EYEBALLS, NORTH DAKOTA, AND OTHER ADVENTURES OF A PHYSICIST TURNED ENGINEER

UIUC Physics Career Seminar

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Preface / Disclaimer

- I am not representing anyone but myself

- All the advice herein is based on a sample size of N = ~1

- This advice is (probably) not the silver bullet for getting a job

- Geared toward private sector

Outline

- ## My background

- ## Current job and company
  - Engineering (gross!)
  - FTL Program
  - Northrop Grumman and the defense sector

- ## My job search and other job hunt advice
  - Use your resources
  - Transferrable skills
  - Learn to communicate

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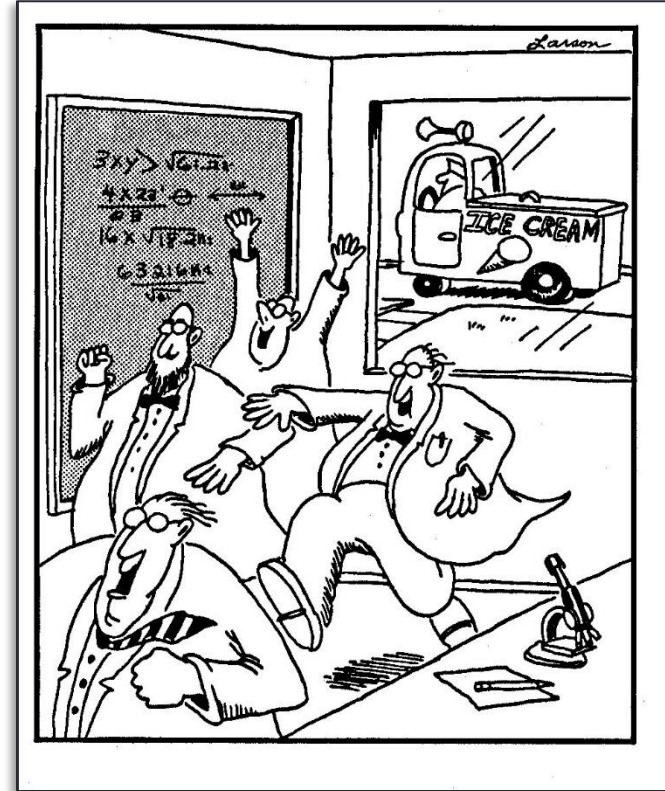
My Background

- BS in physics and BA in mathematics in 2011 (University of Virginia)

- Ph.D. in 2017 (Raffi Budakian's group)

- Thesis topic: Low-temperature magnetic force microscopy, multiferroics, quantitative modeling

- PGSA Co-President and GPS mentor

- Summer internship and follow-on 1+ day/week at Inprentus starting in 2016

My Background
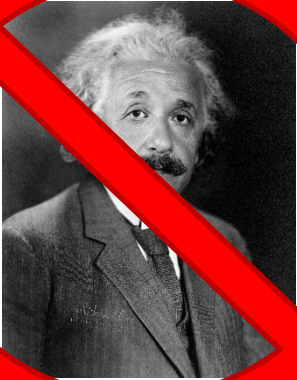
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[2]

Real-space magnetic imaging of the multiferroic spinels MnV_2O_4 and Mn_3O_4

B. Wolin, X. Wang, T. Naibert, S. L. Gleason, G. J. MacDougall, H. D. Zhou, S. L. Cooper, and R. Budakian
Phys. Rev. Materials **2**, 064407 – Published 22 June 2018

| Article | Reference | No Citing Articles | Supplemental Material | PDF | HTML | Export Citation |

[3]

Why my current job?

- No interest in academia/post-doc/finance

- Wanted to move back to East coast

- Get to pursue leadership while staying technical and working on interesting problems

- Hiring process was finished ~5 months before I defended

- Good salary and work-life balance
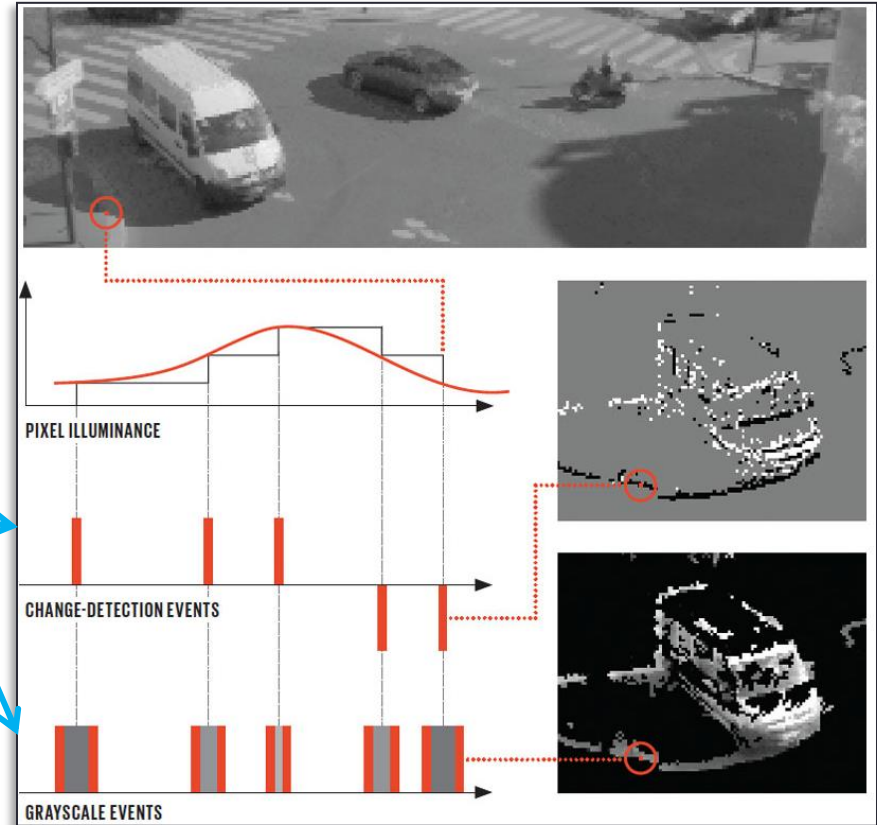
Transition from "physics" to "engineering"

- Day to day activities of physics and engineering aren't necessarily that different

- More emphasis on reliability, interoperability; more acceptance of uncertainty, imperfection

- There are still tons of interesting, hard, low-TRL problems to solve

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Figure 1. Airborne AESA Configuration
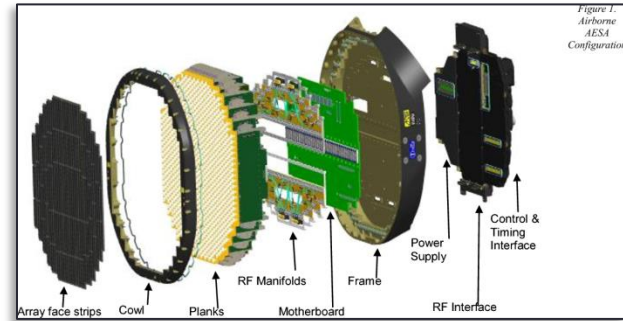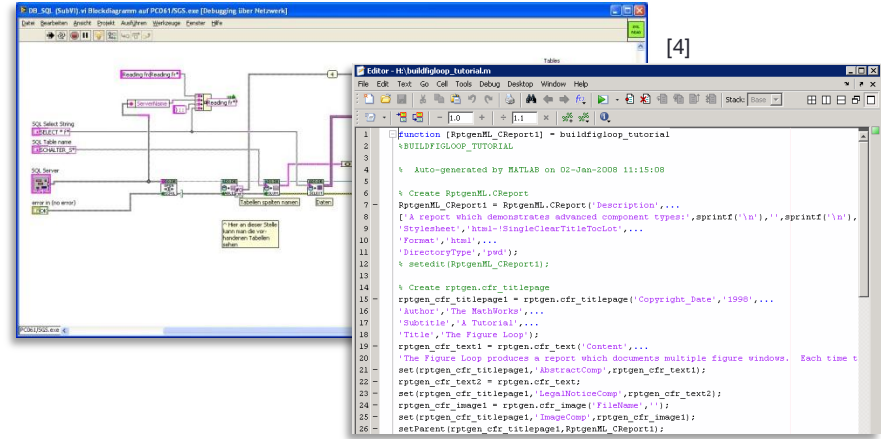
TRL = technology readiness level
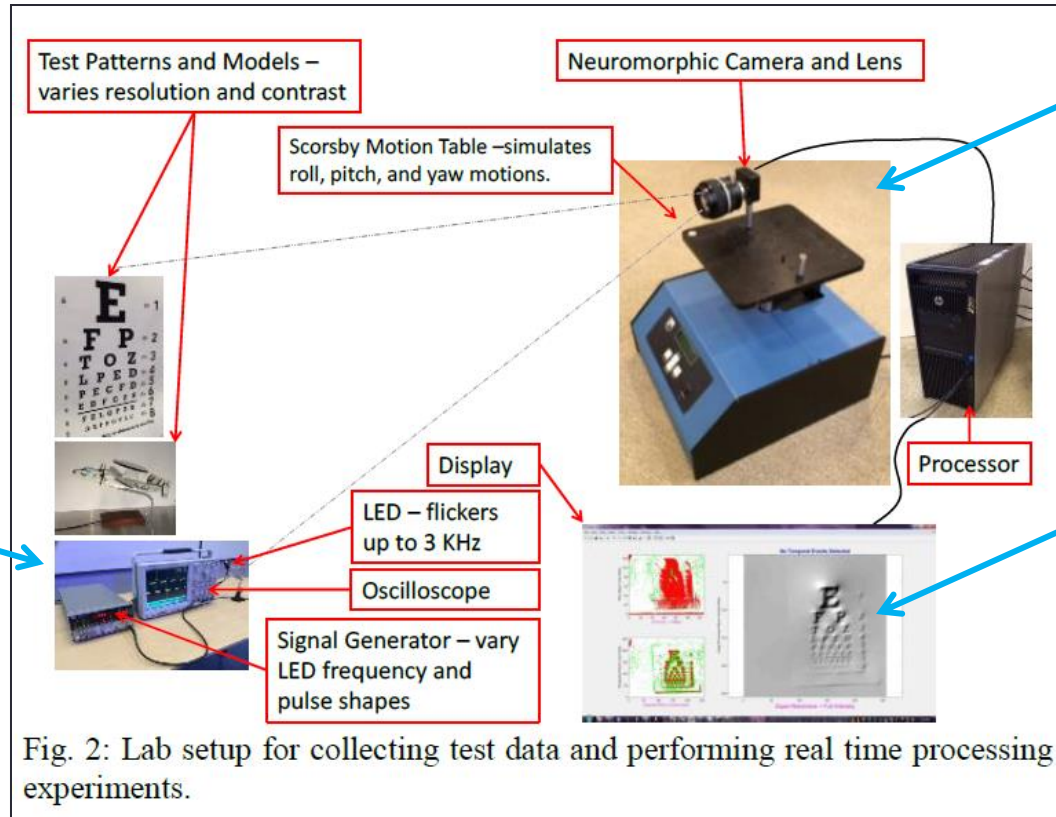
Project example: neuromorphic imaging

- Optical sensor built on the same principles as the human visual system

  - Asynchronous pixel (photoreceptor) reporting
  - Parallel processing paths for different tasks
  - Event-based reporting

- Advantages in data throughput, temporal resolution, power requirements…

PIXEL ILLUMINANCE

CHANGE-DETECTION EVENTS

GRAYSCALE EVENTS

[7]

Project example: neuromorphic imaging

Motion control of sensor pointing

Grayscale image reconstruction

Flickering LED for high temporal resolution testing

Test Patterns and Models – varies resolution and contrast

Neuromorphic Camera and Lens

Scorsby Motion Table –simulates roll, pitch, and yaw motions.

Processor

Display

LED – flickers up to 3 KHz

Oscilloscope

Signal Generator – vary LED frequency and pulse shapes

Fig. 2: Lab setup for collecting test data and performing real time processing experiments. [8]
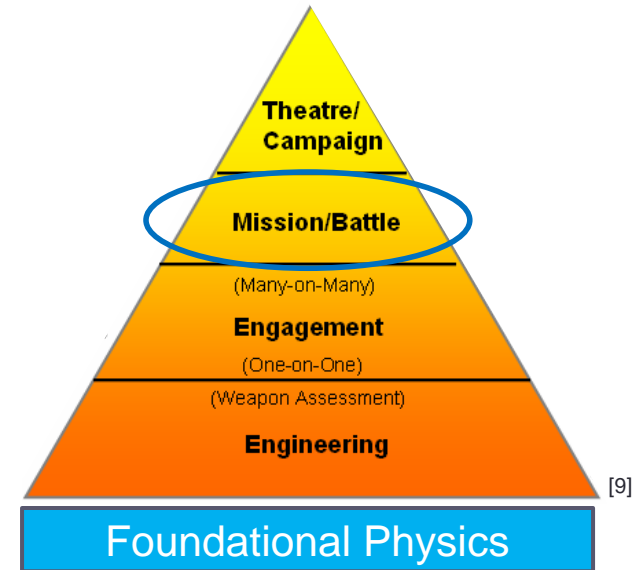
# Project example: mission engineering for business development

- Goals of mission engineering and mission MS&A

  - Understand current capabilities and gaps
  - Explore wide trade space of solutions
  - Analyze threats
  - Aid planning
  - Guide future research and development

- My role:
  - Create models for relevant systems and behaviors
  - Develop scenarios and simulations
  - Analyze results to produce customer-relevant metrics and visualizations

Modeling & Simulation Pyramid

Theatre/Campaign

Mission/Battle

(Many-on-Many)

Engagement

(One-on-One)

(Weapon Assessment)

Engineering

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Foundational Physics

Working in the defense industry

- Lots of jargon, acronyms, and history

- People care deeply about the work and mission

- Well behind commercial realm in some ways, well ahead in other ways

- Work with people from diverse backgrounds, including military

- Ph.D. confers a lot of respect (especially physics)

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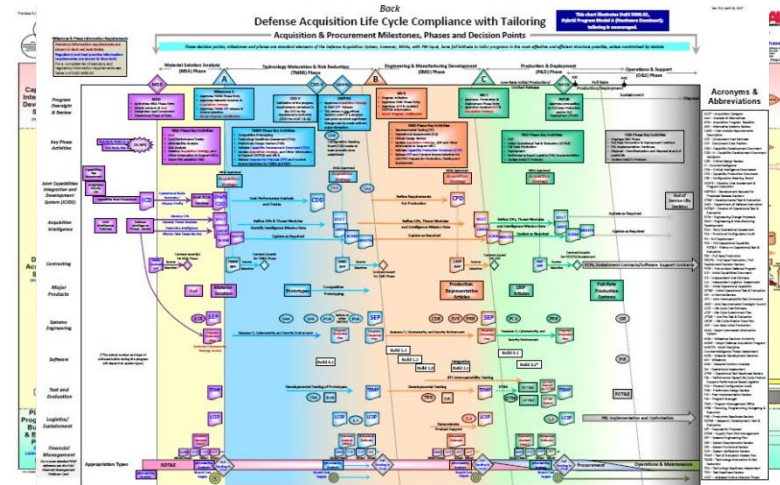
My job search timeline

- Overall about ~9 months, but varying levels of intensity

- 3-5 on-campus or phone interviews

- 2 on-site interviews

- 1 offer – accepted (obviously)

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Starting early: Spring 2016

- Went to career fair with a plan and an OK resume

- Responded to email from Lance about NG recruiter on campus and met with the recruiter (stealth interview)

- Put together profile on UIUC online career search tools

- Attended several seminar events by Grad college career development office

Searching in earnest: Fall 2016

- Resume review and edit with career development office (and more seminar events)

- Another meeting with NG recruiter
  - Assembled application package (recommendations, transcripts, "cover letter", etc.)
  - Informational interview with UIUC grad current employee

- Went to career fair with a plan and a polished resume

- Several on-campus interviews
  - Trading firm
  - Large materials/products manufacturer

- Phone screen and on-site interview with semiconductor company

Sealing the deal with NG: Fall 2016+

- Late October: 2-day on-site interviews and activities

- Early November: Offer extended

- Late December: Accepted offer (no negotiation)

- July 2017: First day in Baltimore

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Use your UIUC resources!

- Grad College Career Development Office
  - Career development workshops
  - 1-on-1 resume review and advising
  - Mock interviews
  - Etc.

- Career Services Platform (Handshake)

- Career fairs

- Department-level events

- Lynda courses or similar

[13]
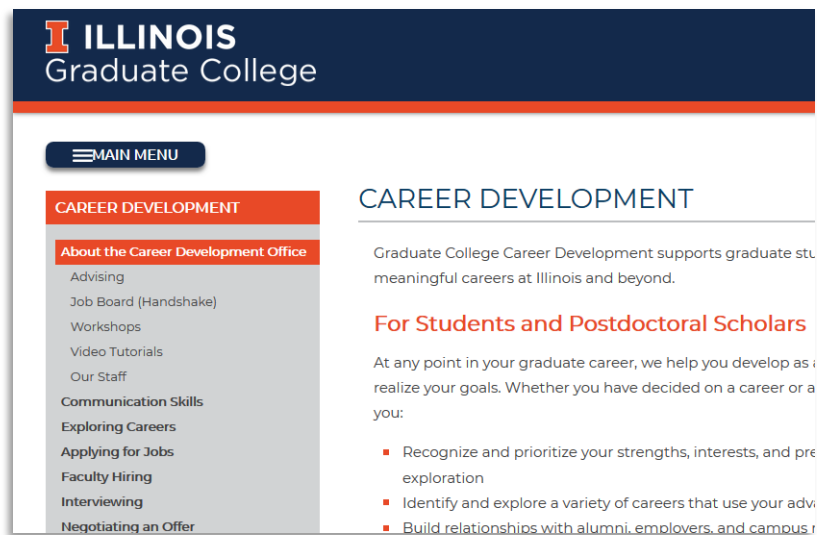
Transferrable Skills

- Unless you are going into your exact research field, you need to think about transferrable skills

- BUT you already have lots of transferrable skills, you just need to articulate them
  - Breaking down complex problems into solvable elements
  - Working in a team; collaborating between teams
  - Research and analytical skills
  - Self-motivation and time management
  - Joining and working on an in-progress project
  - Etc. etc. etc.

Learn and practice communication skills

- You will likely be going into a very technical job, but you will need to interface with non-technical people

- Take the Communicating Physics Research course

- "Soft skills" like communication are routinely listed by managers and executives as more important than hard technical skills

- Career fairs and other hiring/networking events are great places to practice

Random other thoughts…

- Career fairs: don't put yourself in a box, I talked to companies that didn't list PhD *or* physics in their profile
- Companies sometimes cannot get out of their own way trying to hire
- Luck is a significant factor in finding a job
- Other career seminars to check out:
  - Xu Wang (Intel)
  - Richard Aburano (Hiring Manager)

- Engineering/science master's degrees and doctorates with high GPAs and faculty recommendations

- U.S. citizens able to obtain a security clearance

- Demonstrated drive and aptitude for leadership

- Eager to broaden their perspective
  - Explore different technical domains
  - Experience leadership of small teams and beyond
  - Develop business and management competencies

- **Willing to relocate for rotation assignments**

- **FTLs must maintain exceptional performance in their rotation assignments to remain in the program**

Interested?

Talk to your alumni recruiter
Visit www.northropgrumman.com/ftl

Questions?

Knowing how it could change the lives of canines everywhere, the dog scientists struggled diligently to understand the Doorknob Principle.

[15]

Image Sources

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