The Many Paths of Medical Physics

ANNUAL STUDENT MEETING
WASHINGTON, D.C.
JULY 31, 2016

Follow us on Facebook: AAPM Students and Trainees Subcommittee
Check out our blog: aapmstsc.wordpress.com

AAPM | Students & Trainees Subcommittee

Student and Trainee Day

All are welcome. Only registered attendees get lunch.

Pick up tickets outside this ballroom 12:00-4:30

Time	Event
9:30-11	Annual Student Meeting
11:30-1	WGSTR Student and Trainee Lunch: Core Asp Physics Education
1-3	Residency Fair
3-5	Poster Session
4-6	Career Expo
6-8:30	Student Night Out: All-inclusive Experience at the DC United Soccer Game!

More Student and Trainee Activities

Get your picture taken

Day	Time	Event
Tuesday	9:30-11	Expanding Horizons ePoster Session
Tuesday	4:30-6	New Member Symposium
Wednesday	10:15-11	Interview Workshop (Academic, R careers)
Wednesday	11:15-12	Interview Workshop (Regulatory, Industry Careers)
Wednesday	1:45-2:45	Fostering a Successful Career in Research
Ongoing		Partners for the Future

AAPM 2016 JUL 31–AUG 4

COMMUNICATING OUR VALUE.
IMPROVING OUR FUTURE.

58TH ANNUAL MEETING & EXHIBITION | WASHINGTON, DC

Partners for the Future

Thanks to the following Corporate Affiliates for partnering with AAPM to provide demonstrations designed specifically for medical physics trainees attendees

- Brainlab - Booth #4071
- Elekta, Inc. - Booth #2017
- LAP of America Laser Applications - Booth #5011
- Mobius Medical Systems, LP - Booth #4029
- ModusQA - Booth #4064
- PTW– New York - Booth #3029
- Radcal Corporation - Booth #3038
- Radiological Imaging Technology - Booth #4011
- ScandiDos - Booth #1111
- Standard Imaging, Inc. - Booth #1036
- Sun Nuclear Corporation - Booth #4051

Bringing Medical Physics Trainees & Corporate Partners Together

The Path of a Chief of Medical Physics

David Shepard
Swedish Cancer Institute

SWEDISH

UNIVERSITY OF WISCONSIN

6

7

UNIVERSITY OF MARYLAND
SCHOOL OF MEDICINE

8

Swedish Cancer Institute

SWEDISH 9

Why would you want to serve as a Director of Medical Physics?

- Broader scope of influence
- Ability to shape the direction of your department
- Impact on employee satisfaction

Harvard Business Review: "What's the one factor that most affects how satisfied, engaged, and committed you are at work? All of our research over the years points to one answer - and that's the answer to the question: Who is your immediate supervisor?"

Why would you want to serve as a Director of Medical Physics?

			Primary Income			
				Percentiles		
Total Employees Supervised	Number	Median Yrs Exper	Average	20th	Median	80th
None	415	10	173.9	145.0	170.0	200.0
1 - 3	204	15	188.3	156.0	189.4	220.0
4 - 9	211	15	206.1	168.0	200.0	250.0
10 or more	189	21	245.4	182.0	242.0	300.0

Note: Salaries are in thousands of dollars.

Job Considerations

- Job can be largely administrative in nature
- Significant percentage of time spent in meetings
- Need to engage in HR issues (corrective actions, layoffs, interpersonal disputes, unhappy employees)
- Dynamic of relationships with your physicist colleagues will be different

Choosing the Right Career Path

- Does this work match your interests and passions?
- Does it match your personality strengths?

How do I set myself up to become a Director of Medical Physics?

- Start planning now for where you want to be in 5 or 10 years
- Make an ongoing commitment to professional development
- Build your CV to make yourself an appealing candidate
- Grow your network of connections – "It's not what you know, it's who you know, and who knows you."

"Try not to become a person of success, but rather try to become a person of value." - Albert Einstein

What are potential employers looking for?

Applicants must have a Ph.D. in Medical Physics or equivalent discipline and at least five years of experience with board certification by the American Board of Radiology. Candidates must have proven leadership skills, a strong desire to mentor faculty and staff, and excellent oral and written communication skills.

Develop Clinical Skills

- Find good clinical mentors
- Develop a breadth of clinical skills (not too focused)
- Find opportunities to attend formal training courses
- Get board certified by ABR
  - For positions with >10 direct reports, 82.6% are ABR certified

Develop Research Skills

- Presentations and publications will help build up your profile
- Practical clinical topics still provide opportunities (local AAPM chapter, spring AAPM, JACMP, PRO)
- Find good collaborators (look to other disciplines)
- Look for grant opportunities (internal grants, corporate grants, government grants)

Develop Leadership Skills (1)

- Get involved with your local AAPM chapter
- Get involved with AAPM, ASTRO, ABR, etc. by serving on a committee, task group, etc.
- Lead your department's ASTRO/APEX or ACR accreditation

Develop Leadership Skills (2)

- Look for opportunities within your department:
  - Oversee students (dosimetrists, physicists, therapists)
  - Take lead with residency program
  - Head up projects (linac commissioning, new technology selection and/or roll out)
  - Participate with and possibly chair committees (quality committee, safety committee, radiation safety)
- Hospital-wide opportunities (e.g. faculty senate)

Develop Communication and Interpersonal Skills (1)

Applicants must have a Ph.D. in Medical Physics or equivalent discipline and at least five years of experience with board certification by the American Board of Radiology. Candidates must have proven leadership skills, a strong desire to mentor faculty and staff, and excellent oral and written communication skills.

- Continuous improvement in English skills (particularly English as a second language). Commit to ongoing improvement and do not let skills plateau.
- Become a good listener

Develop Communication and Interpersonal Skills (2)

- Crucial Conversations: strategies for dealing with difficult conversations and negotiations
  - Having the ability to successfully engage in difficult conversations is an important skill to successfully manage relationships and results.
  - "One of the greatest arts in life is learning how to disagree without being disagreeable", William Ury

You've Got the Job – Now What?
"I Wasn't Trained for This"

- We are trained as scientists. A medical physicist has likely never had a course in management, finance, or strategic planning
- You need to develop skills: negotiating deals with vendors, interviewing and negotiation with job candidates, keeping the peace among staff members, creating a fair work environment, saying "no" to requests
- Lesson: Have open and honest conversations with your employees. Do not shy away from difficult conversations.

"We all make mistakes. That's what happens when you try." - Barack Obama

Conclusions

- Surround yourself with good people
- Find your passion (patient care, research, new technology, health care administration) and point yourself in a direction to build a career around that passion.
- Improving your clinical skills, research skills, leadership skills, and communications skills will set you up for success regardless of which career path you choose.

AAPM Student Meeting: Physicists in Small Business

Nathan Childress, PhD, DABR
Mobius Medical Systems, LP
Founder

My background

- 2001-2004: PhD student at MD Anderson Cancer Center
  - Developed open-source DoseLab software (film-based IMRT QA)
- 2004-2010: Clinical physicist at The Methodist Hospital
- 2010-present: Founded Mobius Medical Systems, LP
  - Designed DoseLab TG-142 for machine QA
  - Designed Mobius3D for treatment plan QA
  - Designed MobiusFX for patient delivery QA
  - Designed CBCT module for patient positioning QA

How I decided to start a business

- After working in the clinic for 6 years, I wanted to do something more challenging and exciting
  - Starting a company went too far the other way
- My clinical experience allowed me to design software to better meet the needs of radiation oncology departments

Starting your own company

- It is very difficult to compete with established companies
  - They have working capital
  - They have established distribution channels
  - They have a known name
- Even a fantastic product will not sell without great distribution
- I advise (and have advised) entrepreneurs to either develop in academia or work for an established company

Sometimes it's hard to sleep well

About Mobius Medical Systems, LP

- 35 employees
- Software used in >1,000 sites in >50 countries
- Our software monitors >11,000 treatments each day

Pros of industry

- Can have a positive effect on hundreds or thousands of clinics
  - However, clinical physicists can serve on Task Groups
- Jobs can be less routine and span more duties than the clinic
- Easier to work from home or have a flexible schedule
- Can create products that are used worldwide
- There are usually more than two rungs on the corporate ladder, rather than simply physicist vs. chief physicist

Cons of industry

- Typically lower pay than the clinic
- Can be harder to transition back to clinic in the future
- Does not count towards ABR experience
- Clinical experience is valuable in the clinic and industry

Don't cheat yourself out of clinical experience

Small vs. large business

- Small companies require that many of their employees have diverse roles, sometimes spanning from sales to support to backend business operations to regulatory
- Large companies typically have more defined functions, but can offer greater benefits and more opportunity for advancement along a defined chain

Some choices aren't as good as you hope

How my background prepared me for today

- Physics-wise
  - You get to use theory you learned in classes to develop products!
  - You get to use clinical experience to develop and support products
- Business-wise
  - I had no idea what I was doing
  - I have more of an idea now
  - I am not convinced an MBA helps significantly
  - Reading typical business texts and case studies are helpful

In conclusion

- Industry and small business can be very rewarding
- Clinical experience is not necessary, but is always helpful
- Jobs can range from developing applications using theory to clinical support
- Never self-fund a business

The Path of a Research and Development Physicist

Kenneth Ruchala, PhD *

* Not an actual R+D Physicist

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Career Overview

- Graduate School in Medical Physics at UW-Madison
- Joined UW TomoTherapy Research Group in 1995
- Finished a PhD in 1999 as the TomoTherapy Company spun off
- Worked in Research on TomoTherapy from 1999-2015
  - The size and scope of "Research" varied significantly as the company passed through different stages
- Currently a Product Manager for Gammex, a Sun Nuclear Company

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15 years in "Research"

Changing roles in a changing company

- R+D focused roles
  - Research
  - Advanced development
  - Development
  - Project planning
  - Testing
  - Intellectual property management
- Business facing roles
  - Team/group leadership
  - HR and personnel
- Market facing roles
  - Product strategy
  - Product marketing
  - Sales support
  - Internal training
- Clinical facing roles
  - Collaborations
  - Clinical support
  - Escalations

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Industry needs physicists (but they don't always know it)

- In a clinic, there is a potentially high correlation between a medical physics degree and a medical physics job
- In industry, there are many areas where a physicist might be a great fit for a job, even though the job description isn't for a "physicist"
- Physicists can be exceptional at tasks involving physics knowledge
- Physicists can also leverage excellent general skills
- Spoiler Alert: Some of the very best people were the hardest to hire

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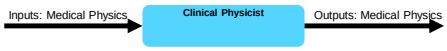
Archetypical Industry Jobs for Physicists

- Customer-Facing Roles *(eg Clinical Medical Physicist)*
  - Product expertise
  - Supporting customers (install, questions, etc)
  - Providing feedback to R+D
  - May entail travel
  - Can be a good entry role



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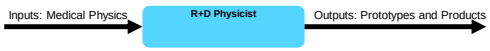
Archetypical Industry Jobs for Physicists

- Product-Facing Roles *(eg Research, Software Engineer)*
  - Turn ideas into prototypes and products
  - At junior levels, more likely to be implementing ideas into a bigger framework
  - At higher levels, may have more freedom, more project and personnel management, more strategic involvement, etc
  - Possible as an entry role, but may require particular skills (more on this later)



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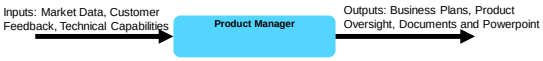
Archetypical Industry Jobs for Physicists

- Market-Facing Roles *(eg Product Manager)*
  - Analyze market data, customer feedback, competitive landscape, product opportunities, etc
  - Determine strategic direction of a product line
  - Represent customer and business needs through development
  - May also entail brochures, pricing, advertisements, etc
  - Less common as an entry role



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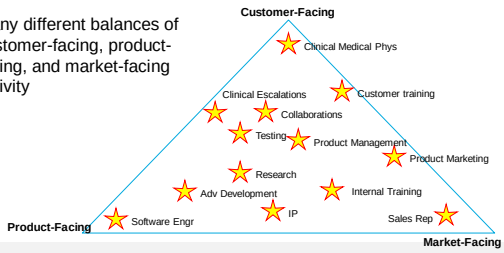
An Abundance of Jobs and Roles

- Many different balances of customer-facing, product-facing, and market-facing activity



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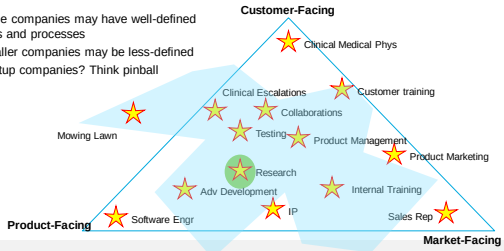
Differences vs Company Size and Culture

- Large companies may have well-defined roles and processes
- Smaller companies may be less-defined
- Startup companies? Think pinball



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Potential Differences in Industry (esp. R+D)

- Chance to see your ideas turn into products that get used
- Limited patient contact
- Equipment might be easier to purchase
- Fewer opportunities to publish
  - More opportunities to work with collaborators
- Hours may be more flexible
- Potential to be involved in many parts of the organization, diversify your career
- Perspective on how a business works

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Hiring Challenges, Revisited

- A company's typical approach to hiring
  - Some work or opportunity is not being staffed
  - Hire a skill to meet a specific need (e.g. a Software Engineer to work on this subsystem to help release this project)
- What I'm really looking for when hiring
  - Build an incredible team !!!
  - Find exceptional people with lots of potential
  - Invest in them, treat them well
  - Have them excel at what we hired them for
  - Have them take on bigger and better things to help the group and the company
- Some of the very best people were the hardest to hire
  - A job needs to exist
  - We need someone willing and demonstrably able to do the job

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Getting hired

- Maximize skills to better fit more job descriptions
  - Computer science
  - Engineering (SW, EE, MechE, etc)
- Start early (e.g. 1 year) – It takes us time to
  - Plan what you will do
  - Arrange work so it fits with the rest of the team
  - Work the job opening through the budget cycle
- Contacts from advisors and collaborators can be invaluable
- Inquire about collaboration and contracting opportunities
- Stay in touch

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About Salary

- I'm looking to build an incredible team !!!
- I want to pay you fairly, really
  - Not too much, not too little. Fairly.
  - I don't benefit from underpaying you
  - Fair can be complicated (salary survey, budgets, job description, co-workers, etc)
- If I ask you salary requirements, I'm sanity checking
  - The job already has a range and I have a sense where you fit
- In my experience with R+D jobs, if we want you enough to hire you, we want to treat you fairly. If someone likes the job they take it
- Disclaimer: this is my experience

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Thank you

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U.S. Food and Drug Administration
Protecting and Promoting Public Health
www.fda.gov

Federal Service Career Opportunities

Robert Ochs, Ph.D.
Director
Division of Radiological Health
Office of In Vitro Diagnostics and Radiological Health
Center for Devices and Radiological Health
U.S. Food and Drug Administration
robert.ochs@fda.hhs.gov

Undergrad

- Bachelors in Physics
- Ball State University, Muncie, IN
- Department Chair facilitated job shadowing medical physicists at a local cancer center → independent study → graduate assistantship

BALL STATE UNIVERSITY

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Graduate

- Doctorate in Biomedical Physics
- University of California, Los Angeles
- CAMPEP Accredited Medical Physics Program
  - Research in medical image processing
  - Experience with clinical study design and execution
  - Experience in medical device development

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Career

Hired at FDA's Center for Device and Radiological Health (CDRH) a few months after graduation

Main Headquarters – Silver Spring, MD

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U.S. Food and Drug Administration Protecting and Promoting Public Health www.fda.gov

Career

- FDA's Origins
  - Started with the Food and Drugs act of 1906 (amended since)
  - 1976 Medical Device Regulation Act (regulate medical devices)
- FDA Regulates more than $1 trillion worth of consumer goods
  - (about 25% of consumer expenditures in the U.S.)
- Over 14,600 employees
  - ~5,000 are field investigators
  - ~1,900 Center of Devices and Radiological Health (CDRH)
  - Division of Radiological Health: 55 employees

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U.S. Food and Drug Administration Protecting and Promoting Public Health www.fda.gov

Career

- Scientific Reviewer (first 3 years)
  - Lead the review of the safety and effectiveness of new/modified diagnostic imaging, radiation therapy, and image processing devices prior to entry onto the market
  - Highlights
    - Always a new challenge (reviewed 100s of devices)
    - Lead interdisciplinary review teams (engineers, radiologists, statisticians) to make a final decision
    - Participate in outreach, industry training
    - Provide feedback to principle investigators, industry executives, and legal counsel on study design and regulatory strategy

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U.S. Food and Drug Administration Protecting and Promoting Public Health www.fda.gov

Career

- Branch Chief (middle 2 years)
  - Supervise staff of 10 who performed premarket device reviews, clinical study protocol reviews, postmarket compliance, outreach, and research collaborations
  - Highlights
    - Represent the branch / division at higher level meetings inside and outside FDA
    - Participate in outreach and industry training
    - Ensure timely performance
    - Mentor new staff

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Career

- Director, Division of Radiological Health (last 2 years)
  - Manage four branches with over 50 employees
  - Regulate medical and non-medical (e.g., lasers, microwaves) radiological products
  - Highlights
    - Opportunity to set the direction of multiple regulatory programs
    - Exceptional staff of talented and dedicated employees
    - Opportunity to attend meetings with FDA commissioner, Center Director, and industry executives to discuss new programs and polices

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Are you motivated to…?

- Apply your education, research, and clinical experiences to help ensure the safety and effectiveness of new medical devices
- Utilize technical, communication, judgment, and interpersonal skills to lead interdisciplinary teams
- Balance many competing priorities
- Enjoy engaging with groups inside and outside the organization to support medical product research and development
- Desire and persistence to make a difference on long term projects
- Looking to develop new skills and/or open new career paths

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Potential Career Paths

- Other positions at FDA
  - Commissioner's Office
  - Center for Drug Evaluation and Research
- Other Federal Agencies
  - NIH (e.g., Scientific Review Officer)
- Industry (e.g., regulatory product specialists/director)
- Returned to clinical work
- Retired / Consulting

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U.S. Food and Drug Administration Protecting and Promoting Public Health www.fda.gov

Other Benefits/Opportunities

- Supportive work/life balance, flexible schedules, 40 hour weeks, telework days, good office environment, and numerous outside-work opportunities in the area
- Other unique positions
  - FDA Commissioner's Fellowship Program
  - American Institute of Physics, Congressional Science Fellowship Program
  - NIH, NSF, NRC – other regulatory agencies related to science/physics/medicine
  - Specific Agent, Criminal Investigators
- Check USAJobs.gov and email managers with a CV to ask about future hiring

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U.S. Food and Drug Administration Protecting and Promoting Public Health www.fda.gov

To learn more about FDA…

CDRH/FDA Regulatory Processes and Device Science Activities

Professional Symposium
Tuesday, August 2nd, 2016
7:30 AM - 9:30 AM
Room: 204

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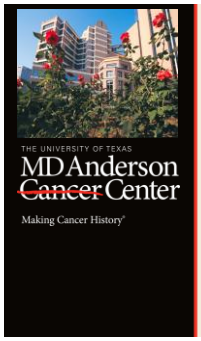

The Path of an… Academic Physicist

Rebecca M. Howell, PhD
Associate Professor
Radiation Physics
rhowell@mdanderson.org

Three key elements to success on any path…

- Learn your craft
- Work hard
- Establish high-quality and lasting relationships
  - Colleagues
  - Mentors
  - Sponsors

Where did my path begin ?

- 1997: BS in Chemistry/Biology, UTEP → *6 years to complete*
  Why so long?
  - Work, work, work…
  - Learned invaluable lessons that still apply today in my career as an academic medical physicist.
    - Always be on time.
    - Be respectful of your colleagues.
    - Do your fair share of the work.
    - Sometimes you have to work the "worst" shifts.
    - Sometimes you have to mop up a big mess.

The early days….

1998: Began graduate school in Radiation Biology, UTHSCSA

2000: PhD candidacy exams in Radiation Biology and Medical Physics
Married

2001: MS in Medical Physics, UTHSCSA
Moved to Atlanta, got a job as junior physicist at Emory University
After a 1-year break from grad school, I reenrolled at UTHSCSA and completed my dissertation research.

2005: PhD in Medical Physics, UTHSCSA
ABR certification
Assistant Professor (clinical track), Emory University

And then…
MD Anderson in Houston, Texas

2007: Assistant Professor (tenure track), MD Anderson

2010: Started a family 

2011: Divorce

Requested/granted 1-year tenure clock delay 

2014: Associate Professor (with tenure)

2016: Director of Late Effects Group and Associate Director of Radiation Dosimetry Services

Things I've learned along the way……

Learn your craft

- Learn to be a good clinical physicist. It is rewarding and makes you a better researcher.
  - ABR certification is important even for academic careers; e.g., a tenure track appointment at MD Anderson is 70% clinical and only 30% research (until you have grants to buy more time).
- Stay focused on your research.
  - A project is not complete until the manuscript is published. Always follow through.
  - Grants, grants, grants, and more grants (lots of applications to get one funded).

And to do both of these well, you have to work hard (and lots of hours).

Find good mentors and sponsors

- Early in your career, your mentors tend to be your research advisor and thesis committee members.
- As you progress, it is important to seek out broader mentorship.
  - I have many mentors, each of whom have different areas of expertise and very different perspectives.

Listen to the hard feedback

- **Mary Martel (mentor/sponsor):**

"You can't just keep working on random projects. If you want to make tenure, you have to pick an area in which to focus your efforts and become nationally known for that…"

(After initially being taken-back) I took her advice to heart and focused on out-of-field dose and late effects. Six years later, I made tenure, largely based on research in those areas.

Establish collaborations

- Prior to AAPM 2004, I searched the meeting program for "neutrons", and I found a presentation by Stephen Kry on a topic very similar to my own research.
  - I emailed him, and we met at AAPM and began discussing collaborative projects, one of which we began later that year.
  - To date, we have co-authored **20** manuscripts.

Get involved in AAPM

- **<u>But how?</u> No one just invites a new graduate to join a committee!**

<u>Self-Referral</u>

- Email committee chairs and ask to sit in.
- My experience is they usually say yes. ☺
- And if you show an interest and are willing to work, they will often let you "join".

<u>Mentor Referral</u>

- Ask your mentors to recommend you for open committee positions.
- And then follow through with direct contact.
- This is how I got on my favorite committee, CAMPEP GEPRC.

Establish a network of contacts

- In 2006, I set my sights on MD Anderson, but there were no open positions, and all of my inquiry emails had been ignored.
- I got creative. I emailed someone I met through committee work (and a former MD Anderson employee) for advice on how to get my foot in the door.
- I ran with his advice…

Recommended reading

- SDAMPP Student Guide to a Medical Physics Career

Are there any questions?