How to Find, and Succeed in, an Industrial Job

Thomas C Halsey, Rice University, April 4, 2025
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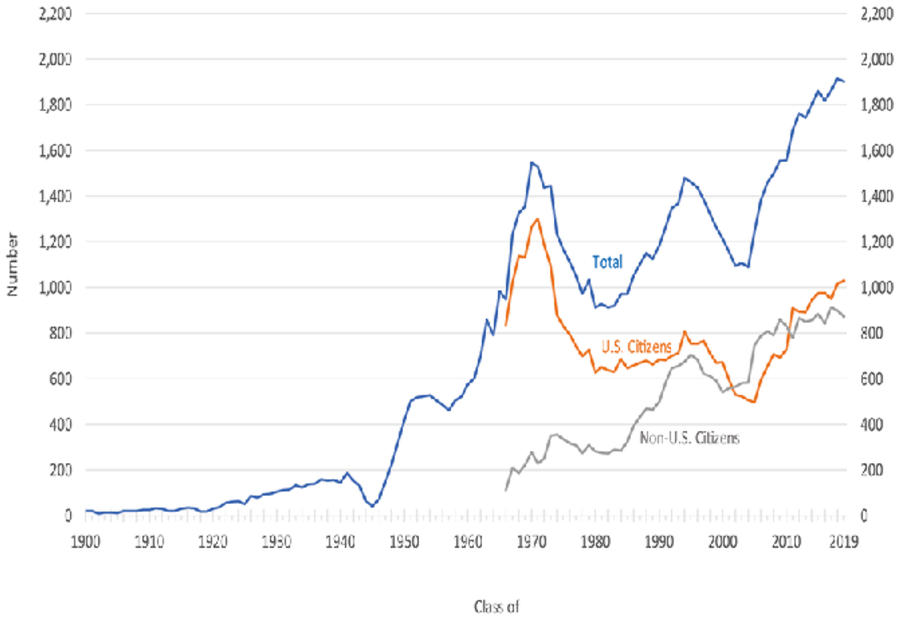
Physics Education and Careers

"The race is not always to the swift, nor the battle to the strong; but that is the way to bet." —Hugh Keogh

Physics PhDs Conferred in the US, 1900 through 2019



Sources: ACE (1900-1919), NAS (1920-1961), AIP (1962-2019)

AIP | Statistics aip.org/statistics

Estimated Number of Faculty Departures in Physics Departments, 2016–17 Academic Year

	Highest Physics Degree Offered			
	PhD	Master's	Bachelor's	Overall
Number of Departures	202	31	138	371
Percent of Departures Among Faculty Members	3.4%	3.5%	3.8%	3.5%
Percent of Departments with Departures	61%	31%	25%	35%
Percent of Departing Faculty Members that Left Without Tenure	10%	15%	24%	16%
Total Headcount of Faculty Members	6,015	870	3,615	10,500

Note: The total headcount of faculty members is for the academic year of 2017–18. The total number of faculty members in this report differs from the total number reported in "The Number of Faculty Members in Physics Departments", which reported full-time equivalent (FTE) faculty totals, not headcount totals.

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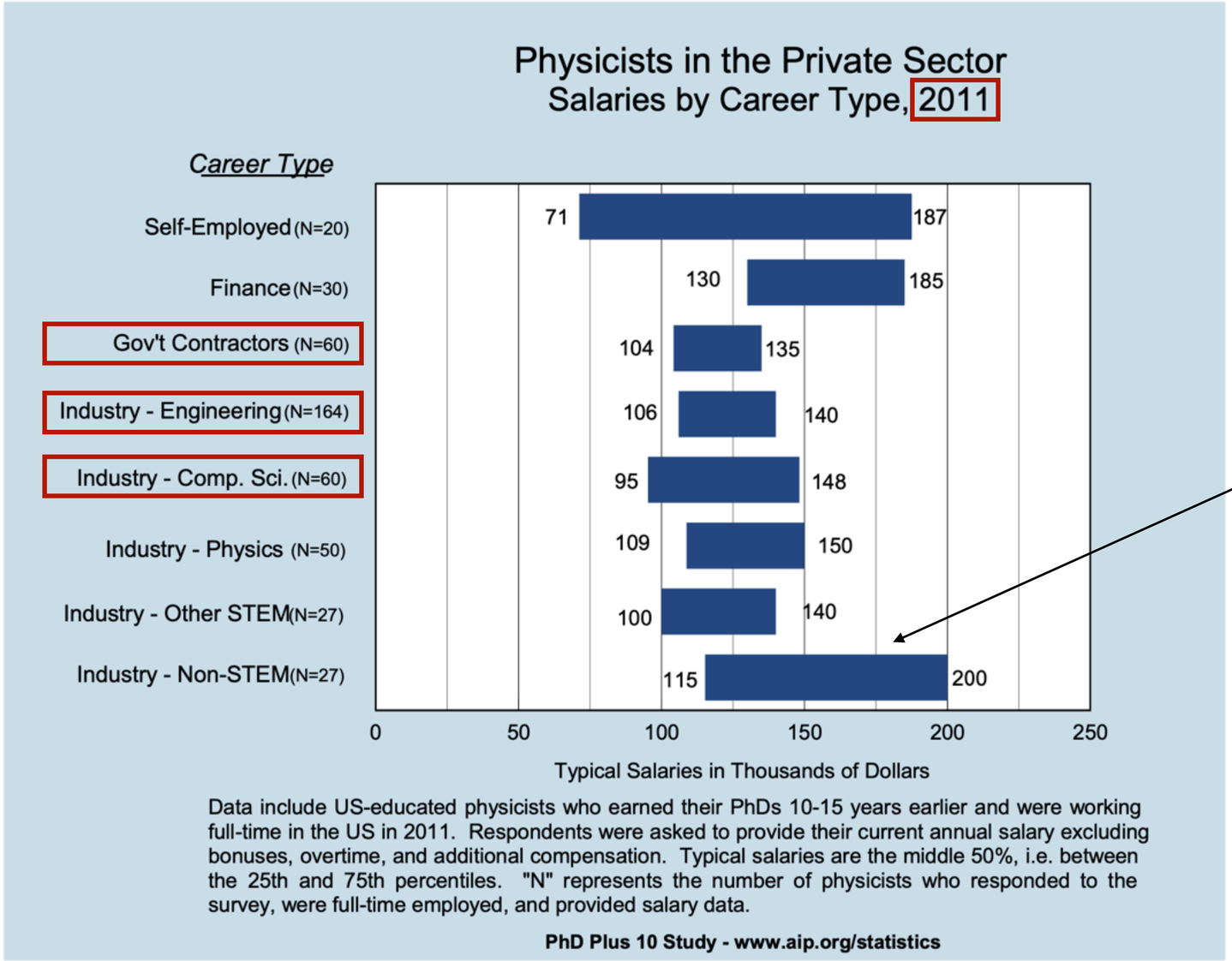
Job Market Conclusions

- By these metrics, in steady state 15-20% of US-granted PhDs will become US-based physics faculty
  - Some will become faculty in other countries, or disciplines. But some non-US PhDs will become US faculty, and some non-physics PhDs will become physics faculty
- Roughly 50% of new PhDs take postdoctoral jobs
- Most people who take postdocs as their first jobs will not become physics faculty
  - Will what they learn in a postdoc be more or less valuable to their future employer than what they would learn working directly for them?

Sectors of PhD Graduates



Often obtained other degrees, e.g. JD or MBA

A PhD in Physics is Preparation to Become Physics Faculty

- Includes
  - Broad training in key disciplines of modern physics
  - Teaching assistantships— apprenticeships in university teaching
  - Experience in selecting, defining, executing, documenting, communicating and publishing academically valuable research
  - Research use of software and digital tools
- Usually does not include
  - Business fundamentals— teamwork, marketing, business functions and hierarchy
  - Immersion in business values and pace of business life
  - Innovation and intellectual property
  - Enterprise use of software and digital tools

Overall Framework for Choosing Careers

“A good man always knows his limitations” — Dirty Harry

What you know how to do, or are good at learning

- Software and hardware skills
- Scientific, mathematical and business knowledge
- Experience with people or organizations

What society needs, and is willing to pay for

- Location of jobs
- Career paths
- Compensation and flexibility of available work

What you want in life; how you enjoy spending your time

- Technical work vs. working with people
- Working with your mind vs. with your hands
- Mathematical vs. logical vs. language-oriented work
- Financial success vs. other types of success

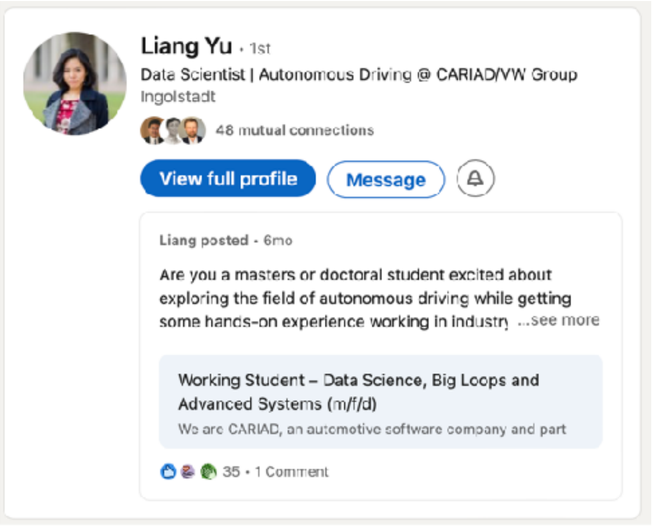
Skills

“Software is eating the world”— Marc Andreessen

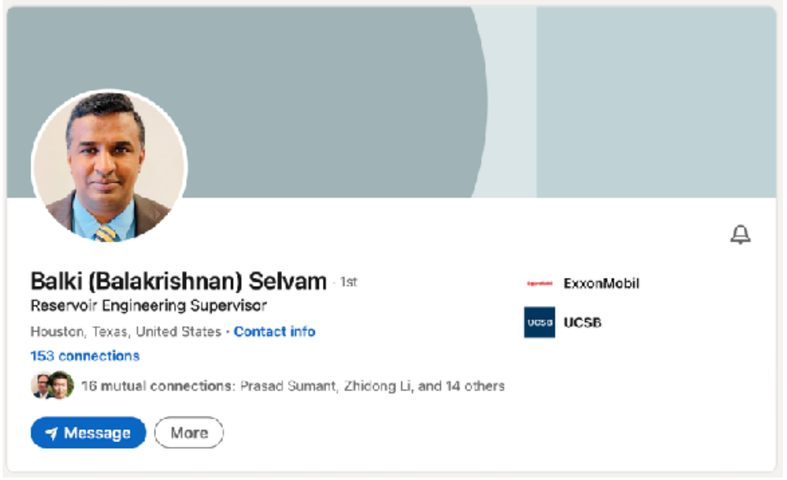
- Software—not just programming
  - Enterprise software development, including version control
  - Cloud computing (Azure or AWS certification)
  - Object-oriented programming
- Data science (statistics)
  - SQL and NoSQL databases
  - Basic Machine Learning techniques
  - “Basic” Artificial Intelligence— convolutional neural networks, GANS, etc
  - LLMs / Generative AI
- Engineering principles— optimization, trade-offs, integrative thinking
- Business skills
  - Entrepreneurship
  - Innovation and intellectual property
  - Basic business concepts— marketing, sales, manufacturing, logistics,…

Choosing an Industry

“When you come to a fork in the road, take it” — Yogi Berra



- Do they hire or recruit PhDs?
- Is the industry growing, stable, or shrinking?
- What are the career paths of technical employees?
- Is the industry concentrated in places you want to live?
- Is the mission of the industry consistent with your values?
  - Weapons work
  - Oil and gas
  - Pharma
- Can you take time to research the industry?



Megatrends

“You don’t need a weatherman to know which way the wind blows” — Bob Dylan

- Artificial intelligence / machine learning
  - Retail
  - Government
  - Transportation
  - Robotics
  - Finance
- Health care
- Energy “Transition” (including Mining)
- Materials
  - Semiconductors
  - Plastics and composites

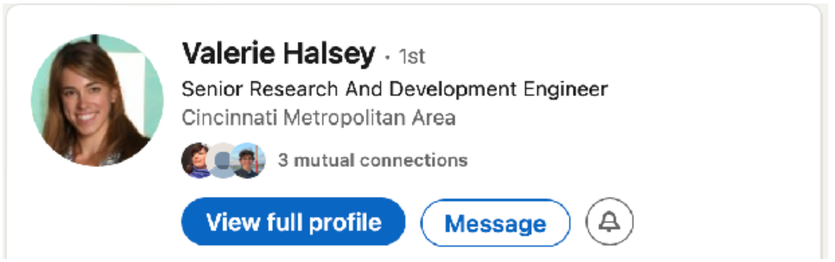
Identifying a Potential Employer

- Where have graduate students from your department / group gone?
- Networking— Goal is to find information more than to find a job
- Internships— Reduce risk for yourself and your potential employer
- Career fairs— Go early and often. Ask people what skills they are looking for
- Social media— Reach out to people with whom you have some connection, and are in companies in which you are interested

What Companies Want

“The single biggest problem in communication is the illusion that it has taken place”—George Bernard Shaw

- Technical expertise and problem solving ability
- Communication, communication, communication
- Demonstrated leadership aptitudes
  - About more than charisma and interpersonal skills
- Easy to work with
- Commitment to <u>them</u> and their industry



The Interview

“Be yourself, everyone else is taken”— Oscar Wilde

- Research the company
  - Key challenges
  - Stock price history
  - Senior leadership
- Dress for success
- Be ready for tests
- Authenticity— why do you want the job?
- Interview talk— needs to be understandable for non-specialists

Succeeding in Your Job

- Careers have a natural progression— you are building your own skills, your ability to add value to the enterprise
  - Technical Skills
  - Interpersonal Skills
  - Business Skills
  - Strategic Leadership Skills
- Always be looking for ways to increase the value you bring to your employer

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Ethics, Integrity and Value

“Right is right even if no one is doing it; wrong is wrong even if everyone is doing it”—St. Augustine

- The most important quality required for your success is integrity
- If you find yourself in a situation where those around you, or the company as a whole, systematically lack integrity, get out before something bad happens
- Value includes
  - **Value to society**
  - **Value to the enterprise**
  - **Value to yourself**
- When these are aligned, the system works. When they get out of alignment, trouble ensues

Management

“One of the penalties of refusing to participate in politics is that you end up being governed by your inferiors.” —Plato

- Almost everyone in industry manages to some degree, even if only at a project level
- Special K

  Know yourself *— emotional maturity*

  Know your people *— compassion*

  Know your business *— expertise*

Focus on What is Important

“Elegance is refusal”— Coco Chanel

- Industrial environments are different from academic environments. You must embrace change
- Success is measured by your impact on the company, not your impact on your field
- If you know more about a subject than those around you, you are the expert
- Decisions are always made under uncertainty. A decision taken too late usually does more damage than a wrong decision

Good Luck!

Questions?