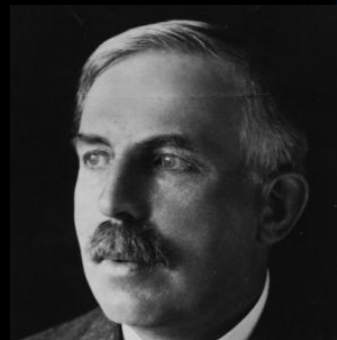
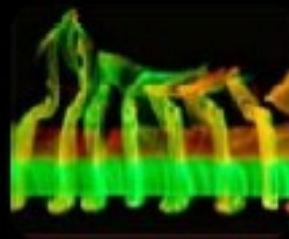


Academic and Career Paths in Physics

Mike Kotlarchyk
Professor & Head
RIT School of Physics & Astronomy



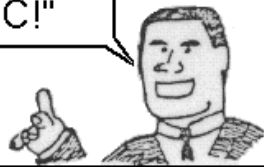
"All science is either physics or stamp collecting"

E. Rutherford

A bit about my personal path.....

"In just 38 months, you can earn big PROFIT\$ as a fully trained QUANTUM MECHANIC!"

Learn secrets of QUANTUM MECHANICS in your own home, in your spare time, without quitting your present job!



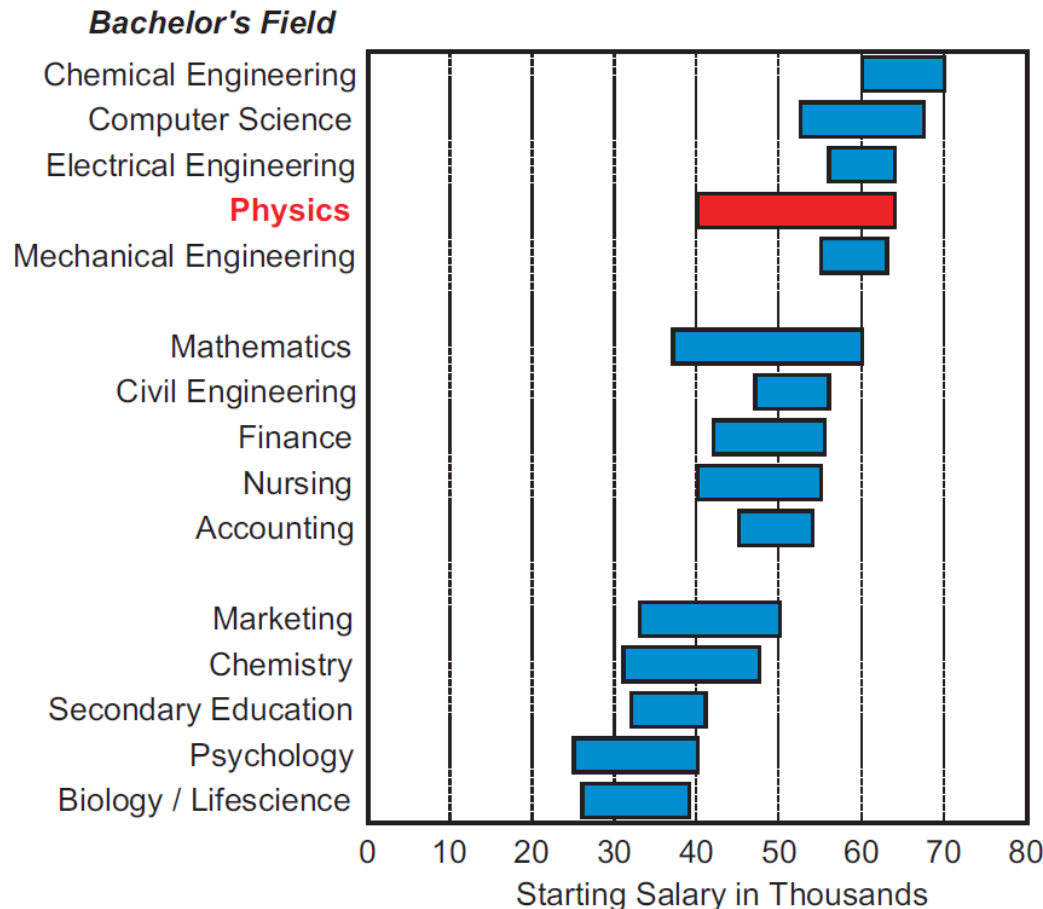
UG Physics Enrollment and Placement National Data

(American Institute of Physics)

- **Enrollment in UG Physics rose by ~45% over the last decade**
- **Placement Statistics 1-Year After Graduation (2012)**
 - Graduate Study in Physics or Astronomy (36%)**
 - Graduate Study in Other Fields (22%)**
 - Employment (38%)**

What's a Bachelor's Degree Worth?

Typical Salary Offers by Campus Recruiters, AY 2008-09

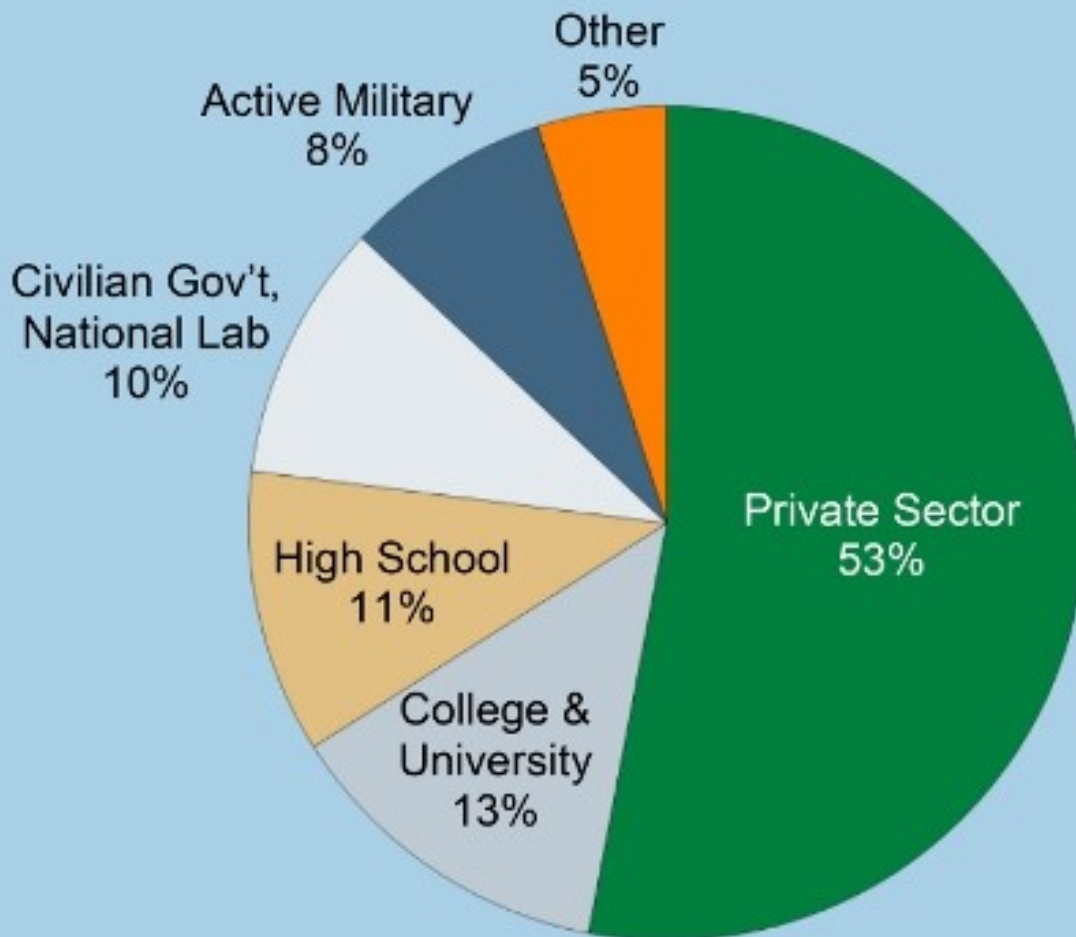


Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.

Reprinted from the Fall 2009 Salary Survey, with permission of the National Association of Colleges and Employers, copyright holder.

Avg Starting
Salary with
Physics BS:
\$50,775

Initial Employment Sectors of Physics Bachelor's, Classes of 2009 & 2010 Combined



<http://www.aip.org/statistics>

Recent RIT Physics Graduate School Placements (Last 3 Years)

- Cornell University (PhD, Applied Physics)
- Cornell University (PhD, Physics)
- University of Southern California (MS, Mechanical Engineering)
- Brandeis University (PhD, Physics)
- University of Washington (PhD, Physics)
- New York University (PhD, Physics)
- University California at Davis (PhD, Economics)
- Montana State University (PhD, Physics)
- Northwestern University (PhD, Physics)
- RIT (MS, Management)
- Rutgers University (PhD, Mathematics)
- Nazareth College (MS, Education)
- Case Western Reserve University (PhD, Physics)
- University of Colorado, Boulder (PhD, Physics)
- University of North Carolina, Chapel Hill (PhD, Physics)
- University of Massachusetts, Amherst (PhD, Physics)

Recent RIT Physics Industry and Government Placements (Last 3 Years)

- Optimax (optical engineer)
- Lawrence Berkeley National Laboratory (research scientist)
- Epic Systems (healthcare systems software)
- Ball Aerospace (space systems engineer)
- Creative Microsystems (microtechnology)
- Advanced Geolocation Solutions (satellite work)
- Corning Tropel (photonics industry)
- Naval Research Laboratory (solid state division)
- Triad Semiconductor (semiconductor industry)
- Navy Nuclear Power School (nuclear sub training)
- National Instruments (laboratory interfacing software)
- Lockheed martin Space Systems (astronomical instrumentation)
- High School Physics Teacher

Some Summer Research Placements: NIST SURF Program, NASA-Glenn, REU's (various), Max-Planck Institute for Gravitational Physics, RIT COS Research Fellowships

Interested in a Teaching Career?

According to the 2010 report by the American Assn of Employment in Education, universities report that

Physics tops the list of
63 education disciplines for teacher demand

- 1. Physics teachers**
- 2. Teachers for those with severe/profound disabilities**
- 3. Math teachers**
- 4. Chemistry teachers**
- 5. Teachers for students with emotional disabilities**

So You Want to Go on to Graduate School?

If you go on to seek a Ph.D. in Physics or related field, tuition costs are normally covered by the hosting institution.

In addition, you are paid a living stipend typically in the range of approx. \$20-30K.



RIT Physics Career and Co-Op Workshop Series

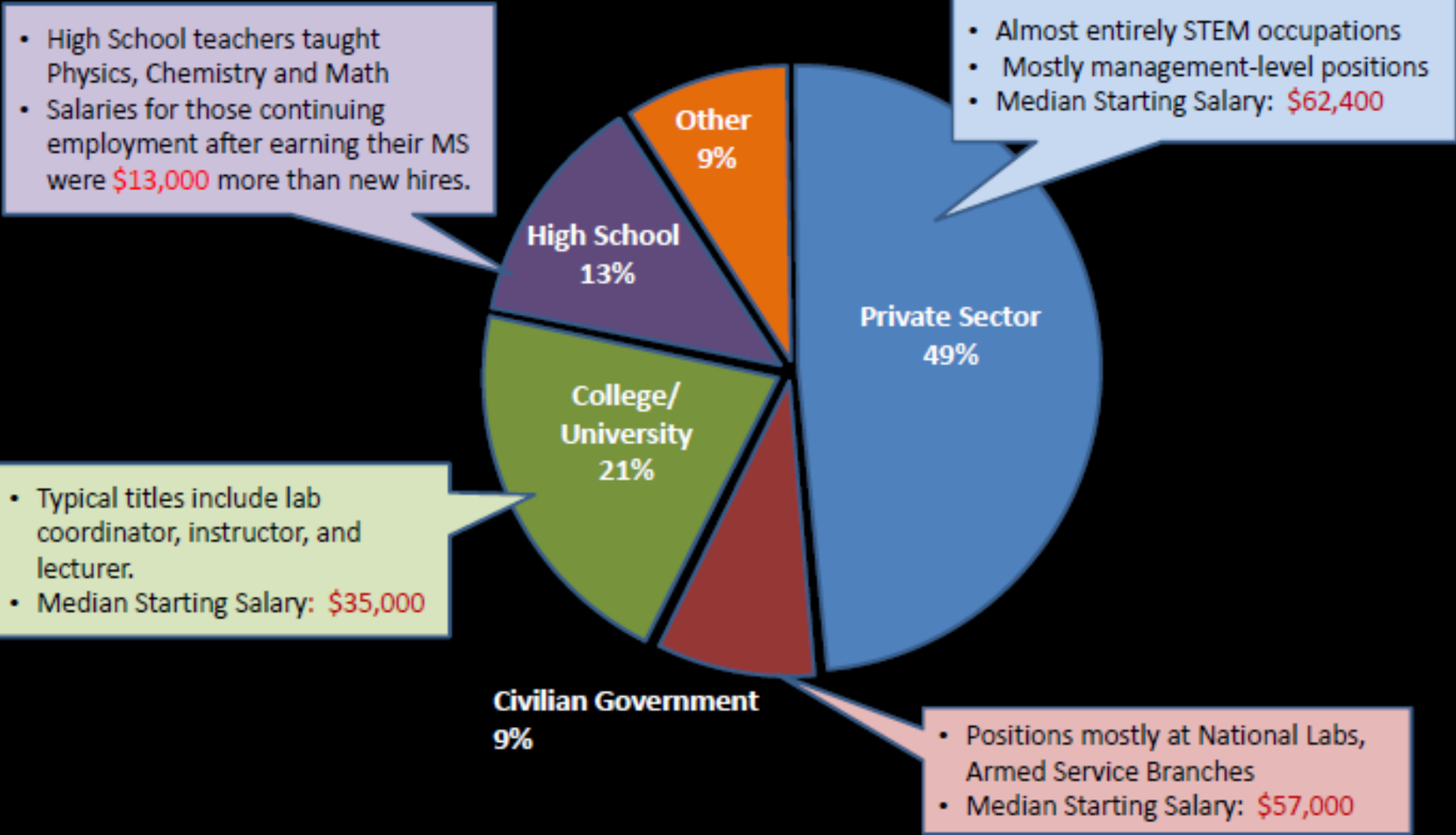
- How to identify and apply for summer co-ops in industry and other areas of the private sector
- How physics majors should structure a resume and cover letter
- How to apply to graduate school
- Applying for summer research internships (REU's, SURF's, etc.) at universities and national laboratories
- Honing interviewing skills
- Networking and applying for positions
- Developing an "elevator speech."
- Preparing for the RIT Career Fair
- Applying for jobs after graduation

Student Research Opportunities in RIT Physics

- Astrophysics and Astronomy
- Nanoscale materials and device physics
- Condensed matter and materials physics
- Optics and photonics
- Atomic/molecular physics
- Biological, soft-matter, and granular physics
- Physics education research
- Particle and nuclear physics

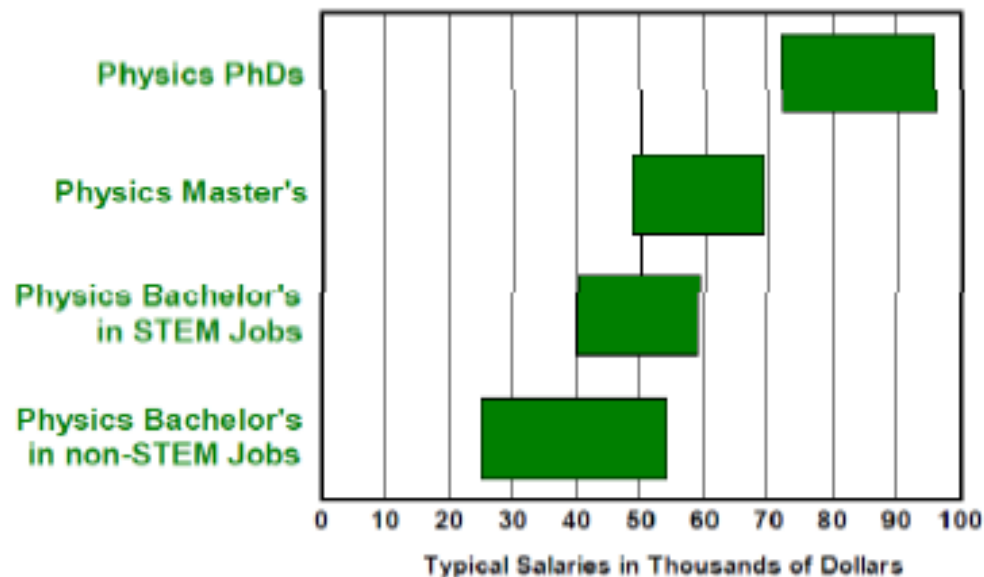
Master's Degree

Between 2006-2008, 64% of physics masters recipients entered or remained in the workforce.



Not surprisingly, physics master's degree holders also earn more than physics bachelor's:

Starting Salaries for Physics Degree Recipients in the Private Sector,
Classes of 2007 & 2008 Combined



Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.

STEM refers to positions in Science, Technology, Engineering and Math

AIP Statistical Research Center, Initial Employment Survey

Bottom line: A physics master's degree will open the door to more advanced positions in a variety of technical fields, with higher salaries.



Michelle O'Brien, Physics MS

Manager of the Mammography Calibration Facility
Nat'l Institute of Standards and Technology (NIST), Gaithersburg, MD

Educational Background

BS – Physics, University of Tennessee (Chattanooga)
MS – Health Physics, University of Tennessee (Knoxville)

Michelle oversees the testing of dose measurement equipment from medical practices around the country—making this life-saving procedure safer for everyone.

Paul Markoff–Johnson, Physics MS
DayStar Technologies, Santa Clara, California

Educational Background

BA – Physics, Princeton University
MS – Applied Physics, Stanford University

Paul works in thin film processing and is working on using thin films to make less expensive solar power.

Originally an Engineering major, Paul found that Physics offered more career options— but was also drawn to Physics because it could explain the things he was seeing around him.



RIT Accelerated 5-Year Dual Degree Options

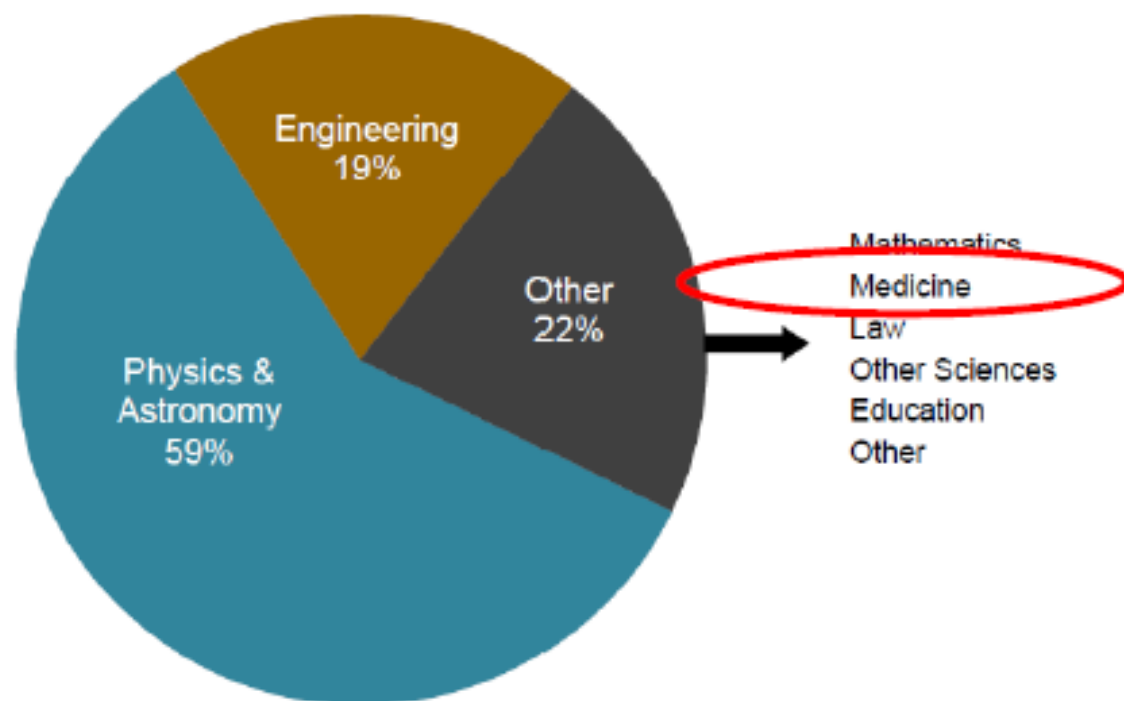
- **BS** Physics + **MS** Materials Science & Engineering
- **BS** Physics + **MS** Science, Technology & Public Policy
- **BS** Physics + **MS** Astrophysical Sciences & Technology

Beyond the Bachelors Degree

Medical Careers

- Over one-fifth (22%) of physics bachelors continuing to graduate school in 2007 pursued non-physics or non-engineering fields.
- A significant portion of these graduates went into medicine.

Fields of Study for Physics Bachelors Continuing Directly on to Graduate School, Classes of 2007 - 2008



Source: AIP Statistical Research Center, Initial Employment Survey, Classes of 2007 and 2008

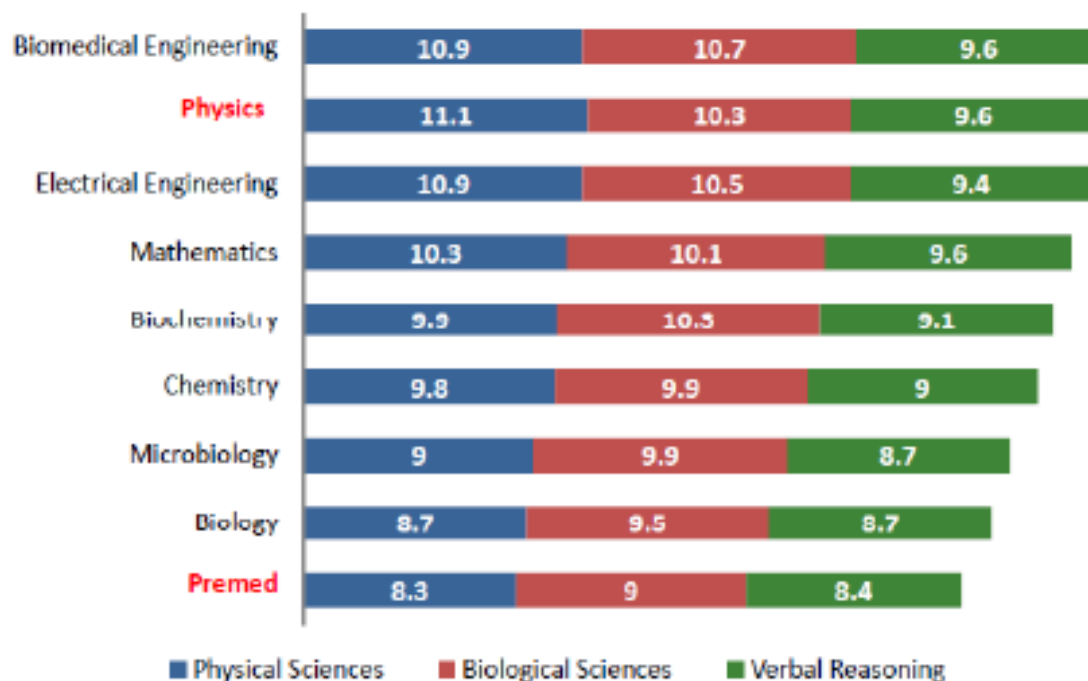
- Physics majors out-performed many other majors (including pre-med) on all three sections on the MCAT.

- Physics majors also account for less than 1% of individuals taking the exam...

These factors make Physics majors stand out compared to other applicants to medical school.

Average MCAT Scores by Selected Majors, 2009

Scores above 9.5 in each section are considered competitive by most medical schools

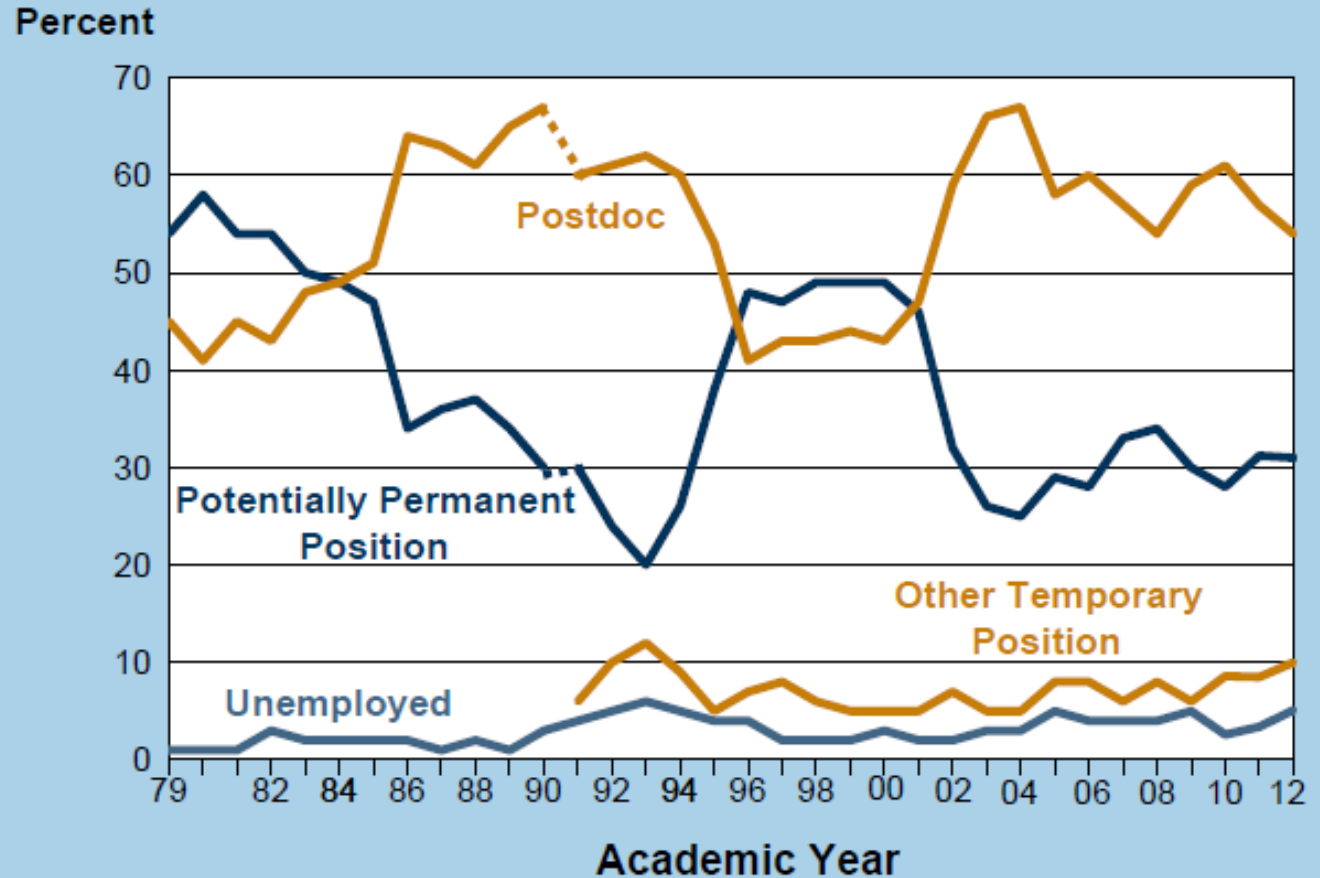


Source: AIP Statistical Research Center compiled data from the Data Warehouse of the American Association of Medical Colleges

In what other ways do my career options change as I pursue an advanced degree?

Employment of Physics PhDs

Initial Employment of Physics PhDs, 1979 through 2012.



The percent of physics PhDs accepting potentially permanent positions has stayed stable for the last eight years, despite the recession of 2008 and 2009. However, the number of physics PhDs conferred since 2004 has been rising steadily, indicating that the market for those with the knowledge and skills associated with a physics PhD continues to grow. Not all the potentially permanent jobs accepted are in physics, but an overwhelming majority are in STEM fields.

Initial Employment of Physics and Astronomy PhDs by Subfield of Dissertation, Classes of 2011 & 2012 Combined.

Percent

0 20 40 60 80 100

Applied Physics

Plasma & Fusion

Optics & Photonics

Condensed Matter

Atomic & Molecular

Materials Science

Particles & Fields

Astronomy & Astrophysics

Biological Physics

Nuclear Physics

■ Postdoctoral Appointment ■ Other Temporary ■ Potentially Permanent

Initial employment outcomes of new physics PhDs are affected by their subfield of research.

“Hidden physicists”

Physicists whose careers have taken them away from the “traditional” physics community.



What is a “traditional” career path?

A physics professor? Any PhD physics researcher?

How many “hidden physicists” are there?

- Over half of graduating bachelors in 2006 and 2007 went to graduate school.
- About 60% of these entered graduate school in Physics or Astronomy (or about a third of the total).
- Many of these will exit with a master’s degree, switch to a master’s program in another discipline, or leave the program.
- The AIP Statistical Research Center estimates the number of 2006-2007 grads receiving a physics PhD will be **1 in 7**...
- ...and the rest will likely become “hidden physicists”.



Alison Binkowski

Health Policy Analyst

Government Accountability Office—Washington, D.C.

Educational Background

BS – Physics and Computer Science, Wesleyan University

MS – International Affairs and Public Health, Columbia University

Alison has volunteered internationally (in places like Costa Rica and China) for programs connected with Public Health issues.



“My analytic training was noted as a primary reason why I was offered a partial academic scholarship in graduate school, and what helped me stand out...to get my current job at the GAO.”



Ellen Ochoa, Physics BS

Astronaut Office Deputy Director

NASA—Lyndon B. Johnson Space Center, Houston, TX

Educational Background

BS - Physics, San Diego State University

MS and PhD – Electrical Engineering, Stanford University

A veteran of four space flights, Ellen has logged over 978 hours in space—and is the first Hispanic female astronaut.

Ellen’s expertise involves using the shuttle’s robotic arm to deploy and capture satellites, perform space station maintenance, and move crew members around on spacewalks!

Where can I find out more?

ComPADRE Physics Careers Resource Website

- The comPADRE Careers Resource Website provides advice and resources for students, educators and parents who want to know more about physics and physics careers.

www.careersinphysics.org

APS Webinars

- APS webinars are designed to connect you with individuals who can offer insight into physics careers, educational programs, and professional development for students, working physicists, and educators.

www.aps.org/careers/webinars

AIP Statistical Research Center

- The latest statistics are available on physics employment, enrollment, demographics, and more!

www.aip.org/statistics

APS Job Center

- Partnered w/ Physics Today, AAPT, AVS Science and Technology, IEEE Computer Society, and SPS. Store copies of your resume, set up job alerts, search the database, and apply for jobs online for FREE!

careers.aps.org