Cyberinfrastructure Framework for 21st Century Science & Engineering (CIF21)

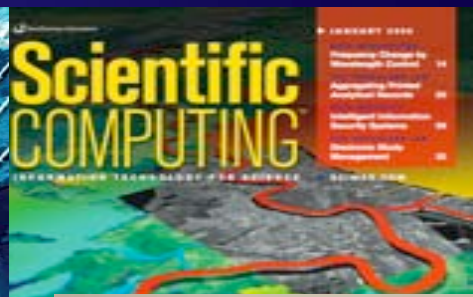
NSF-wide Cyberinfrastructure Vision

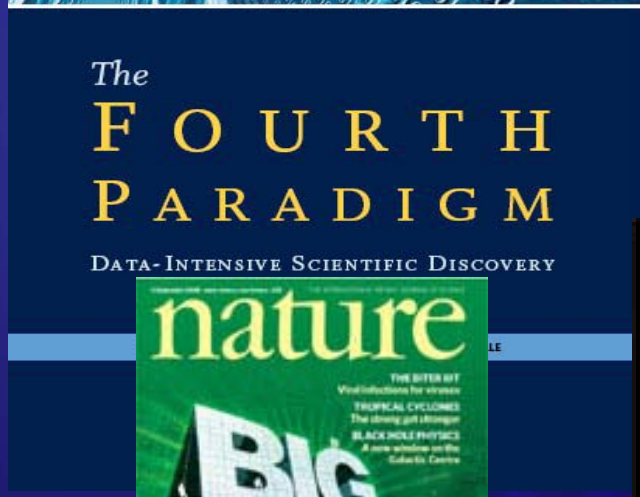
People, Sustainability, Innovation, Integration

Alan Blatecky
Director OCI

Framing the Challenge:
Science and Society Transformed by Data

- Modern science
  - Data- and compute-intensive
  - Integrative, multiscale
- Multi-disciplinary Collaborations for Complexity
  - Individuals, groups, teams, communities
- Sea of Data
  - Age of Observation
  - Distributed, central repositories, sensor-driven, diverse, etc



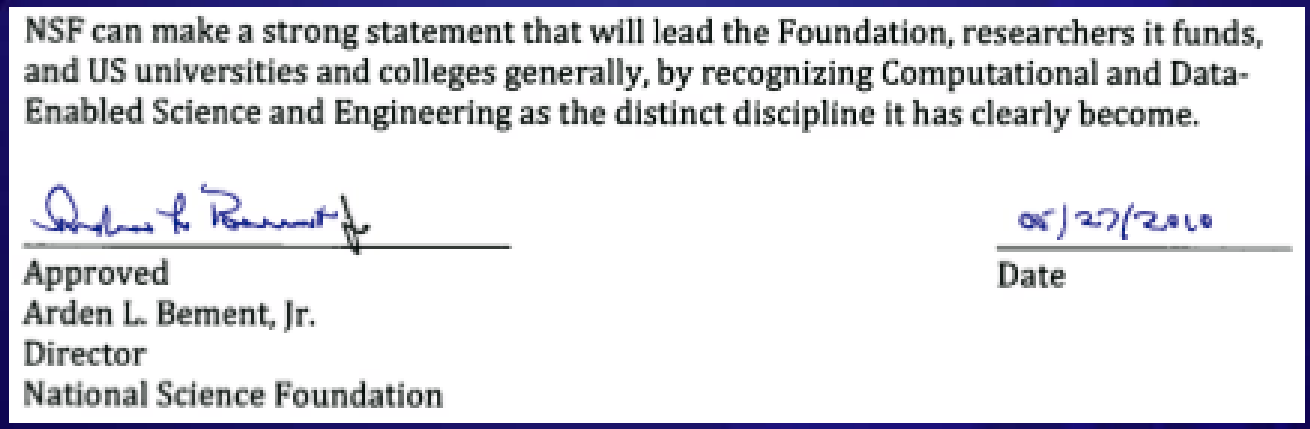


ACCI Task Force Reports

- Final recommendations presented to the NSF Advisory Committee on Cyberinfrastructure Dec 2010
- More than 25 workshops and Birds of a Feather sessions and more than 1300 people involved
- Final reports on-line

Recommendation of NSF Advisory Committee on Cyberinfrastructure ACCI

"The National Science Foundation should create a program in Computational and Data-Enabled Science and Engineering (CDS&E), based in and coordinated by the NSF Office of Cyberinfrastructure. The new program should be collaborative with relevant disciplinary programs in other NSF directorates and offices."

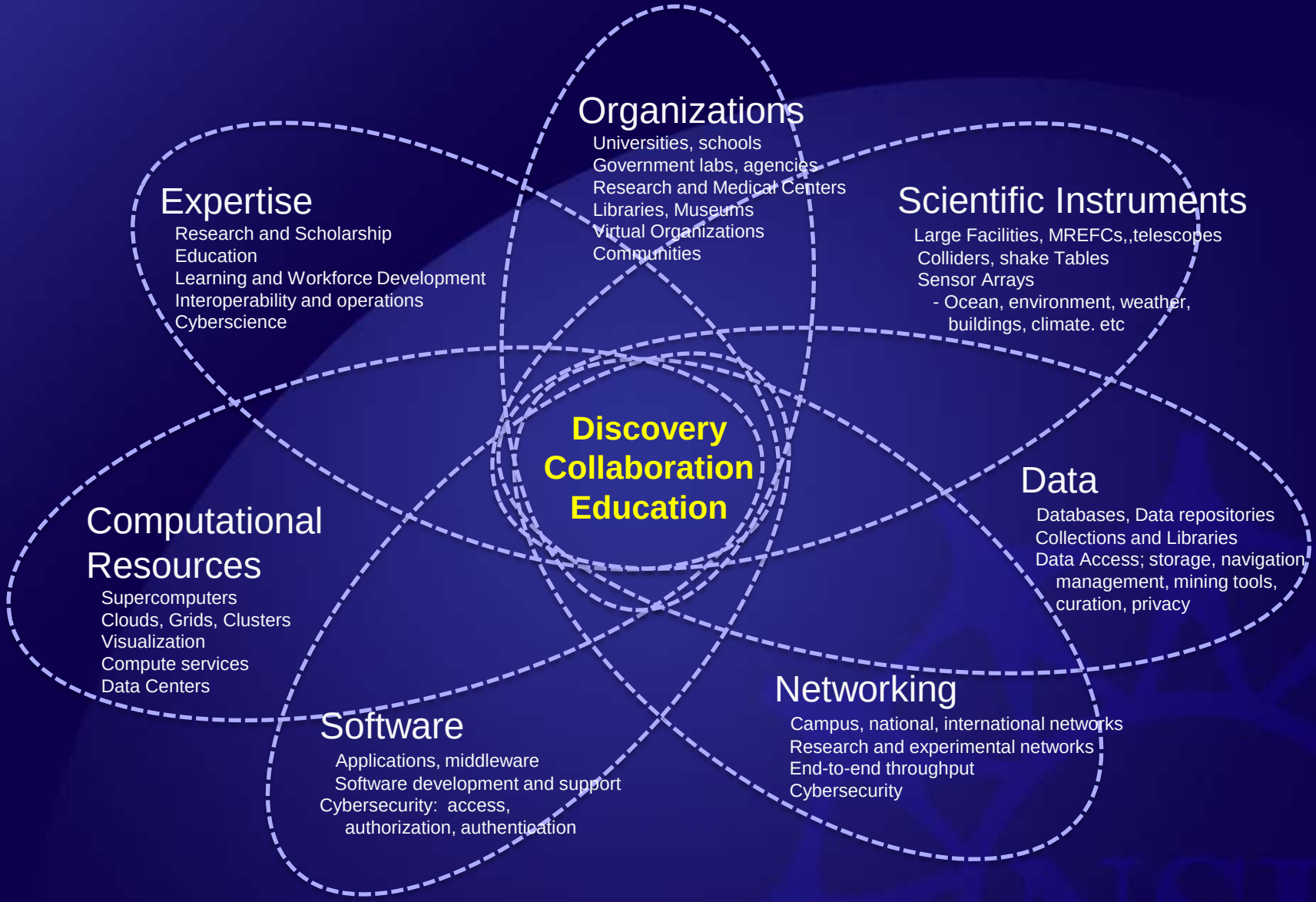


NSF can make a strong statement that will lead the Foundation, researchers it funds, and US universities and colleges generally, by recognizing Computational and Data-Enabled Science and Engineering as the distinct discipline it has clearly become.

Approved
Arden L. Bement, Jr.
Director
National Science Foundation

05/27/2010
Date

Cyberinfrastructure Ecosystem (CIF21)



Maintainability, sustainability, and extensibility

CIF21 – a metaphor

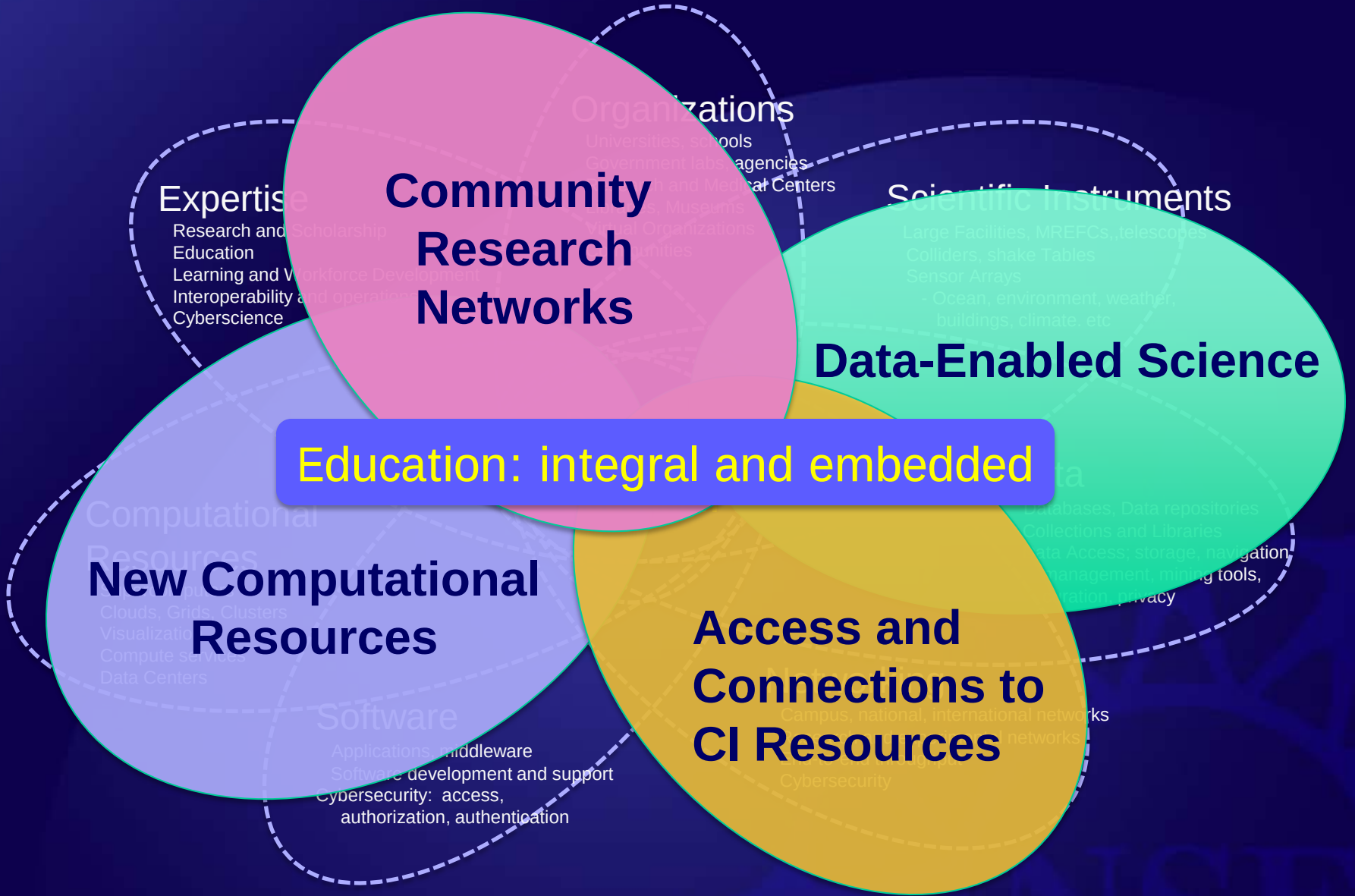
- A goal of Virtual Proximity —--
  " you are one with your resources"
  - Continue to collapse the barrier of distance and remove geographic location as an issue
  - ALL resources (including people) are virtually present, accessible and secure
  - End-to-end integrated resources
  - Science, simulation, discovery, innovation, education are the metrics

An organizing fabric and foundation for science, engineering and education

Broad Principles to Lead CIF21

- Builds national infrastructure for S&E
- Leverages common methods, approaches, and applications – focus on interoperability
- Catalyzes other CI investments across NSF
  - Provides focus and is a vehicle for coordinating efforts and programs
  - Is a “force multiplier” across NSF
- Shared governance; embedded into every directorate and office
- Managed as a coherent program

Four Thrust Areas



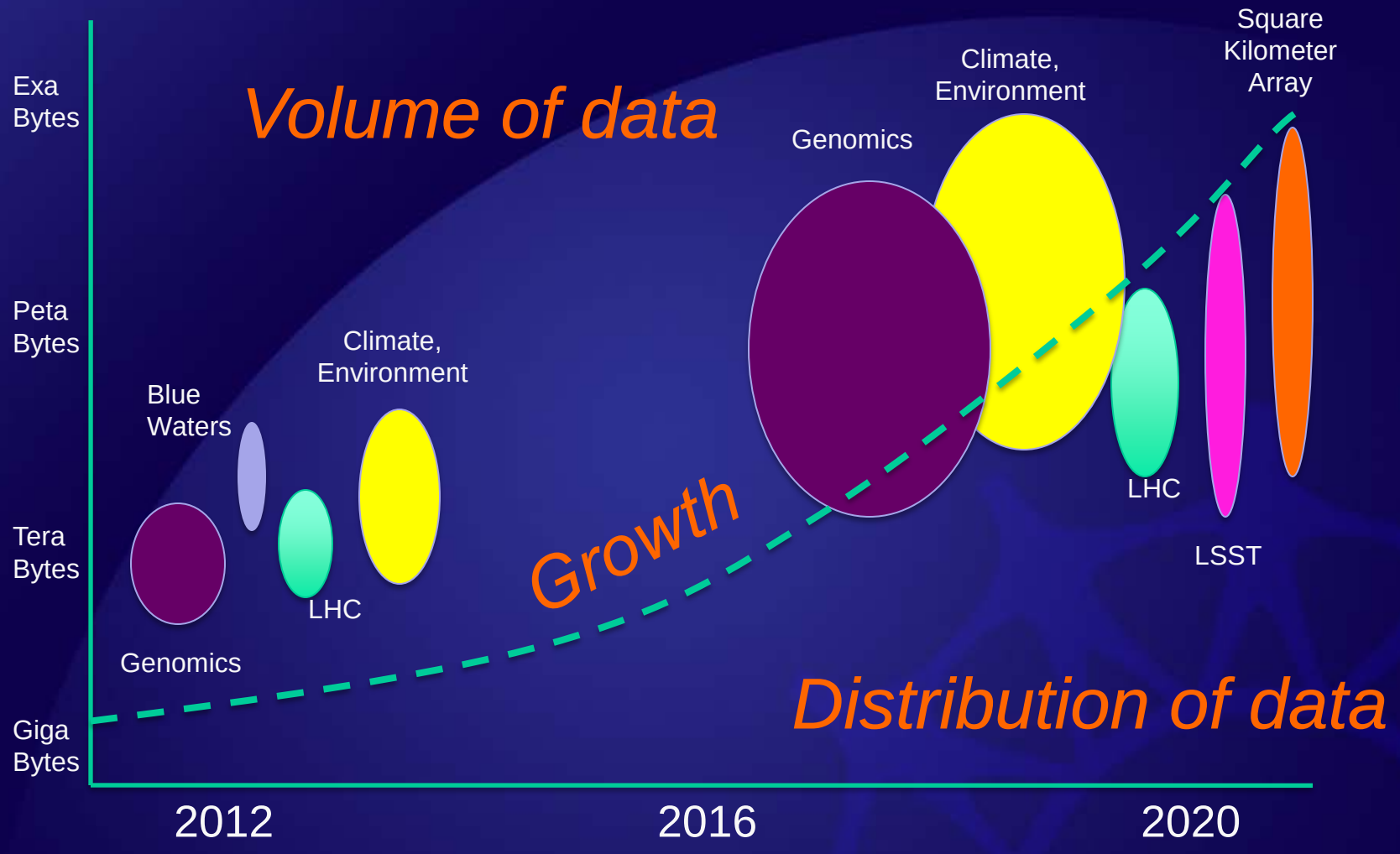
Data-Enabled Science Thrust Area 1

- Data Services Program *(data)*
  - Provide reliable digital preservation, access, integration, and analysis capabilities for science and/or engineering data over a decades-long timeline
- Data Analysis and Tools Program *(information)*
  - Data mining, manipulation, modeling, visualization, decision-making systems
- Data-intensive Science Program *(knowledge)*
  - Intensive disciplinary efforts
  - Simulation, modeling
  - Multi-disciplinary S&E

THE CHRONICLE
of Higher Education

Dumped On by Data: Scientists Say a Deluge Is Drowning Research

Data Challenges



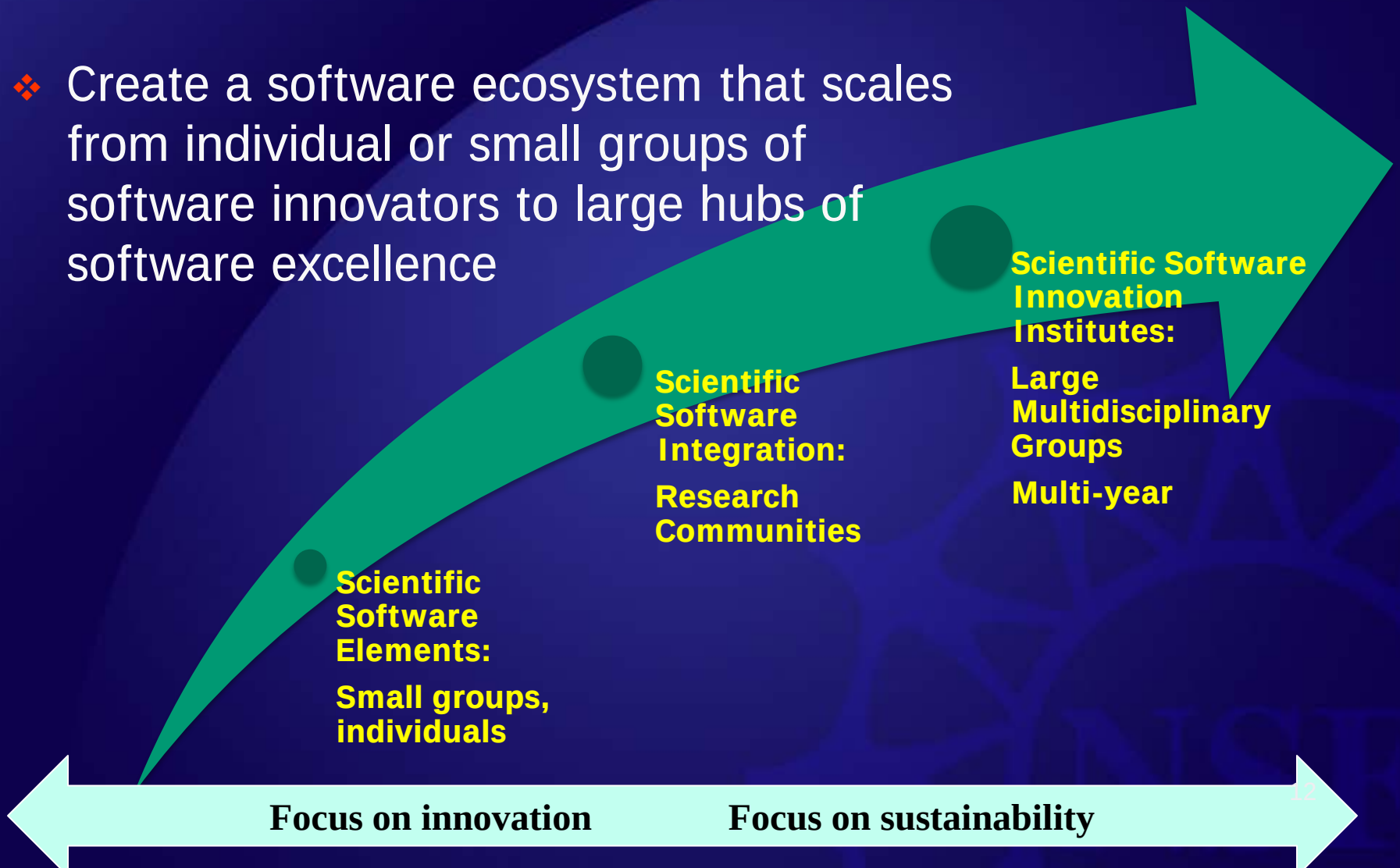
Interoperability of Data

New Computational Infrastructure Thrust Area 2

- Computational and Data-enabled resources
  - HPC, Clouds, Clusters, Data Centers
  - Computation capabilities
  - Modeling, simulation, visualization
- Long-term software for science and engineering
  - Sustained software development and support
- Discipline-specific activities
  - Services, tools, compute, simulation environments that serve specific research efforts and communities

Creating Scalable Software Development Environments

- Create a software ecosystem that scales from individual or small groups of software innovators to large hubs of software excellence



Community Research Networks Thrust Area 3

- New multidisciplinary research communities
  - Address challenges beyond individuals and disciplinary research communities
  - Support and optimize collaboration across small, mid-level and large community networks
  - Support SEES and new research communities
- Advanced research on community and social networks
  - Structures, leadership, fostering and sustainability
  - “virtuous cycle” providing feedback through formal evaluation and program iteration

Access and Connectivity
Thrust Area 4

- Network connections and engineering program
  - Real-time access to facilities and instruments; Begins to tie in MREFC activities
  - Integration and end-to-end performance to provide seamless access from researcher to resource
- Cybersecurity – from innovation to practice
  - Deployment of identity management systems
  - Development of cybersecurity prototypes

CIF21 Strategic Plan

- Development of a detailed CIF21 Roadmap for FY12 and beyond; updated as needed
- Developing a plan and guide for CI investments across NSF
- Established internal NSF working group
- Exploring and developing data policies on open access, publications, citation, etc
- Multidirectorate/office “collective” programs designed to build critical infrastructure and capabilities

CIF21 Strategy Plan con't

- Outcomes and metrics being identified for each Thrust Area
- Spiral development model adopted for all components
  - 3-5 year overlapping spirals
  - Iteration and creation of new versions and capabilities and improvements with each spiral
- NSF Advisory Committee on Cyberinfrastructure to review CIF21 progress; individual directorate ACs to review as well

End