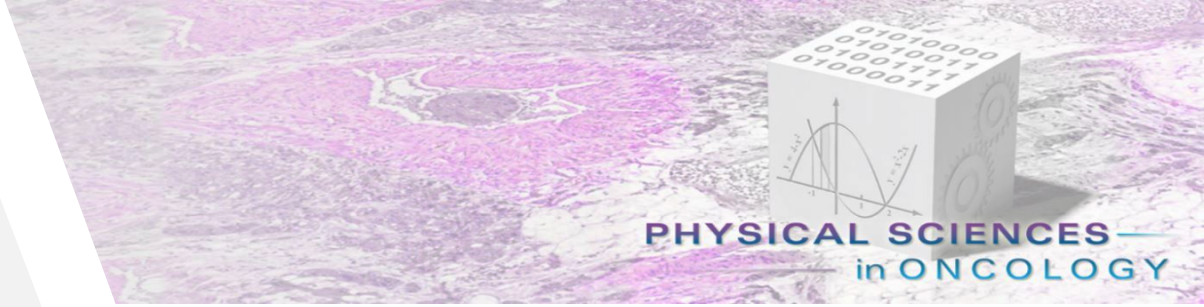

Physical Sciences-Oncology Network Overview

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Physical Sciences-Oncology Program
Division of Cancer Biology
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NIH NATIONAL CANCER INSTITUTE

August 31, 2016

Cancer Continues to be a Leading Cause of Death

PHYSICAL SCIENCES— in ONCOLOGY

Estimated New Cases

Males				Females		
Prostate	180,890	21%		Breast	246,660	29%
Lung & bronchus	117,920	14%		Lung & bronchus	106,470	13%
Colon & rectum	70,820	8%		Colon & rectum	63,670	8%
Urinary bladder	58,950	7%		Uterine corpus	60,050	7%
Melanoma of the skin	46,870	6%		Thyroid	49,350	6%
Non-Hodgkin lymphoma	40,170	5%		Non-Hodgkin lymphoma	32,410	4%
Kidney & renal pelvis	39,650	5%		Melanoma of the skin	29,510	3%
Oral cavity & pharynx	34,780	4%		Leukemia	26,050	3%
Leukemia	34,090	4%		Pancreas	25,400	3%
Liver & intrahepatic bile duct	28,410	3%		Kidney & renal pelvis	23,050	3%
All Sites	**841,390**	**100%**		**All Sites**	**843,820**	**100%**

Estimated Deaths

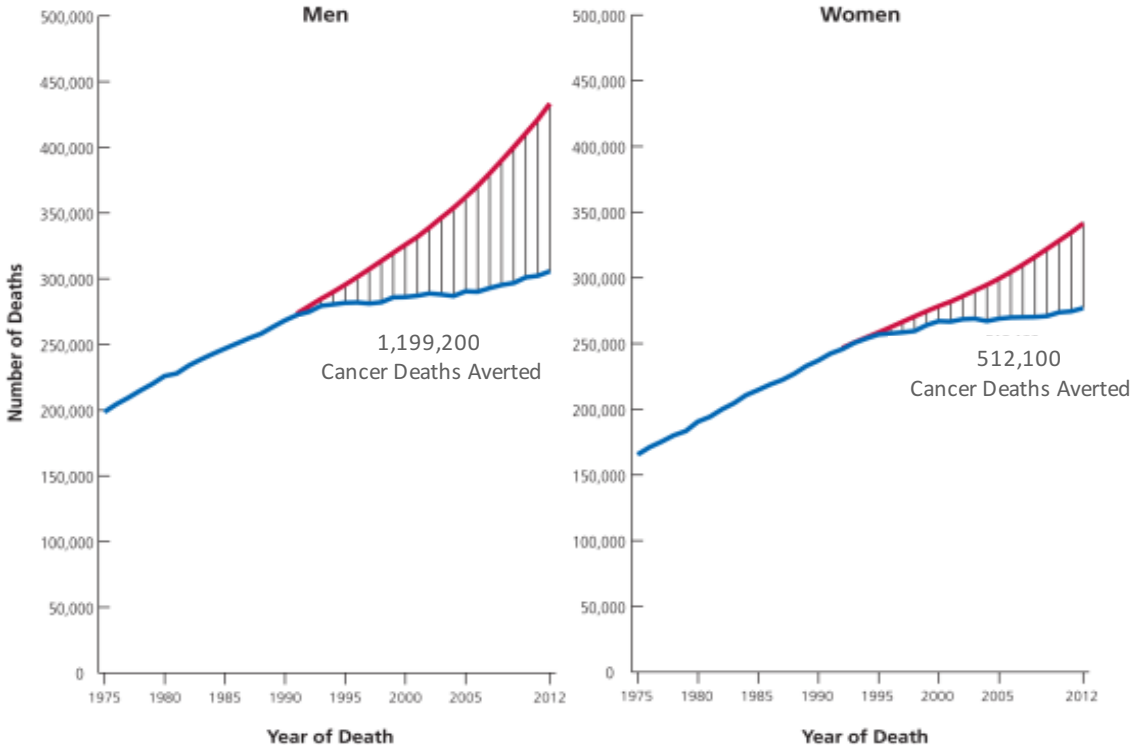
Males				Females		
Lung & bronchus	85,920	27%		Lung & bronchus	72,160	26%
Prostate	26,120	8%		Breast	40,450	14%
Colon & rectum	26,020	8%		Colon & rectum	23,170	8%
Pancreas	21,450	7%		Pancreas	20,330	7%
Liver & intrahepatic bile duct	18,280	6%		Ovary	14,240	5%
Leukemia	14,130	4%		Uterine corpus	10,470	4%
Esophagus	12,720	4%		Leukemia	10,270	4%
Urinary bladder	11,820	4%		Liver & intrahepatic bile duct	8,890	3%
Non-Hodgkin lymphoma	11,520	4%		Non-Hodgkin lymphoma	8,630	3%
Brain & other nervous system	9,440	3%		Brain & other nervous system	6,610	2%
All Sites	**314,290**	**100%**		**All Sites**	**281,400**	**100%**

- Cancer is the 2nd leading cause of death in the U.S. and is projected to kill nearly 600,000 Americans in 2016
- More than 1.6M Americans estimated to be newly diagnosed in 2016 (4600 new diagnoses each day)

NIH NATIONAL CANCER INSTITUTE

Siegel et al. Cancer Statistics 2016; Lowy and Collins. N Engl J Med 2016

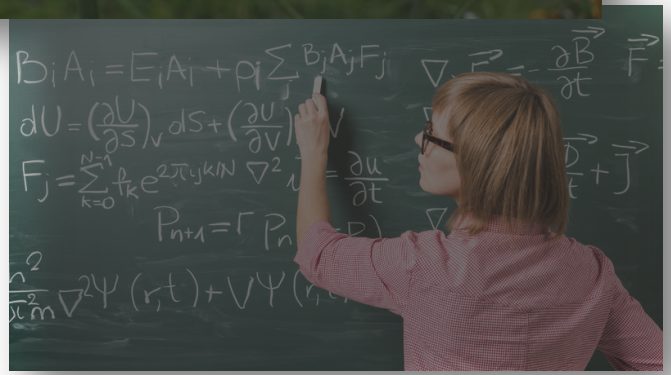
Progress is Hopeful, and More Work Needs to be Done to Improve Patient Outcomes



Although the cancer death rate has dropped by 23% since 1991 (estimated 1.7M cancer deaths averted in the past 25 years) **more progress is urgently needed.**

Siegel et al. Cancer Statistics 2016

How Things Appear is Always a Matter of Perspective . . .



Timeline of the Physical Sciences-Oncology Initiative

PHYSICAL SCIENCES in ONCOLOGY

12 Awards

4 Awards 6 Awards 5 Awards

PS-OC RFA Sep — Phase I — Phase II May Sep Aug

2008 2009 2012 2013 2014 2015 2016

Feb Jul Oct

Pre-Award Think Tanks

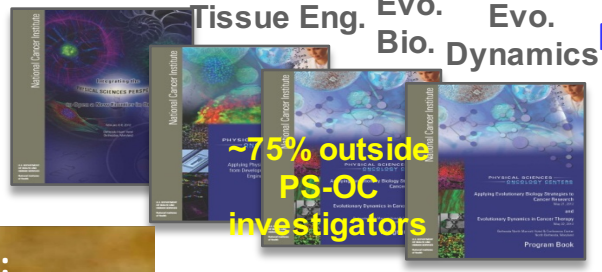
~300 extramural participants

Feb Think Tank

Apr Dev. Bio. Tissue Eng.

May Evo. Bio.

Evo. Dynamics

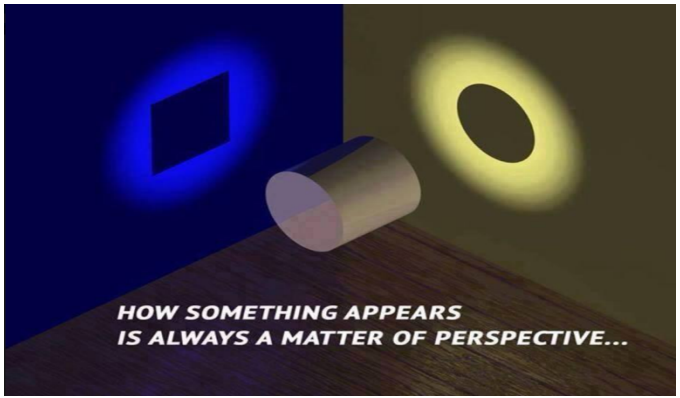


75% outside PS-OC investigators

Nov Phase II PS-ON PARs Approved

PAR-14-169

PAR-15-021



Physical Sciences-Oncology Network (PS-ON): *Mission*

- Complement and expand our current understanding of cancer across ***many biological length- and time-scales*** by using approaches and theories from the physical sciences.
- ***Integrate the physical dynamics of cancer*** – physical properties such as mechanical cues, transport phenomena, bioelectric signals, and thermal fluctuations – ***with molecular and genetic processes*** to understand how they modulate the behavior of cancer cells.
- Explore the ***complexity of multi-scale processes and spatio-temporal organization*** often dysregulated in cancer.
- Understand information transfer by ***computationally integrating data across length-scales and time domains***.

The Physical Sciences-Oncology Network: *PS-ON 2016*

PHYSICAL SCIENCES— in ONCOLOGY

U54 Centers (PS-OC)

Columbia
Cornell
Dana Farber
Hopkins
Methodist
Minnesota
MIT
Moffitt
Northwestern
UPenn

U01 Projects (PS-OP)

Berkeley
Harvard
MIT
Utah
Vanderbilt

U24 Coordinating Center

Sage Bionetworks

PS-ON Phase II

10 U54 Centers
5 U01 Projects

- ~50 institutions
- ~200 investigators
- ~30 trainees

and growing . . .

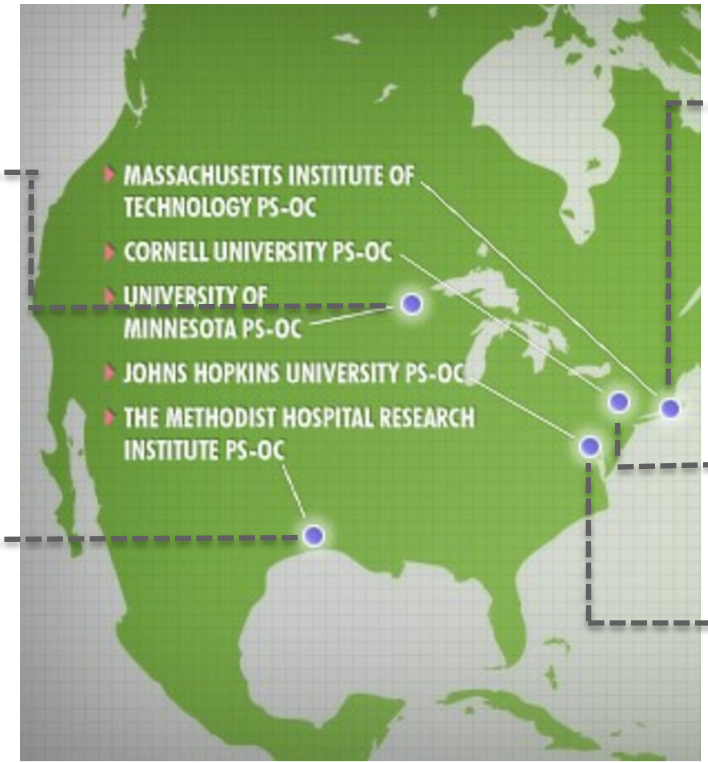
Welcome and Congratulations to the 5 New PS-OCs!

PHYSICAL SCIENCES— in ONCOLOGY

Odde

Largaespada

Rosenfeld



White

Sarkaria

Fischbach

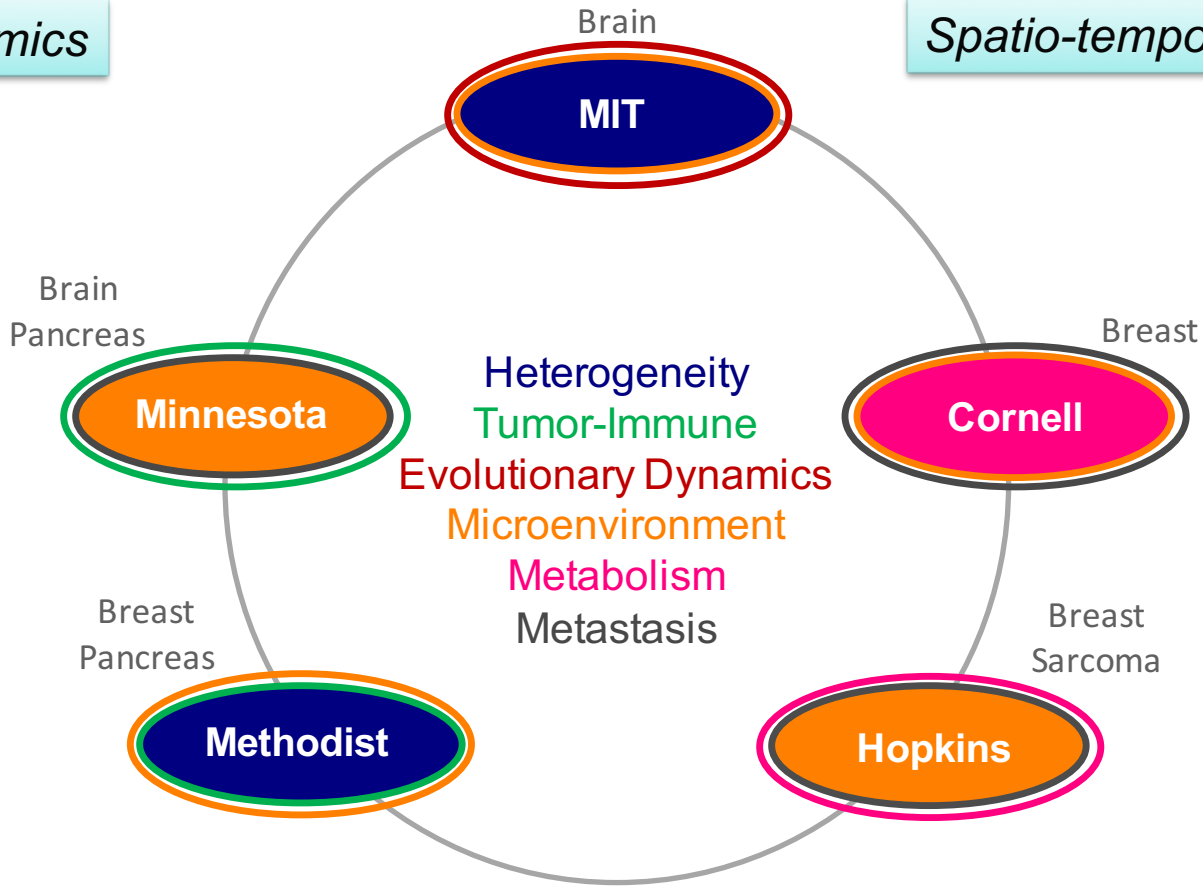
Cantley

Ferrari

Wirtz

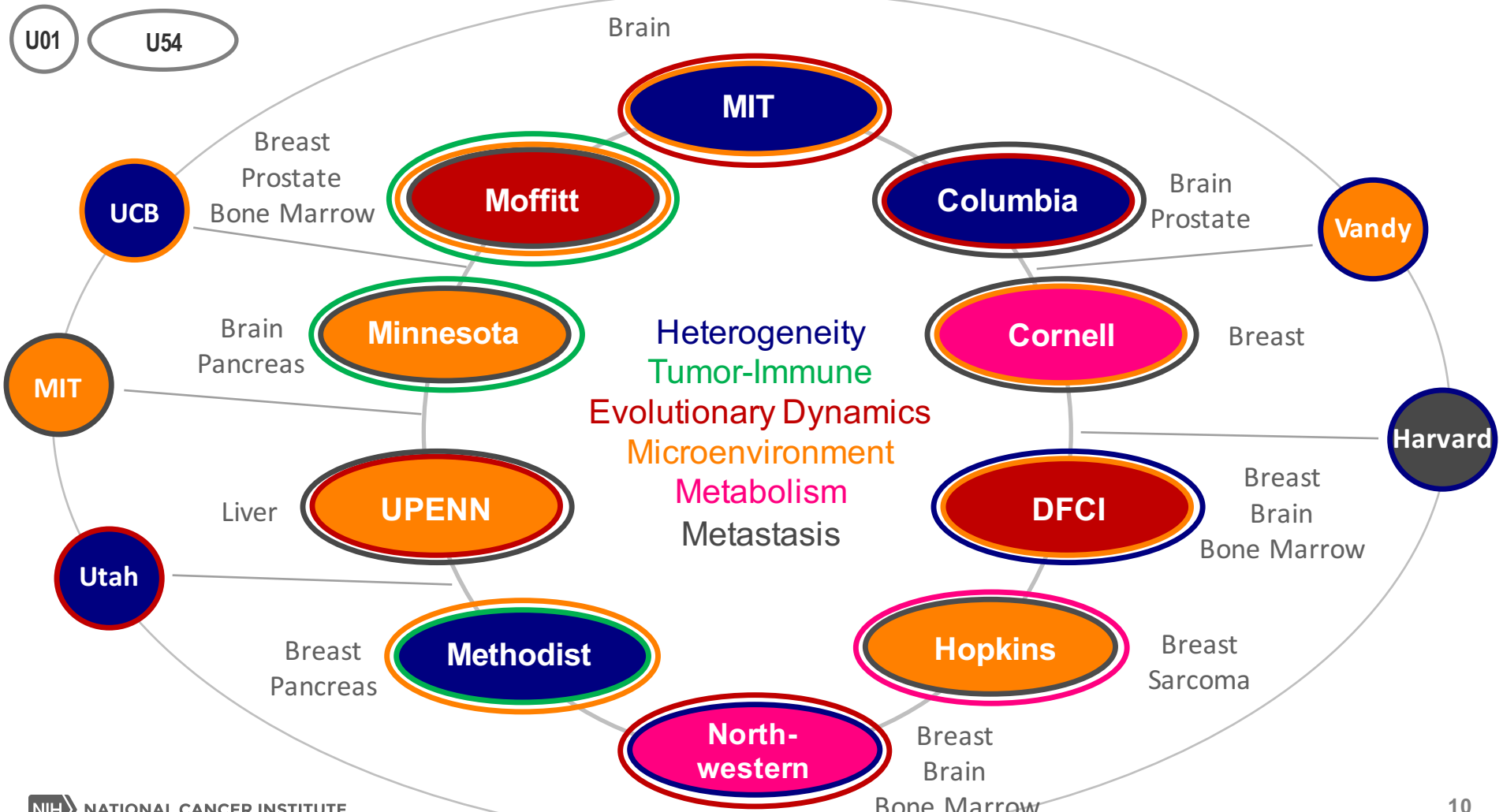
Physical dynamics

Spatio-temporal organization



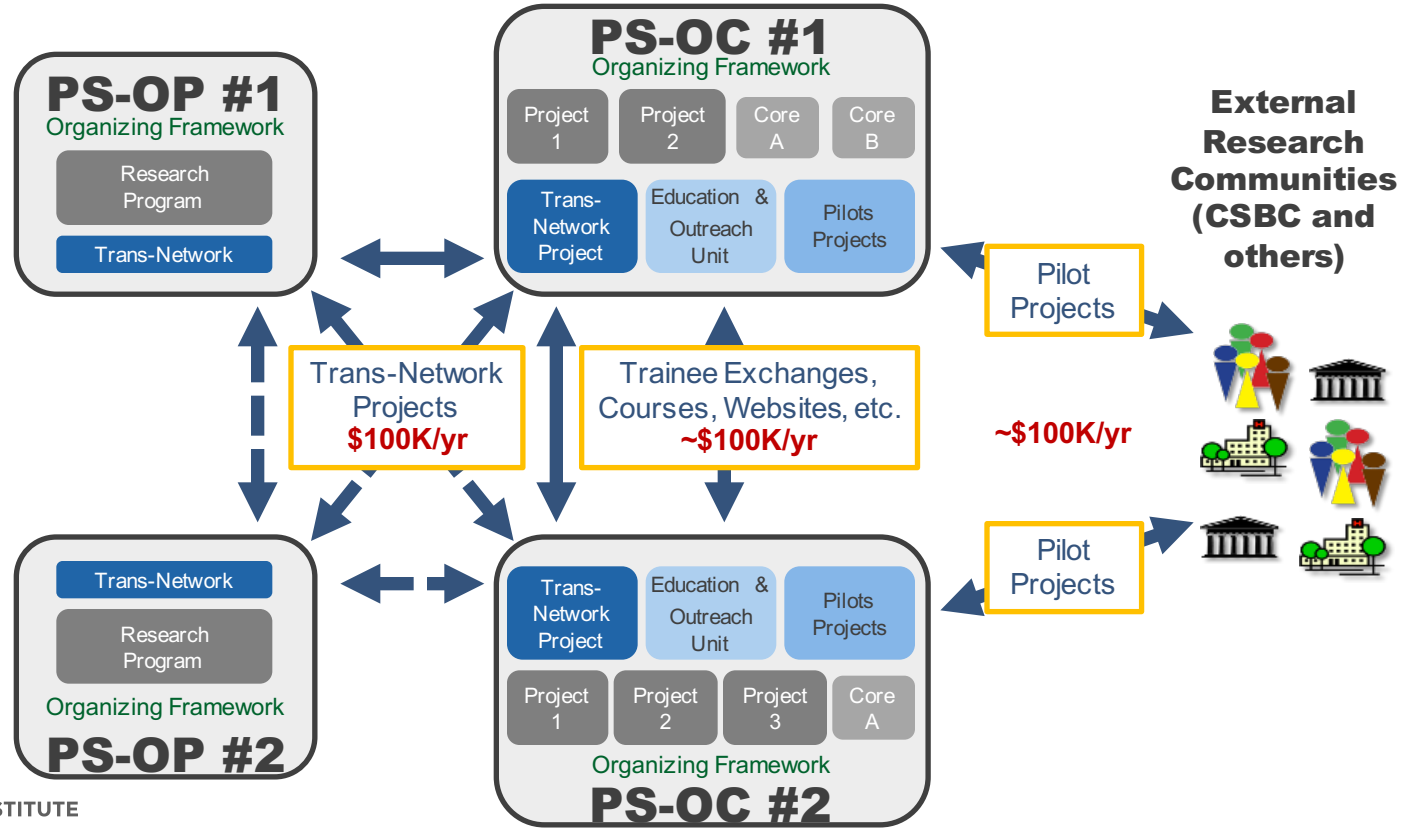
Multi-scale computational models

Novel technologies


U01
U54
Brain
MIT
Breast
Prostate
Bone Marrow
Moffitt
UCB
Columbia
Brain
Prostate
Vandy
Brain
Pancreas
Minnesota
Heterogeneity
Tumor-Immune
Evolutionary Dynamics
Microenvironment
Metabolism
Metastasis
Cornell
Breast
MIT
Harvard
Liver
UPENN
DFCI
Breast
Brain
Bone Marrow
Utah
Breast
Pancreas
Methodist
Hopkins
Breast
Sarcoma
North-
western
Breast
Brain
Bone Marrow

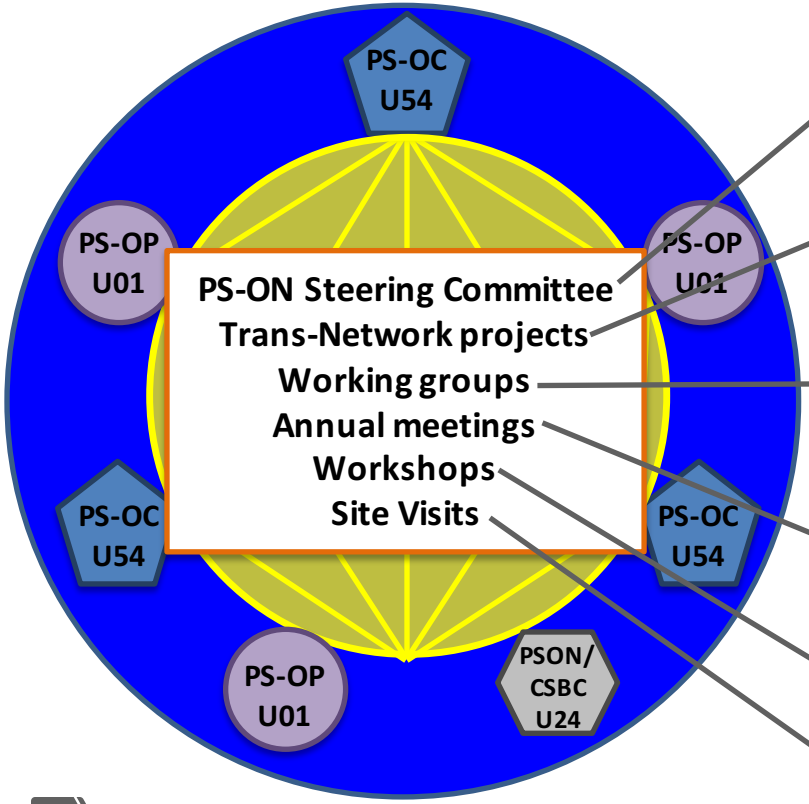
PS-ON Model: *Using "PI-driven" interactions to build a community within the Network and beyond*

PHYSICAL SCIENCES— in ONCOLOGY



An Integrated Network: *Organization of the PS-ON*

PHYSICAL SCIENCES— in ONCOLOGY



Monthly webinar with representatives from each U54, U01, U24 and NIH program staff

Rolling submissions, presentation at Steering Committee meeting, and opportunity for comment by SC.

Led by PS-ON members and facilitated by NCI and Sage
Education & Outreach;
Resource and Data Sharing
Additional WGs to be proposed by PS-ON members (optional for U01s)

Will be facilitated by NCI and Sage – annually in Summer/Fall

Will be facilitated by NCI and Sage. Could also be led by PS-ON members.

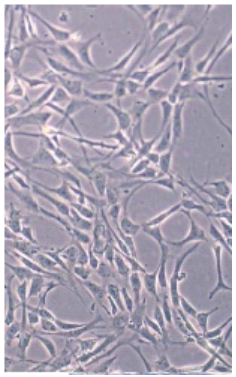
Annually beginning 2nd year for PS-OCs

PS-ON Bioresource Core Facility (PBCF): *A resource for PS-ON & CSBC investigators*

PHYSICAL SCIENCES in ONCOLOGY

Cell lines, SOPs and ordering information:
http://pson.cancer.gov/bioresources

- 41 human immortalized cell lines from 8 cancer types and non-malignant counterparts, shipped with certificate of authentication, detailed culture protocols, and media starter kit.
- DNA and RNA extracts available for all cell lines.
- Cell lines and reagents available at reduced cost for PS-ON investigators and collaborators.



Cell line data available:
http://pson.cancer.gov/data

- Genome characterization (exome, SNP, CNV, mRNA, miRNA)
- Physical characterization (mechanics, motility, morphology, volume)
- To come: proteome and transcriptome of cells on various substrates

PS-ON Bioresource Core Facility

See ATCC program manager: Sudakshina Ghosh

PS-ON Program Team

Mariam Eljanne, PhD

Mike Espey, PhD, MT

Elyse Gillen, BA

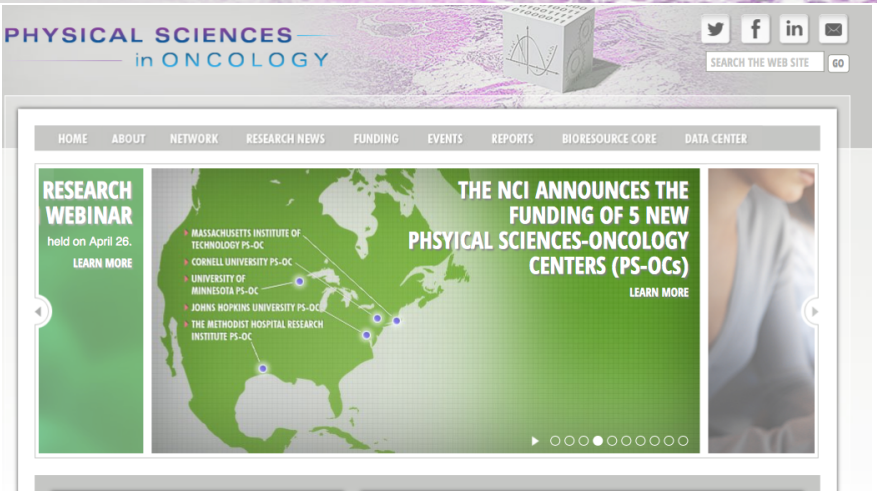
Serving as program officers, project scientists and facilitators for the Network

Shannon Hughes, PhD

Nas Kuhn, PhD

David Miller, PhD

Get Connected with PS-ON:
Website, LinkedIn and Twitter



http://www.pson.cancer.gov/

LinkedIn

Physical Sciences-Oncology Group

https://www.linkedin.com/groups/4536998

twitter

NCI PhysicalSciences

@NCIPhySci

#PSONCSBC16

The Patient Voice in PS-ON

Carole Baas, PhD
Patient advocate, Methodist Hospital Research Institute PS-OC
Co-founding editor, Convergent Science Physical Oncology Journal

Samson, Acerbi, Baas, Weaver, Rugo, EPJ Nonlinear Biomed Physics 2013