

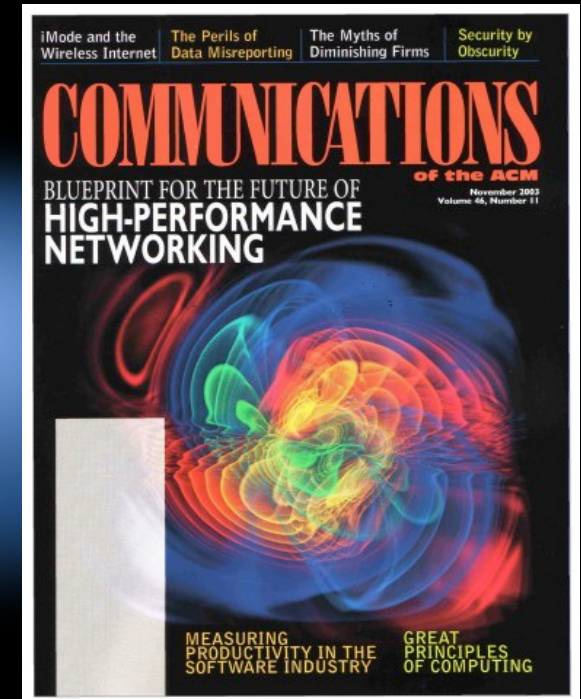
Building a Foundation for Computational Science & Engineering

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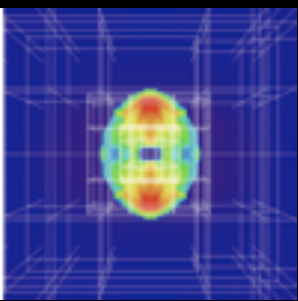
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Where Discoveries Begin

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Cyberinfrastructure



Complexity of the Universe

LHC, Gamma-ray bursts, Hurricanes!

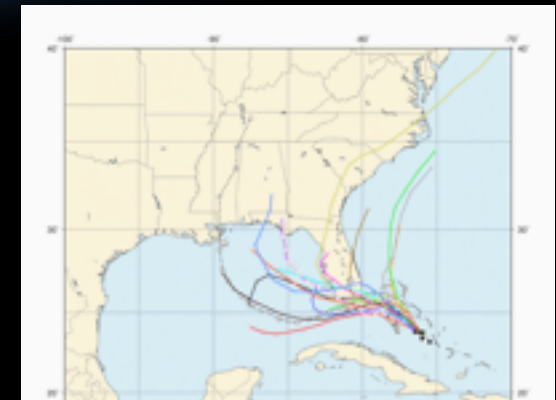
- Gamma-ray bursts!
 - GR, hydro, nuclear physics, radiation transport: globally distributed collab!
 - Scalable algorithms, complex AMR codes, viz, PFlops*week, PB output!
- LHC: What is the nature of mass? Higgs particle?
 - ~10K scientists, 33+ countries, 25PB data, distributed!
 - Planetary lab for scientific discovery!
- Katrina: Where is it going?
 - Coupled atmosphere-storm surge-wave-supply-traffic models...



Remote Instrument



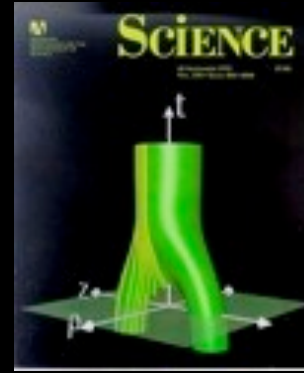
Remote Instrument



Data & Compute-Driven Complex Problems

Great Collaboration Challenges of 21st Century

- Every field of science
 - General Relativity, HEP
 - Geosciences, Bio, SBE...
 - And all combinations...
- Science and Society being transformed by CI- and Data-Driven approaches
 - Completely new methodologies required
 - “The End of Science” (as we know it)
- We must support, train people to work in this multidisciplinary, CI-rich environment
 - No single community can attack challenges
 - Must support development of science with this CI backdrop



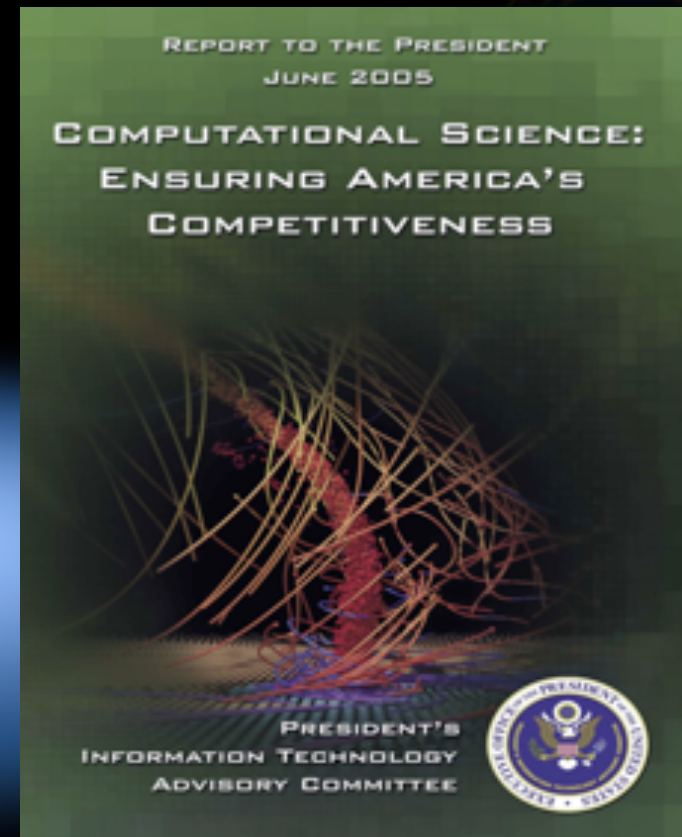
This is all
computational science!
We need to find a
home for it!



Computational Science PITAC Report Summary



“Universities must, through significant change in organizational structures: scientific, interdisciplinary and outmoded structures, within collaborative research, are needed for US to remain competitive in global science”



Finding a Foundation for CS&E

The Third Pillar Needs a Place to Stand

- OCI can help create this foundation in NSF
 - NSF supports all disciplines, all universities
 - OCI can be neutral catalyst across NSF for Computational Science & Applications
 - Work with CISE, MPS, Bio, Geo, SBE, etc...
 - Create new CI/CSE-research agenda
 - Software, networks, compute systems (HPC!)
 - Support those who prototype, use, etc?
 - These people are central to our dept!
 - Education and Workforce development
 - CAREER awards, curriculum development, etc
 - Help universities align
 - Curriculum, best practices, rewards... Need help to organize community:!

How do we catalyze creation of 21st century universities?

