

# 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...

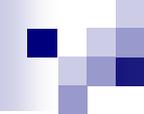
But things don't always go as planned...



# 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

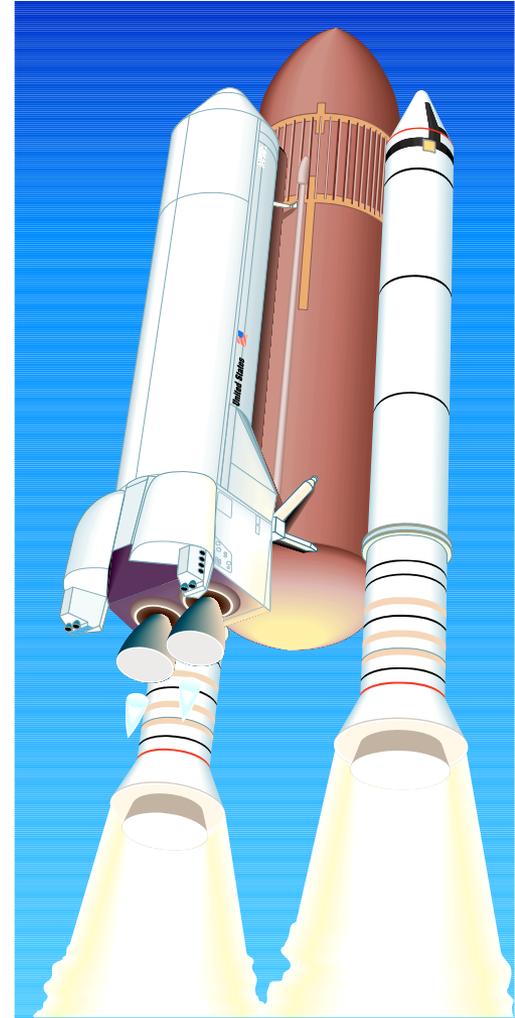
- Coop student (Naval Marine Eng. Lab) while attending VA Tech
- Pion physics @ Space Rad. Effects Lab (now Jefferson Lab)
- Met husband at FSU (also physics grad student) & got married
- *Detour*: Left FSU after MS; needed money to continue education; Bob working for Schlumberger Well Services; son 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
  - ✓ H<sup>-</sup> 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
- *Inc. 500 List* for rapid growth - 1991 & 1992
- 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

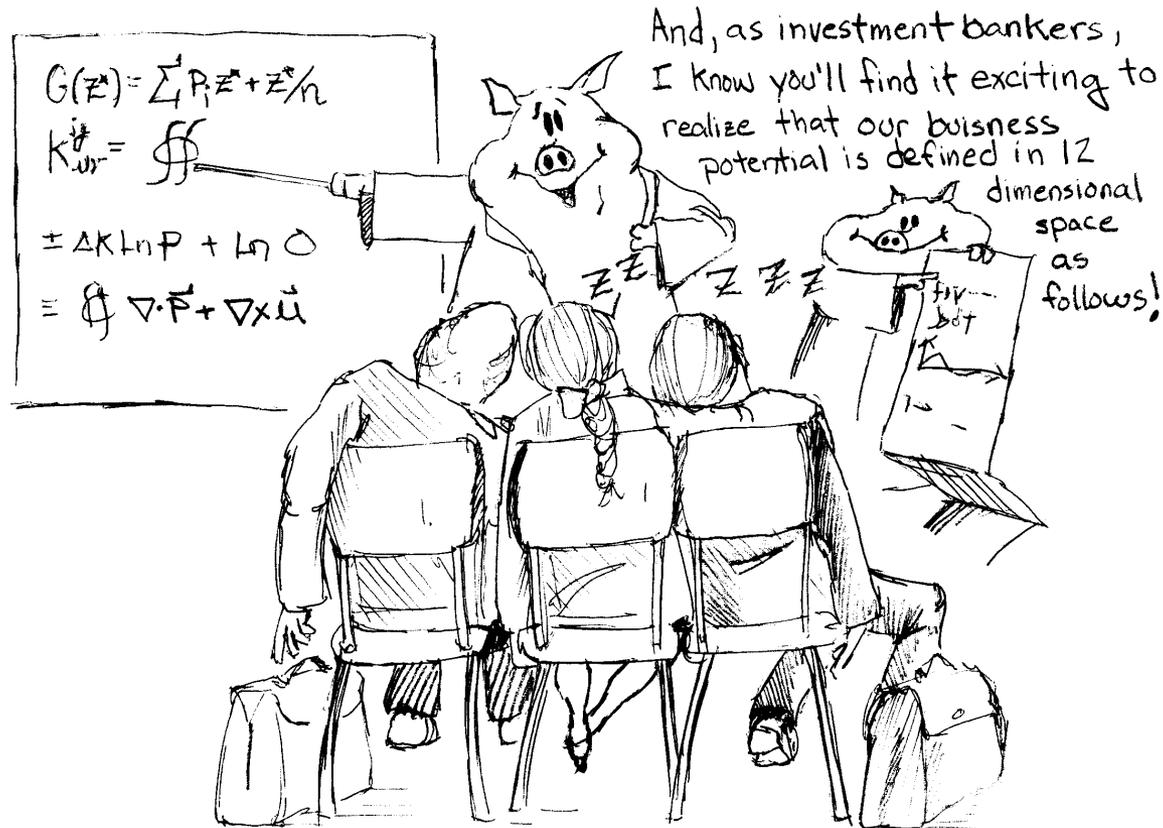
# Parallels Between Graduate Studies and Business

- 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 $\Leftrightarrow$ “Sell” your plan

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

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



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