

Medical Physics is already MultiDisciplinary, so Multi-Disciplinary Collaborations Should Be Easy!

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Acknowledgements

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Rich Tuli MD PhD (C-S)

Disclosures

none

Medical Physicists

When we describe ourselves, we
have only two choices:

1. We are multidisciplinary

or

2. We are oxymorons

I like to think we are multidisciplinary

Establishing Multi-Disciplinary Collaborations

- Virtually all progress in Rad Onc involves multidisciplinary collaboration
- How do you get multidisciplinary collaborations started?
- Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
- Multidisciplinary collaboration takes work
- Conclusions

Progress in RT



What did it take to get from contours to CT?

Progress in RT



X-ray tube	Physicist	Coolidge, 1913
Tomography	Radiologist	Vallebona, early 1900s
Radon Transform	Mathematician	Radon, 1917
The idea: scanning transmitted x-rays, reconstruct image	Neurologist	Oldendorf, 1959
Algorithms	Particle Physicist	Cormack, 1963-4
Mini-Computer	Comp. Eng.	DEC, 1964
CT scanner	Elect. Eng.	Hounsfield, 1967-71

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How do you get started ?

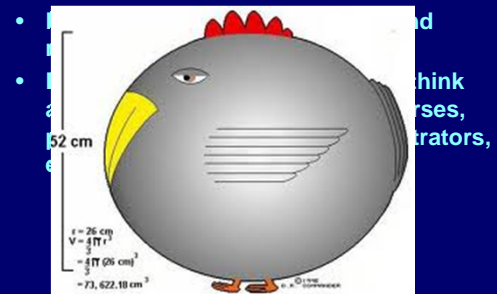
1. Go to clinical conferences, keep your ears and mind open
 - Learn what clinical problems are important
 - Understand how the docs (and others) think about the problem
 - Think about what it would take to fix the different issues

How do you get started ?

2. Look for opportunities
 - Things that potential collaborators might be interested in
 - and which you (the physicist) are interested in
 - Take advantage of the skills and capabilities that are around you – rather than picking a problem and then looking for people to help

How do you get started ?

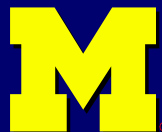
3. Learn to communicate with the other people



Laser-Accelerated Protons



Don Umstadter
Tolya Maksimchuk
Kirk Flippo
Teh Lin

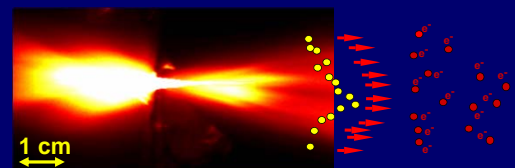


University of Michigan
Radiation Oncology

Dale Litzenberg
Don Roberts
Mary Davis

Proton Acceleration

High power ultrafast laser pulse on thin film target:



- Protons are accelerated by huge electric field that is created

A. Maksimchuk, S. Gu, K. Flippo, V.Yu. Bychenkov, D. Umstadter PRL, **84**, 4108 (2000)

UM: Litzenberg 03

Laser-Accelerated Protons



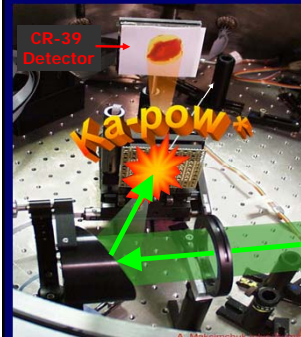
Don Umstadter
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University of Michigan
Radiation Oncology

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Experimental Setup

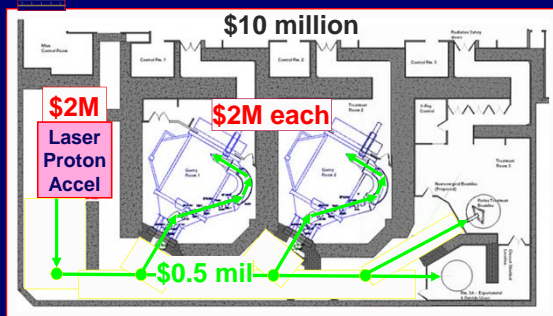


T³ Laser

- 6 J Energy in Pulse
- 400 fs Pulse Length
- 15 TW Power
- 6 μm Focal Spot
- 15 ExaWatts/cm²

UM: Litzenberg 03

Imaginary Laser Proton Therapy Center

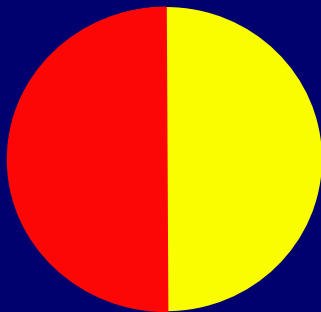


UM: Litzenberg 03

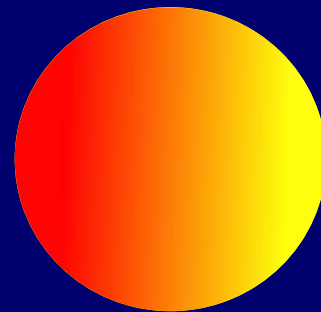
How do you get started ?

4. Which thing should you work on?

- If you pick issues of interest to others in your department, it is easier to justify the effort
- Issues related to your clinical protocols blur the line between clinical and research effort – which is a good thing. It also makes improvements much easier to take all the way to clinical use



"I'd like a 50-50 research/clinical position"



Here's what you really want!

How do you get started ?

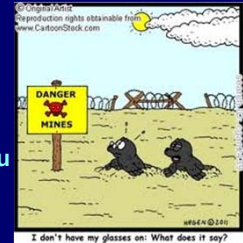
5. All collaborations must be win-win propositions

- A project which does not interest or help the collaborators will never work well
- Share control, publications, talks
- Help people on their projects, they'll help you with yours

How do you get started ?

6. Think through how the project will succeed and eventually make it to patient care

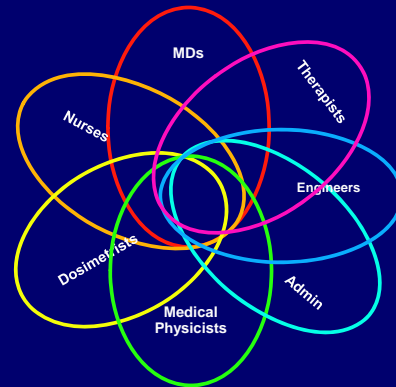
- Make sure there's a possible path to success
- If you don't know what's necessary for the project to succeed, it won't.
- "Visualize how you might traverse the minefields"



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Radiation Oncology Department



Multidisciplinary Collaborations in RadOnc are Crucial for the Clinic!

SBRT for Locally Advanced Pancreatic CA

SBRT Team:

- Wensha Yang PhD
- Troy Gustafson RTT
- Lola Semaan CMD
- Rich Tuli MD PhD
- Tracey Weaver-Smith (MedSec)
- Robert Reznik MD (resident)

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SBRT for Locally Advanced Pancreatic CA

SBRT protocol: Team

Fiducials

CBCT+KV guidance

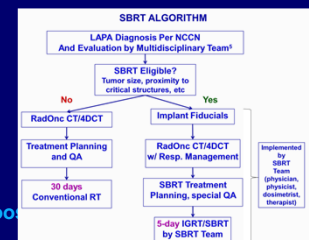
Resp. Motion Management

VMAT guided by CBCT+KV

Concurrent Chemo

Simultaneous Integrated Boost

PET eval. pre- and post-Tx



Yang

Multidisciplinary Collaborations in RadOnc are Crucial for the Clinic!

SBRT for Locally Advanced Pancreatic CA

SBRT protocol

Fiducials: with Interventional GI Surgeons, imaging

CBCT+KV guidance

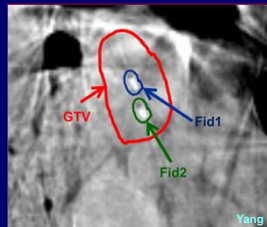
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SBRT protocol

Fiducials

CBCT+KV guidance: Physicists, RTTs, MDs

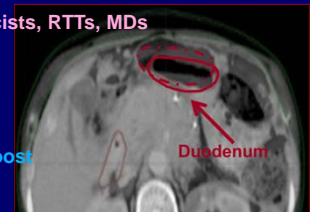
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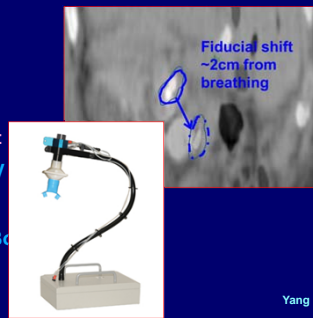
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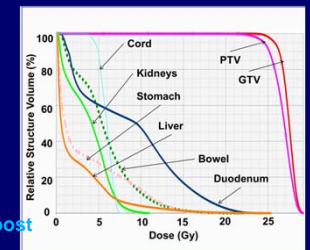
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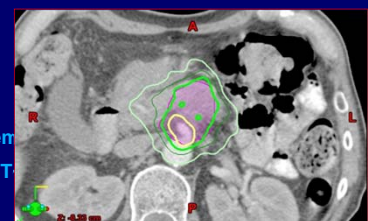
Resp. Motion Management

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Concurrent Chemo: Med Oncs, Nurses, etc.

Simultaneous Integrated Boost

PET eval. pre- and post-Tx



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Concurrent Chemo

Simultaneous Integrated Boost: Phys, Dosims, MDs

PET eval. pre- and post-Tx

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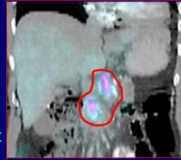
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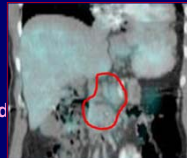
Concurrent Chemo

Simultaneous Integrated Boost

PET eval. pre- and post-Tx: NMed



Pre-Tx
PET



Post-Tx
PET

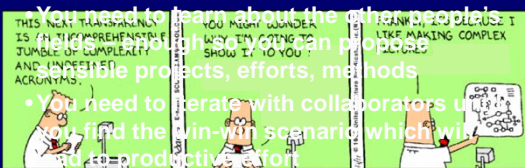
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Multi-Disciplinary Collaboration Takes Work!

- It takes numerous meetings + interactions to learn how to communicate



- You need to learn about the other people's ideas and how you can propose possible projects, efforts, methods
- You need to iterate with collaborators until you find the win-win scenario which will lead to productive effort
- There needs to be someone who "shepherds" the interaction and maintains communication

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Conclusions

- Multidisciplinary collaboration is a crucial part of much of the progress made in medical physics and radiation oncology
- As a medical physicist, you can do much to prepare the way to make multidisciplinary collaborations easier to start and more likely to be successful
- The goal of such collaborations should be to pull in the expertise needed to make the project successful – and to eventually improve clinical results for patients