Life Beyond Your Degree

…or “what can you do with a PhD?”…

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Why get a PhD?

- Intellectual challenge and personal satisfaction from pure pursuit of knowledge (particularly in physics - the most basic of all science)
- Knowledge is power - More likely to be the boss, the leader or get the better position
- You can’t ever lose your education
- More education → More career choices with (hopefully) better rewards (note: “rewards” isn’t just money!)
- Scientific method and analytical thinking can be used to solve virtually any problem in life
- Graduate school is not a bad place to be in a recession
- Most importantly you **learn how to learn!**
Sampling of Career Choices for Scientists

- **Traditional choices**
  - Teaching
  - Basic Research
    - Educational Institutions
    - National & International Laboratories
  - Applied Research & Engineering
    - Academic & Corporate R&D Facilities
    - Aerospace/Defense/Homeland Security Industry
    - Non-Profit Research Institutes

- **Interdisciplinary choices**
  - Biophysics, biochemistry, geophysics, chemical physics, genetic engineering…
  - Medical physics & nuclear medicine
  - Energy, materials & environmental sciences
  - …and many more…
But things don’t always go as planned…

Cartoon by Glenn James
High Technology Industry Careers
(for any discipline someone’s probably made a business out of it!)

- Environmental (testing, clean-up, waste management, energy, global warming, going “green”)
- Robotics and electronics
- Bio- & genetic engineering
- Nuclear medicine isotopes & equipment
- Computer sciences & artificial intelligence
- Communications technology
- High tech equipment design & manufacturing
- Engineering services
- Defense contractors & “Think Tanks”
My Story:
Education

- BS Physics (with Honors) – Virginia Polytechnic Institute, 1968
- MS Physics – Florida State University, 1970
- 1.5 year “Detour” – Research Assistant at M. D. Anderson Hospital & Cancer Center
- PhD Physics – Texas A&M University, 1976
Academic Years

- Coop student (Naval Marine Eng. Lab) while attending VA Tech
- Pion physics @ Space Rad. Effects Lab (now Jefferson Lab)
- Met husband at FSU (also physics grad student) & got married
- **Detour:** Left FSU after MS; needed money to continue education; Bob working for Schlumberger Well Services; son was born in Houston
- Did medical physics research @ M.D. Anderson until entering A&M for PhD
- Did heavy ion physics research at Cyclotron Institute
- Active in student politics at TAMU - first female Graduate Student Body President; served on several student advisory committees
- Distinguished Grad Student Award for Research; graduated with 4.0
Career Evolution

- First considered fast-track MD
- Post-Doc at Los Alamos Meson Physics Facility (LAMPF)
  - Traditional basic research in pion and muon physics
  - \( \text{H}^- \) photo-detachment studies (Bob part of collaboration; work published in Phys. Rev. Letters on excited states of hydrogen)
  - Planned experiments and wrote data acquisition and analysis software
- Staff member – Plasma Physics Group (Z-pinch)
- Staff member – Applied Nuclear Technology Group
  - Practical application of technology to nuclear safeguards
  - Heavy emphasis on data analysis software & communication network
  - Prepared me for later entry into own businesses
Another Detour (Almost)

- At urging of LANL Women in Science chapter, applied for Mission Specialist Astronaut.
- Interviewed in 1980 – 1 of 100 applicants chosen out of thousands.
- Almost made it! (Probably not chosen only due to mitral valve prolapse, or “sticky” heart valve).
- Message is don’t ignore unusual opportunities.
Transition to Industry…

How I Became Co-Founder & COO of an Accelerator Company

- Went to California (Bob’s career opportunity and entrepreneurial desire)
- Started software consulting business (seeds of my own entrepreneurship)
  - Software for specialized networks (for old group at LANL)
  - Cancer treatment software for cyclotron facilities at MD Anderson and UCLA
- Co-founded AccSys Technology, Inc. in 1985 with Bob and two other LANL colleagues; as COO, duties included:
  - Overseeing all aspects of business operations – accounting, contracts, HR, etc…
  - Serving on the Board of Directors
  - Developing software for accelerator control systems
  - Technical writing & editing of proposals, reports and product manuals
- Elected delegate to 1995 White House Conference on Small Business; became activist to improve economic & regulatory climate for US small business (helped establish two organizations for this effort)
- National Director of American Electronics Association (3 years)
Brief History of AccSys – Highlights

- Founded in 1985 as spin-off from Los Alamos National Laboratory with Tech Transfer Agreement and Small Business Innovative Research grant from National Cancer Institute.
- Privately held California corporation
  - 80% purchased by Hitachi, Ltd in 2002; remaining 20% in 2007
  - $40k initial investment by founders and private stock sales of ~$0.6M, with final purchase price of $7.65M
- SDI Technology Spin-Off Award - 1988
- Gov’t grant success company (13 Phase I & 8 Phase II grants) - $8M helped fund product development
- Company sales of $58M during 22 years under our management
- By 2007, annual revenues of~$9M with another ~$9M in backlog
- 35 systems sold and delivered through 2007
Parallels Between Graduate Studies and Business

- Understand theory & abstract concepts
- Learn & apply mathematical principals
- Write proposals & papers
- Conceive & perform experiment:
  - Get idea
  - Setup
  - Take data
  - Problems => tinker & fix
  - Take more data
  - Publish!
- Write thesis

- Understand bosses, lawyers, bankers…
- Learn & apply accounting & legal principals
- Write proposals & progress reports
- Conceive & develop product:
  - Get idea
  - Develop
  - Test
  - Problems => tinker & fix
  - Test again
  - Success!
- Write project or business plan
Defend thesis $\iff$ “Sell” your plan

- Defend thesis $\Rightarrow$ get job
  $\Rightarrow$ earn money

- Pitch plan $\Rightarrow$ get job/funded
  $\Rightarrow$ stay in business/ keep job

And, as investment bankers, I know you’ll find it exciting to realize that our business potential is defined in 12 dimensional space as follows!

Cartoon by Glenn James
Prepare for Career Opportunities in Industry or Academia

- **Key Job Skills Needed**
  - Theoretical knowledge
  - Technical expertise
  - Innovation
  - Practical problem solving
  - Project management
  - Good communication skills
  - Technical writing skills
  - Computer literacy

- **Give Yourself an Edge**
  - Broaden your background & experience whenever possible
  - Outside interests can show you are well-rounded & flexible
  - Watch for non-traditional opportunities and be willing to seize them
  - Understand the risks and potential rewards of changing disciplines and/or careers