Phys 7857 Graduate Seminar
“How to get a job in physics”

Today: rationale for the course

Far away and long ago you decided to get
a Ph.D. in Physics or Astronomy…

*"How many leading theoretical physicists were once insecure,
small, pimply boys who got their revenge besting the jocks (who got the girls)
in the one place they could—math class?"*

Lee Smolin, "The trouble with physics" (Houghton Mifflin 2006).

More recently the thought probably morphed into
"I want to get a job having to do with physics"…

The problem is you conceived this thought in a highly
distorting environment: a university.

Unfortunately, attempting to become a professor at a major research university is a highly dangerous endeavor career-wise.

Human beings are not very good at calculating abstract risks. As N.N. Taleb puts it "*We respect what has happened, ignoring what could have happened. In other words, we are naturally shallow and superficial – and we do not know it. This is not a psychological problem; it comes from the main property of information. The dark side of the moon is harder to see; beaming light on it costs energy. In the same way, beaming light on the unseen is costly In both computational and mental effort.* "

http://en.wikipedia.org/wiki/Nassim_Taleb

Yes, everyone knows that becoming a professor is "hard". But how hard?

Let's look at the facts:

http://incoherently-scattered.blogspot.com/2007/06/does-phd-pedigree-matter.html

AIP graduate program listings, which I believe are compiled in 2005-2006 list 636 professors in the top 50 institutions (I used NRC'95 rankings) in associate or assistant rank. Typically their PhD years span about 12-15 year period from about 1990 till ~2003-2004. 162 of them have foreign PhDs (more on that later) and 472 held PhDs from US. More than half of those hires have PhDs from just 8 institutions: Harvard, Princeton, MIT, Berkeley, Chicago, Stanford, Caltech and Cornell.

Harvard University	42
Princeton University	39
Massachusetts Inst of Technology	34
University of California-Berkeley	32
University of Chicago	29
Stanford University	28
California Institute Technology	26
Cornell University	22
University of Michigan	14
Columbia University	13
University of Minnesota	11
Univ of California-San Diego	9
Univ of California-Santa Barbara	9
Univ of Illinois Urbana-Champaign	9
University of Washington	9
Yale University	9

To try to normalize these numbers (s)he divided by the number of PhD’s produced at each of those institutions in that period.

Harvard University	14.1
Princeton University	18.4
Massachusetts Inst of Technology	5.5
University of California-Berkeley	5.7
University of Chicago	10.1
Stanford University	9.1
California Institute Technology	7.5
Cornell University	5.8
University of Michigan	4.6
Columbia University	5.7
University of Minnesota	3.8
Univ of California-San Diego	3.2
Univ of California-Santa Barbara	3.4
Univ of Illinois Urbana-Champaign	1.4
University of Washington	2.6
Yale University	4.6

State U of New York-Stony Brook	2.1
University of Texas at Austin	1.6
University of Wisconsin-Madison	2.0
Johns Hopkins University	3.6
University of Pennsylvania	2.9
University of Rochester	2.8
Univ of California-Los Angeles	1.8
University of Maryland College Park	1.5
Northwestern University	2.1
Rice University	1.9
University of Colorado	1.4
Boston University	1.9
Indiana University	2.3
Rutgers State Univ-New Brunswick	1.0
Brandeis University	3.0
Duke University	1.4
Purdue University	0.7

As you can see the number drops quickly into low single digits, where these statistics stop being meaningful. But they nevertheless emphasize how rare getting a professorial job actually is.

“Crew wanted for hazardous journey. Low wages, bitter cold, long hours of complete darkness. Safe return doubtful. Honor and recognition in event of success."

Ad published in a London Newspaper by Antarctic explorer Sir Ernest Shackleton before a mission (apocryphal…)

http://www.antarctic-circle.org/advert.htm

So if getting a job is so hard, why isn't all this discussed more openly?

Going back to NN Taleb "*We respect what has happened, ignoring what could have happened".*

There is also a tendency to confuse a job with a prize. "If you do well in research you'll get a job" is a much repeated mantra. That is, you do well and you will be rewarded with a job.

But a job is not a prize. A job is the exchange of work for money. The person who will be hiring you is not rewarding you for previous achievements, (s)he wants your future work. Unless in an infinitesimal fraction of position, the work involved is more than research. It usually involves teaching, interacting with colleagues, raising funds, promoting your work. All these aspects are hardly ever taught in graduate programs in physics.

As is usual in any job application, *previous experience matters.*

The purpose of this course is to give you some of the information and tools that are needed in the job seeking process.

We will first cover what jobs are out there. We will start from the obvious ones, professorial jobs at (various kinds of universities), emphasizing aspects that perhaps are opaque from the point of view of graduate students.

We will then consider other types of jobs available to physicists, like working in national labs or in industry.

We will then move to more non-conventional jobs, like jobs in Wall Street and other less traditional industries from a physics point of view.

We will also cover the mechanics of the job application process and interviewing including preparing a resume and giving a talk.

Lecture 1 Mon Jan 14 Introduction: So you want to get a job in physics?

Lecture 2 Mon Jan 28 The academic research enterprise: research universities

Lecture 3 Thu Feb 7 Other academic possibilities: colleges

Lecture 4 Mon Feb 11 Working in a National Lab (Guest: Jonathan Dowling)

Lecture 5 Mon Feb 25 Jobs outside the US

Lecture 6 Thu Feb 28 The allure of Wall Street (Guest: Mijan Huq, JPMorgan)

Lecture 7 Mon Mar 3 Working in Industry (Guest: Sameer Gupta, Citrix)

Lecture 8 Mon Mar 10 Fellowships and other opportunities

Lecture 9 Mon Mar 24 Less standard options

Lecture 10 Mon Mar 31 What if I am an astronomer? (Guest: Juhan Frank)

Lecture 11 Mon Apr 7 Preparing a resume

Lecture 12 Thu Apr 17 Giving a job talk

Lecture 13 Mon Apr 21 Going for an interview

Lecture 14 Mon Apr 28 Strategies for doing research as a grad student or postdoc

Even if your goal is to become a professor…

Alternative career paths might be useful.

When one thinks of a “professor” one is usually thinking of a “full professor”. The full professor job can be considered by some as privileged and desirable: salary in $100-150k range, flexible hours, great autonomy and lifetime tenure, no fixed retirement age.
http://www.aip.org/statistics/trends/highlite/salary/salary04.htm

Before becoming a full professor the usual route in a university is to spend six years as a non-tenured assistant professor and 4+ years as associate professor. All this after spending one or two periods as a “post-doc”.

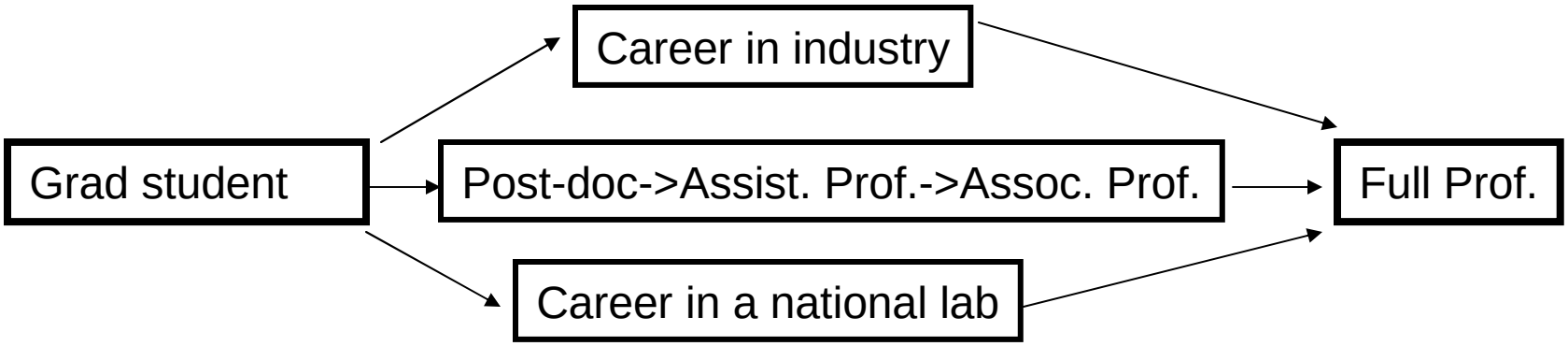
That means that a PhD who graduated at, say 27 or 28 years of age, will become a full professor in her/his mid 40’s.

The years spent in those ranks are not as rewarding as people may imagine.

The postdoctoral periods are quite challenging. One has to move, salary is $30-40k/yr and worse, one has to adapt to a new group and deliver results in less than a year.

The typical pressures undergone by an assistant professor have been compared to those of a graduate student, perhaps even worse. A lot of people do not find the stress and working conditions of an assistant professor a desirable period to transit through. Not to mention salary is $50-70k, even lower if you don't have a grant.

An alternative is to become a full professor "as a second career", after a successful stint in a national lab or industry.



As an assistant professor, your duties are not too well defined. You have to do research, teach, write proposals, be a good citizen of your department serving on committees, etc. You will have to raise money from grants to carry out your activities. A lot of people find it quite challenging to balance all these duties. Most people work very long days to accomplish all that is expected, under a lot of pressure.

At industry or at a national lab, your duties are well defined. You basically have to do meaningful research. You will have a supervisor, but generally if you were hired for a research position they will give you freedom. In addition to that, most national labs will provide you with everything you need for doing research. And entry level salaries are considerably higher than those of an assistant professor ($80-90k).

"The future ain't what it used to be" Yogi Berra

Even becoming a professor is not as desirable as it once used to be.
http://chronicle.com/free/v54/i04/04a00102.htm

THE CHRONICLE OF HIGHER EDUCATION

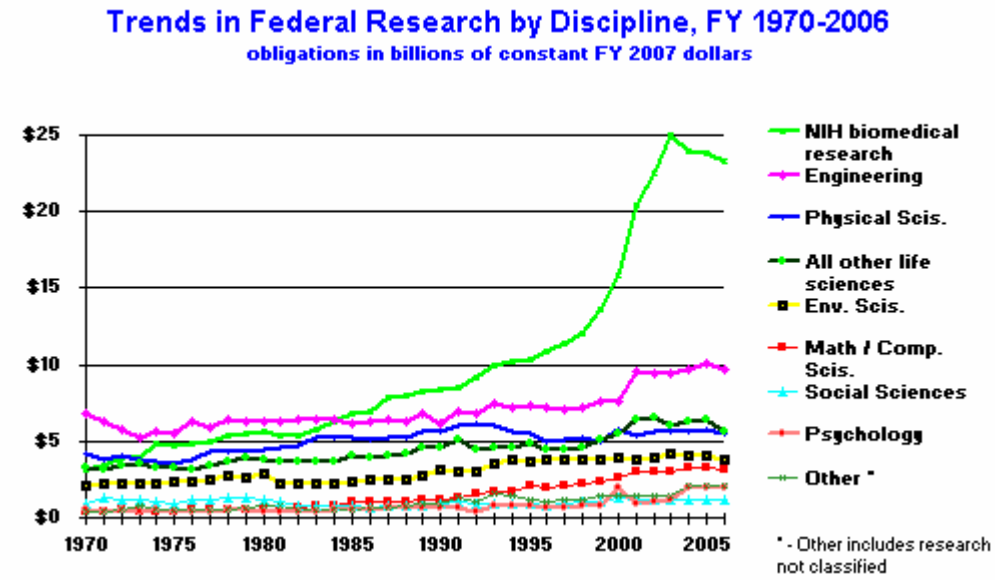
Research & Books

From the issue dated September 21, 2007

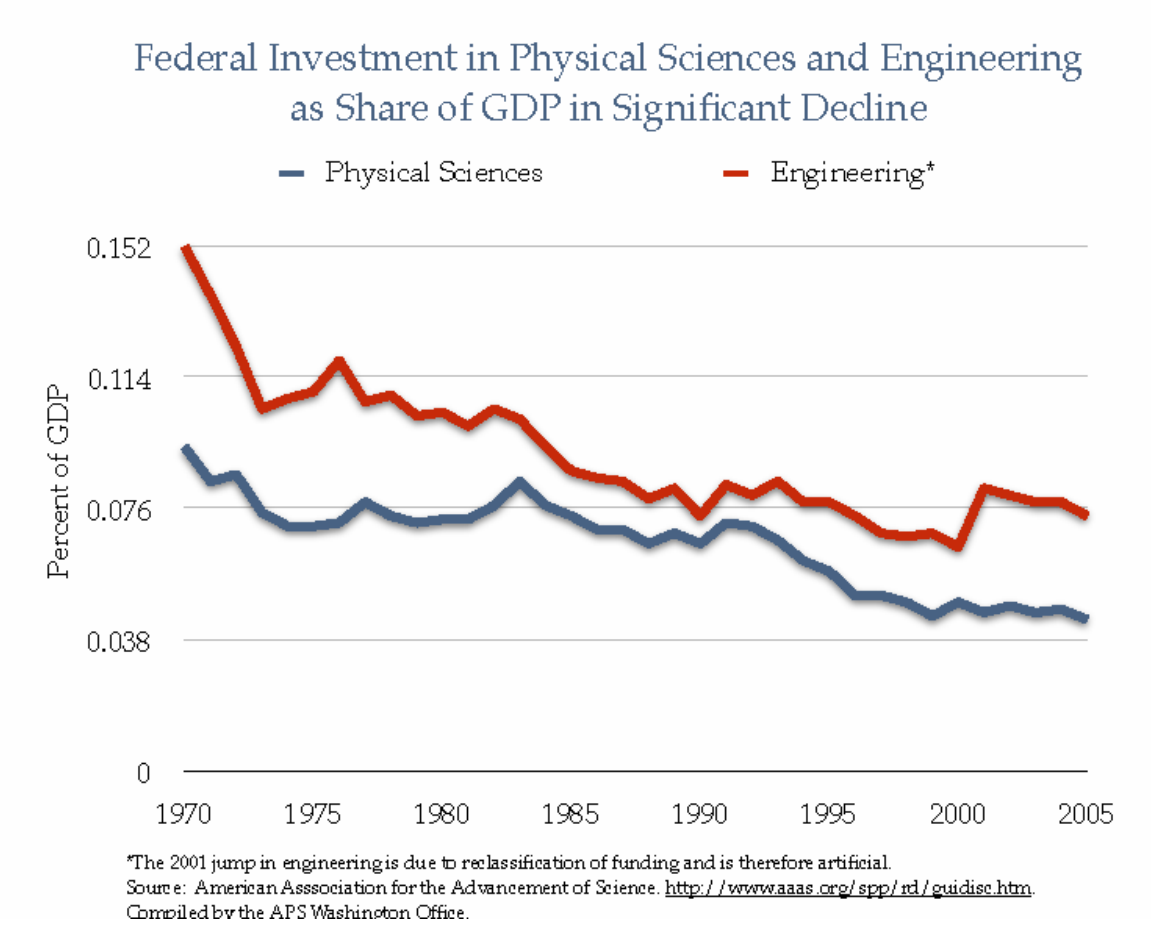
AMERICA'S SCIENCE TEST

The Real Science Crisis: Bleak Prospects for Young Researchers

Tight budgets, scarce jobs, and stalled reforms push students away from scientific careers

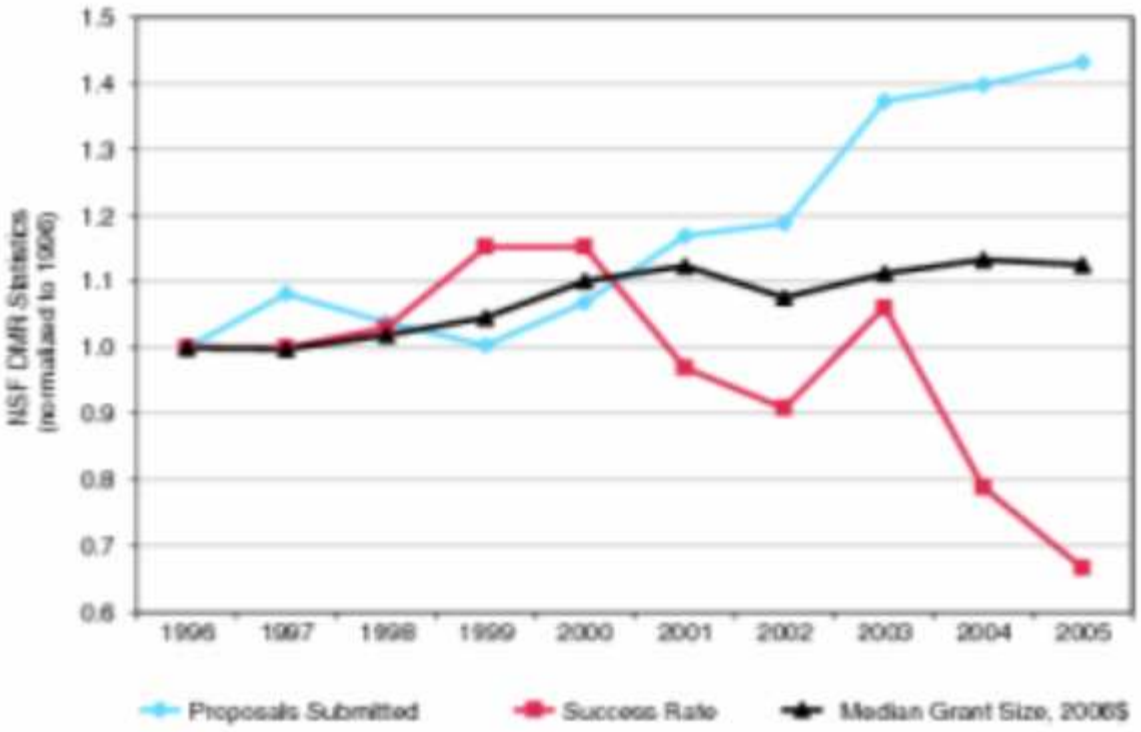


http://www.aaas.org/spp/rd/08pch2.htm



http://futureofinnovation.org

So in the early stages of your professorial career, you will be competing for grants within agencies where success rates for proposals are ever diminishing.



http://books.nap.edu/openbook.php?record_id=11967&page=178
Committee on CMMP 2010, Solid State Sciences Committee, National Research Council

Also teaching is not what it used to be…

When you could only hear Beethoven live and in concert, you would tolerate lots of wrong notes. Higher standards in recorded music have increased not only the standards of playing on those recordings, but also in our concert halls. It's the same with lectures. They better be good. Tomorrow's professor blog. http://amps-tools.mit.edu/tomprofblog/archives/2007/04/786_teaching_na.html#more

Even tenure is not what it used to be…

http://www.aaup.org/AAUP/protect/legal/topics/post-ten-review.htm

The system of post-tenure review at Virginia State University, as the administration implemented it in the cases of [the two dismissed professors], made no provision for faculty peer involvement in the performance evaluation that triggered the post-tenure review process [in their cases], permitted an unsatisfactory evaluation effectively to stand alone as grounds for dismissal, and shifted the burden of proof for retention from the administration to the affected faculty member.

Summary:

- Buyer beware, if you want to become a professor.
- We will explore what is needed to get a job as a professor and also other jobs.

Caveats:

- Why should we believe this guy?
- You shouldn't…
- The main point of this course is to give you resources. I think the web links and references I give out should pique your curiosity and you will research on your own.
- After all, that is the only way to do make **an informed decision.**
- **Course is new, will have rough edges, *your help is much appreciated*.**