# PHYSICS CAREERS BEYOND ACADEMIA

BY ISAAC WOODARD

# ABOUT ME

- Graduated December 2019
- Currently work in the Physics Stockroom
- Worked as a lab instructor
- Volunteered in Dr. Tenne's lab
- Volunteered in the Physics & Astronomy club

# CAREER PLANNING

- Not job specific
- Combination of education, skills & experience
- Target job sectors
- Diversify for flexibility

# CONTRASTING PERSPECTIVES:
## WHAT JOBS CAN I GET WITH AN APPLIED PHYSICS DEGREE?

Larry Boyer, Certified Career Coach and Economist helping people navigate disruption

Answered Jun 4, 2016 · Author has **1.7k** answers and **530.1k** answer views

Anything you want - here's why.

What do you think you learned with a physics degree? Mechanics, E&M, lab skills? Wrong.

You learned problem solving from first principles. You learned how to look at a situation and figure out what to do about it. Along the way you added some tools - math (calc, stats, etc), specialized knowledge (the particulars about your subjects) and lab skills. The latter, while obvious, are the less relevant.

With your physics you can go and do anything - business, entrepreneurship, marketing, big data, computer science, management consulting, and on and on. Of course if you need something that requires specialized knowledge (as mentioned by others) you will need to learn that (like being a doctor). But your skills in figuring out problems are what you will be valued for.

6.2k views · View 11 Upvoters

Leonard Carter, PhD Applied Physics & Space Science, Boston University (1995)

Answered Sep 20 2017 · Author has **1.3k** answers and **622.4k** answer views

The answer I was planning to draft would follow closely along the lines of the one provided by Joseph Marotta. Because you want to major in Applied Physics, you obviously have an interest in physics, but not in the domain of "pure" physics, which is very competitive and virtually restricts a graduate to only academic positions. As has been said already, you need to (or already have) focus your career aspirations on a professional field where a high level of competency in physics would be a major asset, both in securing a position and in building a successful career in your chosen field. Also, it would be advisable to minor in that field, whether it be computer science, traditional EE, ME, or Aero. Eng., and, if at all possible, tailor your applied physics curricula around that field; for example, if the field is CS, see if your institution offers a QM course that includes quantum computing; if it's astronautics that involves propulsion systems, take extra courses in thermodynamics and plasma physics (ion drives for deep space probes are becoming more popular). Of course, the most important rule is to make a well thought-out decision on where you want to go, and then choose your coursework to get as best prepared and qualified as possible.

8.8k views · View 7 Upvoters · View Sharers · Answer requested by Juan Madero

# THE SOFT SKILL DILEMMA

- Specialization is necessary
- Physics develops broad skills
- Job training & graduate school
- Perception of academia

Career Options for Physicists

## ATTENTION PHYSICS STUDENTS:

# You Have Options

**Q: What can you do with a physics degree?**
**A: Get a PhD and become a physics professor OR ...**

What comes after the "or" is not widely known in many physics departments, even though data show that less than a third of physics bachelor's degree recipients enroll in a physics or astronomy graduate program within one year of graduating. People with undergraduate degrees in physics pursue a variety of fascinating, fulfilling, and well-paying careers. This is evidenced by decades of data collected by the Statistical Research Center at the American Institute of Physics. Illustrated below are the common paths of physics bachelor's recipients based on the most recent data. Unless otherwise indicated, all data are for graduates of US physics programs who remain in the United States.

### Over 8,400 physics bachelor's degrees were awarded in the class of 2015–16.

A record high![1] Typically…

- Three-fourths of those who earn physics bachelor's degrees have **research experience**.[2]
- One-third graduate with a **double major**, many in math.[3]
- One-tenth start at **two-year colleges**.[4]

**Within one year of earning a physics bachelor's degree...**

### 20% enroll in graduate programs other than physics or astronomy or in professional degree programs.

- About half enter an **engineering** program; the rest enter programs in math, medicine, education, or another field.[5]
- As a group, physics majors score among the highest of all majors on medical school and law school admission tests (the **MCAT** and **LSAT**).[6]
- Students in professional degree programs are more likely to be **self-funded** than students in research-based graduate programs, who usually have teaching assistantships, research assistantships, or fellowships.[5]

### ~30% attend graduate school in physics or astronomy.[5]

- About 3/4 enroll in a **PhD program**; the remainder choose a master's degree program.*
- Most are **fully supported** by teaching assistantships, research assistantships, or fellowships.

**Of those who start graduate school in physics or astronomy...**

### ~50% enter the workforce.[5]

Common employment sectors include:

**Private sector**
- ~2/3 of those who enter the workforce take jobs in the private sector.
- Of those that enter the private sector, the large majority hold science, technology, engineering, and math **(STEM) positions**.
- Those in private-sector STEM positions are well compensated, with a median starting salary of about **$57K**.

**Colleges or universities**
- More than half of the students in these positions were employed at the same institution they graduated from. Many work in research or IT.

**Civilian government**
- The civilian government sector includes national labs. The vast majority of these positions are in STEM fields, many related to defense or energy.

**Active military**
- Physics bachelor's work across all branches of the armed forces. Many work in aviation or nuclear power.

**High school teaching**
- About a quarter of the high school teachers indicated that their undergraduate degree had a high school physics teaching focus.

The Statistical Research Center does not formally follow the career paths of these individuals, but we hear that they go on to successful careers in engineering, management, education, law, medicine, business, and a variety of other areas.

**Add to the mix:**
Foreign citizens coming to the United States for a graduate degree, students who earned bachelor's degrees in another field but want a graduate degree in physics, and students who earned a physics bachelor's degree in previous academic years.

### ~1 out of 6 US physics bachelor's receive a physics or astronomy PhD.*

- A doctorate in physics takes an average of **6–7 years**.[7]
- Most PhD students are **fully supported** by teaching or research assistantships or fellowships.[5]

**Within one year of earning a physics PhD...**

### ~1 out of 12 US physics bachelor's receive an exiting physics or astronomy master's degree.*

Exiting master's degree recipients are individuals who leave their current department upon receiving a master's degree. Many other students earn an en route master's degree, continuing on to a physics PhD in the same department.

- Over half of those who earn exiting master's degrees do so with a **specific research focus**.[5]
- A master's degree in physics usually takes about **two years**.

**For US citizens, within one year of earning an exiting master's degree...**

### ~1/2 enter the workforce.[5]

- About half work in the **private sector**, virtually all in STEM fields.
- The largest portion of exiting master's working in the private sector are employed in the field of engineering.
- Other common employment sectors for exiting master's include **colleges and universities, high schools, and civilian government**.

### ~1/2 continue with graduate studies.[5]

- Most transfer to other institutions to earn a **physics PhD**.
- Others transfer to programs in **related fields** such as materials science, engineering, medical physics, and mathematics.

### ~1/2 accept a temporary position

(e.g., a postdoc), primarily at a university or with the government.[5]

### ~40% accept a potentially permanent position.[5]

- ~3/4 of new PhDs accepting potentially permanent positions are employed in the **private sector**.
- The **median starting** salary for new physics PhDs employed in the private sector is **$105K**.

### Employment sectors of physics phDs 10-14 years since receiving their degree.[8]

- 45% Private sector
- 43% Academe
- 6% Government
- 6% Other

## References and Notes

The following data references published by the Statistical Research Center of the American Institute of Physics are available online at: www.aip.org/statistics.


1. Starr Nicholson and Patrick J. Mulvey, *Roster of Physics Departments with Enrollment and Degree Data, 2016*, September 2017.
2. AIP Statistical Research Center, *AIP Physics Trends: Research Experiences of Physics Undergraduates*, Fall 2009.
3. AIP Statistical Research Center, *AIP Physics Trends: Physics Students Have Broad Interests*, Spring 2011.
4. Susan White and Raymound Chu, *Physics Enrollments in Two-Year Colleges*, April 2013.
5. AIP Statistical Research Center, data from follow-up surveys of physics bachelor's, master's, and PhDs, www.aip.org/statistics/employment.
6. Casey Langer Tesfaye and Patrick Mulvey, *MCAT, LSAT and Physics Bachelor's*, December 2013.
7. Patrick J. Mulvey and Starr Nicholson, *Trends in Physics PhDs*, February 2014.


*Estimate provided by the AIP Statistical Research Center, Summer 2014.

Learn more at the Careers Toolbox website:
**www.spsnational.org/careerstoolbox**


AIP American Institute of Physics · SPS · NSF

Updated 12/2017

# OUTLINE

1. Career Paths
   - Engineering & Technology
   - Research Science
   - Medical & Health Physics
   - Specialist Engineering
   - Data Science & Quantitative Research Analysis
   - Secondary Education
   - Patent Law
   - Science Communications
2. Building Skills
   - Physics Department
   - Undergraduate Opportunities
   - Graduate School
3. The Job Search
   - Job Market Research
   - Job Postings
   - Networking
   - BSU Career Fairs

# CAREER PATHS

# ENGINEERING & TECHNOLOGY

- Fields - Mechanical, Materials, Electrical, Electronics, Software
- Standard Path
  - Entry Level Position
  - Senior Engineer: 4+ years of experience
  - Technical or Management Ladder

# META-ENGINEERING

- Research Engineer ($82,191)
  - Experimental design and data analysis experience
  - Graduate degree and/or experience preferred
- Test Engineer ($71,858)
  - Research skills
  - Computer hardware & programming skills
- Systems Engineer ($79,835)
  - IT skills
  - Job experience preferred

# OTHER POSITIONS

- Product Development Engineer
- Product Design Engineer
- Manufacturing Engineer
- Process Engineer
- Project Engineer
- Technicians

# RESEARCH SCIENCE

- Fields – Biophysics, Astrophysics, Geophysics
- Research Assistant ($39,411)
  - Research experience preferred
- Research Scientist ($79,228)
  - Masters or PhD

# BIOPHYSICS

- Related Fields – Molecular Biology, Biochemistry, Genetics, Medical Physics
- Skills & Education – Computer Modeling, Lab Experience, Engineering
- Employers – Hospitals, Pharmaceutical Companies, Government Agencies

# BIOPHYSICS

- Lab Management
  - Lab Technician: $41,287
  - Lab Manager: $69,325, 3+ years experience

# ASTROPHYSICS

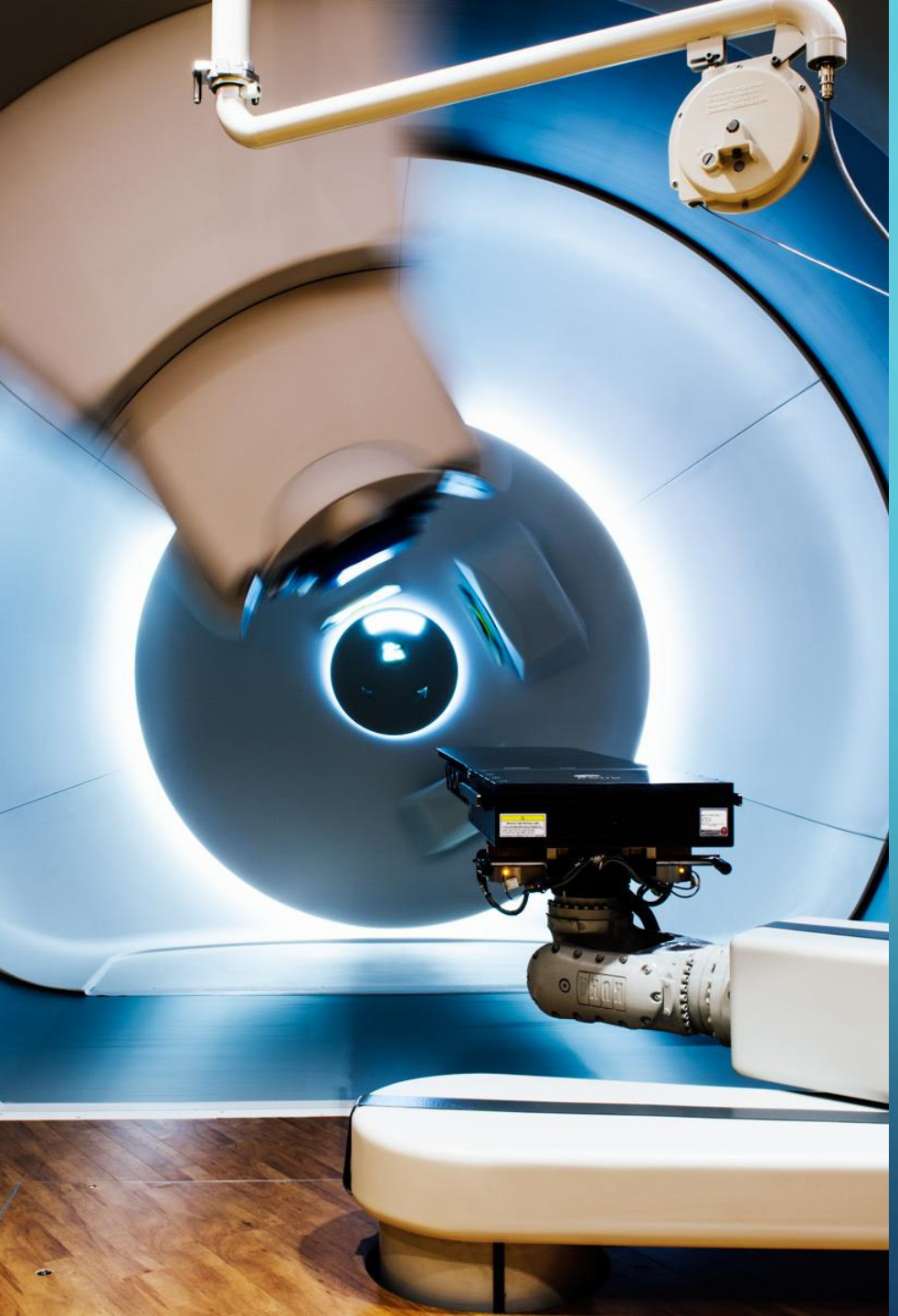
- Related Fields – Astronomy, Cosmology, Space Science
- Skills & Education – Programming, Telescope operation, Mathematics
- Employers - NASA, Department of Defense, Aerospace Industry, Consulting Firms

# GEOPHYSICS

- Related Fields – Geoscience, Seismology, Oceanography, Atmospheric Science
- Skills & Education – Fieldwork, Computer modeling & analysis, Project management
- Employers – Government Agencies, Consulting Firms, Mining & Oil

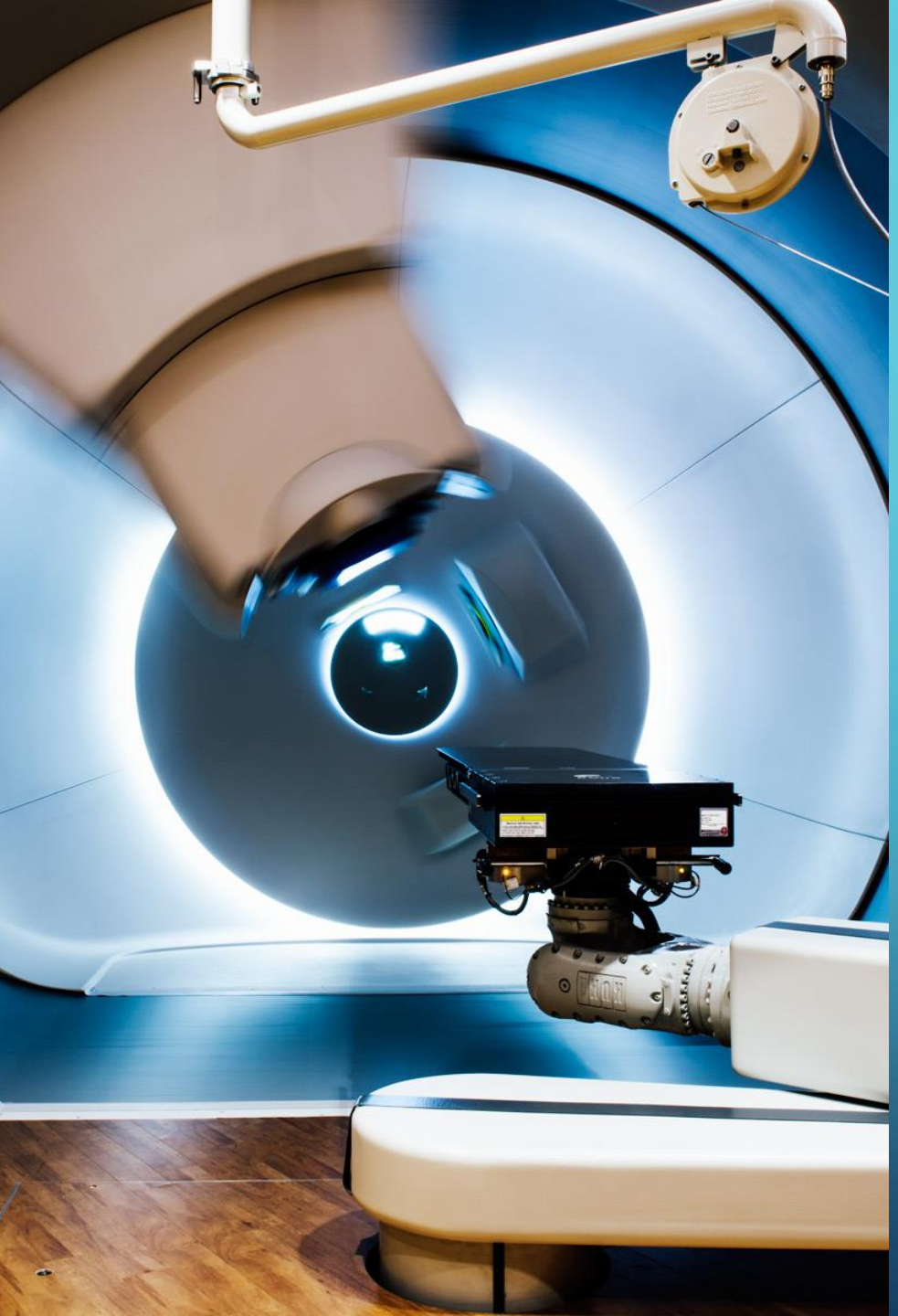
# GEOPHYSICS

- Energy Analyst ($60,384)
  - Experience or graduate education usually required
  - Economics/Engineering education or Political Science education



# MEDICAL & HEALTH PHYSICS

- Medical Physics Specialties – Radiation Therapy, Nuclear Medicine, Radiology
- Medical Physicist ($147358)
  - Masters in Medical/Health Physics
  - Residency & Certification
  - Patient Care or Research
- Dosimetrist ($98881)
  - 1 year certification program



# MEDICAL & HEALTH PHYSICS

- Health Physics Employers – Manufacturing, Military, Government, Environment, Healthcare
- Health Physicist
  - Masters degree or 4+ years experience
- Health Physics Technician ($59,126)
  - 2+ years Radiation Protection experience, training or education

# SPECIALIST ENGINEERING

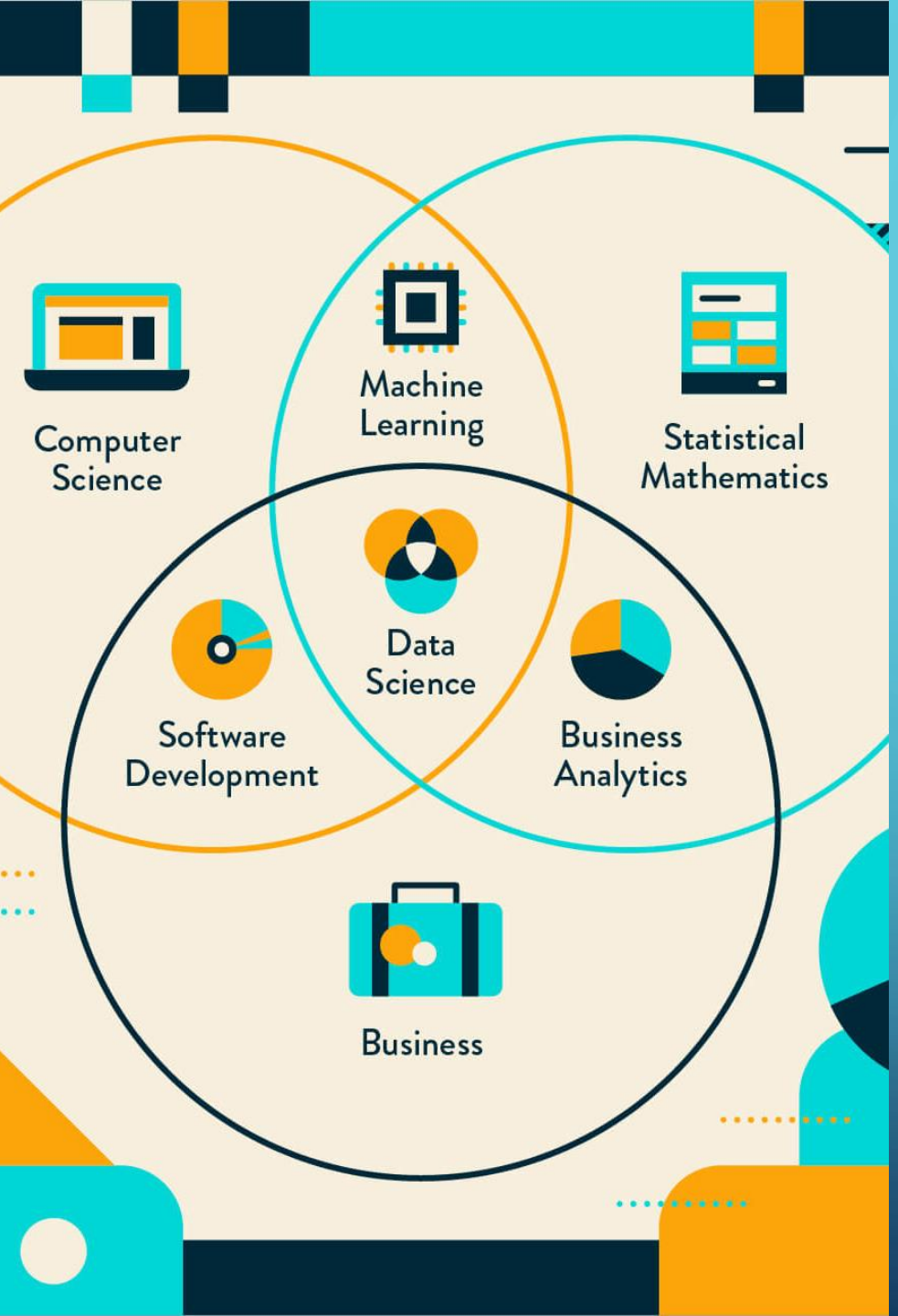
- Masters degree usually required
- Fields – Aerospace, Nuclear, Robotics, Photonics, Nanotechnology, Biomedical, Petroleum, Mining, Marine

# AEROSPACE ENGINEERING

- Divisions – Aeronautical, Astronautical
- Employers – Government Agencies, Defense Contractors, Military
- Aerospace Engineer ($83,409)
  - Masters in Aerospace Engineering, Mechanical Engineering, Electrical Engineering, Computer Science, Systems Engineering, Physics, or Mathematics

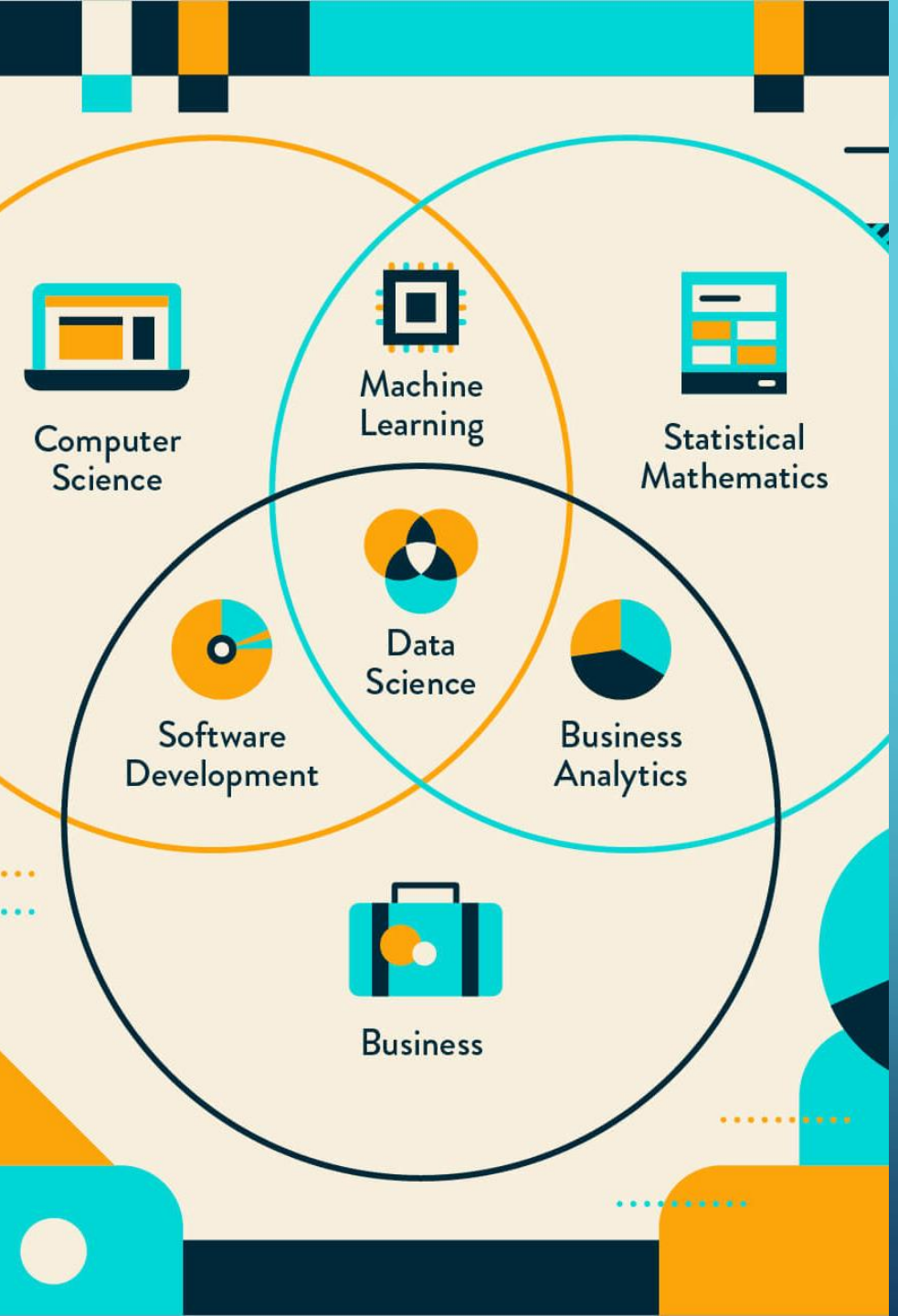
# NUCLEAR ENGINEERING

- Divisions – Power Reactors, Nuclear Medicine
- Employers – Navy, Power Plants, Hospitals
- Nuclear Engineer ($87,221)
  - Masters in Nuclear Engineering




# DATA SCIENCE & QUANTITATIVE RESEARCH ANALYSIS

- Important Skills – Computer Science, Statistics, Economics
- Quantitative Analyst, Quant ($84379)
  - Masters or PhD in Mathematics or Finance preferred
  - Some positions for Physicists
- Data Scientist ($96032)
  - Masters in Data Science preferred
  - Staying up to date with software and tools




# DATA SCIENCE & QUANTITATIVE RESEARCH ANALYSIS

- Overcoming the Entry-Level Barrier
  - Search for entry-level positions
  - Complete internships
  - Build a professional portfolio
  - Apply anyway

# SECONDARY EDUCATION

- Important Skills – Lesson planning, Communication, Patience
- High School Physics Teacher ($53990)
  - Physics Teaching Endorsement Minor
- Middle School Math/Science Teacher ($46419)
  - Physical Science Teaching Endorsement Minor

# PATENT LAW

- Important Skills – Writing, Science & Tech Literacy, Detail Oriented
- Patent Agent: ($99,353)
  - Registration Exam with USPTO
- Patent Examiner: ($101,641)
  - All positions are with USPTO in Alexandria, VA
- Patent Attorney:  ($136,165)
  - Law Degree

# SCIENCE COMMUNICATIONS

- Important Skills – Writing, Research, Self Management
- Technical Writer ($59,833)
  - Field-specific knowledge
- Science Writer/Journalist ($55,332)
  - Field-specific knowledge
  - Masters or PhD preferred
  - Professional Portfolio

# CHOOSING A CAREER PATH

- Where do I want to live?
- What work conditions am I comfortable with?
- How much money do I want to make?
- How much education do I want to pursue?

# CHOOSING A CAREER PATH

- Job security, market growth, competition
- Advancement opportunities, continued education, job flexibility

# BUILDING SKILLS

# PHYSICS DEPARTMENT

- Emphasis Programs
  - Applied
  - Biophysics
  - Astrophysics
  - Secondary Education

# PHYSICS DEPARTMENT

- Work & Volunteer Opportunities
  - Lab Teaching
  - Research
  - Stockroom
  - Tutoring, Teaching Assistant, Grading
  - Physics & Astronomy Club

# UNDERGRADUATE OPPORTUNITIES

- Minor Programs
  - Computer Science
  - Applied Mathematics
  - Electrical Engineering
  - Geophysics
  - Economics

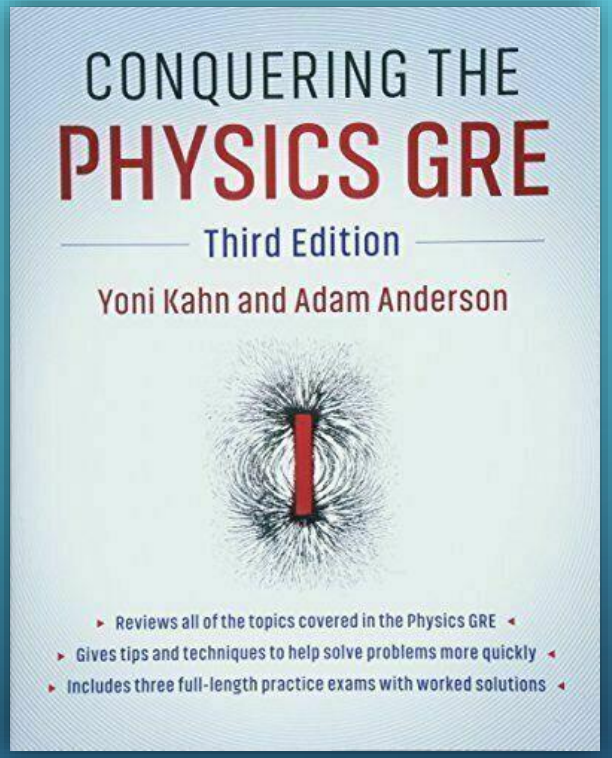
# UNDERGRADUATE OPPORTUNITIES

- Extracurriculars
  - Internships
  - Research Experience for Undergraduates (REU's)

# GRADUATE SCHOOL

- Programs
  - Physical Sciences
  - Engineering
  - Computer Science
  - Economics & Finance
  - Medical School
  - Law School
- Funding
  - Research Assistantships
  - Teaching Assistantships
  - Fellowships & Scholarships
  - Company Programs

# CONQUERING THE PHYSICS GRE 3RD EDITION



# DOCUMENT ACHIEVEMENTS

- Keep track of dates
- Projects, skills, responsibilities
- Contact list
- Course documents

# DOCUMENT ACHIEVEMENTS

1. Confirmation for employers
2. Records for resumes, CV's and portfolios

# THE JOB SEARCH

# JOB MARKET RESEARCH



- Study.com
- Forums
- Career Profiles
- PayScale.com

# JOB POSTINGS



- Job Hubs
  - Glassdoor.com
  - Indeed.com
- Company websites

# NETWORKING

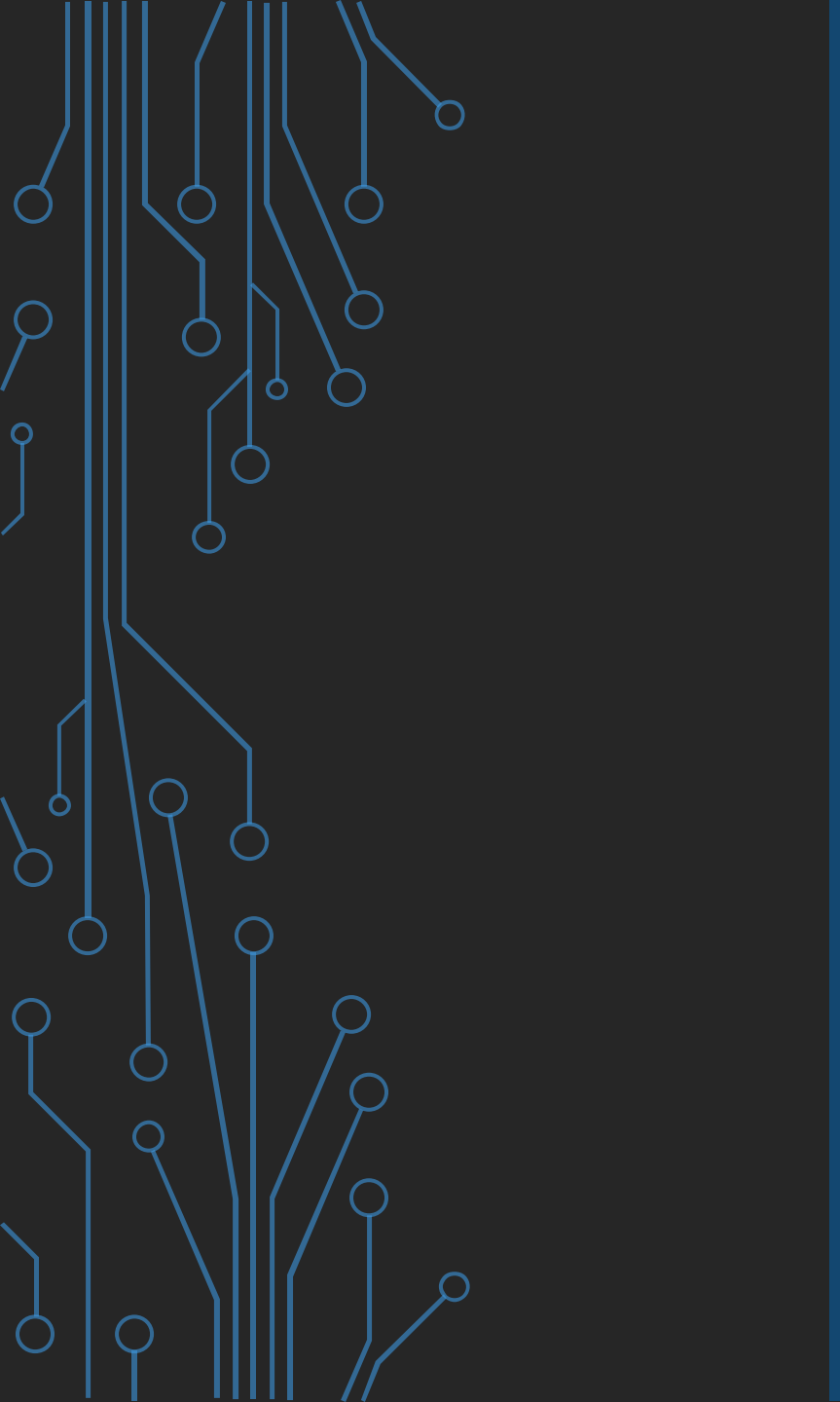
- Professional Social Media
  - LinkedIn.com
  - Handshake.com
- Long-term benefits

# CAREER FAIRS

- BSU General Career Fair (Spring & Fall)
- BSU Engineering Career Fair (Fall)

# CAREER FAIR PREPARATION

- Company research
- Make a list of sample questions
- Bring resumes if looking for a job or internship



# Career Services

Drop in Quick Tips

- 15min help with resume, cover letter, job search questions
- Monday-Thursday 2:00-4:00

Career Counseling

- 1 hour meeting to help you explore career options
- Help with career planning and job search process

Career Advising

- 1 hour meeting to help with resume, job search, and mock interviews

# Q & A