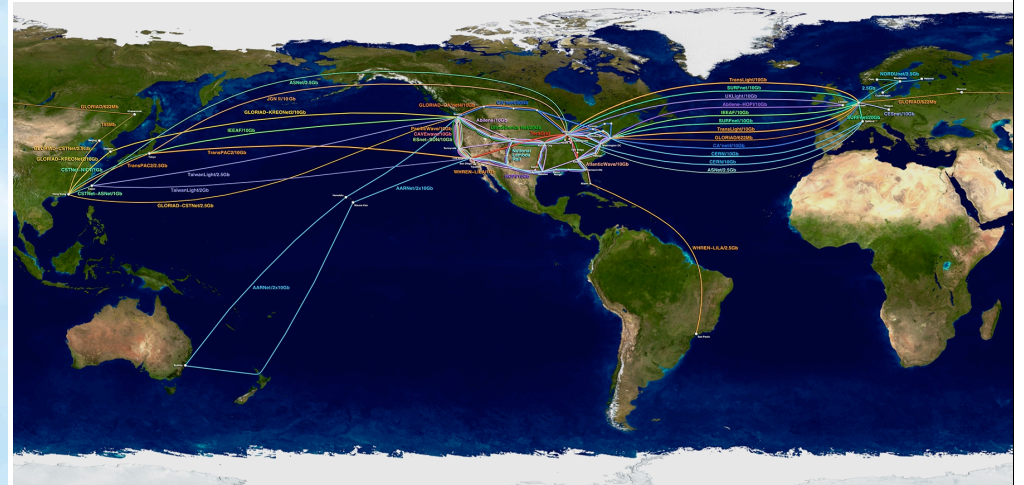
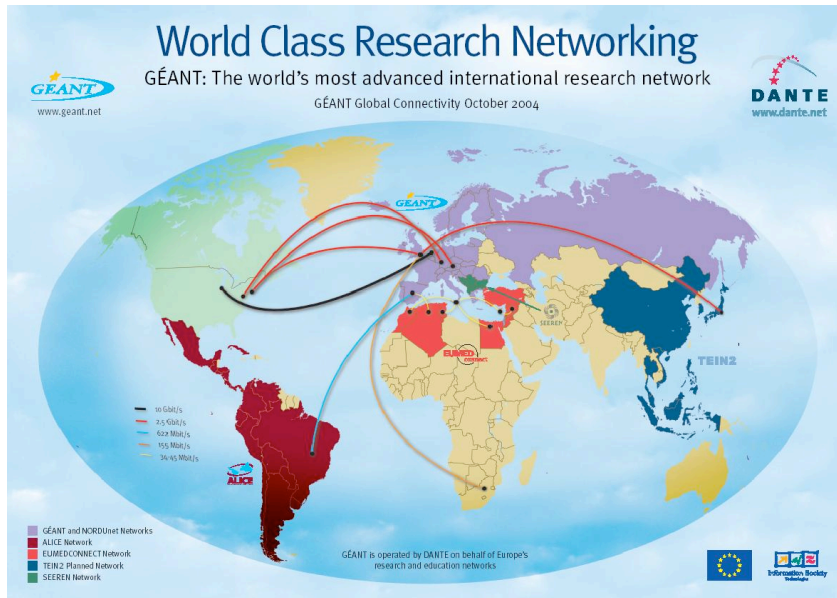
Bringing the best brains together
Sharing the best scientific resources



Producing the best science



VO-substrate: International R&E Networking



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Learning &
Workforce
Development

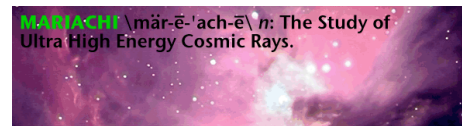
- Learning **supported by** CI. (cyber-enabled learning).
- Workforce development **to create and use** CI for S&E research and education.
- **Broadened participation:** Exploit the new opportunities that cyberinfrastructure brings for ... people who, because of physical capabilities, location, or history, have been excluded from the frontiers of scientific and engineering research and education.
- Explore CI support for **integrated research and education.**



BIOINFORMATICS CI INSTITUTE



EPIC



MARIACHI



CyberBridges

OCI Program Officer Presentations



- *HPC Program* - Steve Meacham



- *CI TEAM* - Miriam Heller



- *Implementing the Strategic Vision for Digital Data* - Chris Greer



- *Middleware/ Software* - Kevin Thompson



- *Towards Virtual Organization Initiatives* - Abhi Deshmukh

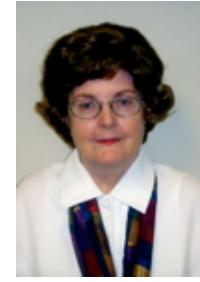


Other OCI Personnel



- Terry Langendoen, Program Officer

- Irene Lombardo, Staff Associate



- Diana Rhoten, Consultant

- Priscilla Bezdek, Prog. & Tech. Specialist



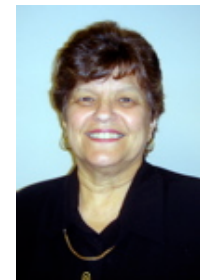
- Abani Patra, Consultant

- Deborah White-Wilkins, Sec. to Dir.



- Judy Hayden, Budget & Operations

- Mary Daley, Sec. to Dep. Dir.



José Muñoz,
Deputy Director

- Courtney Zajdel, STEP Student



Questions & Discussion



ACCI Task Force Groups



The Halloween Project

- **Portfolio**

- Jim Bottum, Chair
- Mark Ellisman
- J. Tinsely Oden
- Priscilla Nelson
- Anne Trefethen
- Jeron Tromp

- **Digital Data**

- Henry Brady, Chair
- Sara Graves
- Robert Robbins
- James Kinter
- Terry Gaasterland
- Gordon Shepard

- **CI and Competitiveness**

- James Duderstadt, Chair
- Stuart Feldman
- Brian Bershad
- Neerja Raman
- Ann Gates
- Brian Behlendorf

- **CI-Learning, Discovery, and Broadened Participation**

- Steve Castillo, Chair
- Diana Oblinger
- Adebisi Oladipupo
- David Oxtoby
- N. Radhakrishnan
- John Gage
- Wesley Harris (liaison)

