Innovative technologies. Members of the USP hold patents for products as varied as ozone producers, a low interference amplifier, and metal detector originating from ideas arising from the above-mentioned research projects, which are now being applied in the industrial sector.

When M.Sc. and Ph.D. students work on these projects they acquire knowledge and experience enabling them to work as physicists in a broad spectrum of careers. Students that have recently acquired their doctorates, now work in areas as varied as lecturers and researchers at universities, space scientists in California, a computer scientist in New York, financial engineer in Sandton, and technology developer in Saudi Arabia. There is a great shortage for such people, and no physicist that graduated in the past 30 years has ever been unemployed.

4. Physics Merit Bursaries

4.1 NWU Academic Merit Bursaries 2008

First year academic bursaries

Student average	Bursary value
85 %	Complete tuition fees
80 %	80 % of tuition fees
75 %	50 % of tuition fees
70 %	25 % of tuition fees

Students that have acquired 6 or more higher grade A-symbols and average of 85% or more in the matric final examination, qualify for a 125% discount on tuition fees.

Senior Academic Bursaries (2nd, 3rd years)

Student average	Bursary value
75 % and higher	50 %
70 % - 74 %	25 %
Student passes all subjects	10 %

4.2 Physics Merit Bursaries 2008

These bursaries are awarded above and beyond the NWU academic merit bursaries. **All bursaries depend on availability of funds**. Only a limited number of bursaries are awarded each year.

First year
If you have acquired an A-symbol in general science (higher grade) and major in Physics, you may apply for a bursary of R3 000.

If you have acquired a final average of 75% or higher for physics in your first or second year of study, and wish to continue your postgraduate studies in physics, you may apply for one of the following bursaries:

Second year. Bursaries of up to R8 000 each are available yearly.

Third year. Bursaries of up to R10 000 each are available yearly.

If you have acquired a final mark of 65% or higher in physics during your third or fourth year of study, you may apply for a bursary for postgraduate study.

Fourth Year (Hons. B.Sc.)
The bursary values are: 65-74%; R30 000; 75% and more: R35 000. These bursaries are awarded for a maximum duration of one year.

Fifth year (M.Sc.)
The bursary values are: 65-74%; R35 000; 75% and more: R40 000 awarded for a maximum of two years.

Ph.D. study: If you have acquired a final average of 65% or higher in your fifth year, you may apply for an amount of R50 000 to be awarded each year, for a maximum period of three years.

Various postgraduate bursaries are available from the National Research Foundation (www.nrf.ac.za) and other government institutions, e.g. the Department of Labour (for scarce skills).

Applications and Administration. First year students must apply within the first month of the academic year to the Subject Chair of Physics per letter. Bursary applications from the 2nd year of study and onwards are to be received by the Subject Chair of Physics in written form at the commencement of the academic year. In all cases, the personal NWU account of the successful applicant will be credited.

Sponsored bursaries. Enquiries regarding sponsored bursaries can be made at the Bursaries and Loan Office (NWU) by calling the following telephone numbers: 018-299-2188/89/93/4245.

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

School of Physical and Chemical Sciences
Subject Group: Physics

Unit for Space Physics

- **Study fields**
- **Job opportunities**
- **Bursaries**

Enquiries:
Subject Chair: Physics
Prof. H. Moraal
E-mail: Harm.Moraal@nwu.ac.za
Tel: (018) 299 2402
Fax: (018) 299 2421

Director, Unit for Space Physics:
Prof. R.A. Burger
E-mail: Adri.Burger@nwu.ac.za
Tel: (018) 299 2409/2423
Address: North-West University
Potchefstroom Campus
Potchefstroom 2520

1. The subject of Physics

Physics is the study of natural forces, and as new phenomena are discovered, these discoveries are applied to new technologies. Well-known examples of such technologies are the transistor, the laser, and the modern computer. Physics, along with Chemistry and Mathematics, form the core of the natural sciences, information technology and engineering.

2. A career in Physics

A physicist does **research** to discover new phenomena, applies this knowledge to **technology** and **trains** new physicists. There are approximately 1 000 physicists in South Africa, and there is a great shortage. These physicists work at institutions such as:

- **NECSA** (Nuclear Energy Commission of South Africa) in the manufacturing of silicon chips by radiation from the Safari reactor.
- **ARB** (Agricultural Research Board) in general technology development.
- **HartRAO** (Hartebeesthoek Radio Astronomy Observatory) in basic research.
- **IMT** (Institute for Maritime Technology) in geophysics, ocean and space technology.
- **MRC** (Medical Research Council and hospitals) as radiation technologists.
- **NAC** (National Accelerator Centre) doing basic research and developing radiation technologies.
- **SAAO** (South African Astronomical Observatory) doing basic research in stellar physics and astronomy.
- **SABS** (South African Bureau of Standards) in technology development.
- **SAWB** (South African Weather Bureau) developing weather and climate models.
- **CSRI** in technology development e.g. laser and aviation technology.
- **ESCOM** in the nuclear reactor industry at Koeberg and new developments such as the Pebble Bed Modular Reactor.
- **SANDF** (South African National Defence Force) in technology development or as a lecturer at the military academy in Saldanha.
- **De Beers** Industrial Diamond Division (now Element Six) doing basic and applied research on diamonds.
- **Telkom** Telecommunication, satellite technology, optical fibre technology, laser technology and nano-technology.
- **Universities, Technicons and secondary education institutions:** The physics lecturer working at a university or natural science teacher teaching at high school level is probably the most important people when it comes to stimulating technological progress of a country. These professions are of extreme importance for South Africa, and although they may not be the most popular choices, mind sets regarding these professions are starting to change.

3. Physics at the NWU

The **Subject Group: Physics** is part of the Faculty for Natural Sciences. In the first year, students choose four subjects from among Chemistry, Physics, Computer Science, Statistics and Mathematics, with Mathematics being compulsory. In the second year the student continues with three of these subjects, and in the third year the student continues with two of these subjects as main subjects for the B.Sc. degree. An honours degree is obtained after a fourth year of study. In the fifth year the student may enrol for an M.Sc. degree. During the completion of the M.Sc. degree a student will be required to do research for an M.Sc. thesis. As a final preparation for an academic career the Ph.D. follows, which takes three to four years to complete, during which the student is tasked to do original research in a specific area. All Ph.D. students are awarded bursaries or earn salaries as research assistants.

At the NWU, M.Sc. and Ph.D. students in Physics are trained at the **Unit for Space Physics (USP)**. This unit is one of the thirteen focus areas within which all the research done at the NWU are managed. Internationally the USP is held in high regard for the quality of training it delivers through the following programs:

Gamma-ray Astrophysics with specially designed telescopes. Since 1999 the USP has been the primary Southern African partner in an international group of physicists doing research with a world class gamma-ray telescope, costing almost R100 million, which was constructed by the Max Planck Institute for Nuclear Physics, Heidelberg, Germany at Gamsberg, Namibia.

Radio-astronomy. Members of the USP are co-workers at the Hartebeeshoek Radio Observatory near Krugersdorp.

Space Physics in Antarctica with projects involving ionospheric, magnetospheric and heliospheric Physics. Each year two postgraduate students are sent to the SANAE base in Antarctica, earning a full salary.

Heliospheric Physics and numerical modelling. Members of the USP distinguished themselves by studying phenomena observed by NASA and ESA space missions in the heliosphere with the aid of self-developed computer models (computational Physics).