

Key attributes of scientific excellence: rigor, innovation, and relevance

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Medical Physics 3.0

- Give an example of how physics is personalized, and how it can be used to redefine the role of physics in modern medicine by growing the number of physicists.
- Motivate the role of physics in modern medicine by growing the number of physicists to take a data-based care. scientific approach in quantification
- Understand how physicists can practice scientific rigor and innovation in their developmental work.

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Key Attributes of Scientific Excellence

Much of this talk was obtained from federal guidelines, e.g., from NIH and FDA.

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Who am I?

- Academic background
- Research interests, analysis, researchers
- Education

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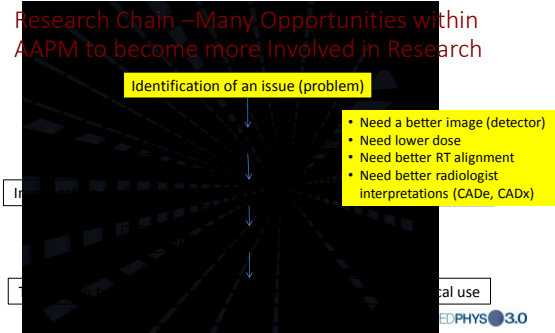
Three key aspects

- Note that this applies to many components in a medical physics career.
- I will focus here on research.

Research Chain –Many Opportunities within AAPM to become more Involved in Research



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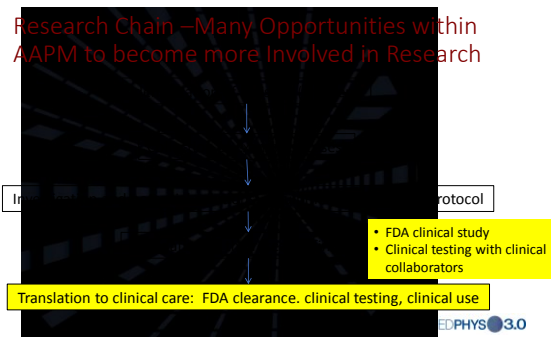
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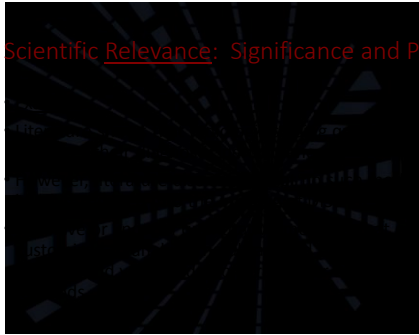
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- ...real problems

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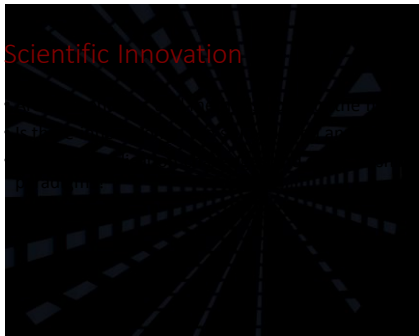
Scientific Relevance: Significance and Premise



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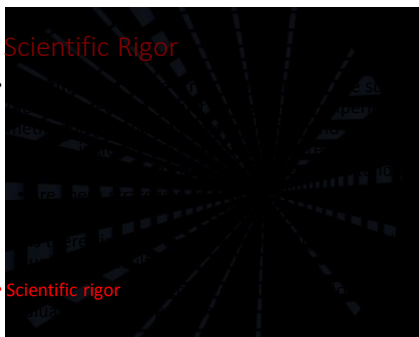
Scientific Innovation



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Scientific Rigor



- Scientific design, of experimental findings used
- Scientific rigor

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Scientific Rigor

robust and unbiased

- Good to methodology,
- d
- l-controlled

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Biological Variables need to be included and addressed

- Critical factors that affect health or disease, such as sex, age, weight, and underlying health condition.
- frequently ing to an differences d treatment

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Role of Medical Physics within state-of-the-art biomedical research

Clinician

Genomic Biologist

Medical physicist

Computer scientist

Statistician

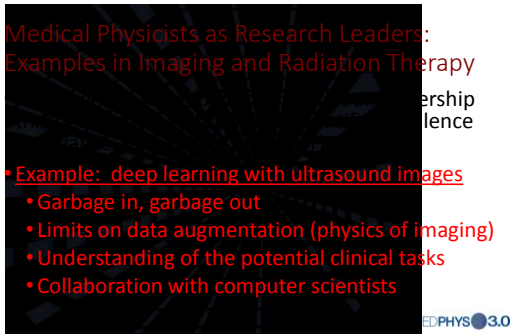
Attitude: similar to when x-rays were first discovered.

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Medical Physicists as Research Leaders: Examples in Imaging and Radiation Therapy

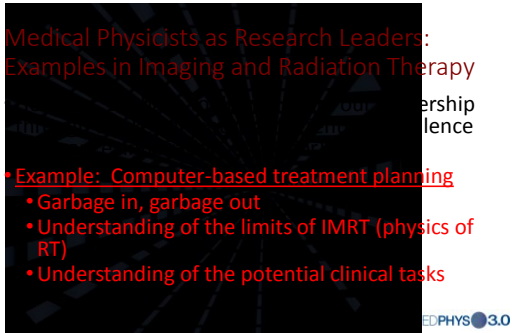


Medical Physicists as Research Leaders: Examples in Imaging and Radiation Therapy



- Example: deep learning with ultrasound images
 - Garbage in, garbage out
 - Limits on data augmentation (physics of imaging)
 - Understanding of the potential clinical tasks
 - Collaboration with computer scientists

Medical Physicists as Research Leaders: Examples in Imaging and Radiation Therapy



- Example: Computer-based treatment planning
 - Garbage in, garbage out
 - Understanding of the limits of IMRT (physics of RT)
 - Understanding of the potential clinical tasks



