Careers for Physicists in Medical Diagnostics & Devices

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April 16, 2015
• Medical Diagnostics
• Abbott Diagnostics
• Private Sector R&D
• Systems Integration
• Advice
• Questions – Please interrupt me!
What is Medical Diagnostics?

Information to guide treatment
What is Medical Diagnostics?

Guide medical treatment decisions

- Detecting Diseases/Infections
  - Hepatitis, HIV, Syphilis, Chagas, Ebola

- Measuring chemical concentrations in body fluids
  - Glucose (Diabetes)
  - Cholesterols (Heart Disease)
  - Hormones (Cancer, Pregnancy, Cardiac, Development)
  - Na, K, Ca (Organ failure, diet)

- Blood cell assessment
  - Red blood cells counts (anemia)
  - Immune reaction monitoring

- Monitor drug levels during surgery or treatments
Use antibodies to detect specific chemicals/proteins

- Chemical to detect
- Antibody
- Labeled Antibody
Immunoassays Yesterday and Today

**40 years ago**
- Expensive
- Slow
- Labor-intensive
- Unreliable

**Today**
- Cheap
- Fast
- Automated
- Reliable

Image from www.sri.com
Abbott Accelerator Video
Medical Diagnostics at Abbott

- Automated devices (hundreds of tests per hour)
- Point of Care devices (at patient location)
- Informatics (global disease monitoring)

1985 – Abbott developed the first licensed test for HIV
~2000 – 100% U.S. blood supply screened by Abbott PRISM
2015 – Developing rapid tests for Ebola
Global disease monitoring

HIV subtype distribution
Continuously monitoring patient sequences

Ariën et al. Nature Reviews Microbiology 5 (February 2007) | doi:10.1038/nrmicro1594
Other Medical Devices at Abbott

- **Vascular**
  - Self-expanding, bio-absorbable stents
  - Drug eluting stents and catheters
  - Coronary guide wires

- **Optics**
  - iLASIK
  - Glaucoma implants
  - CATALYS system for cataracts surgery
What am I doing now?

Systems Integration Specialist in Medical Diagnostics
What is Research & Development

Research

Discovery

Similar to academic research. Publish in scientific journals. Often involves buying startups

Intellectual Property

Write patents. Research ideas and existing products

Product Design

Core R&D Creating marketable products and making them function

Product Development

Refine products, improve reliability, repeatability, ease-of-use. Make it the best product on the market

Development

Operations

Maintain and improve existing products. Keep up with new diseases. Troubleshoot new problems as they arise

Market

Prior art
What is Research & Development

Research

- Prior art
  - Similar to academic research.
  - Publish in scientific journals.
  - Often involves buying startups

- Discovery
  - Intellectual Property

Development

- Product Design
  - Core R&D
    - Write patents.
    - Research ideas and existing products
  - Creating marketable products and making them function

- Product Development
  - Refine products, improve reliability, repeatability, ease‐of‐use.
  - Make it the best product on the market

- Operations
  - Maintain and improve existing products.
  - Keep up with new diseases.
  - Troubleshoot new problems as they arise

I work here

I feed back over here
What do I do?

Systems Integration
Integrating all components of the instrument

I solve problems and improve existing instruments
- New tests are more sensitive,
- Improvements make tests faster, more reliable
- Customers do strange things

Who do I work with?
- Biochemists
- Organic chemists
- Electrical Engineers
- Bioengineers
- Computer Programmers
- Customer support
- Marketing
Why Medical Diagnostics?

**Rewarding**
- Developing instruments that save and improve millions of lives
- Working for a company that isn’t evil

**Autonomy**
- Flexible “9-5”
- Organize my own time
- Set my own goals

**Faster pace**
- More projects
- Faster project turnover

**Life-work separation**
- I rarely bring work home
- Bosses do not email requests on nights and weekends

**Great compensation**
- Vacation, retirement, parental leave, continued Ed support

**Potential downsides**
- Not doing cutting-edge science
- Business considerations drive decisions
Advice for now

• Develop technical skills in grad school
  You have...
  • Time
  • Access to classes
  • Access to experts in many fields

• Do an internship

• Practice communication
  • This is the most underappreciated skill of PhDs
  • Speak about your research as often as possible
  • Learn to make good graphs
Advice on applying for jobs

• Network (cliché, but this is how you find jobs)

• Career Center

• Research the field
  • Figure out what you want to do
  • and why

• Sell your skills
  (They don’t know what Physicists do)
  • Software/Programming
  • Data analysis
  • Instrumentation
  • Electronics
Extra Slides
Biography

• BS Physics, Hope College 2002-2006
  • Nuclear Physics Research

• PhD Physics, University of Illinois 2007-2014
  • Biophysics Research

• Abbott Labs Diagnostics Division, April 2014-Present
  • Systems Integration