

NEUTRINO BEAM

## About Physics and Astronomy

**What do Physicists do?**

Some physicists use theoretical techniques (mathematics and computer codes) to study physical principles.

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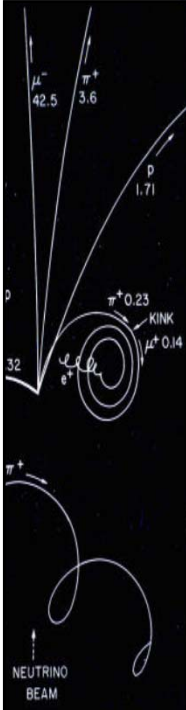
"At this point we notice that this equation is beautifully simplified if we assume that space-time has 92 dimensions."

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## About Physics and Astronomy

**What do Physicists do?**

Others design and build apparatus to investigate a particular problem in the laboratory.

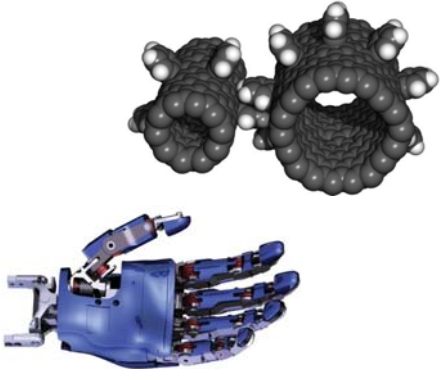

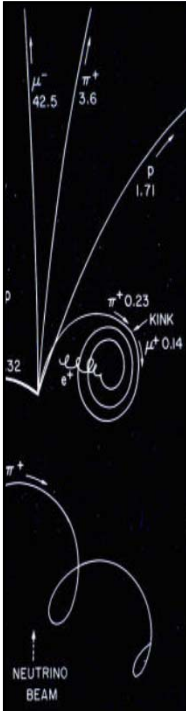


A diagram showing particle tracks from a neutrino beam. Labels include  $\mu^-$  42.5,  $\pi^+$  3.6,  $p$  1.71,  $\pi^+$  0.23, KINK,  $\mu^+$  0.14,  $e^+$ , and  $\pi^+$ . A label at the bottom left reads "NEUTRINO BEAM".

## About Physics and Astronomy

### What do Physicists do?

Many physicists apply their physics knowledge to practical areas such as the development of advanced materials, electronic and optical devices and medical equipment.


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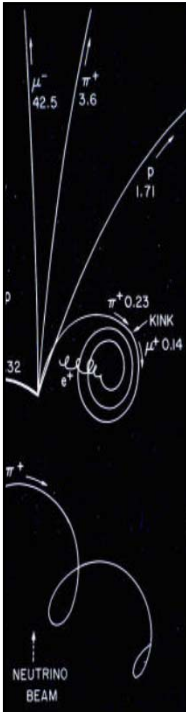
## About Physics and Astronomy

### What do Physicists do?

Physicists generally specialize in one of many subfields such as elementary particle physics, atomic physics, the physics of condensed matter, etc.....

Growing numbers of physicists work in combined fields such as medical physics, biophysics, chemical physics, and geophysics.



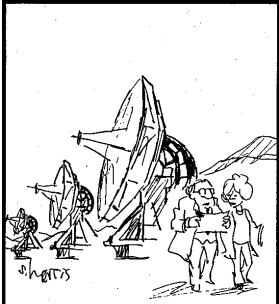


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## About Physics and Astronomy

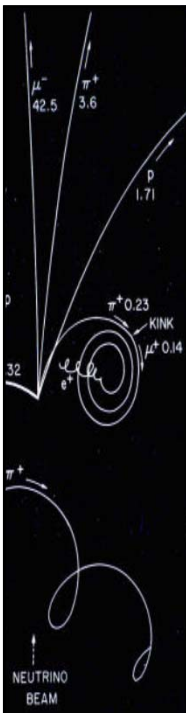
**What is Astronomy?**

Astronomers and astrophysicists use the principles of physics and mathematics to learn about the fundamental nature of the universe, including the sun, moon, planets, stars, and galaxies.



"We've discovered a massive dust and gas cloud which is either the beginning of a new star or just a hell of a lot of dust and gas."







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## About Physics and Astronomy

**What is Astronomy?**

Astronomers also apply their knowledge to problems in navigation and space flight, and to develop the instrumentation and techniques used to observe and collect astronomical data.





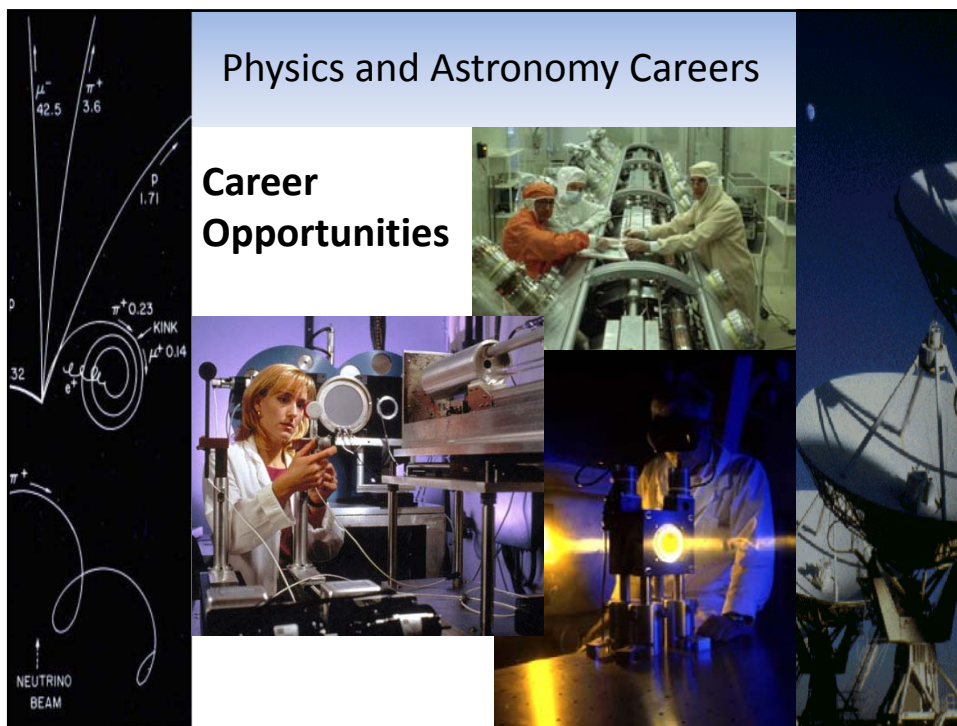
## Physics and Astronomy Dept.

**Research at the University of Manitoba**

## P&A Research at the U of M

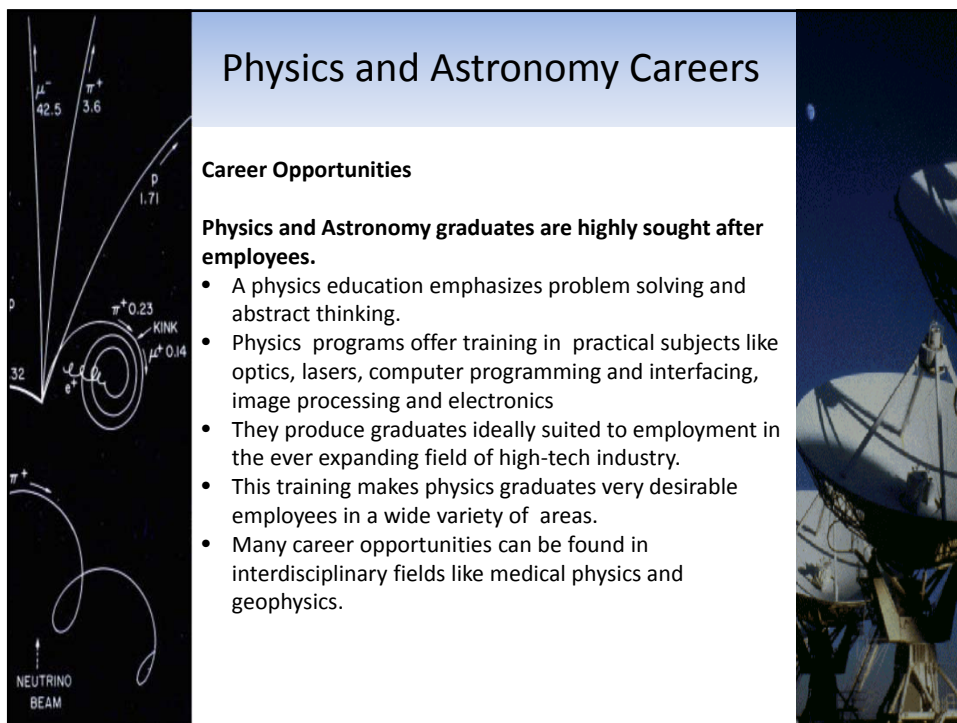
**Research at the University of Manitoba**

- Astronomy/Astrophysics
- Atomic/Molecular physics
- Bio- and soft condensed matter
- Condensed matter and materials
- Subatomic and particle physics
- Medical and biological physics
- Theoretical physics
- Biomedical mass spectrometry



## Physics and Astronomy Careers

### Career Opportunities

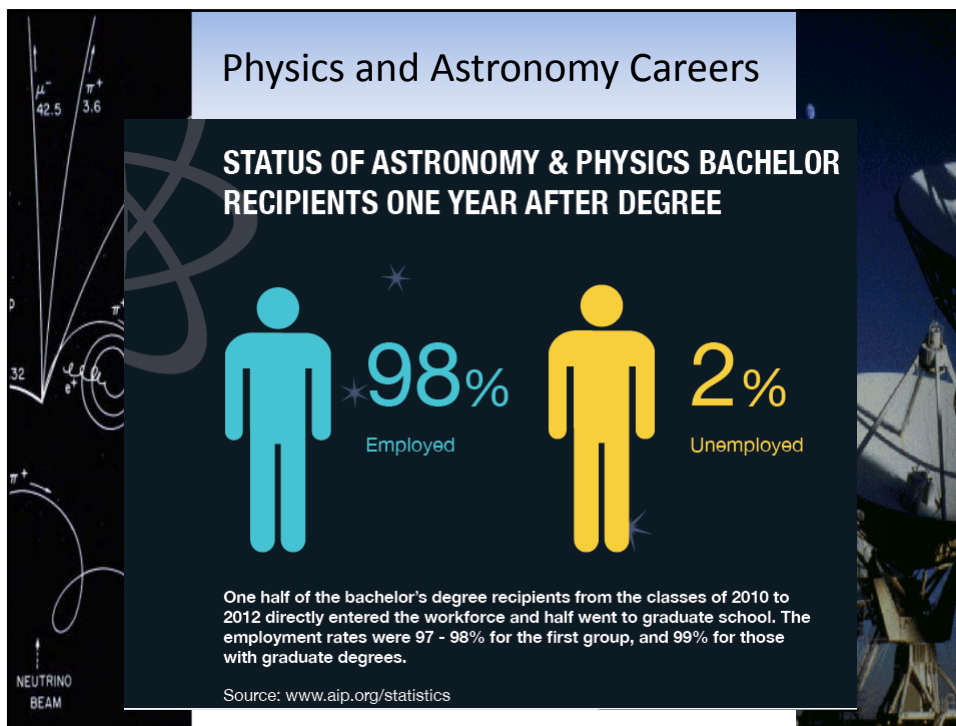


## Physics and Astronomy Careers

### Career Opportunities

**Physics and Astronomy graduates are highly sought after employees.**

- A physics education emphasizes problem solving and abstract thinking.
- Physics programs offer training in practical subjects like optics, lasers, computer programming and interfacing, image processing and electronics
- They produce graduates ideally suited to employment in the ever expanding field of high-tech industry.
- This training makes physics graduates very desirable employees in a wide variety of areas.
- Many career opportunities can be found in interdisciplinary fields like medical physics and geophysics.



## Physics and Astronomy Alumni



**Mark de Jong, B.Sc. (Hons)/74, Ph.D./81**

**Director of Accelerators and Medical Isotope Project leader,  
Canadian Light Source Project**

de Jong manages the operations of the 2.9 GeV electron storage ring, which includes oversight of the departments of Accelerator Operations and Development, Engineering and Technical Services, Controls and Instrumentation Development, and Information and Communication Technology. He also operates the linear accelerator designed to produce selected radioisotopes.

## Physics and Astronomy Alumni



**Jim Peebles, B.Sc. (Hons)/58, D.Sc./89**

Albert Einstein Professor of Science, Emeritus,  
Princeton University

Peebles is a world renowned physicist and cosmologist who has made many important contributions to the big bang model, nucleosynthesis, dark matter and dark energy. He has contributed to the theory of structure formation and he predicted cosmic microwave background radiation. He is the author of *Physical Cosmology*, (Princeton University Press, 1971), which transformed the study of cosmology into a broadly-based physical science.

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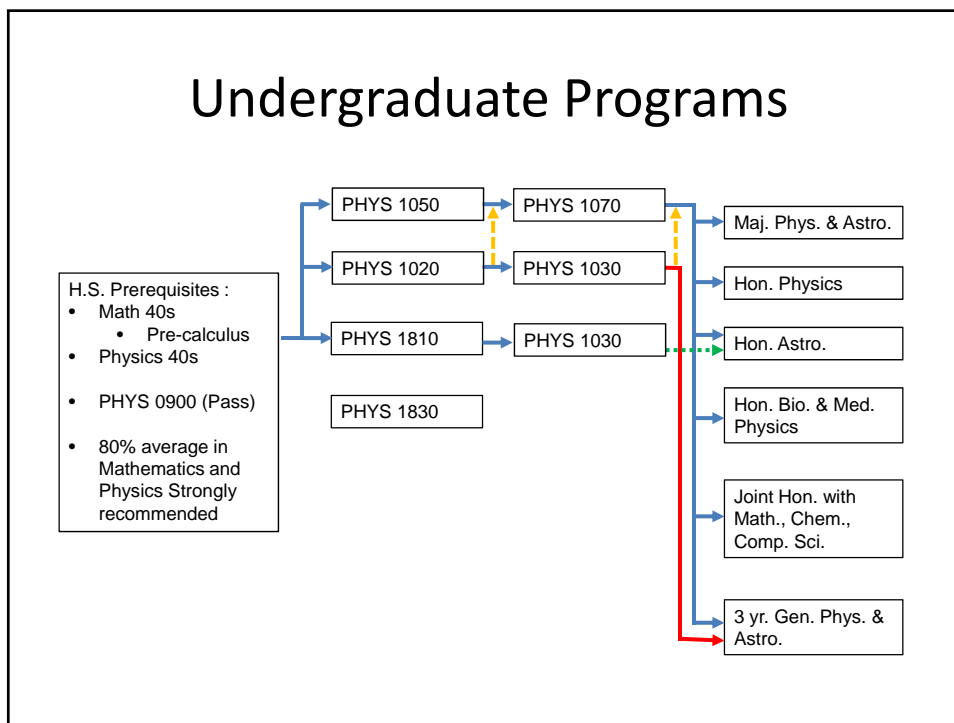
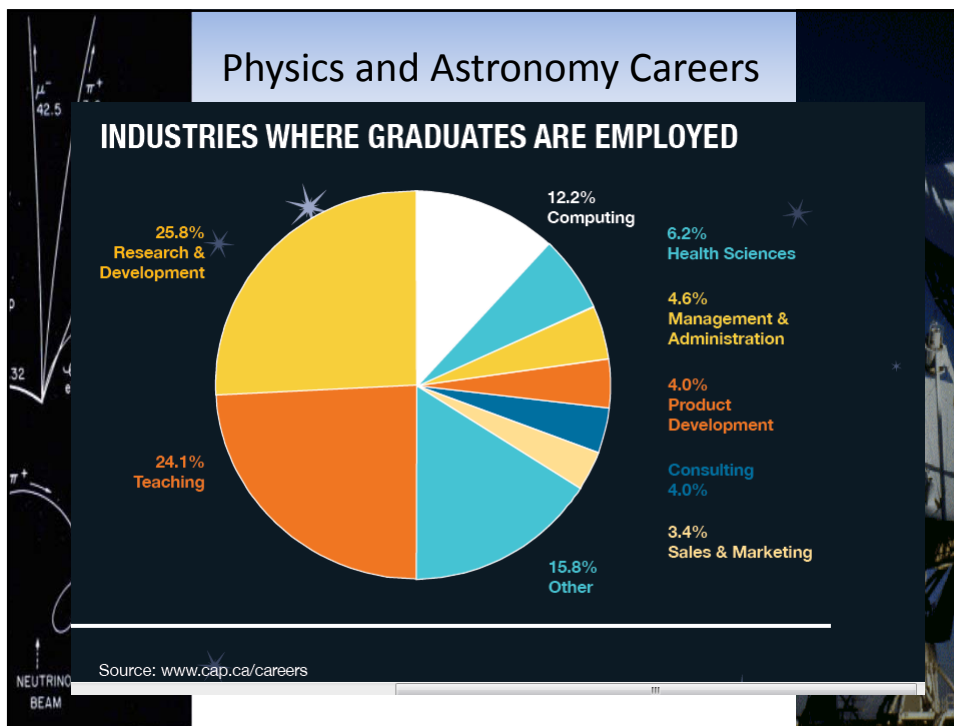
## Physics and Astronomy Careers

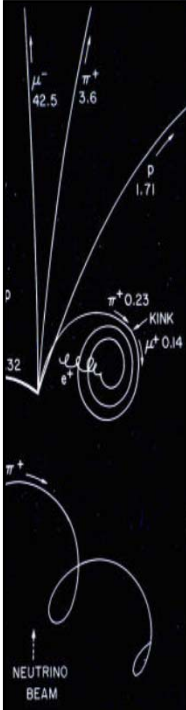
### Career Opportunities

- Students who major in physics or astronomy often do so with the idea that they will complete Ph.D studies and eventually be professional physicists engaged in research (pure or applied) in industry, government laboratories, hospitals and universities.
- Many physics and astronomy Ph.D holders ultimately teach at the university level.
- Many pursue careers in industry, the government or non-university education. Job titles such as engineer (process and instrumentation development, software development), manager, computer scientist or technologist are common.

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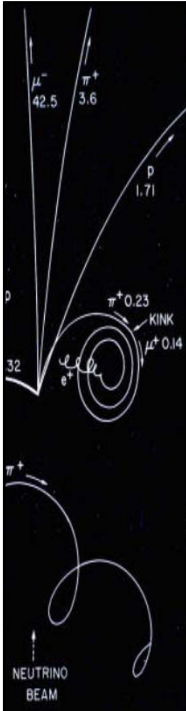
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## Physics and Astronomy Careers

**INTERNET RESOURCES: CANADA**

**Human Resources and Skills Development : National Occupational Classification (NOC)**  
 Classification Structure  
 Natural and applied sciences and related occupations  
 Physicists and Astronomers  
<http://www5.hrsdc.gc.ca/NOC/English/CH/2001/StructureResult.aspx?v=2>

**University of Manitoba Career Services: Exploring Occupations**  
 Descriptions of many occupational options provided at:  
<http://umanitoba.ca/student/counselling/careers.html>





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## Physics and Astronomy Careers

**INTERNET RESOURCES: CANADA**

- Website of the Department of Physics and Astronomy for detailed program and course information, faculty profiles, ongoing research, news, events and media coverage. <http://www.physics.umanitoba.ca>
- Careers page of the website of the Canadian Association of Physicists (CAP) where you can learn about the nature of various physics careers, explore career prospects and read profiles of real physicists and their career paths. <http://www.cap.ca/careers/careers.html>



## Physics and Astronomy Careers

**INTERNET RESOURCES : UNITED STATES (INTERNATIONAL)**

<http://www.bls.gov/oco/ocos052.htm> The Occupational Outlook Handbook of the US Department of Labor - Bureau of Labor Statistics. This site describes all the important aspects of a particular career: nature of the work, employment opportunities and outlook, training and qualifications, salaries, etc.

Latest employment data for physicists, astronomers and related scientists:  
<https://www.aip.org/statistics/employment>

## University of Manitoba Physics and Astronomy Programs Thank you for coming!