Careers ~~In~~ *With* Physics: Dispelling the Myth

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THE MYTH:

There are no jobs in physics.

THE REALITY:

There are many good jobs with physics.

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Outline

- The economics of a degree in physics: indicators of supply and demand.
- What do physicists do: post-BS education and employment outcomes.
- How to compete in this game: options and strategies.
- How you can learn more.

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But first, a definition:

"physicist" = anyone with a degree in physics

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As with any market, supply and demand influence the professional options and ultimate outcomes for physicists.

Supply ↓ and Demand ↑ = Value ↑

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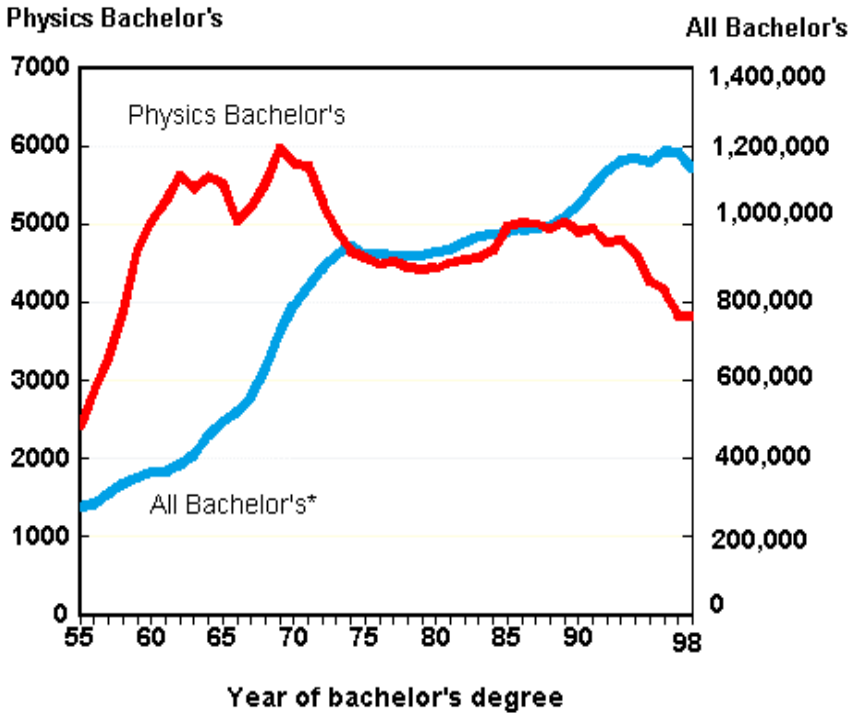
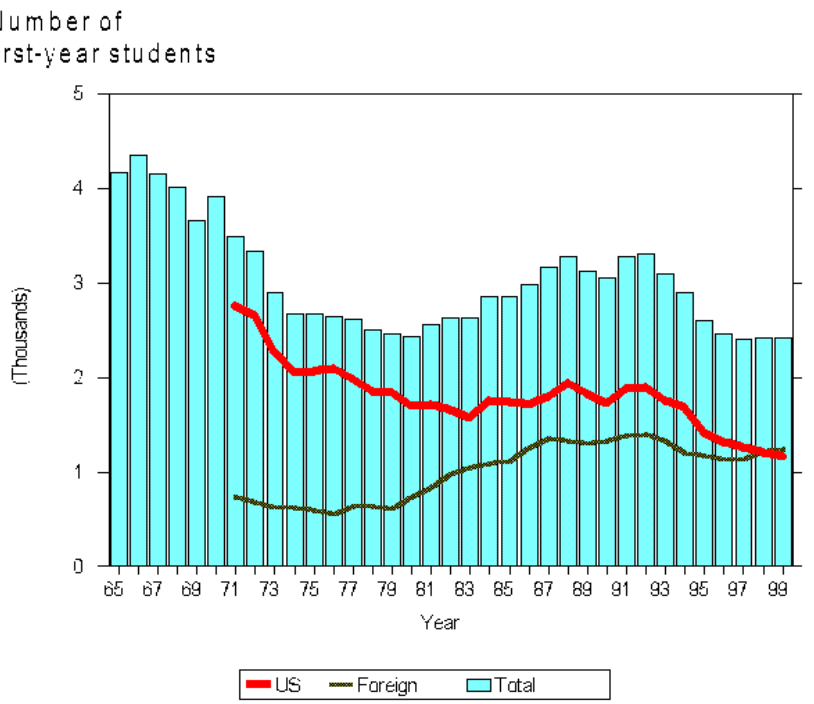
Supply of Physicists is Down

- The supply of physicists is going down at all degree levels.

Bachelors Production



First Year Grad School Enrollments



Sources: AIP Statistics Division

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Demand for Physicists is Up

- Demand for physicists can be measured using two indicators:
  - relative unemployment rate
  - relative salary
- Unemployment is low and below the overall national rate.
- Salaries are competitive, in absolute and relative terms.

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Unemployment is Low

- Avg. *overall* unemployment rate fell from

  ~5.5% in ‘96 to ~5.0% in ‘97.

- For Physics Bachelors, unemployment has dropped from

  5% in ‘96 to 3% in ‘97.

- For Physics PhDs, unemployment has dropped from

  4% in ‘96 to 2% in ‘97.

Data from BLS and AIP Statistics Div.

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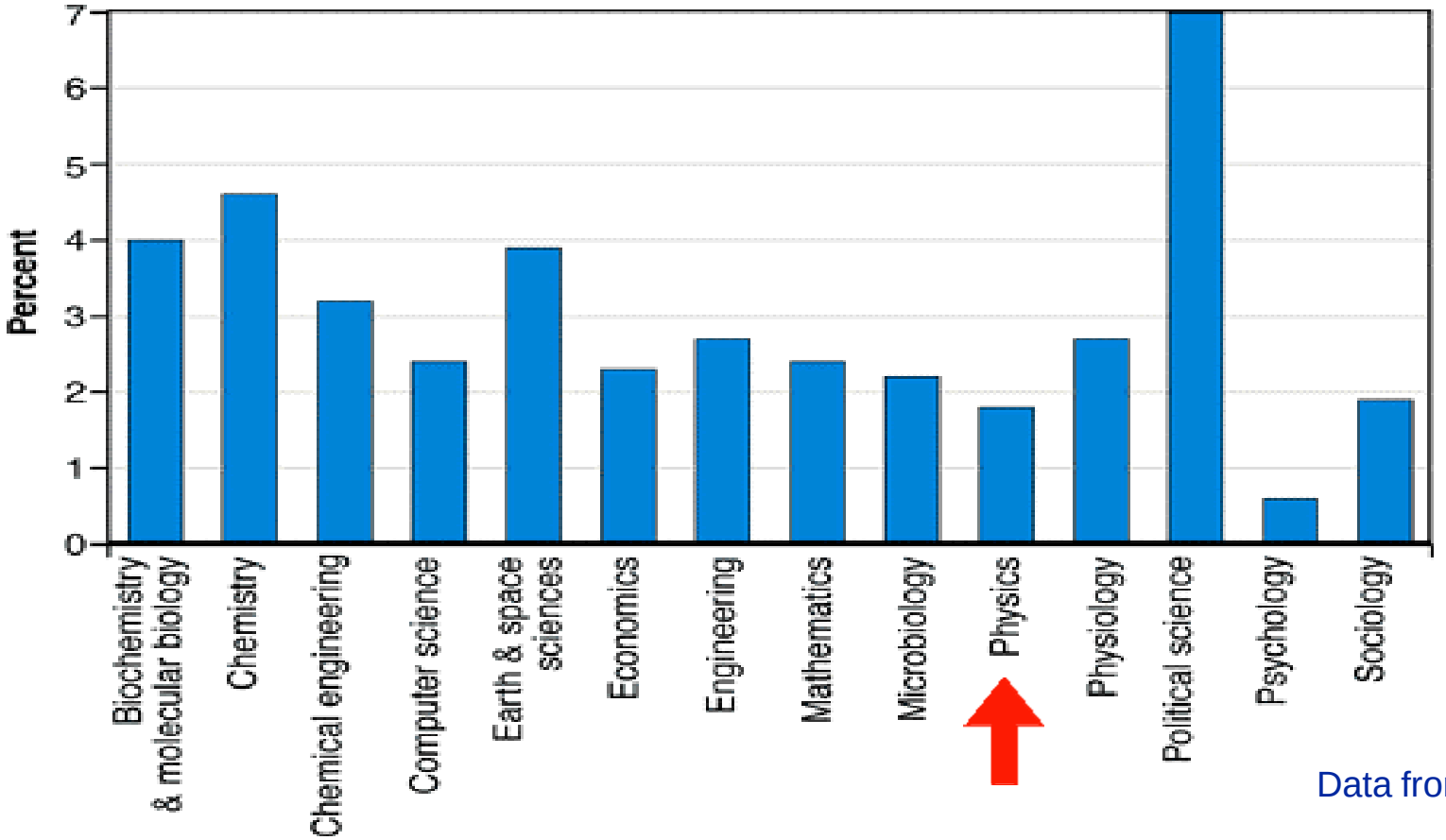
Physics PhDs Also Compete Favorably Compared to Other Disciplines

Unemployment Rates (1996-1997 PhDs as of mid-October)



Data from CPST

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Salary as an Indicator of Demand

- Physicists rarely work as physicists (in the traditional sense).
- They typically work as managers, engineers, computer scientists, members of technical staff, and other “industrial” titles.
- But is a physics bachelors degree competitive?
- Can physics compete with engineering and computer science?

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The Earning Power of Physics Training: Mid-Career

- Median annual earnings by college undergraduate major.
- Bachelors is terminal degree.
- Men aged 35-44 (mid-career).
- Data from Monthly Labor Review, 12/95 (p.3).

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The Earning Power of Physics Training: Mid-Career

1.	Engineering	$53,268
2.	Math	$51,584
3.	Computer Science	$50,509
4.	Pharmacy	$50,480
5.	Physics	$50,128
6.	Accounting	$49,500
7.	Economics	$49,377
8.	Enginrg. Tech.	$45,799
9.	Chemistry	$44,989
10.	Business	$44,865
11.	Nursing	$44,677
	ALL FIELDS	$43,199
12.	Architecture	$42,603

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Data from NSF and BLS

The Earning Power of Physics Training: Late-Career -- Growth Potential

- Median annual earnings by college undergraduate major.
- Bachelors is terminal degree.
- Men aged 45-64 (late-career).
- Data from Monthly Labor Review, 12/95 (p.3).

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The Earning Power of Physics Training: Late-Career (w/%growth from mid-career)

1.	Physics	$61,965	24%
2.	Engineering	$59,213	11%
3.	Mathematics	$56,388	9%
4.	Accounting	$54,737	11%
5.	Economics	$52,263	6%
6.	Chemistry	$52,146	16%
7.	Comp. Sci.	$51,943	3%
8.	Enginrg. Tech.	$51,278	12%
9.	Pharmacy	$51,026	1%
10.	Business	$50,895	13%
11.	Communications	$49,984	28%
12.	Poli. Sci. & Gov't.	$49,922	22%
	ALL FIELDS	$49,390	14%
13.	Geology	$49,007	16%

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Data from NSF and BLS

Median Earnings as a Function of Occupation and Field of Study

- Field of study is bachelors level, with bachelors being highest degree earned.
- Salaries are for men aged 25 - 64.
- Data from Monthly Labor Review, 12/95 (p.3).

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Median Bachelors Earnings as a Function of Occupation and Field of Study

Field	All Majors	Physics	Engineering	Comp. Sci.
All occupations	$42.5K	$50.4K	$51.6K	$44.9K
Physical scientists	$40.7K	$42.8K	$43.1K	NA
Engineers, incl. computer	$50.4K	$57.5K	$51.5K	$49.1K
Computer occups. excl. engineers.	$44.9K	$49.4K	$48.4K	$43.8K

Data from NSF and BLS

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- We have established that physicists have high economic value.
- What physics grads do after their BS shows how that value is realized.
- The secret is career diversity and flexibility.

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So Where Do Physicists Go?

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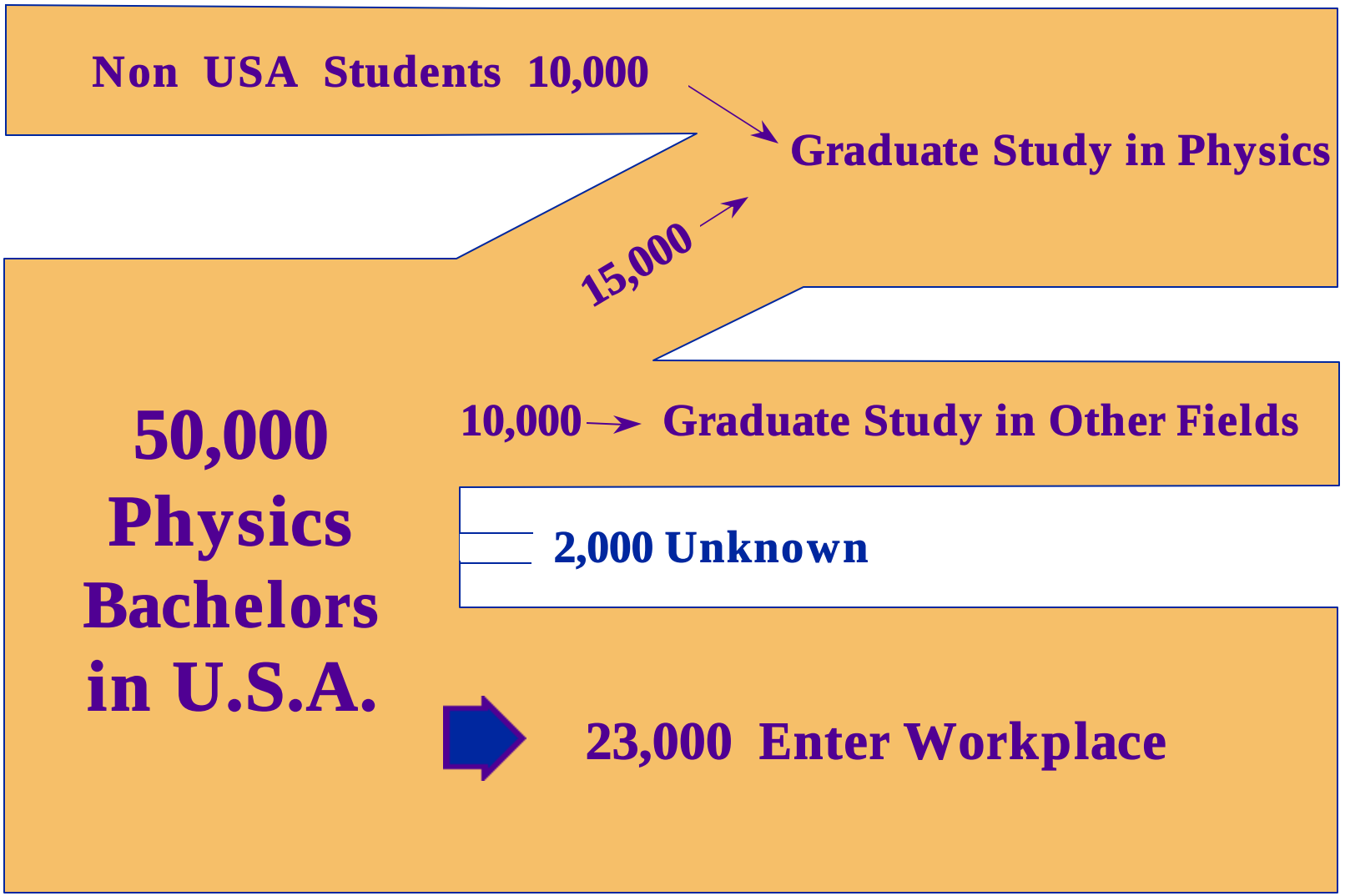

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Numbers To Chew On

- There are about 200K physics degree holders in the workforce (BS, MS, PhD, obtained in US).
- About 16% (32K) of physics bachelors educated in the US get a PhD in physics.
- Of these 32K US-trained PhDs, only about 40% are teaching or doing long-range physics research (ie., traditional physics).
- There has been an influx of about 4K PhD physicists from abroad.
- Thus, of the 200K US-trained physicists in the workforce, only about 7% are doing “physics” in the traditional sense.

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If only 7% of our bachelors end up working as “physicists” (in the traditional sense), then what are the rest doing?

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Where Do Physicists Work?

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Where Do PhD Physicists Work?

- Academia -- 45%
- Industry -- 33%
- Government -- 22%

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Where Do MS Physicists Work?

- Academia (incl. HS) -- 27%
- Industry -- 40%
- Government (incl. military) -- 28%

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Where Do BS Physicists Work?

- Academia (incl. HS) -- 17%
- Industry -- 63%
- Government (incl. military) -- 17%

- We’re starting to paint a picture here.

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Job Titles From the ΣΠΣ Survey: Engineers

- **Test engineer**, automotive seat design.
- **Analytical systems engineer**, fluid control system.
- **Airframe design engineer**, industrial & commercial architecture.
- **Semiconductor process engineer**, thin films.
- **Manufacturing engineer**, plant & safety maintenance.
- **Senior design engineer**, communications satellites.
- **Senior engineer**, optical processors.
- **Systems engineer**, GUIs, vision code.

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Why is it, that whenever physicists make money they're called engineers?

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They're not engineers.
They're *industrial physicists*!

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Job Titles From the ΣΠΣ Survey: Computer Scientists

- **Senior scientist**, software for underwater acoustical data analysis.
- **Computer programming contractor**, mapping and database software for a telephone company.
- **Systems analyst**, communications routing systems.
- **Software developer**, object-oriented software.
- **Computer consultant**, automated business & engineering processes.
- **Software engineer**, CAD preprocessor algorithms.
- **Owner**, computer graphics & multimedia production firm.

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Job Titles From the ΣΠΣ Survey: Managers

- **Quality supervisor**, plastics testing.
- **Plant engineering manager**, capital purchases.
- **Divisional VP of operations**, Wall Street firm.
- **Manager of geometric analysis**, aerospace systems.
- **President**, optical manufacturing firm.
- **Marketing director**, electronics company.
- **Technical manager**, VLSI design transfer to IC manufacture.
- **Engineering technical manager**, digital signal processing.

Physicists also become doctors and lawyers:

- Math and science majors tend to out-perform their counterparts from other majors on the MCAT and LSAT.
- Medical and law schools are very attracted to “non-traditional” applicants and they particularly like physicists.

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Why Do Employers Like Physicists?

- Problem-solving ability.
- Math skills.
- Computation skills.
- Experience with instrumentation / measurement.
- Quick study.
- Love of life-long learning.

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Why Do Employers Like Physicists?

- Oh yeah, knowledge of physics -- that can be valuable too.

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- Physicists have high economic value.
- This value is derived from quality training and career diversity.
- How can you compete in this game?

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How can physics majors realize their full career potential?

- Expand your personal list of career options.
- Learn how to market yourself strategically (no generic CVs!).
- Use summers effectively (internships, coops, jobs outside of physics). EXPERIENCE IS KEY!
- Focus on your skills, what you have accomplished, and couple these to the employer's needs (your physics may be irrelevant!).
- Consider a masters degree to diversify and build skills.

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Masters or PhD?

- The decline in PhD enrollments means there are many opportunities if you want to go to grad school.
- However, the academic job market cannot absorb all who want to be a professor.
- But, the economic data indicates that across sectors, PhDs are in demand.
- What about a Masters? Is it a viable option?

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Masters or PhD?

- Industry expresses increasing interest in masters.
- But not just any masters; industry values those with a “professional masters” degree in physics.
- Or, they like people with a BS in physics and masters in a separate field: CS, EE, MBA, Materials.
- The key is that the degree provide knowledge, skills, and *experience* that a particular sector values.

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Professional Masters Degree

- Ideal Characteristics:
  - Courses are more applied and geared toward industrial problems.
  - Internship and/or project required.
  - Thesis not required (it's not a research degree.)
  - Courses outside of physics.
  - Flexible scheduling.
  - Fixed time-frame, < 2 years.
  - Students may be self- or employer-supported -- i.e., no TAs or RAs (this is a major indicator of the market).

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Professional Masters Degree

- Examples:
  - USC “Physics with Business Applications”
    http://physics.usc.edu/Graduate/degreePrograms.html
  - University of Oregon “Applied Masters Program”
    http://physics.uoregon.edu/physics/apm.html
  - SUNY Stonybrook “Scientific Instrumentation”
    http://insti.physics.sunysb.edu/Physics/msi_intro.htm
  - Texas Tech University “Semiconductor Internship”
    http://www.phys.ttu.edu/~ritlg/msihtml/prof_masters.html
  - San Jose State “Computational Physics Concentration”
    http://newton.sjsu.edu/Masters.htm
  - George Washington University “Computational Science”
    http://www.va.gwu.edu/computation/index.html
  - Rochester “Optics Co-op Program”
    http://www.optics.rochester.edu:8080/coop/CoOp.html

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Useful references.

- http://www.aip.org/industry.html
- *Preparing Physicists for Work* (AIP)
- *Careers for Physicists* (AIP & Sloan)
- http://www.ScienceMasters.com (Sloan)
- http://www.nextwave.org/ (AAAS)

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Careers for Physicists

- Funded by the Sloan Foundation.
- Survey of members of Sigma Pi Sigma
- Online Careers Bulletin Board
- Video
  - » NOW AVAILABLE
- CD-ROM
  - » NOW AVAILABLE
- World Wide Web Information Site
  - » http://www.aip.org/careercornerstone/

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Concluding Comments

- Economically, physics is a viable option, leading to a wide array of high-paying and rewarding professions.
- Physics is great training for an ill-defined technical workplace.
- Physics is an excellent education for those who love physics and who have not narrowed their career goals.
- Do SPS, use summers wisely, do research, give talks, diversify.
- Maybe a masters is the best choice?
- Sculpt your education and experience into a package employers cannot ignore.

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Play the game
smartly and confidently,
and you will do fine!

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THANK YOU!

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