



Future Directions in Cancer Research: Multi-scale/Many-scale Modeling Approaches

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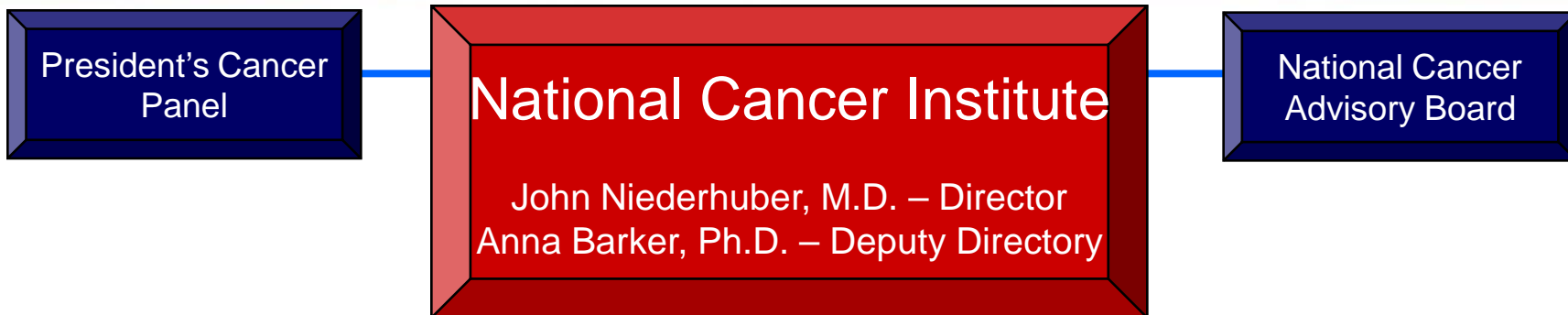
2009 SIAM Conference on Computational Science and Engineering
Panel Session: What Opportunities Exist from a Funding Agency Perspective for CSE?
March 2-6, 2009



NIH Comprises 27 Institutes and Centers

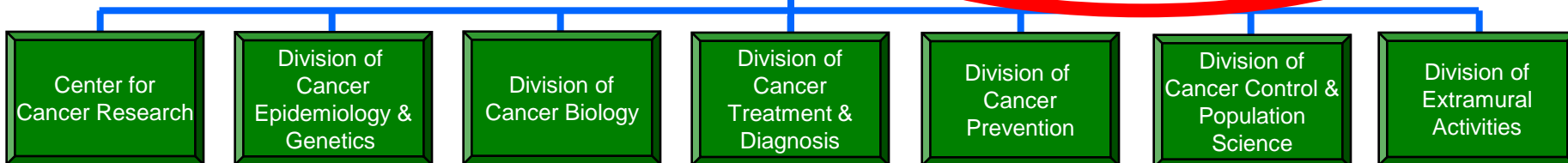
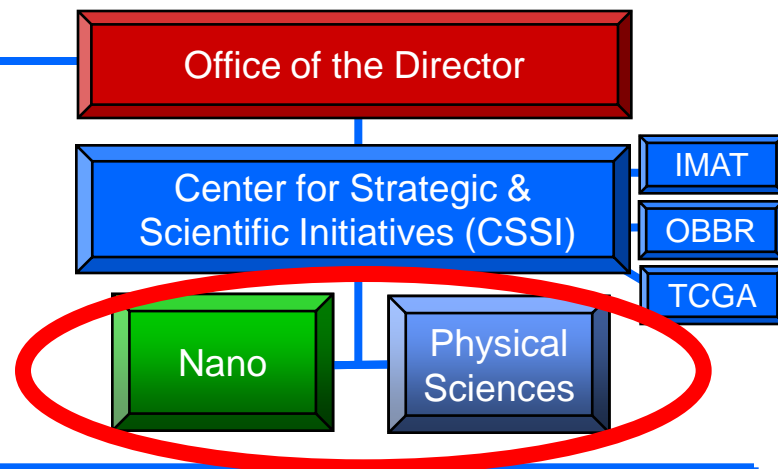


NCI Organizational Chart



NIH Budget 2008: ~\$28.9 Billion

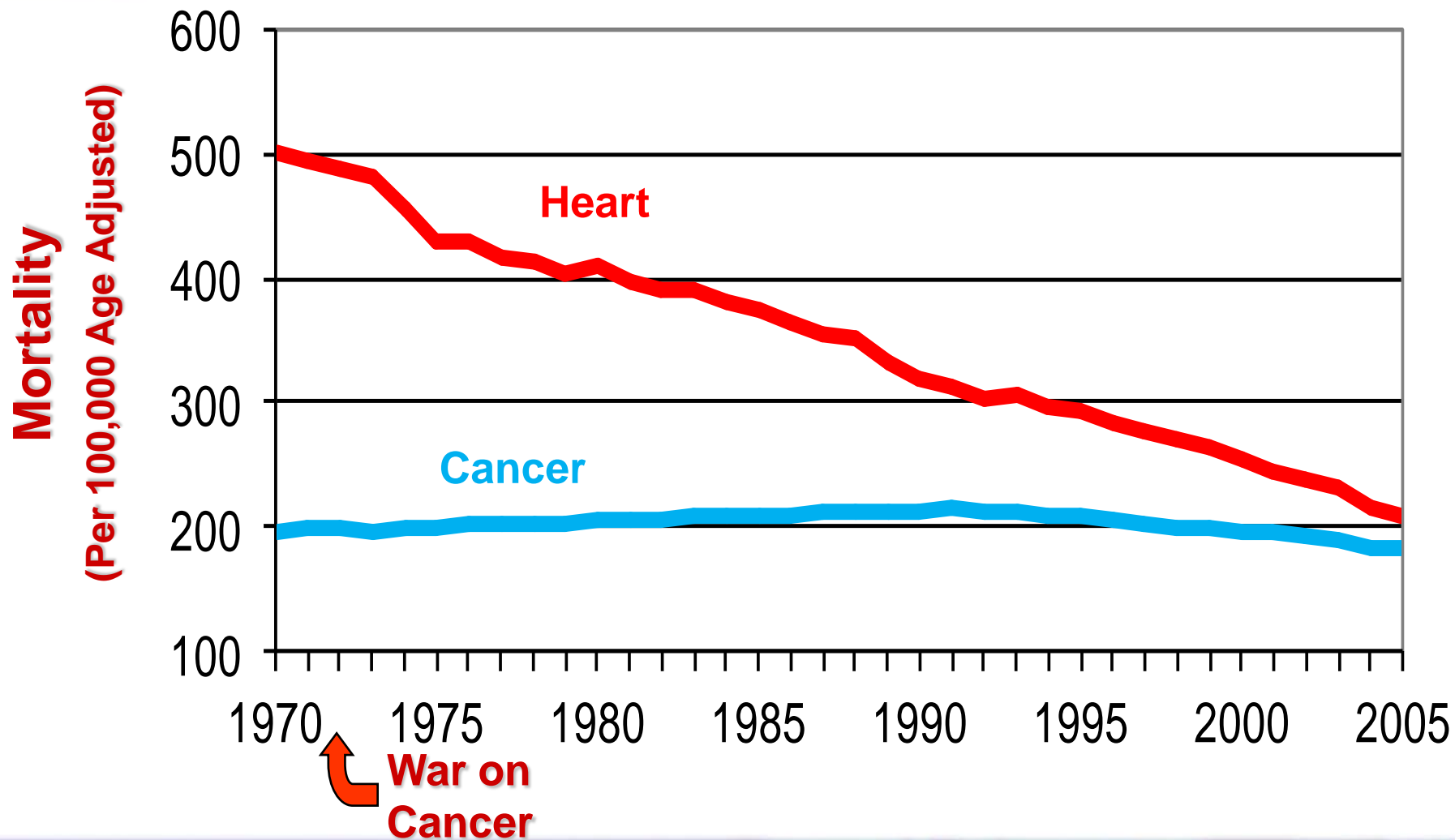
NCI Budget: ~ \$5 Billion



Conducting – Intramural

Funding – Extramural

Limited Progress in Reducing Cancer Death Rate (1970 – 2005)



Leveraging the Physical Sciences: A New Frontier in Oncology Workshops



Consensus Scientific Themes

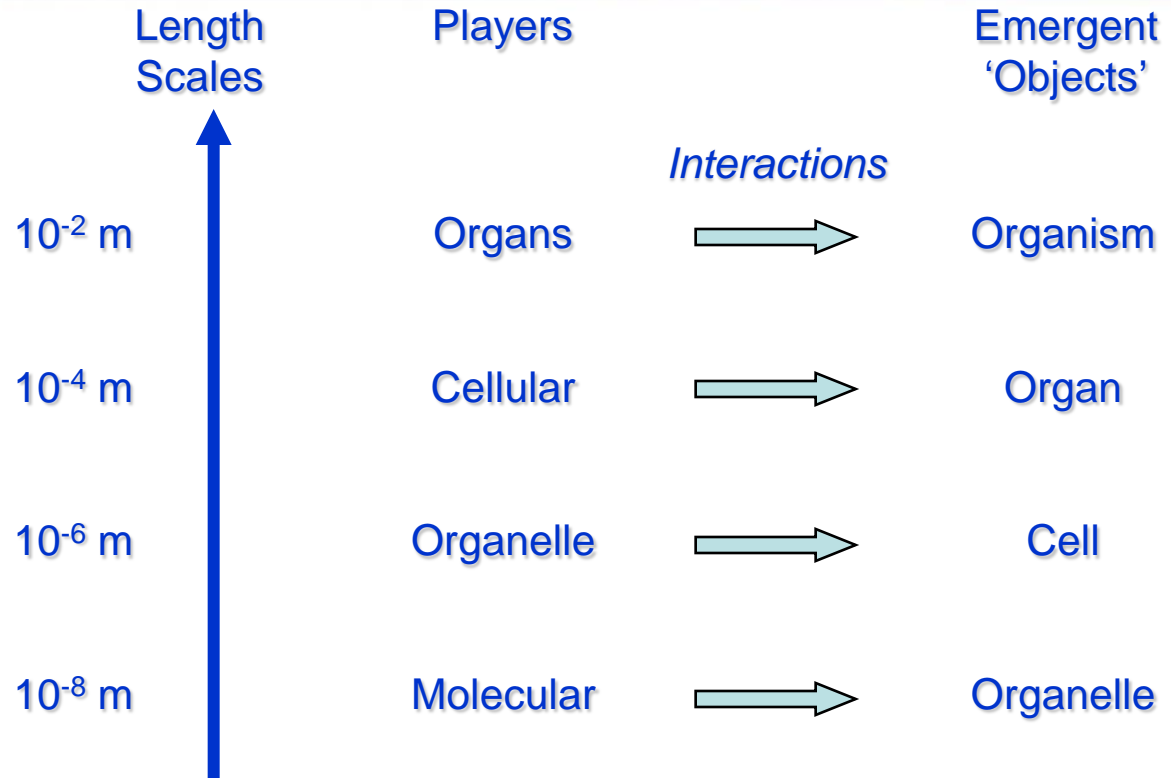
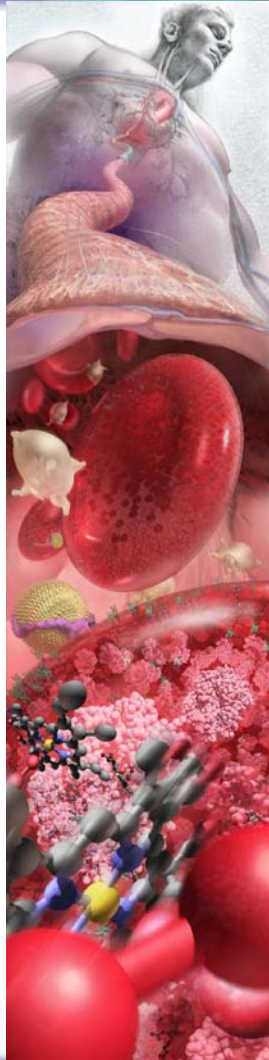
- *Laws/Principles of Physics Apply to Cancer Biology (Understanding the Physics of Cancer)*
- *Evolution and Evolutionary Theory in Cancer*
- *Coding, Decoding and Transfer of Information in Cancer*
- *De-convoluting the Complexity of Cancer*

Outcomes

- *Establish transdisciplinary physical sciences-oncology centers*
- *Centers composed of integrated physical sciences-oncology teams*
- *Focus on theme(s) for center focus*
- *Centers led by physicists with co-principal principal investigator from oncology*

Extramural groups of physicists, computer scientists, mathematicians, engineers, physical chemists, cancer biologists and oncologists.

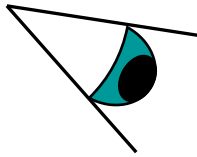
Cancer: Complexity & Emergence



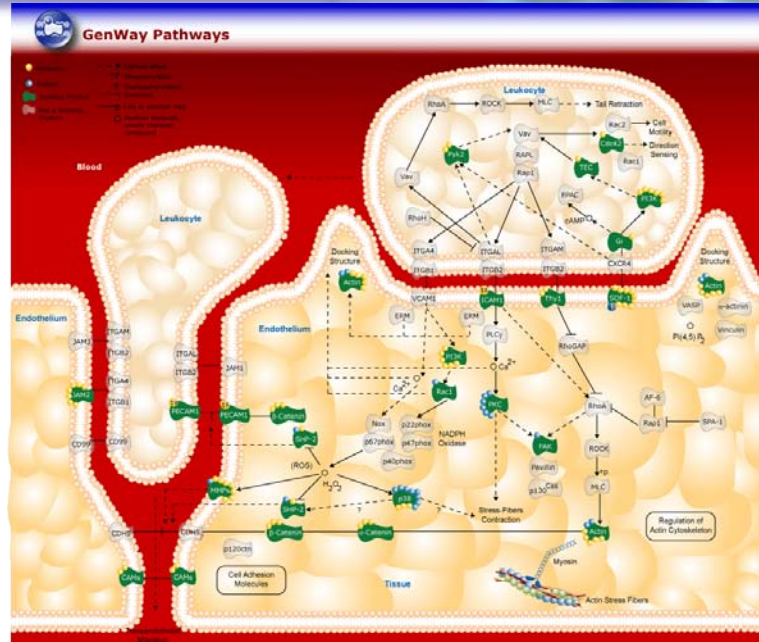
For decades, cancer biologists have been trying to understand the complicated systems of cancer by understanding each part at its most basic level. However, we now look at how the interactions of all the 'players' (within a length-scale) lead to emergent 'objects' - properties that work together in complex tasks.

Comparing “Perspectives”

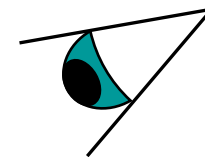
Physicist



- How much energy is needed to do this?
- How much force does it take to cross this barrier?
- Are reactions rates altered during this process?
- How much time does it take?
- What are the spatial effects?



Biologist

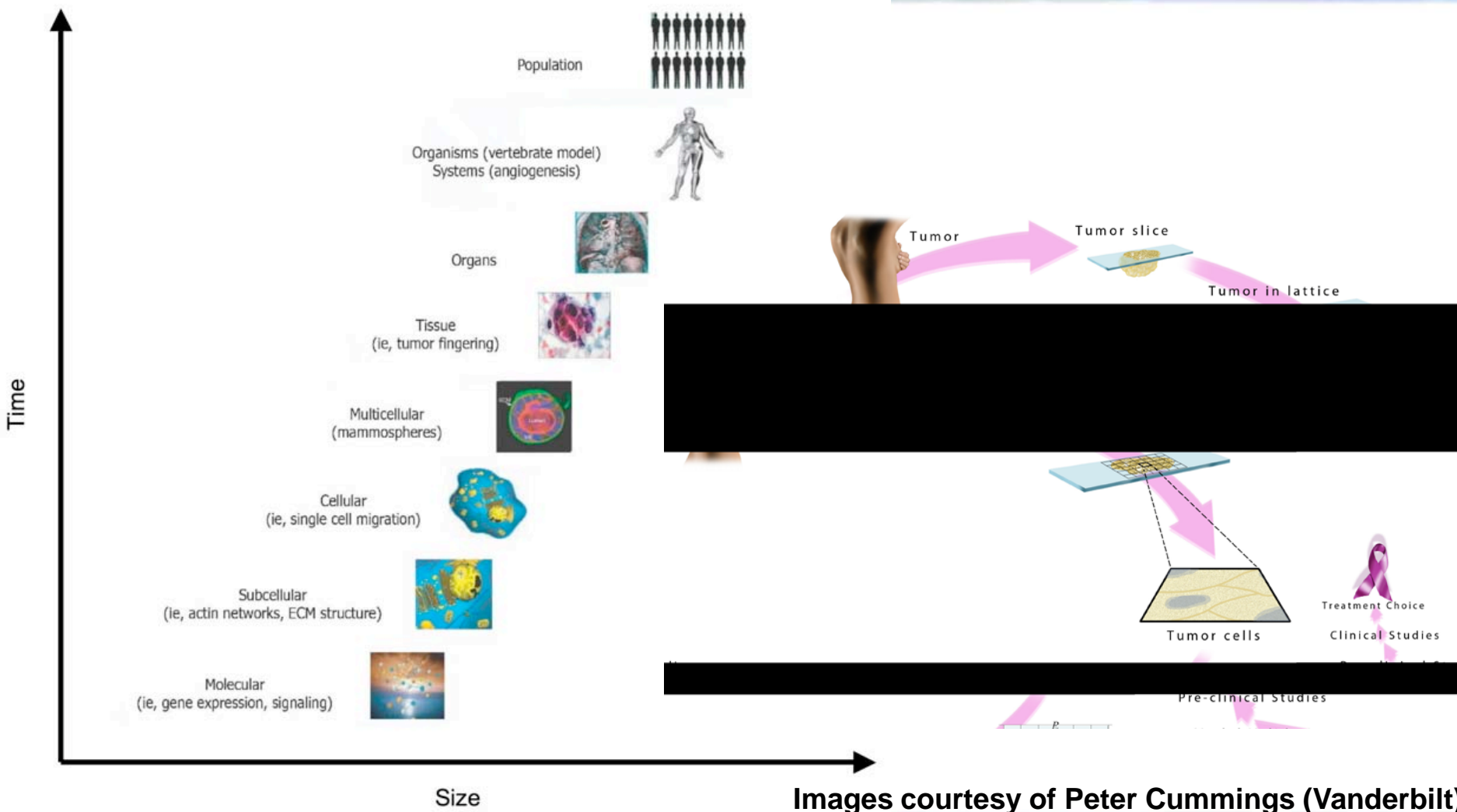


- What cell, molecule, tissue is it?
- What changed?
- Where does this fit?
- Do I see the same thing in several tumors?

Both ‘view’ the same picture differently!

Having both perspectives yields a more comprehensive (clearer) picture of what cancer is and how it functions at all levels – especially at the sub-molecular/atomic scales

Multiscale – “Physics of Cancer”



Images courtesy of Peter Cummings (Vanderbilt)

Physical Sciences in Oncology (physics.cancer.gov)



National Cancer Institute

U.S. National Institutes of Health | www.cancer.gov

Search

Physical Sciences-Based Frontiers in Oncology

PHYSICS.CANCER.GOV

Latest News

[Release of RFA for Physical Sciences-Oncology Centers](#)

RFA Number: RFA-CA-09-009
Receipt Date: March 13, 2009

[BSA Approves Physical Sciences Oncology Program](#)

[Watch Video](#)
Date: 11/06/08

Welcome

The National Cancer Institute (NCI) is exploring new and innovative approaches to better understand and control cancer through initiatives that enable the convergence of the physical sciences with cancer biology. Building on stunning progress in the molecular sciences and advanced technologies, we envision the development of new fields of study based on the application of physical sciences approaches to address major questions and barriers in cancer research. Specifically, NCI's initial goal is to join these often disparate areas of science by building a collaborative network that is composed of Physical Sciences-Oncology Centers (PS-OCs) that will collectively advance our understanding of the physical laws and principles that shape and govern the emergence and behavior of cancer at all scales.

Physical Sciences in Oncology Workshops and Think Tanks



[Integrating and Leveraging the Physical Sciences to Open a New Frontier in Oncology](#)

February 26-28, 2008
Arlington, VA



[Physical Sciences-Based Frontiers in Oncology: A New Look at Evolution and Evolutionary Theory in Cancer](#)

July 13-15, 2008
Tyson's Corner, VA



[Physical Sciences-Based Frontiers in Oncology: The Coding, Decoding, Transfer, and Translation of Information in Cancer](#)

October 29-31, 2008
Pentagon City, Arlington, Virginia

More Information

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Recovery Act Limited Competition: NIH Challenge Grants in Health and Science Research (RC1)

Request for Applications (RFA) Number: RFA-0D-09-003

Key Dates:

Release/Posted Date: March 4, 2009

Application Due Date(s): April 27, 2009

Earliest Anticipated Start Date(s): September 30, 2009

Funds Available and Anticipated Number of Awards. This initiative is funded under the Recovery Act. **NIH has designated at least \$200 million in FYs 2009 - 2010 to fund 200 or more grants**, contingent upon the submission of a sufficient number of scientifically meritorious applications.

Budget and Project Period. Budget requests should be commensurate with project needs up to a two-year project period. The requested budget may not exceed \$500,000 total costs per year for a maximum of \$1,000,000 total costs over a two-year project period.

Page Limits: The Research Plan is limited to 12 pages