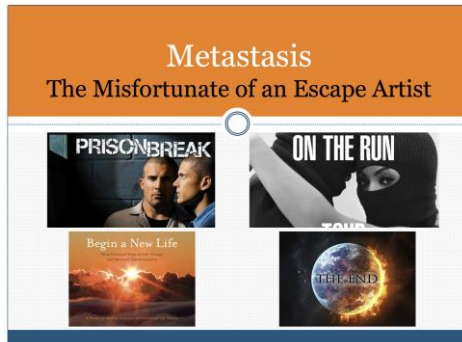


Dumb it down for physicists? NO!



1st Barrier: we don't understand questions and don't know how to work on answers

Solutions:

- "Translate" questions into physics language without losing complexity
- Attract best suited physicists to find answers
 - Change physicists' skill set to be better prepared
 - Matchmaking between physicists, clinicians and biologists
 - Smart students like hard problems
 - Go against trend of over-professionalization

2nd Barrier: Physicists have no clout

Solutions:

- Physicists should get involved in health sciences and health economics
 - Quantify risks
 - Quantify factors related to expensive treatments
- Get involved in regulatory bodies
- Get out of our comfort zone

3rd Barrier: Who is paying for this?

Solutions:

- Modernize study sections for grant review
 - Should be more open minded, see PS-OC
- Paper review of non traditional articles
- DARPA model

DARPA – Defense Advanced Research Projects Agency



The DARPA model

- Ambitious goals
 - Harness science and engineering advances to solve real-world problems or create new opportunities.
- Temporary project teams
 - Bring together world-class experts from industry and academia to work on projects of relatively short duration. These projects are not open-ended research programs. Their intensity, sharp focus, and finite time frame make them attractive to the highest-caliber talent.

The DARPA model

Has often been successful:

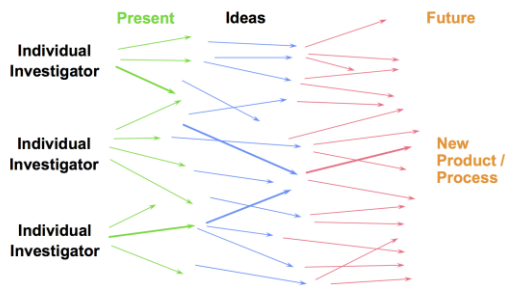
- Internet
- GPS
- Revolutionary prosthetics
- Remote surgery (-> Da Vinci system)
- ...

The DARPA model

Has often been successful – but not always
(robot trying to open door, challenge 2015)

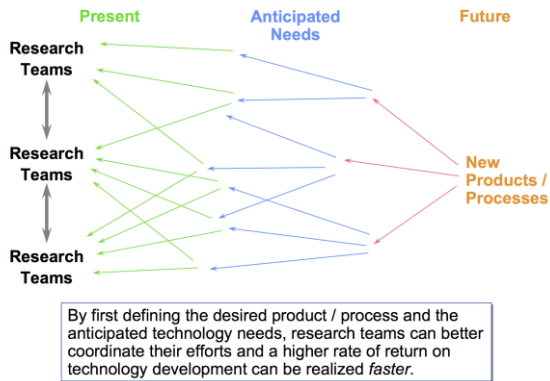


Technology Development: *Typical Approach*



Individual research leads to a vast array of potential technologies and discoveries, only a fraction of which are combined to form useful new products / processes.

Technology Development: *End-game Approach*



End-game approach in Medical Physics

- Proton therapy for all patients



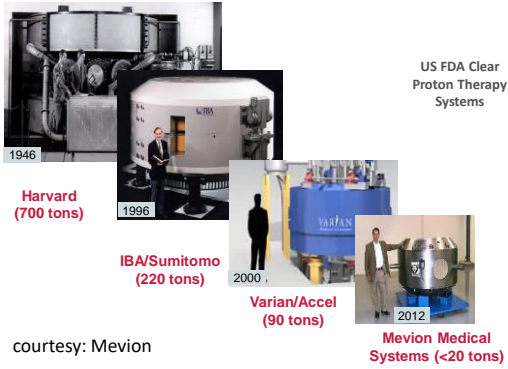
Proton therapy

“I’ve compared it to the Death Star — nothing so big and so useless has ever been discovered in medicine. It’s hard to believe we should be paying handsomely for technology whose benefit is unproven.”

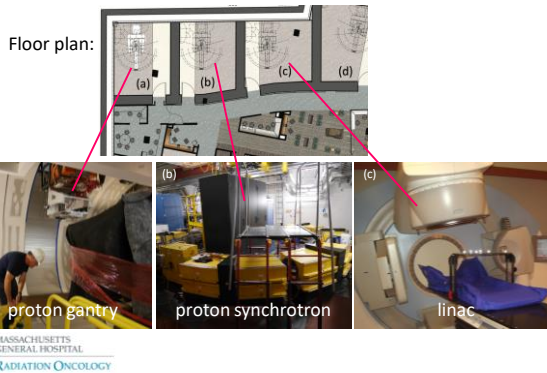
Amitabh Chandra, Harvard Kennedy School
statnews June 2017



Shrinking proton therapy systems



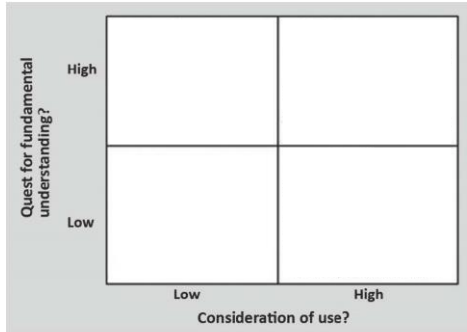
Replace linacs with proton machines?



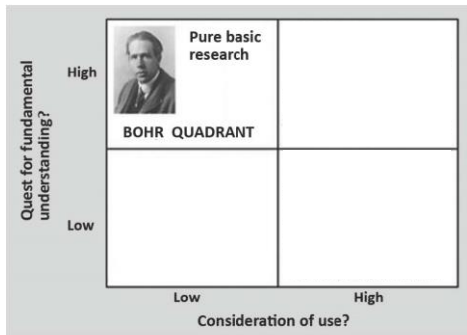
End-game approach in Medical Physics

- Proton therapy for all patients
- Image 1 mm³ tumors
- ...

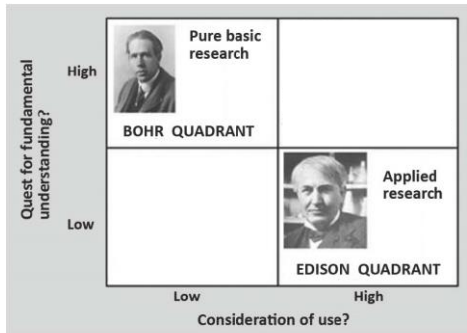
DARPA focusing on Pasteur Quadrant



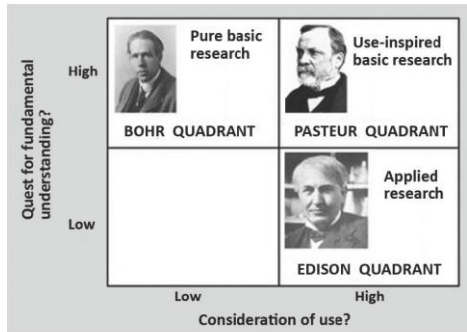
DARPA focusing on Pasteur Quadrant



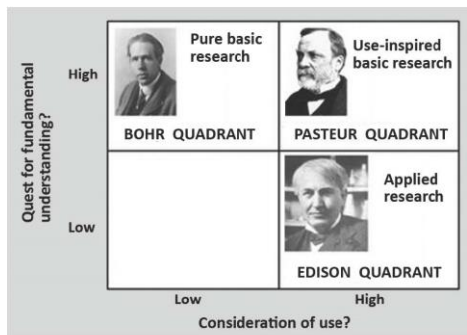
DARPA focusing on Pasteur Quadrant



DARPA focusing on Pasteur Quadrant



Medical Physics in Pasteur Quadrant?



Medical
Physics

Summary: Barriers and Solutions

- Translate questions into physics language
- Attract best suited physicists to solve problems
- Get out of your “normal” comfort zone
- Use DARPA model
 - Ambitious goals
 - Nimble project teams
 - End-game approach
 - Focus on Pasteur quadrant
