Professional development for students (and everyone else)

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The University of Mississippi
Belle II Summer Workshop, Duke University, July 27, 2023

THE UNIVERSITY of MISSISSIPPI

Why am I in graduate school?

- Take a few moments to consider your motivations for entering a PhD program. Add them to the google doc

- Based on your experience thus far,
  - Describe the knowledge you expect(ed) to gain while completing your PhD
  - List the technical skills you expect(ed) to acquire while completing your PhD
  - Describe some "experiential skills" you have gained while working on your PhD
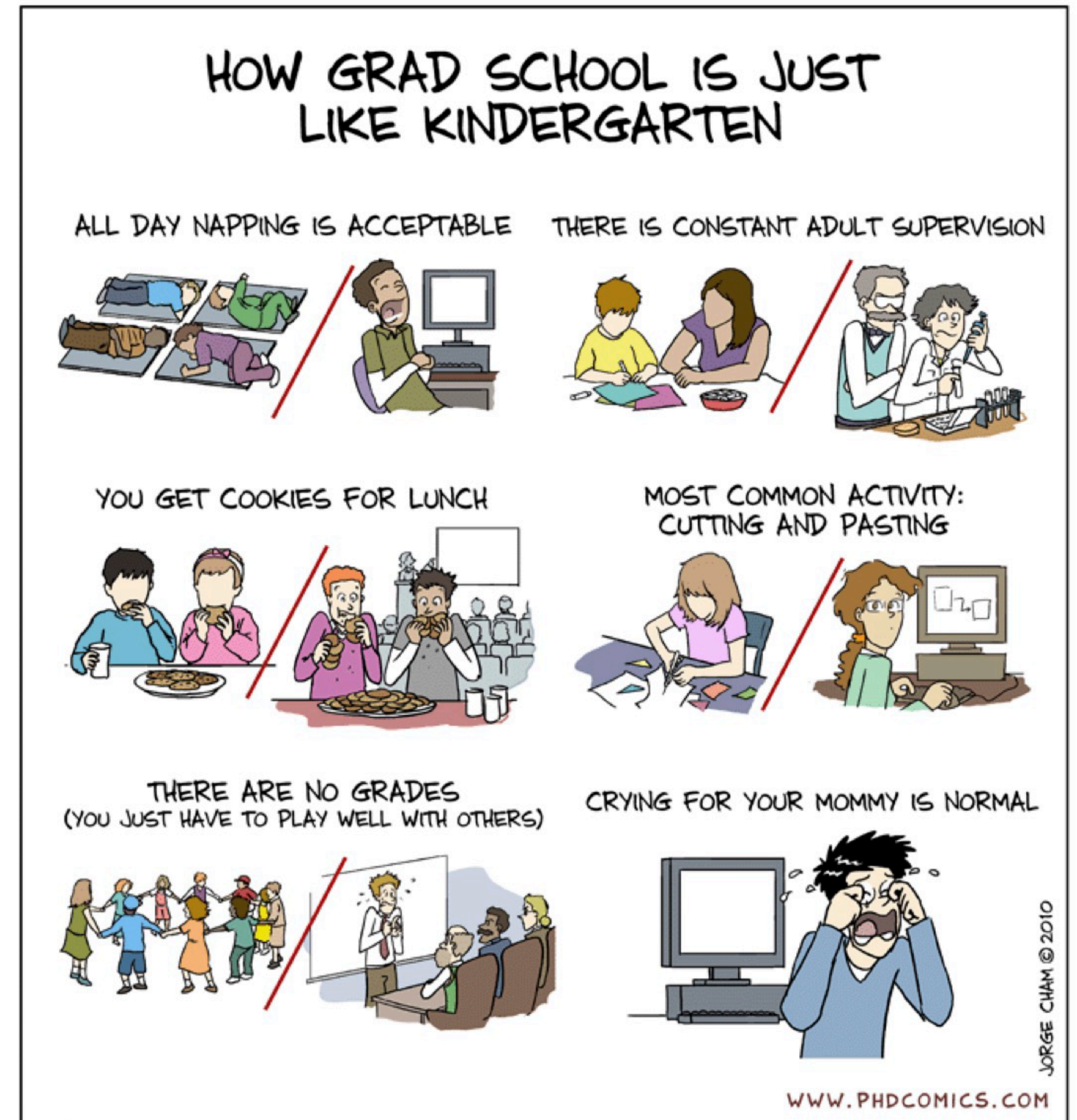
# What is the educational model?

IN CONCLUSION,
AAAAAAAAAAAAA!!!

THE BEST THESIS DEFENSE IS A GOOD THESIS OFFENSE.

- Formal coursework (≈2 yrs)
  - similar to undergraduate [w instructors]
- Research (3-4 yrs)
  - basically an apprenticeship; novice → master [advisor]
- **Professional development (hopefully throughout)**
  - self-awareness, mentorship, networking!

- My PhD project (<thesis title here>)
  - Original research (under supervision)
  - <Advisor> (usually) asks the question
  - Answer: not known (until I answer it)
  - Needs to be correct (how will I know?)
  - Explain (in 50 pages or more)
  - Publish (hopefully) – 3-4 years

What is professional development?

- Acquiring new knowledge and skills that relate to one's profession, job responsibilities, or work environment (an ongoing process, regardless of career stage)
    - Peripheral to cognitive skills

- AIP: employment for physics PhD's is >95%
    - Yet: not a "job mill"; few "physicist" jobs
    - Professional skills play a critical role in career advancement

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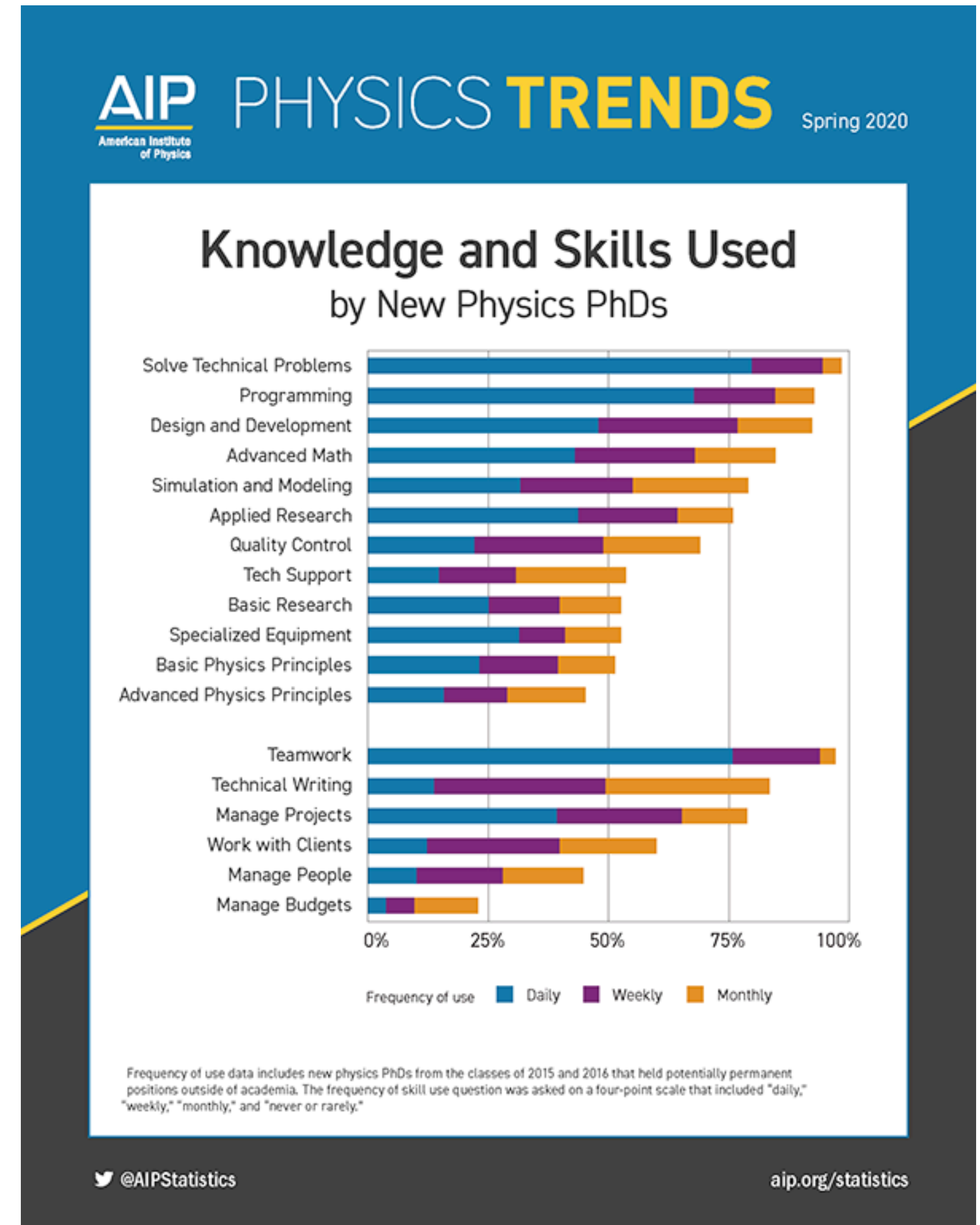
How do I acquire these skills?

- Not formal instruction

  - Think: "why would <employer> want to hire me?"

  - Not someone who fits a mold → your unique strengths

- Can be developed via completion of PhD

  - Be aware of beneficial skills

  - Be self-aware, proactive in developing

- Hints from online resumé advice:

  - "Results-oriented, hands-on individual with more than XXX years of YYY experience… strongly emphasizes teamwork, creativity, and empowering people."

  - Did I save <current employer> time? Did I reach my goals quickly? Did I exceed my goals often?

- In the context of your PhD research, list some skills or abilities you have (or have developed), apart from strictly cognitive physics-related ones, that you believe have been essential to advancing you on your path.

Non-cognitive research skills: benchmarks

- **Definition of project objectives**

  - active involvement in defining aggressive and achievable objectives that thoroughly address the fundamental project needs

- **Technical awareness**

  - awareness of previous work, ability to integrate multiple sources to establish a context for the project at hand

- **Task execution**

  - arrival at meaningful results with minimal supervision

- **Formulation of conclusions**

  - thorough and correct interpretation

  - well-supported, meaningful conclusions

- **Task/project organization**

  - detailed records, easily followed by others

  - minimal wasted time and effort

  - consistent timeliness

- **Communication*****

  - both written and oral: clear articulation of questions, process, findings

Consider your strengths

- For the "non-cognitive research skills" below, consider how the tasks on which you spend time challenge you to develop mastery. List the tasks under each category:
  - Objectives
  - Technical awareness
  - Task execution
  - Conclusions
  - Organization
  - Communication

- Which class of your tasks (hardware, software, management, maintenance, etc) appears most often in the above list?

- Determine the priority order for these tasks, in terms of the development of your research effectiveness and career.

- Write down some actions you will take in the next year to improve your mastery in your priority areas.

How else can I acquire skills?

- **Mentoring**: important for
  - advice (many types)
  - advocacy (when you have challenges)
  - recommendations (for your next job)
- **Mentoring network**
  - know your needs
  - assemble people who can fill your needs
  - advisor, senior colleagues, etc
- **Do not limit yourself!**
  - How often do you have the thoughts in the chart?

- Action item:
  - Write down the names of at least two individuals (not your advisor) to whom you can reach out to for advice

	Weekly	Monthly	Rarely
If I do good work, they will notice and I will succeed.			
They are important; I don't want to bother anyone.			
I should figure this out for myself			
I am looking for the perfect mentor			
They are outside my discipline and won't help.			
I don't want to sound like I am self-promoting			
I only spend time with people I already know.			
I will talk/show them once I have something good.			
I wish I had better support			

An effective mentor network

Substantive Feedback

People who's authority and feedback you trust to provide significant input on your work

Professional Development

How to do what you need to be able to do to be successful

Sponsorship (Senior Mentors)

People of influence and power on your side, that support and promote you behind closed doors.

Emotional support (Family & Friends)

Close emotional friends/family to turn to to share the good and rant about the bad.

YOU

Access to Opportunities

People who are connected and aware of important opportunities or connections and think of you when possibilities come forward

Intellectual Community

For deeply engaging and meaningful intellectual conversations, to read your work and critique your ideas

Accountability

Someone who will point out to you if you aren't doing your best, to hold you to the standard you have for yourself.

Role Models

People who are doing right now what we want to do, and head of us in their career path. Someone we can have a personal relationship with.

Safe Space A place or "home" of people with similar life histories and experiences, that will understand how you feel and you trust to speak truthfully.
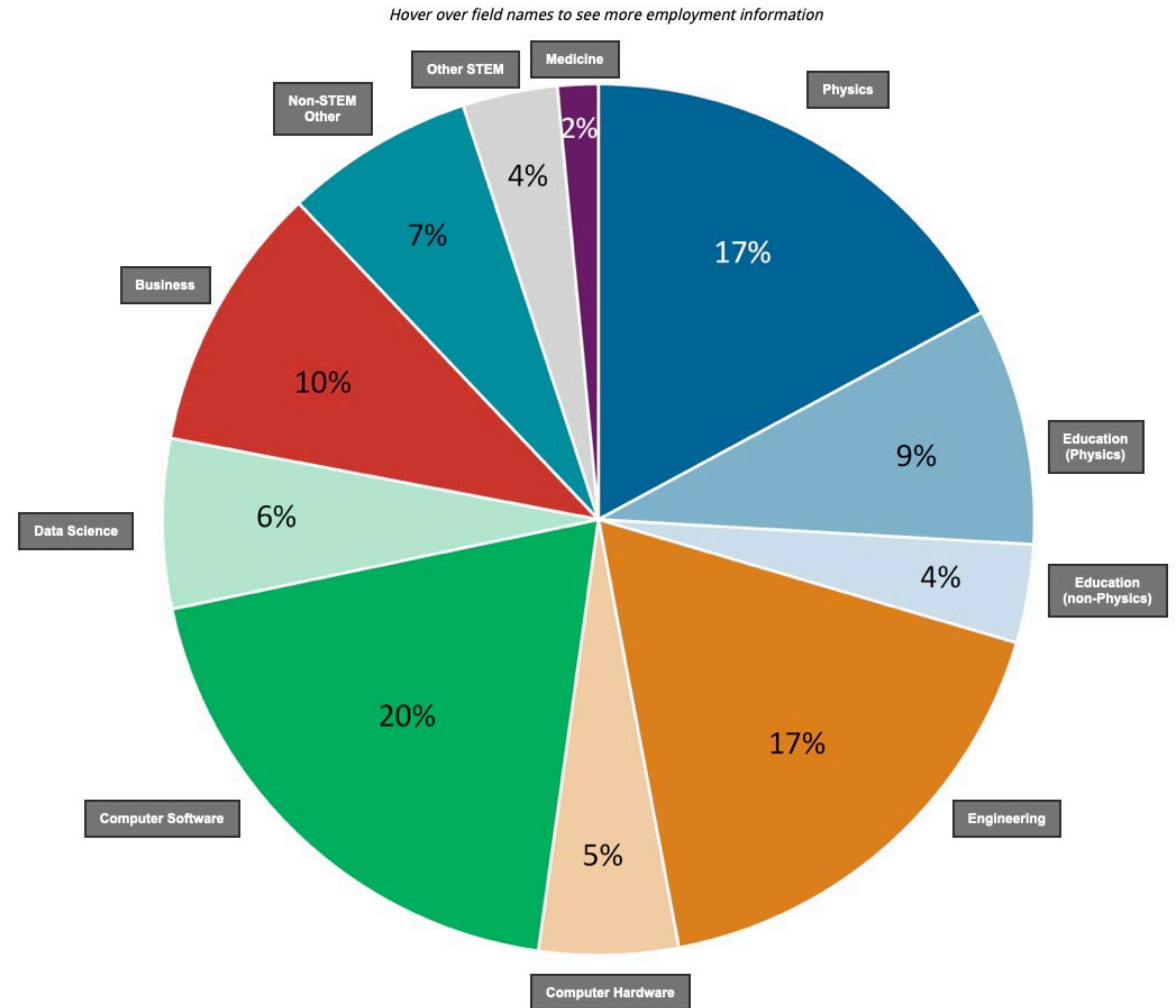
Common career paths

- Three common paths
  - Industry/startup
  - Staff scientist
  - Academic research
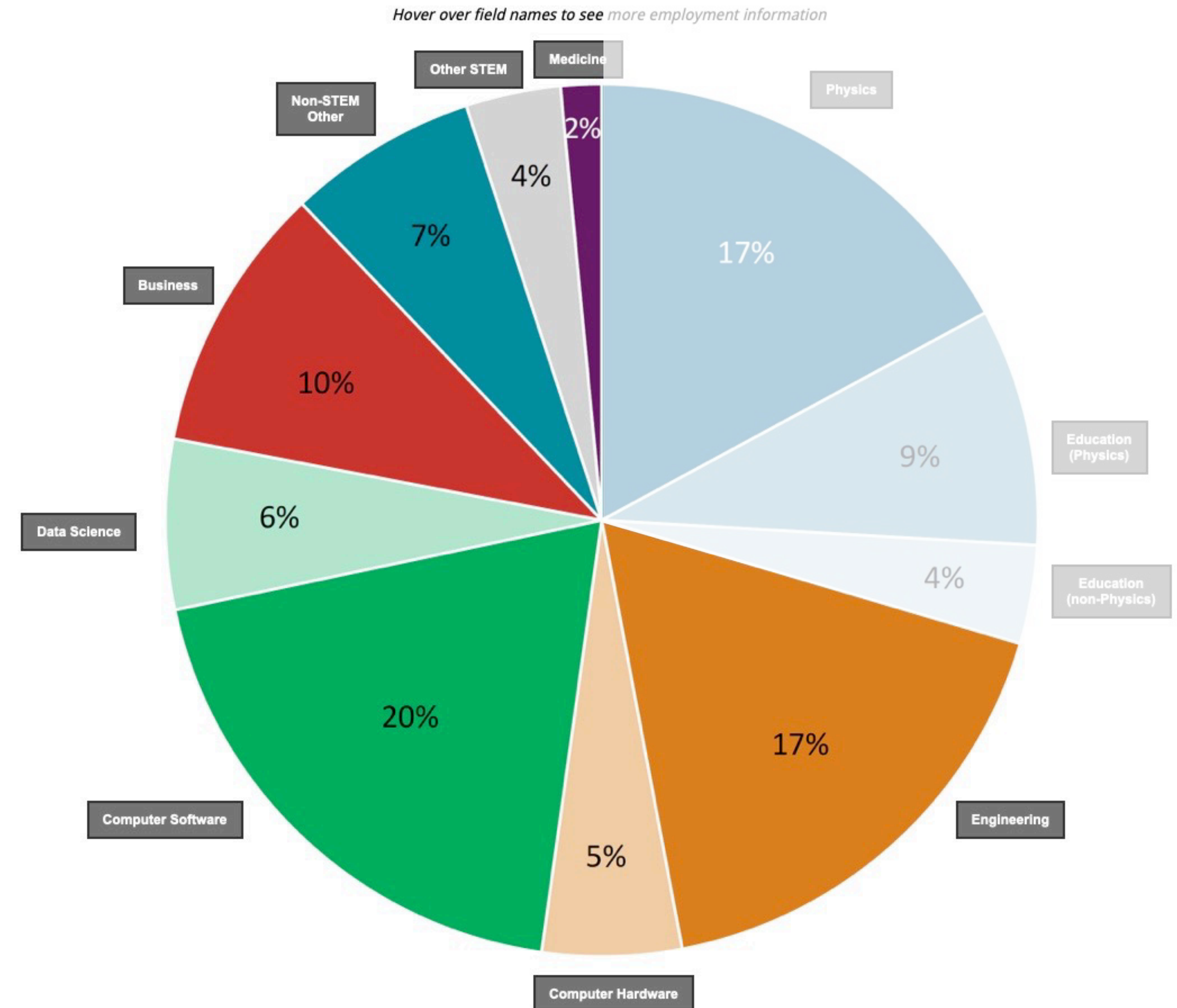

Employment fields for new physics PhD recipients in potentially permanent positions, classes of 2013 through 2018

Hover over field names to see more employment information

Common career paths

- Industry/startup
  - The commercial world likes to hire people who have:
    - Problem Solving Skills - finding answers to questions to which no one knows the answer
    - Technical leadership - organizing a team to work on/solve technical problems
    - Expertise and capabilities in instrumentation, computing, etc.
- Practical advice:
  - **Learn git,** get a GitHub, add a practical project to it, mention it in every interview and conversation
  - A **software CV** derived from your GitHub
  - **Learn SQL, Python, Machine Learning/AI**
  - **Have a profile** on Linked In and the like and use connections to search for opportunities
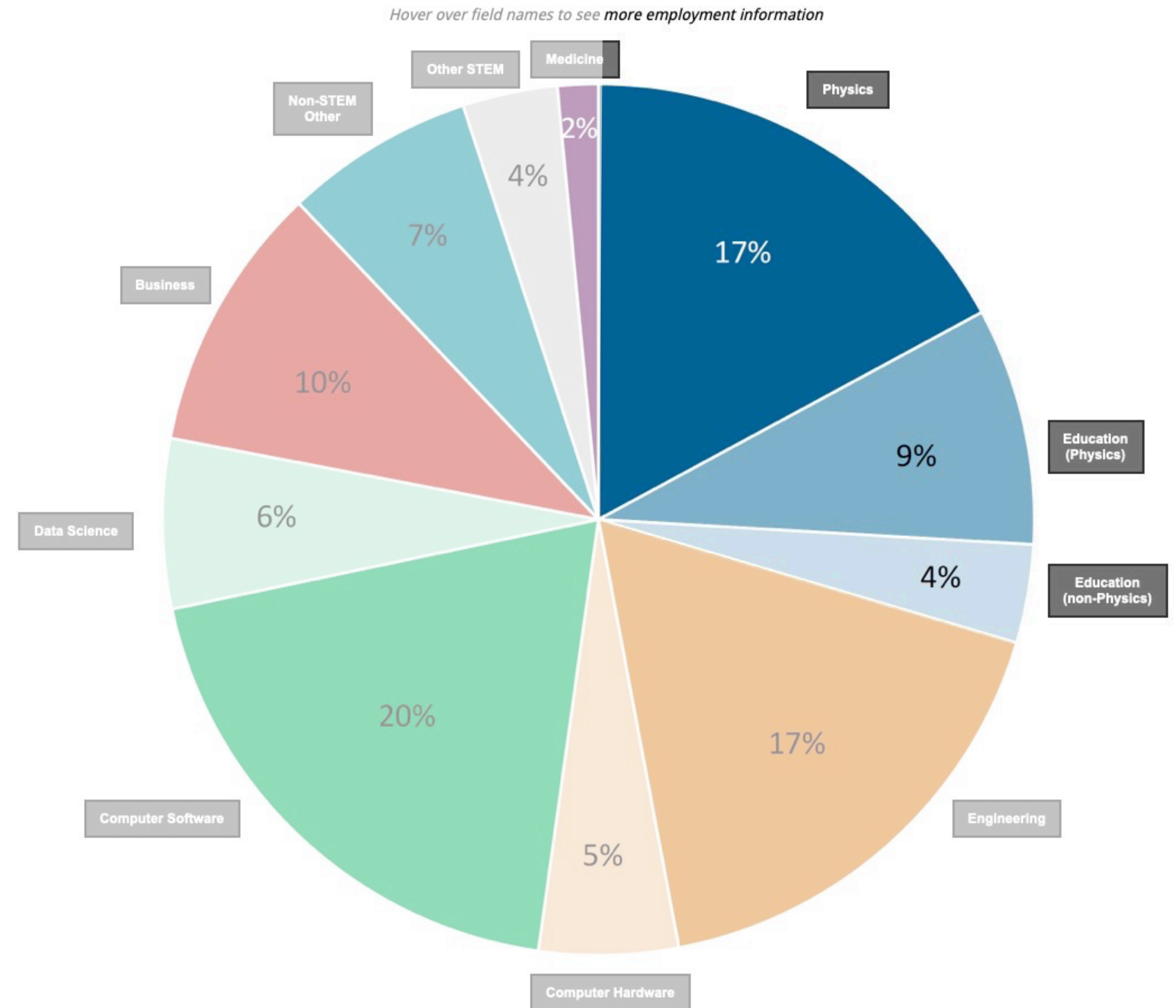 - **Networking is very important**. Work your network!

Employment fields for new physics PhD recipients in potentially permanent positions, classes of 2013 through 2018

Hover over field names to see more employment information

Medicine 2%
Physics 17%
Other STEM 4%
Non-STEM Other 7%
Education (Physics) 9%
Business 10%
Education (non-Physics) 4%
Data Science 6%
Engineering 17%
Computer Software 20%
Computer Hardware 5%

Common career paths

- Staff scientist
  - National Lab Staff/University Staff Scientist
    - Maintaining software, computing
    - Technical work on the detectors, infrastructure, etc.
    - Interfacing with experimenters to ease the use of lab resources
    - Expertise and capabilities in Instrumentation, Computing
  - **National labs are always hiring** and much like industry are looking for the technically minded who can solve problems independently
  - Often these jobs are skill based (looking for someone with a specific skill), but want **flexibility and ability to learn new skills**
  - Hiring process is similar to university hiring (minus teaching) but still look for mentoring

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Physics 17%
Education (Physics) 9%
Education (non-Physics) 4%
Engineering 17%
Computer Hardware 5%
Computer Software 20%
Data Science 6%
Business 10%
7%

Common career paths

- Academic research
  - Jobs are rare and the hiring process is not user friendly
  - Looking for people with an established record of doing high quality research
  - Teaching experience is good, but typically deemphasized
  - Similarly, mentoring abilities are important, but proof of ability to do research is a must!

Employment fields for new physics PhD recipients in potentially permanent positions, classes of 2013 through 2018

Hover over field names to see *more employment information*

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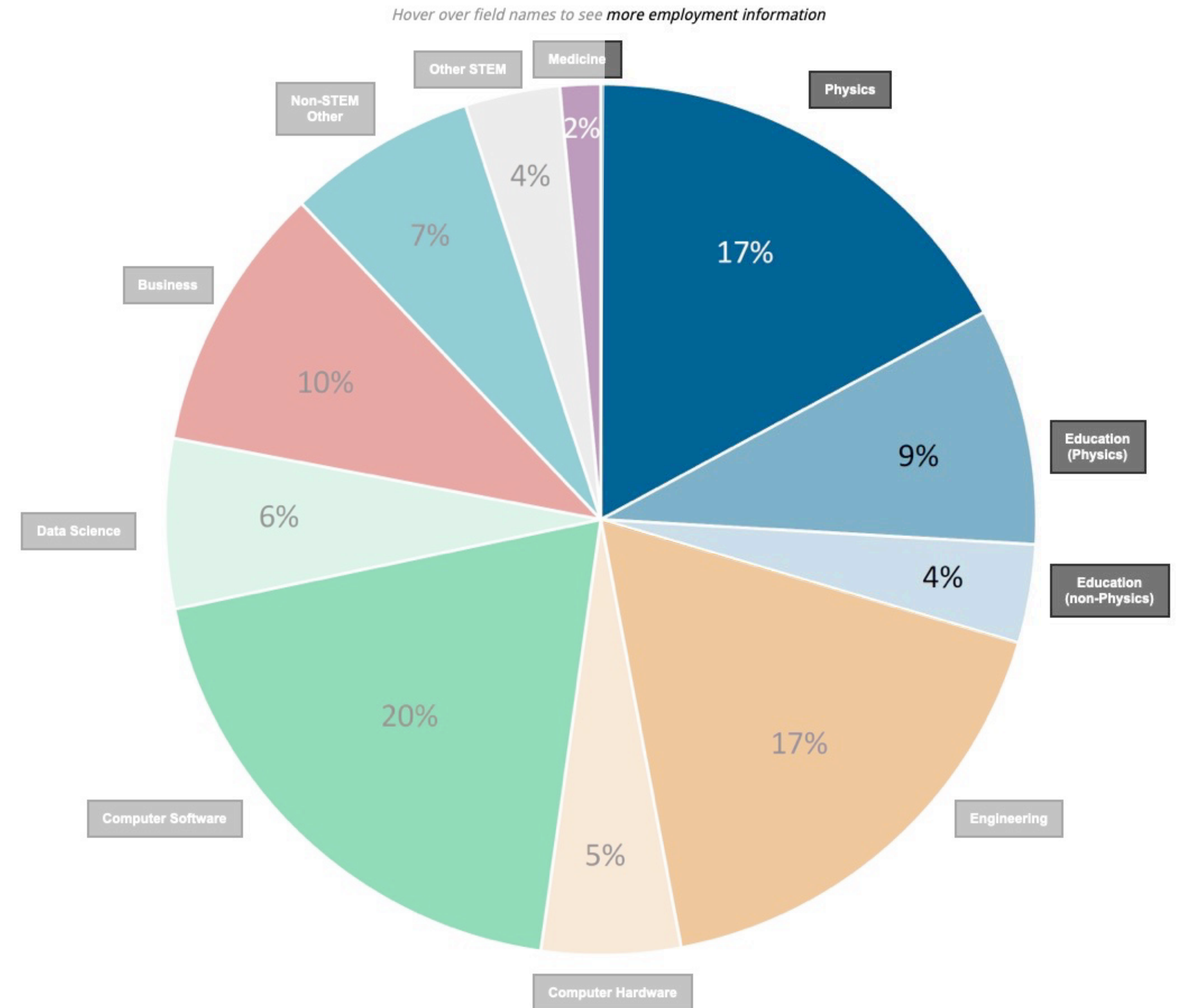
Curriculum Vitae (CV)

- Academic CV

  - Length: academic - as long as it needs to be, industry - short (two pages max)

  - Name, details, and contact information

  - Education History

  - Work History

  - Teaching Experience

  - Grants and Awards

  - Honors

  - Presentations

  - Publications

    - It is best to highlight the publications you actually wrote/ contributed to at the top as they can easily get lost in a long list

    - Ideally these highlight your skills

- Look for examples

  - Style matters!

  - This often provides the first impression, make it count!

Jake Bennett

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Curriculum Vitae

APPOINTMENTS

Assistant Professor of Physics and Astronomy   August 2018 - Present
University of Mississippi   *Oxford, MS*

Postdoctoral Research Associate / Research Physicist   June 2014 - August 2018
Carnegie Mellon University   *Pittsburgh, PA*

PROFESSIONAL PREPARATION

Indiana University   *May 2014*
Ph.D. in Physics
An amplitude analysis of the $\pi^0\pi^0$ system in radiative J/ψ decays with Dr. Matthew Shepherd

Roanoke College   *May 2008*
B.S. in Physics & Mathematics (summa cum laude, valedictorian)
Honors Thesis *Study of Radiative χ_c Decays* with Dr. Matthew Fleenor

PROFESSIONAL SERVICE

US Belle II executive committee   *January 2019 - present*
One of three members of the US Belle II executive committee, to which members are elected for two year terms by the US Belle Institutional Representatives. Responsible for coordination of US Belle II activities and mediation of any potential disputes.

Belle II Computing Steering Group chair/deputy chair   *October 2021 - present*
Responsible for coordinating the procurement and efficient, stable operation of Belle II distributed computing resources.

US Belle II standing committee for Diversity, Equity, and Inclusion   *January 2022 - present*
One of four members of the US Belle II standing committee for Diversity, Equity and Inclusion, to which members are elected for two year terms by the US Belle II Institutional Representatives. Responsible for formation and oversight of the US Belle II bridge program consortium and ensuring equitable and inclusive climate and policies for US Belle II.

Flavor Physics and CP Violation executive committee   *September 2022 - present*
Member of the three-person executive committee for the International Advisory Committee of the Flavor Physics and CP Violation conference series.

Academic hiring process in brief

- Typically you will be asked for:
  - **Academic CV**
  - **Cover letter/research statement** giving research interests, resources needed, and prospects for funding
  - **Teaching philosophy statement**
  - Universities are starting to ask for a **Statement on Diversity** specifying your plans to enhance diversity in your field
  - **Names** of those willing to write letters in your support
- Read the advertisement carefully! Much can be learned and leave nothing requested out.
- **Take advantage of insider knowledge.** If you know someone or multiple someones do not hesitate to get in touch to ask how you should tailor your materials to be attractive to the search committee.
- Search committee reviews all the applications and determines a short list of those invited for **interview**
  - Colloquium talk
  - Present your plans for research and funding
  - One-on-one interviews with faculty, deans
  - Informal meeting with students
  - Lunch/dinner

Academic hiring process in brief

- Typically you will be asked for:

  - **Academic CV** Make yourself stand out!

  - **Cover letter/research statement** giving research interests, resources needed, and prospects for funding

  - **Teaching philosophy statement** Show that you know what you are talking about!

  - Universities are starting to ask for a **Statement on Diversity** specifying your plans to enhance diversity in your field

  - **Names** of those willing to write letters in your support Someone who knows your qualities!

- Read the advertisement carefully! Much can be learned and leave nothing requested out.

- **Take advantage of insider knowledge**. If you know someone or multiple someones do not hesitate to get in touch to ask how you should tailor your materials to be attractive to the search committee.

- Search committee reviews all the applications and determines a short list of those invited for **interview**

  - Colloquium talk Show that you can present your work clearly

  - Present your plans for research and funding Show that you put some thought into how your will conduct/fund your research

  - One-on-one interviews with faculty, deans These people will make the hiring decision…

  - Informal meeting with students …but these people give input and are the stake-holders!

  - Lunch/dinner Show that you are well-rounded and will be a good colleague

The funding process (helpful to know)

- Sources of funding
  - University start-up package: supports your research until you get external funding
  - Research funding agency: US DOE, NSF, DOD, NIH, etc.
- Basis for funding decisions is peer review (there is only so much to go around)
- Typical funding time line is (DOE example):
  - Funding Opportunity Announcement (FOA) appears in July
  - Proposals are due in Oct
  - Proposals are sent out for mail in reviews mid-Oct, due mid-November
  - Review Panels meet in December and January
    - Combine mail-in reviews and panel reviews
    - At least 4 reviews of each proposal
  - Standard basis of review is:
    - Scientific Merit (30%) - Is the science interesting and valuable?
    - Appropriateness (25%) - Are the methods being proposed proper?
    - Competency (20%) - Are the proposers competent to do the work?
    - Budget (15%) - Is the budget reasonable?
    - Relevance (10%) - Is the science relevant to the mission? (If no, probably won't be funded)

Mock interview questions

- How familiar are you with the Unix command line and common programming languages like python, C++, etc?
- How familiar are you with computing infrastructure and networking?
- Are you familiar with <experiment name>? If so, have you worked with hardware, software, analysis (including grid computing)?
- **What are your analysis interests (including near term plans)?**
- Are you familiar with <this complicated analysis technique>?
- Do you have any experience supervising (under)graduate students?
- **Can you give any examples of times you have taken initiative?**
- What unique contributions could you make to our group?
- What is your career plan? Where do you see yourself in 5-10 years?
- Are you willing to travel to and possibly reside in <this foreign place>?