physics

Careers in Physics

Physics is the study of how the universe works. This involves looking at the way matter and energy interact: by observing, measuring and experimenting in order to gain a better understanding of the underlying laws of nature. People who choose to study physics do so because they are fascinated by the world around them. They want to discover more about the how and the why of what goes on.

Some people have the impression that we know everything in physics and that there is nothing left to be discovered. In fact, nothing could be further from the truth. Physics is one of the most rapidly expanding fields of science. Every year hundreds of exciting discoveries are made. Astronomers use powerful telescopes to discover planets orbiting other stars in our galaxy. In the field of nanotechnology, physicists are able to manipulate individual atoms to create miniature machines, which could be used to build a quantum computer - the most powerful computer in the world. Other physics researchers have discovered that not only can you use sunlight to create electricity but you can also reverse this process and cause silicon to emit light.

Studying physics is the basic gateway to a world of continuing change. Government research organisations, industry, defence, schools and universities employ physicists. Studying physics can provide the opportunity to travel and work anywhere, knowing that what you do increases our knowledge of the world and improves the lives of the people in it.

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profiles

Wilfred Walsh

Wilfred Walsh completed a PhD in Astrophysics at UNSW in 1997.

Each morning as I walk from the dome of the Amundsen-Scott South Pole station to the observatory where I work, a few hundred metres away on the other side of the world, I do three things. First, I try to decide how to spend my day, as every day running a sub-millimetre radiotelescope demands its own agenda. Second, I look around at the changing expanses of drifting snow, gently flowing ice 'rivers' and peculiar skies that I've only ever seen here in the middle of the Antarctic plateau. If the winds are strong enough, they scatter ice into the air, which forms strange rainbow rings, arcs and patterns around the sun. Third, walking through this crystal mist at perhaps –60^{o}C with wind chill, I try to ensure that no skin gets frostbitten, that no body parts freeze off.

What got me here was my postdoctoral appointment at the Harvard Smithsonian Center for Astrophysics, where I will spend two years in addition to my year at the South Pole. Previous to living in Boston, I spent nearly four years in Bonn, Germany, working at the Max Planck Institute for Radioastronomy, and one year teaching at Charles University in Prague. Learning the radioastronomy trade has involved using over a dozen telescopes in Australia, various countries in Europe, the USA and Chile. All this was made possible by my PhD studies (on the problem of dark matter in galaxies) that I completed at the Department of Astrophysics, using the world class research facilities of UNSW and the Australia Telescope National Facility.

Now, for the next year, I have responsibility for a telescope that is unique in the world for its ability to explore the sky at sub-millimetre wavelengths. The challenge of running this project at the South Pole, the experience of living here, and the thrill of the prospect of what new discoveries might come out of my research here, are things that no amount of money – and no other degree course – can buy.

Teresa Wang

Teresa Wang completed her Bachelor of Science Medical Physics in 2001.

I found it really hard to choose a university course when I was in Year 12 because I had no idea what I wanted to do. There are so many options! I was tossing up between commerce, engineering, maths or physics. In the end I decided to focus on physics because I think physics knowledge is the most technical and difficult to acquire. Commerce and engineering skills can be gained relatively easily in the workforce and there was always the option of doing a postgraduate degree if necessary.

I was a 'professional student' until I completed my science degree in medical physics. I spent lots of time in the third year laboratory. It really is a hands-on subject and I think it is the subject that got me my job. I found a job as a manufacturing technician at JDS Uniphase, then got into research and development as a technician. I was recently upgraded to development engineer. I assist in improving the manufacturing processes for optical fibre Bragg gratings by carrying out experimental studies of existing and new processes. I also spend a lot of time setting up and maintaining our production system for production trials.

As for my future career, I haven't planned it at all, but so far so good. For example, if I want to travel, there are so many well-paid jobs overseas in the photonics industry and a physics degree is usually one of the pre-requisites. Whatever opportunity comes up I have satisfied the academic requirements for it.

Imma Wormleaton

Imma Wormleaton graduated in 2000 with a combined degree in Science and Arts, including Honours in Physics and Astronomy.

While I retain a strong interest in both physics and astronomy, after Honours I felt a break from student life was desirable. I currently work as a business analyst at Port Jackson Partners Ltd, a management consulting firm focused on improving performance of the senior management of large organisations by resolving issues of strategy, organisation and process. I was attracted to the analytical nature of the work as well as the opportunity to solve problems in a completely new environment. My role as a business analyst uses many of the skills I developed doing my physics degree, particularly the analytical skills developed during my honours year. My everyday work involves gathering information about a particular client or industry and processing that information to test hypotheses to identify problems and lead to their solutions. I often construct complex financial models to test scenarios, and see how various assumptions affect outcomes. The rigorous nature of the analysis is similar to scientific research, and is satisfying and challenging.

Studying physics at UNSW as part of a combined degree allowed me to spend a year as an exchange student in Germany, where I studied physics, astronomy and German at the University of Bonn. A physics degree has given me the skills for my future career, whether I stay in a business environment or go back to a research role in astronomy.

Paul Beasly

Paul Beasly completed a combined degree Bachelor of Science/Bachelor of Arts; majoring in Engineering Physics and English.

I chose to study physics because I knew that instead of being purely trained for a job, I would be encouraged to learn, understand and develop skills to investigate the physical world. Physics turned out to be a good choice because I was able to study many different fields, from electronics to semiconductor physics, lasers and photonics, as well as the theoretical subjects like quantum mechanics and relativity. I have found that I have been able to apply a lot of what I learnt, such as semiconductor physics and laser applications.

My career has only just started. I had previous work experience at CSIRO and I spent six months working at Redfern Integrated Optics as part of my Engineering

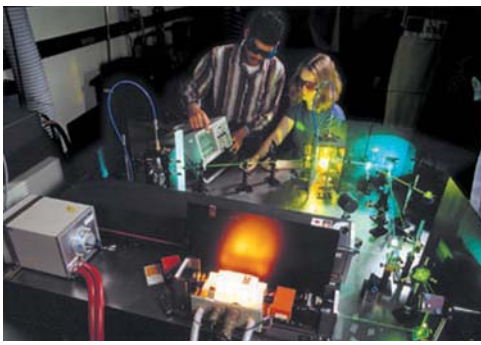
Physics degree. I now work as a design engineer at Mimix Broadband MMIC (Monolithic Microwave Integrated Circuit). I design integrated circuits for microwave radio applications. An example of what I do is designing point to point links between mobile phone reception towers, military radar and broadband telecommunication data links. As part of my job I design amplifier and related circuits at up to 40GHz frequencies. I organise to have prototypes of the circuits manufactured in semiconductor foundries, and collaborate with customers while trying to meet the market's needs.

I recommend studying physics because it teaches a broad range of subjects and encourages students to learn and develop skills in understanding the physical world.

physics

Physics and the future:
careers and opportunities

In our increasingly technological society, enormous opportunities exist for physics graduates. Over the past twenty years the work of physicists has provided the basis for developing CD players, the Internet and fibre optical communications, medical imaging devices such as CAT scans, and the exploration of space. As demand for people with physics and engineering skills increases in the future, physics graduates will have excellent employment prospects.



Medical physics is a fast growing area of employment for physicists. Medical physicists use their scientific knowledge to help improve the health of people, often working alongside other health care professionals to improve the effectiveness of diagnostic tools or treatment. Physicists may be involved in nuclear medicine, administering tests and interpreting images for diagnosis. Others work in radiotherapy to treat diseases such as cancer. Medical physicists also work with other imaging devices such as ultrasound and magnetic resonance imaging, or they may work in research laboratories developing safer and more effective techniques.

The **photonics** industry is another major employer of physicists. This area of physics uses light, usually generated by lasers, to transmit information. Optical fibres can carry vastly more information than the copper wires that have been used in the past. With the rapid expansion of global communication, including the World Wide Web, this is an area with a particularly bright future.

Physics is central to the new field of **nanotechnology**. This is the manipulation of individual atoms to build tiny structures or machines. An example is the quantum computer, which will use individual atoms rather than silicon chips to do calculations much faster than any computer currently available. Nanotechnology might also be used to build tiny devices to deliver a drug directly to a cancer tumour inside a patient's body. Nanotechnology is a fascinating new field for those who are interested in combining many areas of science involving chemistry, biology and physics.

Physics gives astronomers the background they need to understand the almost unimaginable ideas behind the Big Bang, black holes and astrobiology. **Astrophysics** is a vast and demanding field that requires people with many different skills. Some are involved with the more theoretical side of astrophysics, such as studying general relativity, cosmology and black holes. Others observe and analyse data from telescopes, or spend their time building innovative new instrumentation for telescopes.

Not all people who complete a physics degree choose to work as scientists. Physics graduates possess many transferable skills such as problem solving, creativity and teamwork. Graduates easily find jobs in business, finance and management. Physics also provides training in computer science skills and graduates can readily find employment in this industry. Teaching science, journalism or working in science museums are also popular career choices for graduates who enjoy working with people and communicating their enthusiasm for physics to others.

IN OUR INCREASINGLY TECHNOLOGICAL SOCIETY, ENORMOUS OPPORTUNITIES EXIST FOR PHYSICS GRADUATES.