Physical Sciences-Based Frontiers in Oncology

Physical Sciences in Oncology Centers (RFA-CA-09-009) Pre-Application Meeting

PS-OC Program Goals and Objectives

William H. Natcher Conference Center
National Institutes of Health
January 23, 2009
Bethesda, Maryland

PS-OC Program Goal and Vision

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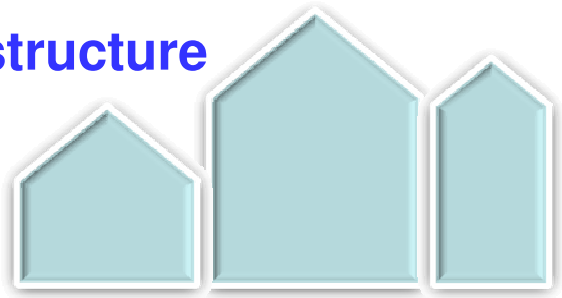
The Specific Purpose for the PS-OC Initiative:

- To generate ***new knowledge*** and catalyze ***new fields of study*** in cancer research by utilizing physical sciences/engineering principles to enable a better understanding of cancer and its behavior at all scales.
- Not looking for new tools to do "better" science, but new perspectives and approaches to do ***paradigm-shifting*** science that will lead to exponential progress against cancer.
- Build ***trans-disciplinary teams*** and infrastructure to better understand and control cancer through the convergence of physical sciences and cancer biology.



"Schools of Thought"

Taking the first step: Physical Science-Oncology Centers (PS-OC)

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- Creating a collaborative network consisting of virtual centers that focus their individual efforts around an

Better vs. Paradigm Shift – Cell Phone

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Component Improvements (Size) = Accepted Dogma

System Improvement (Smarter Phones)

Smaller is Better – Incremental

Paradigm Shift

1983

1989

1996

2003

2004

Apple iPhone

Blackberry Storm

2007

"Fresh" Perspective

- ❑ *Different "SME"*
- ❑ *Challenged dogma*

Email Questions to nci.physics@mail.nih.gov

Mechanism & Funds

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Mechanism of Support: U54, Specialized Center-Cooperative Agreements

*The spectrum of activities comprises a **multidisciplinary attack** on a specific disease entity or biomedical problem area. These differ from program project in that they are usually developed in response to an announcement of the programmatic needs of an Institute or Division and subsequently **receive continuous attention from its staff.** Centers may also serve as regional or **national resources for special research purposes**, with funding component staff helping to identify appropriate priority needs.*

Budget: Not to exceed **$2.0M – $2.25M per year (*direct costs*)** per center

Project Period: Not to exceed 5-year period

Anticipated Awards: 4 – 6 awards

Principle Investigator (PI) & Institution Requirement

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RFA Language:

"To provide appropriate perspective and insights, the PI on an application… ***must be*** *a scientist with formal training and expertise in the* ***physical sciences and/or engineering****…each applicant team* ***must also*** *include a senior co-investigator with formal training and/or expertise in the* ***biological and/or clinical sciences."(oncology)***

Includes formal training and/or demonstrated track record in:

- ***Physics***
- ***Physical Chemistry***
- ***Mathematics***
- ***Engineering***

  …
- ***Materials Sciences***
- ***Computer Sciences***
- ***Astronomy/Astrophysicist***

RFA Language:

"Each awarded PS-OC will be a "virtual" center, headed by a Project Director/Principal Investigator (PD/PI), that is composed of laboratories and research facilities which ***must include two or more collaborating institutions in various sites throughout the country or the world.****"*

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Summary of Six Required Components

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PS-OC Framework	*Center's unique organizing construct to address a major question(s) in cancer using novel physical sciences-based approaches*
PS-OC Projects	*3-5 projects to demonstrate and advance PS-OC framework*
Shared Research Resources	*1-3 shared infrastructures to integrate and support center activities*
Administrative Units	*Coordinate 1) individual center, 2) CAC and center pilot projects (min. 5% total DC/yr set-aside), 3) PSC and trans-network projects (min. $100k/yr set-aside).*
Outreach and Dissemination Unit	*Catalyze new fields of studies based on center's concepts and results by educating research communities and initiating external collaborations (min. $100k/yr set-aside)*
Education and Training Unit	*Train pipeline of new researchers that utilize physical sciences-based approaches in cancer research (min. $100k/yr set-aside)*

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PS-OC Themes

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RFA Language:

Four general ***THEMES*** emerged from these ***NCI-sponsored think tanks*** as new areas of investigation that are critical to understanding and ultimately controlling cancer:

A. Understanding the Physics (Physical Laws and Principles) of Cancer

B. Exploring and Understanding Evolution and Evolutionary Theory in Cancer from a Physics Perspective

C. Understanding the Coding, Decoding, Transfer, and Translation of Information in Cancer

D. Deconvoluting the Complexity of Cancer

PS-OC Framework – Example

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PS-OC Organizing Framework

- ***Address major barriers and fundamental questions in understanding and controlling* cancer**
- ***Novel physical sciences based approach to address barriers/questions***

Organizing Framework: Understanding the Cause & Effect of Metastasis via Integration of Physics (the Physical Laws and Principles) and Cancer Biology (*Theme A*) – Defining the role(s) of *thermodynamics* and *mechanics* in *metastasis* and determining how this knowledge might be employed in new *intervention strategies*.

PS-OC Structure Around Framework Example

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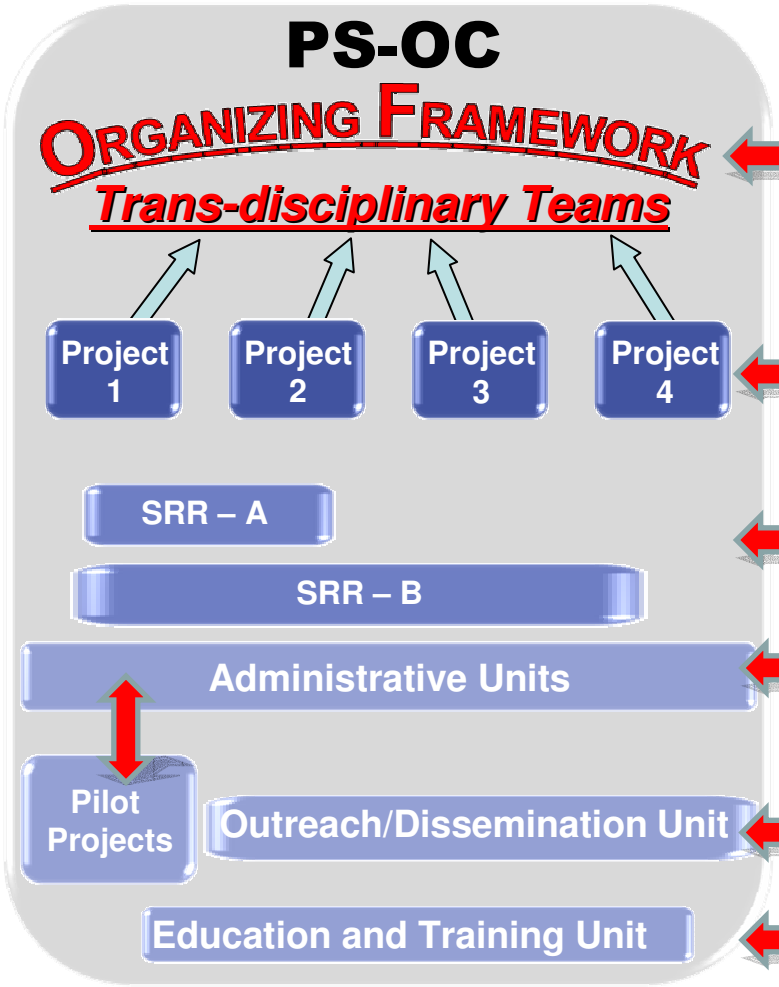

"Understanding the Cause & Effect of Metastasis via Integration of Physics (the Physical Laws and Principles) and Cancer Biology"

Project 1 – Thermodynamics + Metastasis
Project 2 – Mechanics + Metastasis
Project 3 – MechanoThermo + Intervention
Project 4 – …

Shared Research Resources (SRR)
A – Computation Facility (Projects 1 & 2)
B – Cell Line/Mouse Model Core (All)

Administration Unit
- ❑Pilot Projects
- ❑Trans-network Projects

Outreach/Dissemination Unit
- ❑Pipeline of New Researchers

Education/Training Unit
- ❑Pipeline of New Researchers

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Organizational Infrastructure

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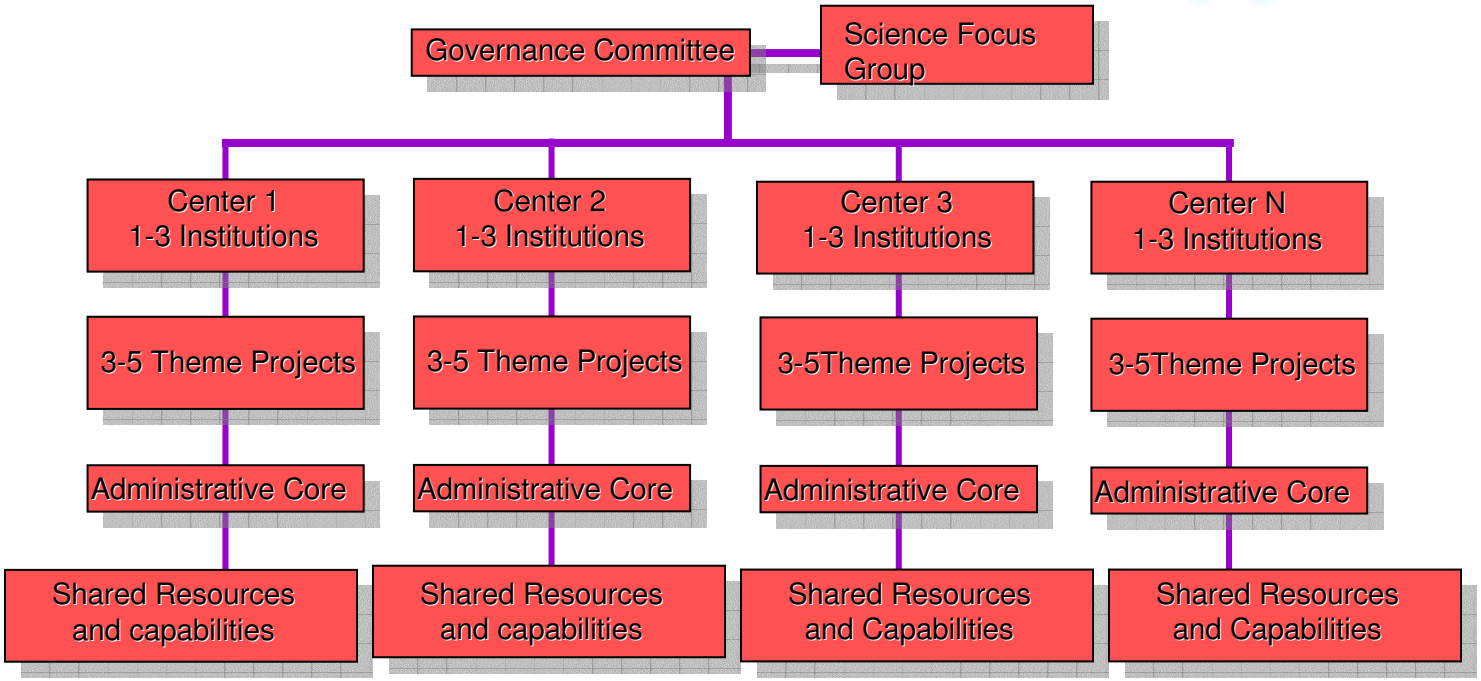

Center Requirements

- ❑Overarching conceptual physical sciences - cancer theme/approach
- ❑Physical scientist PI with basic/clinical cancer researcher co-PI(s)
- ❑Trans-disciplinary team – and team environment
- ❑Adopt 3-5 synergistic theme projects (*i.e.,* complexity, coding, decoding, transferring information, evolution/evolutionary theory, physical science principles/laws)
- ❑Cores: collaboratively linked through multiple centers
- ❑External advisory board provides scientific input to program staff

PS-OC Operation & Network Interaction

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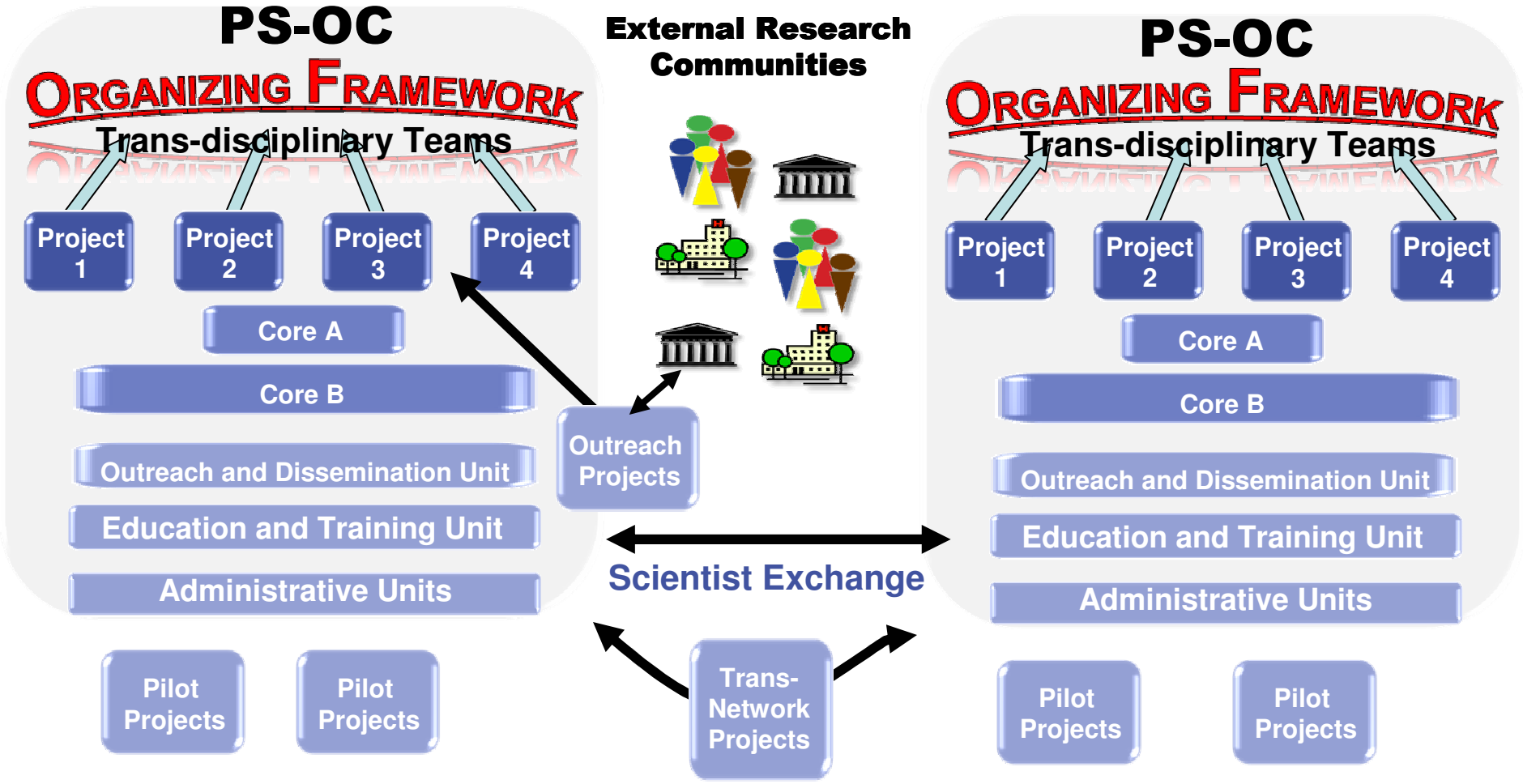

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Section VII. Agency Contacts

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Section VII. Agency Contacts

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Questions?

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Pre-Application Meeting:

Request for Applications (RFA) CA-09-009

"Physical Science-Oncology Centers (U54)"

To submit questions, please e-mail us at

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