

*How do we Accelerate
the Early Diagnosis and
Treatment of Cancer?*

*Enlisting the physical science,
informatics and
materials communities*

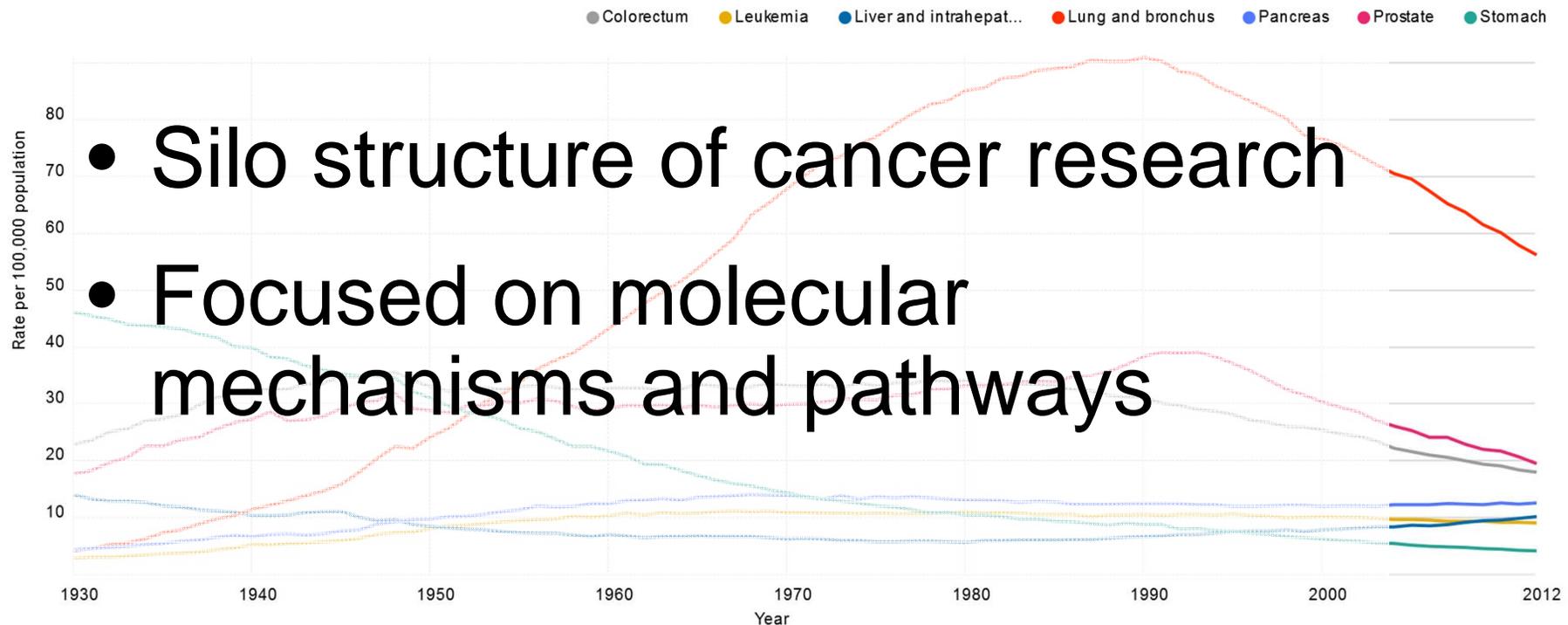
Tom O'Halloran
Founding Director, Chemistry of Life Processes Institute
Northwestern University

Problem: Silo structures and Sunken Costs hinder innovation

Trends in death rates, 1930-2012

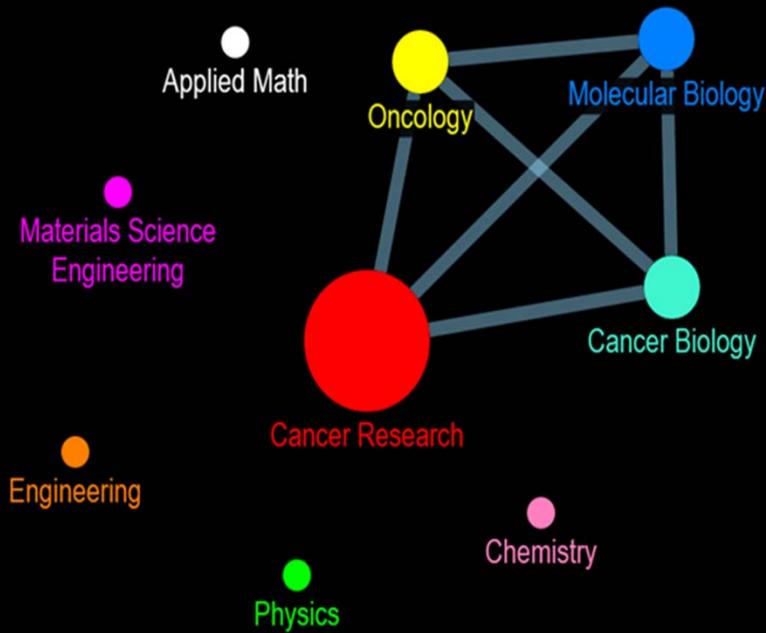
Males

Per 100,000, age adjusted to the 2000 US standard population

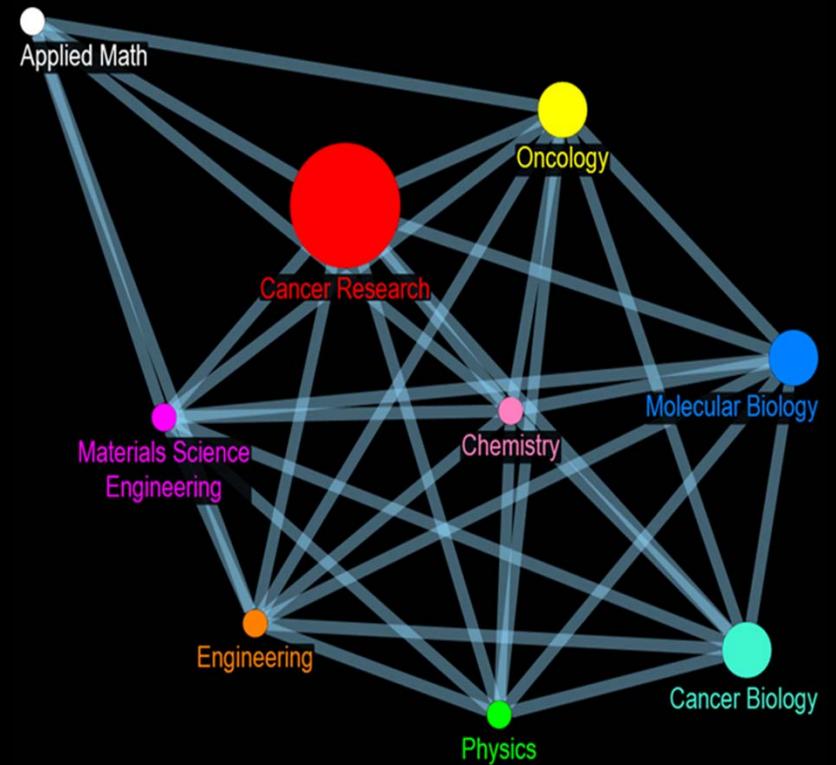


Solution: Catalyze formation of diverse new teams that will bring breakthroughs from physical sciences into the cancer arena

Current Status



Future Innovation Hub



Why this approach? Historically, oncology has built upon physical sciences discoveries... but translation is slow
20+ year gap between discovery and application



X-rays
Röntgen
1901



Radioactivity
Curie
1903 & 1911



Radioimmunoassays
Yalow
1977



Magnetic Resonance Imaging
Lauterberg & Mansfield
2003



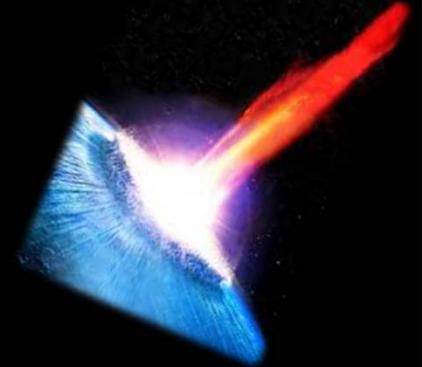
Mass Spec
John Fenn & Koichi Tanaka
2002



Computer-assisted Tomography
Cormack & Hounsfield
1979

Innovation and Impact: Team Science vs. Solo Science

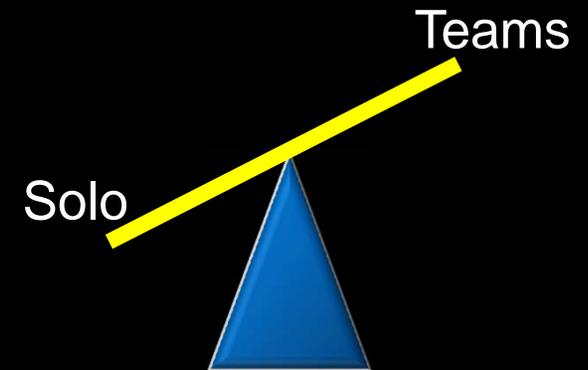
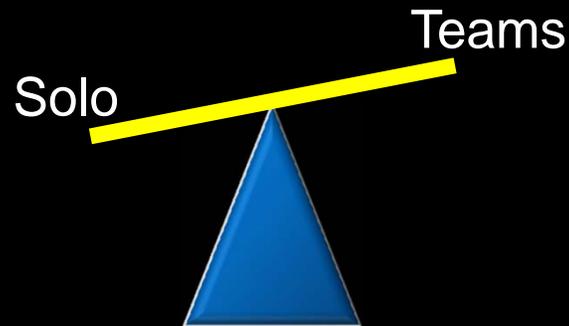
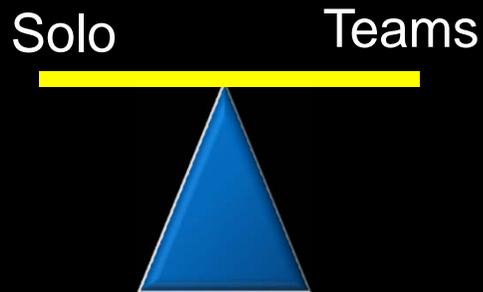
(but what kind of teams...?)



No
difference

Teams
2-to-1

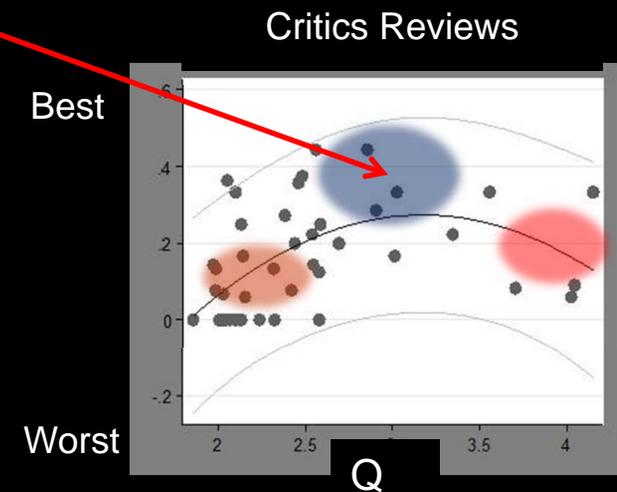
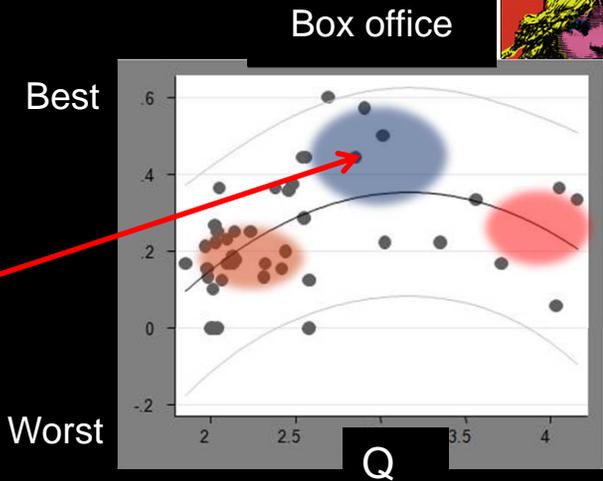
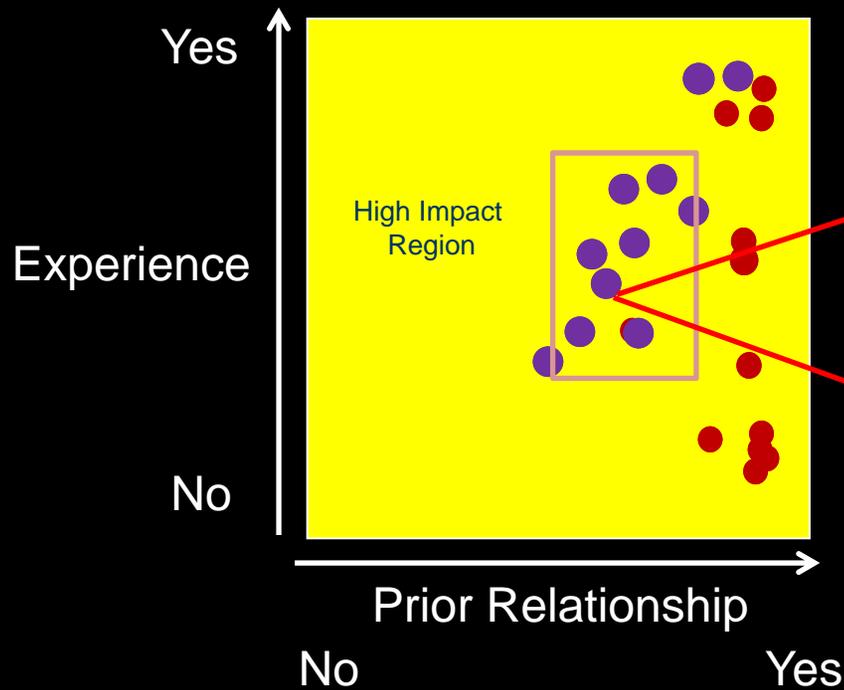
Teams
3-to-1



----- 1950s ----- 1980s ----- 2000s ----->

Paradox of Collaboration & Creativity

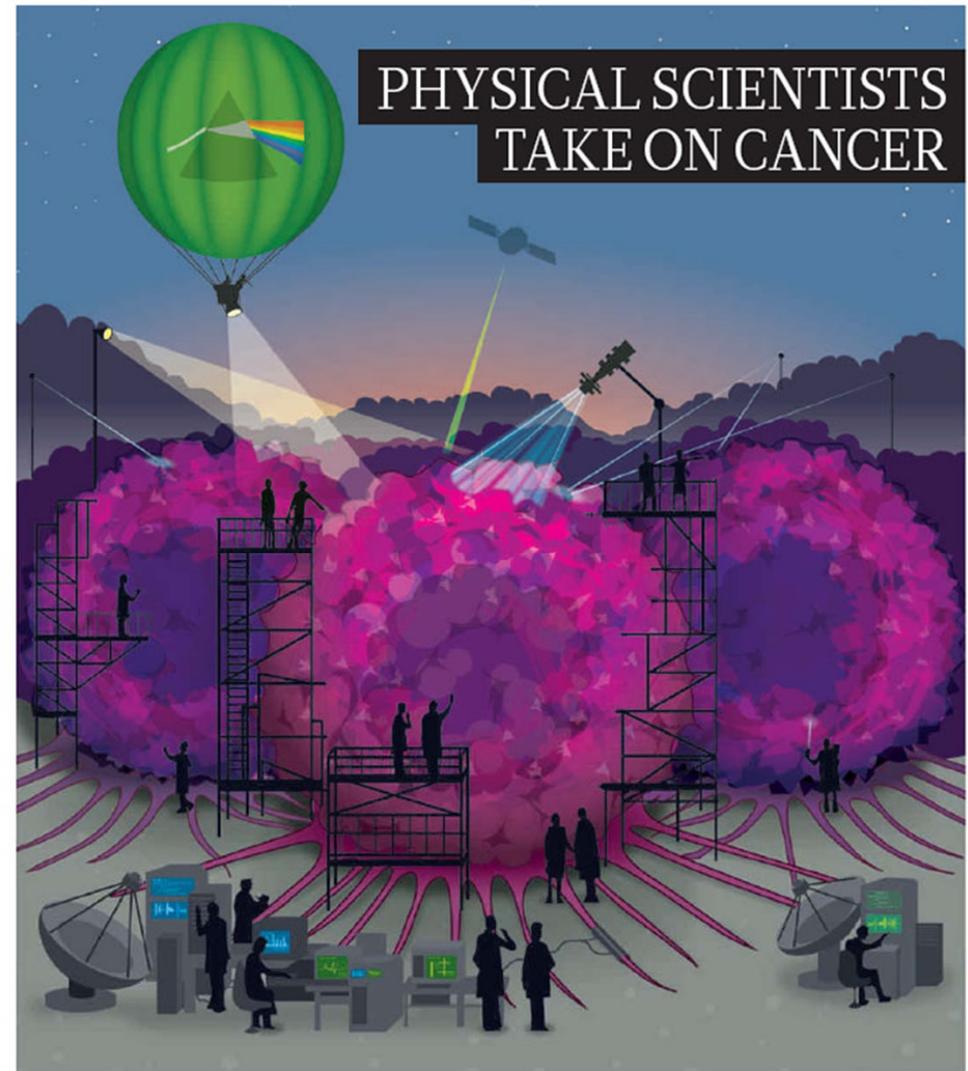
Teams should integrate incumbents and outsiders



NCI and NSF have experimented with supporting teams of incumbents and newcomers

Large, multidisciplinary teams of cancer researchers, engineers, physicists, chemists and mathematicians bring new perspectives and new tools to address the complexity of cancer. (CCNE, PSOC, etc)

natureOUTLOOK



PHYSICAL SCIENTISTS
TAKE ON CANCER

Produced with support from:



Office of
PHYSICAL SCIENCES
ONCOLOGY

Bringing new tools
to the fight

Goal: Centers that Harness Breakthroughs from Outside Traditional Cancer Research

- Fund a national network of cross-disciplinary *Centers* with accountability across agencies
- Examples include NNI and NITRD Programs
- *Centers* would integrate oncologists with physical scientists from multiple disciplines around common scientific themes
- Themes: Early Detection, Molecular Basis of tumorigenesis, health data mining, Development of new materials in cancer therapy etc.

Paradigms for Broad High Impact Interagency Cooperation...

National Nanotechnology Initiative

Impacts on Cancer

- Use nanoparticles to target tumors
- Nanoparticle-based drug delivery systems
- Improvement of tumor imaging
- Theranostic nanoparticles detect and target tumor cells for treatment



Visionary Policy: Coordinate and Fund Sustainable, Dynamic and Robust Interdisciplinary Centers focused on Achievable Goals

2016-17
Develop internal infrastructure
Call for new Centers

2017-22
Development of Network
Optimize Data Hub
Transnetwork Collaborations

2021-26
Preclinical Trials
Clinical Trials
Licensing
Commercial Spinouts

\$ 1.0B

\$1.5B/yr.

\$1.5B/yr.