

School of Physical and
Chemical Science
Subject group: Physics
and
Centre for
Space Research (CSR)



Study fields,
Job opportunities,
Bursaries

Enquiries: Graduate Students
Subject Group Chairman: Physics
Dr. H. Krüger
E-mail: Helena.Kruger@nwu.ac.za
Tel: (018) 299 2422
Fax: (018) 299 2421

Enquiries: Post-Graduate Students
Director: Centre of Space Research:
Prof. S.E.S. Ferreira
E-mail: Stefan.Ferreira@nwu.ac.za
Tel: (018) 299 2412 / 2423
Address: Northwest University
Potchefstroom Campus
Potchefstroom, 2520

Physics

Physics is a study of the forces of nature. As new phenomena are discovered, they are used in technological innovation. Together with Chemistry and Mathematics, physics forms the nucleus of Natural Sciences, Information Technology and Engineering.

“**Emerging Technologies**” of the past 50 years:

- the transistor,
- the laser, and
- the modern computer.

Career opportunities:

Physicists work at institutions such as:

- ▶ **NECSA** (Nuclear Energy Commission of South Africa), e.g. the manufacturing of silicon chips by irradiation with the Safari reactor.
- ▶ **SANSA**: The South African National Space Agency.
- ▶ **HartRAO**: Hartebeesthoek Radio Astronomical observatory: Basic research.
- ▶ **IMT**: Institute for Maritime Technology: Geophysics, Oceanic and Space Research.
- ▶ **MRC**: Medical Research Council (and hospitals) : Medical Physicists mainly applied to radiation technology.
- ▶ **NAC**: National Accelerator Centre: Basic research and Radiation Technology.
- ▶ **SAAO**: South African Astronomical Observatory : Basic Research on Astronomy and Astrophysics.
- ▶ **SABS**: Suid African Buro of Standards: Technology Development.
- ▶ **SAWB**: Suid African Weather Service: Development of weather and climate models
- ▶ **CSIR**: Council for Scientific and Industrial Research: technology development (e.g. in aviation and laser technology).
- ▶ **ESKOM**: Nuclear reactor industry such as Koeberg.
- ▶ **SANDF**: South African National Defence Force: Technology development and lecturing at the Military Academy in Saldanha.
- ▶ **De Beers**: Industrial Diamond Division (now Element Six): Basic and applied research on diamonds.
- ▶ **Telkom**: Tele-communication, satellite technology, optical fibre, laser technology and nano-technology.
- ▶ **Universities, Technikons, and Secondary Education**: Physics lecturers at Universities and a Science teachers at a high schools are probably the most important people to help the country's technological progress. For South Africa these careers are very important and even though they are not popular at the moment, the climate is changing fast!

A career in physics

- ▶ Research: to discover new phenomena,
 - ▶ Technology transfer to make the results of this research useful, and
 - ▶ Education to train new physicists.
- (Even though there are more than 1000 physicists in South Africa, there is still a shortage!)

Physics at the NWU

At the NWU M.Sc. and Ph.D. students in Physics are trained at the **Centre for Space Research (CSR)**, one of the Centres of Excellence at the NWU. The Centre for Space Research is internationally acclaimed for the quality of its training by means of research in the following fields:



Space Physics in Antarctika:

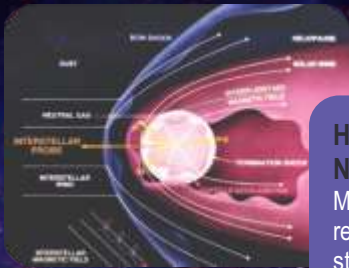
A postgraduate student is sent to the SANAE base in Antarctica annually for 14 months on full salary. He/she does a project in heliospheric physics, and care for instruments that record cosmic ray particles in these extreme weather conditions.

Gamma-Ray Astrophysics:

Since 1999, the North-West University is the principal South African partner in the world's leading gamma-ray observatory, the High-Energy Stereoscopic System near Windhoek, Namibia.



This array of five Cherenkov telescopes is an international project, led by German and French partners, with additional contributions from other European countries as well as the U.S.A., Australia, Armenia, South Africa and Namibia. It probes the most violent places of the Universe, including black holes, neutron stars, and supernova remnants.



Heliospheric Physics an Numerical Modelling:

Members of the CSR are renowned internationally for studying the phenomena observed by NASA and ESA space missions by means of self-developed computer models.

Radio-Astronomy and Star Formation:

Members of the Centre for Space Research collaborate with the Hartebeesthoek Radio Observatory, SALT, Meerkat and the SKA.



Innovative Technologies:

Resulting from the research projects mentioned above, members of the Centre for Space Research hold patents for technologies such as ozone generators, a low noise amplifier, an intelligent spark plug and a metal detector, which being commercialised for industry at present.



When M.Sc. and Ph.D. students work on these projects, they acquire knowledge and skills to allow them to apply physics internationally in a broad spectrum of areas. Some recent Ph.D. graduates work as lecturers and researchers at various universities, as space scientists in California, as computer technologists in New York, financial engineers in Sandton and technology developers for oil companies in Saudi-Arabia. **There is a shortage of skilled people and no physicist completing his / her studies the past 30 years has remained unemployed!**

Physics at the NWU

- ▶ Subject Group Physics is part of the Faculty of Natural Science.
- ▶ In the **first study year** students choose four subjects from Chemistry, Physics, Computer Science, Statistics, Applied Mathematics and Mathematics.
- ▶ In the **second year** three of these are continued.
- ▶ In the **third year** two subjects are chosen as main subjects for a B.Sc. Degree.
- ▶ In the **forth year** a B.Sc. Honours degree can be obtained by continuing with one subject (in this case Physics).
- ▶ In the **fifth year** students can subscribe to an **M.Sc. degree**, during which research is done for the first time for a M.Sc. Dissertation.
- ▶ As final completion of study, a **Ph.D. degree** follows (taking three to four years), during which students do original research on a field of study.
- ▶ All Ph.D. students receive bursaries or earn a salary as research associates.

NWU Academic Merit Bursaries 2012

Novice Academic Bursaries:

Awarded automatically to all full-time first year students meeting specified requirements. Vary from 40% to 110% of tuition fees. (More information can be obtained from Financial Support Services of the NWU).

Senior Academic Bursaries (2nd, 3rd years)

Student average	Award
75 % and higher	50 % of tuition fees
70 % - 74 %	25 % of tuition fees

Other Bursaries

- ▶ Several bursaries for post-graduate study are also available from the National Research Foundation (www.nrf.ac.za) and other government institutions e.g. the Department of Labour (for scarce skills)
- ▶ **Sponsored bursaries:** Enquiries can be made at Financial Support Services (NWU) at the following telephone numbers:
018-299-2045/6/9.

Physics Merit Bursaries 2013

- ▶ These bursaries are awarded on top of the NWU academic merit bursaries.
- ▶ All bursaries are subject to availability of funds.
- ▶ A limited number is available annually.
- ▶ Bursaries are adjusted annually and are free of tax.

Year	Requirements	Bursary
First year of study	<ul style="list-style-type: none"> ▶ Pass Physical Sciences at level 7 (80% - 89%) ▶ Take Physics as main subject 	R 5 000
Second year of study	<ul style="list-style-type: none"> ▶ A final average mark of 75% or better for Physics in your first or second year of study ▶ Plan on studying physics on post-graduate level 	Bursaries of up to R 10 000 each are available annually.
Third year of study		Bursaries of up to R 12 000 each are available annually.
Forth year of study (Hons. B.Sc.)	A final average mark of 65% or better for Physics in your third year	R 70 000, for a maximum of one year
Fifth year of study (M.Sc.)	A final average mark of 65% or better for Physics in your fourth year	R 75 000, for a maximum of two years
Ph.D. study	Average final mark of 65% or better for your M.Sc	R 106 000 per annum, for a maximum of three years

Applications and Administration of Bursaries.

First year students should apply by letter within the first month after the start of the academic year to the Physics Subject Group Chairman.

Applications from the second year students will be received in writing by the Subject Group Chairperson at the beginning of the year.

In all cases the student's personal NWU-account is credited.