UHCL Bachelors Degree in Physics

David Garrison
Director of Graduate Programs for CSE and Associate Professor of Physics
My Background

• Grew up in O’Fallon Missouri
• Majored in Physics at MIT
• Completed a PhD in Physics at Penn State
• Hired as a temporary faculty member at UHCL
• Founded the UHCL Physics Department
• Currently the Director of Graduate Programs and Associate Professor of Physics
What is Physics?

• Physics is not Philosophy
• Physics and Physical Science are not the same degree
• Physics is the most fundamental of the sciences
• The goal of physics is to understand the physical world around us and apply this knowledge to exploration, discovery, invention and the improvement of human life
• Physicists either invented, or made possible, such major inventions as electric power; electric motors; radio, TV, and cellular phone communication; superconductors; transistors; microprocessors; lasers; the Internet; solar energy; nuclear energy and spacecraft.
What do Physics BS grads do?

![Status of Physics Bachelors One Year After Degree, Classes 1995 through 2014](http://www.aip.org/statistics)
Where do Physics BS grads go?
What can you do with a BS in Physics?

Initial Employment Sectors of Physics Bachelors, Classes of 2013 & 2014 Combined

- Private Sector: 65%
- College & University**: 10%
- Civilian Gov't, National Lab: 5%
- Other: 5%
- Active Military*: 6%
- High School: 9%

*Data do not include degree recipients from the three military academies (US Naval Academy, US Military Academy, US Air Force Academy).

** Data include two- and four-year colleges, universities, and university affiliated research institutes.

Figure based on the responses of 1,657 individuals

www.aip.org/statistics
What Jobs can I get with this degree?

Field of Employment for Physics Bachelors in the Private Sector, Classes of 2013 & 2014 Combined

- Engineering: 36%
- Computer or Information Systems: 23%
- Non-STEM: 25%
- Other STEM: 13%
- Physics or Astronomy: 5%

STEM refers to natural science, technology, engineering, and mathematics.
Figure is based on 1,141 responses

www.aip.org/statistics
Who hires Physics BS?

- Texas employers who recently hired new physics bachelor recipients


- This is only a portion of the employers who hired recent physics bachelors into technical positions. There are about 200 Physics BS graduates in Texas every year so this represents the less than 120 new Physics BS graduates who go to the private sector each year.
How much money can I make with a BS in Physics?

Typical Starting Salaries for Physics Bachelors, Classes of 2013 & 2014 Combined

<table>
<thead>
<tr>
<th>Employer</th>
<th>Typical Salaries (in thousands of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector STEM</td>
<td>50-60</td>
</tr>
<tr>
<td>Private Sector non-STEM</td>
<td>40-50</td>
</tr>
<tr>
<td>Civilian Govt. (incl. Natl. Labs)</td>
<td>30-40</td>
</tr>
<tr>
<td>Active Military</td>
<td>20-30</td>
</tr>
<tr>
<td>High School Teachers</td>
<td>10-20</td>
</tr>
<tr>
<td>College or University</td>
<td>5-10</td>
</tr>
</tbody>
</table>

This figure includes only bachelors in full-time, newly accepted positions. Typical salaries are the middle 50% i.e. between the 25th and 75th percentiles. STEM refers to positions in natural science, technology, engineering, and math. Data are based on respondents holding potentially permanent jobs in private sector STEM positions (498), private sector non-STEM positions (114), civilian government positions (52), the active military (44), high school teaching positions (82), and universities or colleges (84).

www.aip.org/statistics
How does that Compare?

What’s a Bachelor’s Degree Worth?
Typical Salaries for Bachelor’s Degree Recipients, Class of 2015

Bachelor’s Field
- Computer Science
- Aerospace Engineering
- Physics
- Chemical Engineering
- Electrical Engineering
- Mathematics
- Mechanical Engineering
- Finance
- Civil Engineering
- Registered Nursing
- Accounting
- Business Admin/Mgmt
- Chemistry
- Psychology
- Biology

Starting Salary in Thousands

Note: Typical salaries are the middle 50%, i.e. between the 25th and the 75th percentiles.
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Fall 2016
The Hamilton Project's chart of median lifetime earnings by college major, in millions of dollars:

Source: Major Decisions, Part 1; authors' calculations from American Community Surveys, 2009–2012.
What about Graduate School?

Field of Graduate Study for Physics Bachelors One Year After Degree, Classes of 2013 & 2014 Combined

Physics or Astronomy: 59%
Engineering: 20%
Other: 21%

Figure based on 2,709 physics bachelors who enrolled in graduate school following graduation.

http://www.aip.org/statistics
Physics BS in Med School?

### Average MCAT Scores* by Selected Majors, 2012

<table>
<thead>
<tr>
<th>Major</th>
<th>Physical Science</th>
<th>Biological Science</th>
<th>Verbal Reasoning</th>
<th>Number of Applicants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>10.8</td>
<td>10.8</td>
<td>9.9</td>
<td>633</td>
</tr>
<tr>
<td>Physics</td>
<td>11.1</td>
<td>10.4</td>
<td>9.8</td>
<td>228</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>11.1</td>
<td>10.6</td>
<td>9.6</td>
<td>1,147</td>
</tr>
<tr>
<td>Mathematics</td>
<td>10.6</td>
<td>10.4</td>
<td>9.3</td>
<td>340</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>10.9</td>
<td>10.1</td>
<td>9.4</td>
<td>135</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>10.1</td>
<td>10.6</td>
<td>9.5</td>
<td>1,615</td>
</tr>
<tr>
<td>English</td>
<td>9.6</td>
<td>10.1</td>
<td>10.2</td>
<td>380</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>10.1</td>
<td>10.4</td>
<td>9.0</td>
<td>2,864</td>
</tr>
<tr>
<td>Chemistry</td>
<td>9.5</td>
<td>10.0</td>
<td>9.0</td>
<td>2,113</td>
</tr>
<tr>
<td>Microbiology</td>
<td>9.2</td>
<td>10.1</td>
<td>8.8</td>
<td>759</td>
</tr>
<tr>
<td>Psychology</td>
<td>9.1</td>
<td>9.6</td>
<td>9.1</td>
<td>2,327</td>
</tr>
<tr>
<td>Biology</td>
<td>9.0</td>
<td>9.7</td>
<td>8.7</td>
<td>13,605</td>
</tr>
<tr>
<td>Premedical</td>
<td>8.3</td>
<td>8.9</td>
<td>8.1</td>
<td>587</td>
</tr>
<tr>
<td>All Majors</td>
<td>9.5</td>
<td>9.9</td>
<td>9.0</td>
<td>44,464</td>
</tr>
</tbody>
</table>

* Sorted by total score. Based on test takers who applied to Medical School. Applicants are allowed to take the MCAT exam more than once; these averages are computed using each applicant’s most recent MCAT exam scores.

Source: Compiled by the Statistical Research Center based on data collected by the Association of American Medical Colleges

[http://www.aip.org/statistics](http://www.aip.org/statistics)
Physics BS in Law School?

Average LSAT Scores* by Selected Majors, 2012

<table>
<thead>
<tr>
<th>Major</th>
<th>Average Score*</th>
<th>Number of Applicants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>162.2</td>
<td>254</td>
</tr>
<tr>
<td>Physics</td>
<td>162.1</td>
<td>126</td>
</tr>
<tr>
<td>Economics</td>
<td>159.1</td>
<td>2,468</td>
</tr>
<tr>
<td>Engineering</td>
<td>157.3</td>
<td>1,127</td>
</tr>
<tr>
<td>Chemistry</td>
<td>156.7</td>
<td>267</td>
</tr>
<tr>
<td>History</td>
<td>156.7</td>
<td>3,323</td>
</tr>
<tr>
<td>English</td>
<td>155.8</td>
<td>3,728</td>
</tr>
<tr>
<td>Biology</td>
<td>155.2</td>
<td>1,095</td>
</tr>
<tr>
<td>Political Science</td>
<td>154.3</td>
<td>12,215</td>
</tr>
<tr>
<td>Psychology</td>
<td>153.3</td>
<td>3,335</td>
</tr>
<tr>
<td>Computer Science</td>
<td>152.3</td>
<td>327</td>
</tr>
<tr>
<td>Pre-Law</td>
<td>149.0</td>
<td>994</td>
</tr>
<tr>
<td>Criminal Justice</td>
<td>145.3</td>
<td>2,878</td>
</tr>
<tr>
<td>All Majors</td>
<td>153.6</td>
<td>66,197</td>
</tr>
</tbody>
</table>

* Based on test takers who applied to Law School. Applicants are allowed to take the LSAT exam more than once; these averages are computed using each applicant’s highest score on the LSAT exam.

Source: Compiled by the Statistical Research Center based on data collected by the Law School Admission Council

http://www.aip.org/statistics
Useful Skills learned

Knowledge and Skills Regularly Used by Physics Bachelor’s Employed in the Private Sector, Classes of 2011 & 2012 Combined.

- Solve Technical Problems
- Work on a Team
- Technical Writing
- Design & Development
- Use Specialized Equip.
- Perform Quality Control
- Manage Projects
- Knowledge of Phys. or Ast.
- Programming
- Work with Customers
- Advanced Math
- Simulation or Modeling
- Manage People
- Manage Budgets

Employment in Engineering

Employment in Computer Science or Information Technology

Percent Regularly Using Knowledge or Skill

Percentages represent the physics bachelor’s who chose "daily," "weekly," or "monthly" on a four-point scale that also included "never or rarely."

http://www.aip.org/statistics
About the UHCL Physics Program

- UHCL’s Physics program grew out the UHCL Physical Sciences: Space Science Program
- Students usually specialize in Planetary Science, Plasma Physics, Astronomy, Orbital Dynamics, Cosmology, Computational Physics and other areas
- Physics Advisory Board to keep up with community demands
- Physics BS approved in 2009, Physics MS approved in 2004, Physics Collaborative PhD approved in 2007
Our Accomplishments

• One of the highest graduate enrollments of any MS – level Physics program in the USA
• One of the largest producers of Physics MS in Texas
• Only Program at UHCL which can advise PhD students
• Graduated 6 of UHCL’s 10 Alumni Astronauts
Facilities

- Computational Physics Lab
- High Performance Computing Cluster
- Modern Physics and Astronomy Teaching Lab
- Collaborations with JSC
- Collaborations with the Lunar and Planetary Institute
- Collaborations with Ad Astra Rocket Company
- Experimental Applied Nanotechnology Lab
- Complete Palomar Sky Survey Data
UHCL Research Topics

• Computational Physics
• Physics Education Research
• Aerospace Applications of Plasma Physics
• Lunar and Martian Exploration
• Sample Return Missions
• Life on Other Planets
• Stellar Structure
• Materials Science
• Condensed Matter Physics
UHCL Research Topics
Continued...

- Radiation Biology
- Biophysics
- Numerical Cosmology
- Numerical Relativity
- Nonlinear Dynamical Systems
- Neutrino Physics
- Quantum Computation and Entanglement
- Astrobiology
- Other areas of interest to students and faculty
Advantages

• Freedom to explore your interests
• Huge range of career opportunities
• High starting and mid-career salaries
• Easy transition into MS, PhD or Professional programs in a wide range of fields
• Internships and Research opportunities with local industry
• Engineering Physics Sub-Plan for BS
Questions?