Mrs. Gump:

Well, I happened to believe you make your own destiny .... Life is a box of chocolates, Forrest. You never know what you're gonna get.

Fostering a Successful Career in Research

Lessons from a Career in (or Involving) Research

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AAPM Annual Meeting, Washington DC
July 31-August 4, 2016

Career Involving Research in Medical Physics

Research & Development + Clinical

For research to be relevant, clinical knowledge is essential

For enhancing clinical effectiveness, it is important to understand what is possible through research

Beats insecurity of being a pure researcher
Importance of Research & Development in Medical Physics

- Contributions to the knowledge base
- Contributions to the improvement in safety, quality and clinical effectiveness of treatments and diagnostic procedures
- Enhancement of the stature of physicists and the recognition of the intellectual and creative contributions we can make
- Avoidance of
  - Being considered expensive technicians
  - The risk of being automated
- ... 

Challenges Facing Career in Research in the Current Environment

- Focus on
  - Short-term vs. long-term
  - "Billables", margins and bottom line vs. creative contributions and advancement of the state of the art
- Reduced research funding
- Job insecurity
- Disparity in clinical versus research compensation
- ...

Is it then appropriate to recommend a purely research career in medical physics?

A career that combines clinical and research may be a safer and more effective
Environments Needs to Change for the Future Wellness of our Field

And the younger generation can be the agent of such change

Lessons Learned
Personal Perspectives

My First Task as Medical Physicist (Early 70’s @MSKCC)
Treatment Planning System (2D)

The high you get when you see the results of what you created
The Thrill of Discovery

The Very First Computerized Dose Distribution Measurement System (Early 70's @MSKCC)

Use your impatience / frustration with routine and repetitive tasks and inefficient practices as drivers of innovation and solutions
“3D Conformal Therapy is Impractical” – RM in 1978

“No radiation oncologist is going to draw tumor and normal tissue contours on so many CT sections”

Fortunately ...
John Laughlin (Chair @MSKCC) prevailed ...

NCI Contract (1983-1987) to Develop and Evaluate 3DCRT

3DCRT & MLC (1980’s)
Be Open to New Ideas and Different Points of View
Embrace Change

IMRT & DMLC (Circa 1995 @MSKCC) – A Collaboration with Bortfeld

The "Photon Bragg Peak" Intensity Distribution

Sliding Window Delivery With Dynamic MLC

Comments at my presentation in 1996

"IMRT is too complicated and not Practical"

"Why do we Need it? We have been doing intensity modulation with wedges and compensators for ever"
Ridding the 50 Year Fetish with Flat Fields

In this day and age of intensity modulation, who needs flattening filter?

- High dose rates
- Cleaner beams
- Reduced shielding
- Reduced secondary cancers
- ... 

Vassiliev, et al (MDACC)

"If people aren't laughing at your dreams... then they aren't big enough!"
Grayson Marshall

Proton Therapy – Hype of Hope (MDACC)
Physical and Biological Uncertainties in Proton Therapy

- "There is no problem"
- "We will scare patients and providers"

Acknowledging the problem is the first step in solving it

→ Program project grants and awards (2009-2014, 2014-2019) to improve our understanding and enhance the effectiveness of proton therapy

Protons vs. Photons Randomized Lung Trial (Part of the P01 Program Project)

- "Unnecessary – We already know protons are better."
- "Unethical to randomize patients to an arm known to be inferior"
- "Patients will no accept to be randomized"

Question everything, be curious
Failing Forward
(Whitelaw)

"Failure is merely an opportunity to intelligently begin again." - Henry Ford

Persistence Pays Off
Collaborativeness is an Essential Ingredient of R&D

Be the First to Trust

Don’t Jump to Conclusions

Dream Big
And
Out of the Box
Heavy Ion Therapy …
Physical, Biological and Immunogenic Properties

Immune Reaction
Nature Rev 2014

Immunogenicity

Profiles and Area

Beamlet Integral Depth Dose

D/A.U.

deff/rel. u.

3He

4He

Protons

12C

Profiling of U on the Field

Thank You

Passion for Values

- Caring and respect
- Integrity and honesty
- Excellence
- Openness and free flow of communication
- Teamwork and collaboration
- Rewarding progress and demanding commitment and accountability
- "Hatred for" bureaucracy and resisting desire to control
- Recognizing change as an opportunity for growth
Working closely with physicians to understand the clinical and biological response

The Very First Record and Verify System (Late 70's)

Mohan, Caley, Ferber, Podmanniczky

IGRT, Deformable Registration, Auto-Segmentation Dose Accumulation, Adaptive RT – 2000's

Dong
"The biggest risk is not taking any risk. In a world that is changing really quickly, the only strategy that is guaranteed to fail is not taking risks."

Mark Zuckerberg

Research, by definition, is risky

"New ideas pass through three periods:
1) It can't be done; 2) It probably can be done, but it's not worth doing; 3) I knew it was a good idea all along"

Arthur C. Clarke

"No idea is so outlandish that it should not be considered."

Winston Churchill