Cyberinfrastructure -

Revolutionizing the Conduct of Science & Engineering Research & Education

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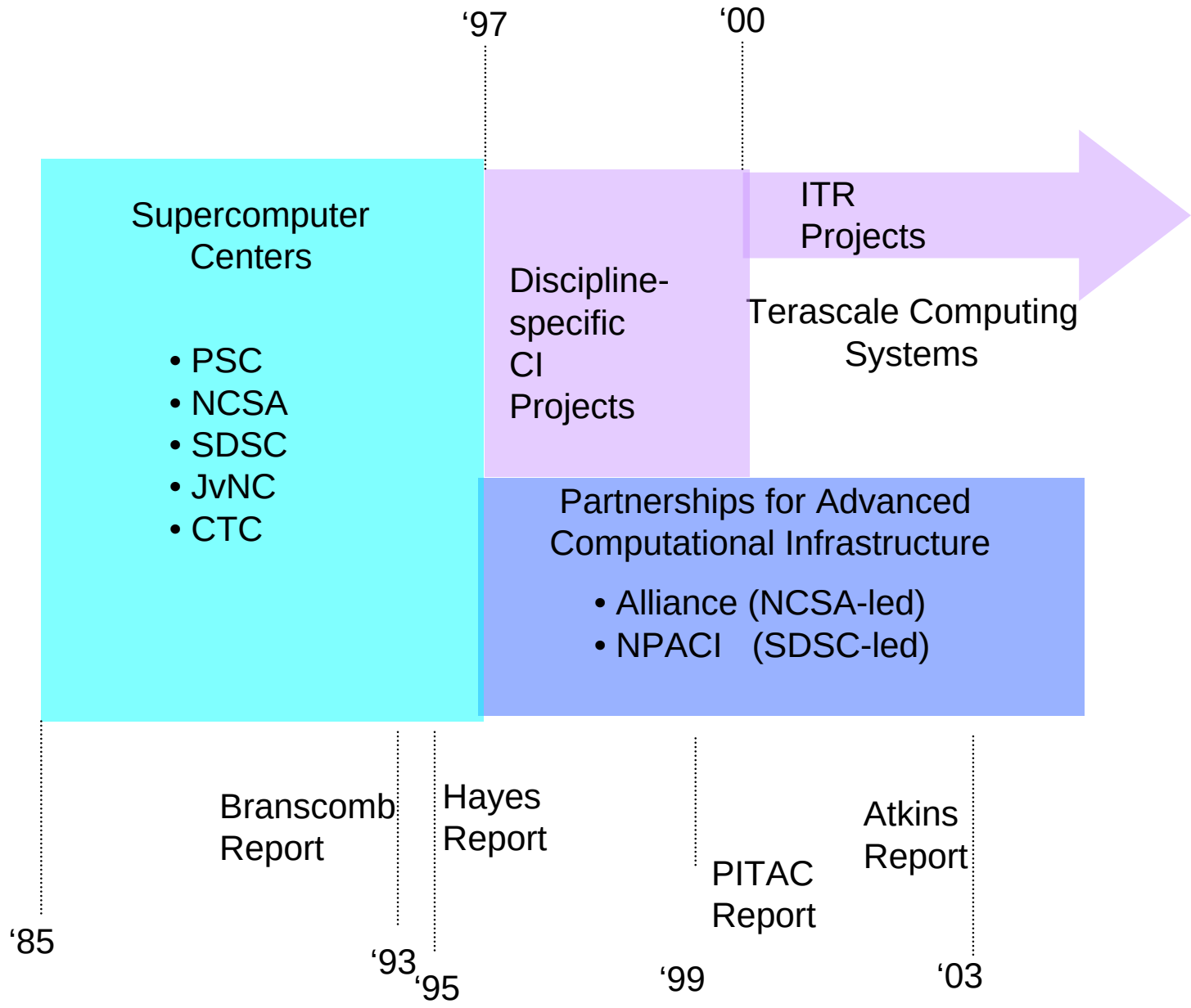
Schumpeter on Innovation

Gales of Creative Destruction

- Innovation
  - equilibrium destruction
  - innovators as social leaders
- New for Old
  - technical
  - sociological
- Two-wave Cycle
  - development
  - exploitation

The Cyberinfrastructure Development Cycle



Calling for Exploitation

"The opportunity is here to create cyberinfrastructure that enables more ubiquitous, comprehensive knowledge environments that become functionally complete … in terms of people, data, information, tools, and instruments and that include unprecedented capacity for computation, storage, and communication."

Cyberinfrastructure "can serve individuals, teams and organizations in ways that ***revolutionize what they do, how they do it,*** **and** ***who can participate***."

Atkins Report, February 2003

Exploitation in Global Society too!

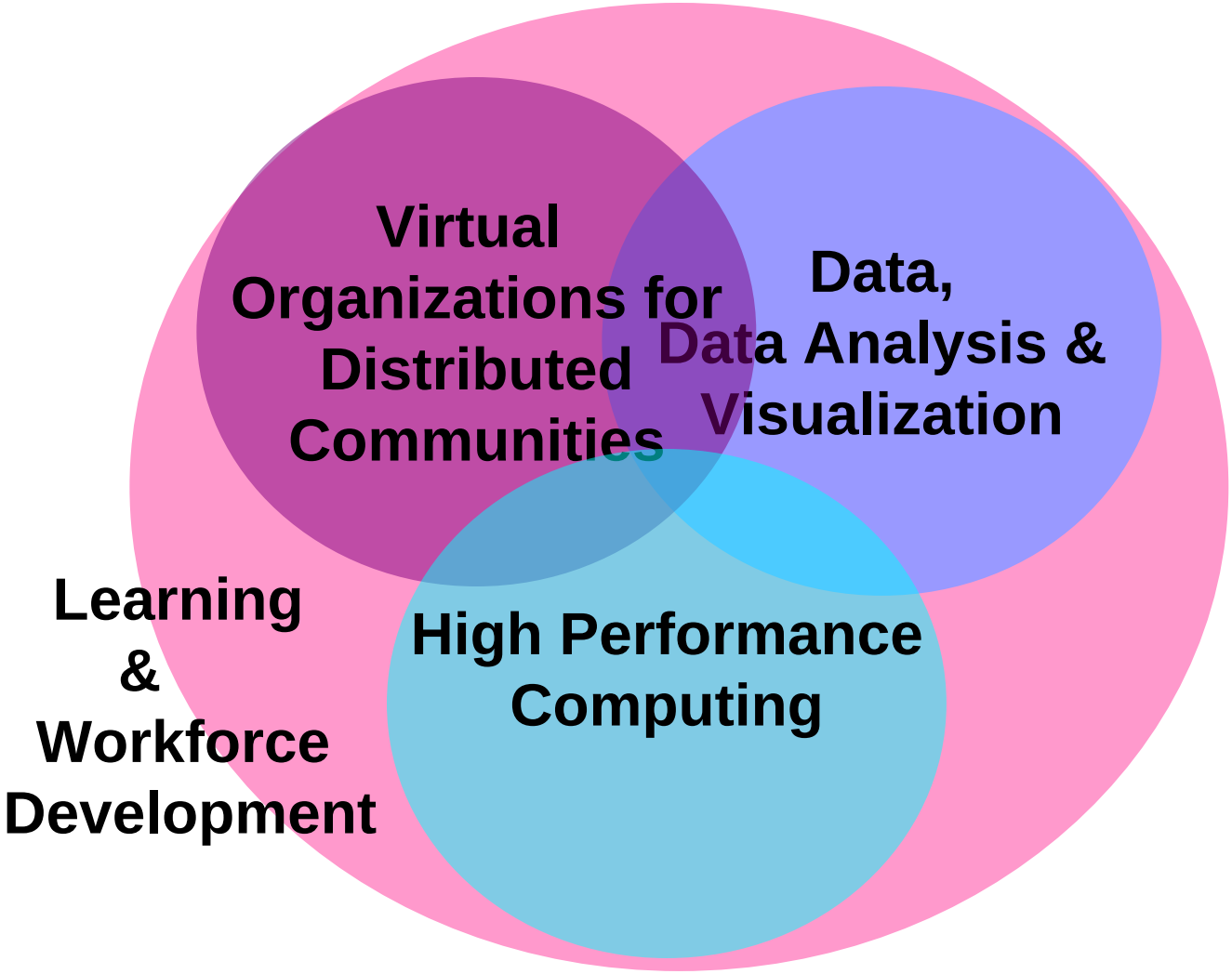
"Clearly, it is now (technologically) possible for more people than ever to collaborate and compete in real-time, with more people, on more kinds of work, from more corners of the planet, and on a more equal footing, than at any previous time in the history of the world."

Thomas L. Friedman, The World is Flat, 2005

New NSF Governance Model

- Cyberinfrastructure Council (CIC) created in 2005
- CIC responsible for shared stewardship and ownership of NSF's cyberinfrastructure portfolio
- OCI created in 2005 and focused on "production-quality" CI for research and education
- CISE remains focused on basic research and education mission, future generations of CI technologies/capabilities
- NSF's Cyberinfrastructure Vision for 21st Century Discovery released in March 2007

Four Cyberinfrastructure Components



All CI Things Created Equal?

Digital Data &
Data Stewardship

Learning &
Workforce Development

Virtual Organizations for
Distributed Communities

High Performance
Computing

All CI Things Created Equal

"Sustainable Digital Data Preservation & Access Network Partners"

"Cyber-Enabled Discovery & Innovation – From Data to Knowledge"

"Community-Based Data Interoperability Networks"

Digital Data &
Data Stewardship

All CI Things Created Equal

"Cyber-enabled Discovery & Innovation - Building Virtual Organizations"

"Software Development for Cyberinfrastructure"

Virtual Organizations For Distributed Communities

All CI Things Created Equal

"CI-TEAM" – currently under revision

"Pathways to Revitalize Undergraduate Education in Computing"

Learning & Workforce Development

Building Capacity for Exploitation

- Broadband Connectivity – Remote but not Isolated
  - Geographical limitations of I2, NLR
  - Public-Private Partnerships

- Long-term Planning at National, State, Local & Institutional Levels
  - Technological
  - Human Capital
  - Financial

- Changing the Practice of Science & Engineering Research & Education
  - Exploring new research and education activities

Revolutionizing Science & Engineering

"[Science is] a series of peaceful interludes punctuated by intellectually violent revolutions . . .[in which] . . . one conceptual world view is replaced by another."

--Thomas Kuhn

From *The Structure of Scientific Revolutions*