

POSTGRADUATE PROGRAMMES

Stellenbosch University

Faculty of **AgriSciences**



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Growing our future

The Faculty of AgriSciences has been a **cornerstone** faculty of Stellenbosch University for more than a **century**.

The University is positioning itself as the leading research-focused higher education institution on the African continent. Academic excellence is non-negotiable, and quality always comes first. It counts among the **top 1%** of higher education institutions in the **world**. Based on the 2020 Times Higher Education World University Rankings, Stellenbosch University is ranked among the top 300 institutions in the world, and takes the third spot among leading universities in South Africa according to the QS Rankings. The university is home to 51 research chairs and 7 Centres of Excellence.

Its Faculty of AgriSciences is the only faculty at a South African university solely dedicated to **agricultural science**. We count among the **Top 50** such faculties at universities **worldwide**, and in 2017 and 2018 was rated as the **No. 1** specialist agricultural sciences faculty in **Africa**.

Our **tradition of excellence** stretches back over more than **100 years**. We have much to celebrate.

In our faculty, the first Pinotage wines took shape, and our wine biotechnologists have made five wine yeasts commercially available to the South African and international wine industry. Our cereal researchers and geneticists have developed 18 new cultivars of triticale or rye, nine of which have been made commercially available for planting to farmers. It is the place where viticulturalists put South Africa's first vineyard robot, the Dassie, through its paces. Our viticulturalists pioneered the in vitro cultivation of virus-free vines in South Africa. We are home to the only dedicated garagiste winemaker shortcourse in South Africa. In our faculty the first doctoral degree dedicated to biltong was completed, as well is the first in insect farming.

Our students do research on two experimental farms, and our Dohne merino stud on Mariendahl Experimental farm is the only one owned by a South African university. Our students also have access to an insectarium, the University's Central Analytical Facility, and plant breeding and cultivation facilities. Wines made in our Welgevallen wine cellar – the only one of its kind at a local university – has won gold medals.

It has always been a faculty with a very specific focus. Everything we do centres around growing and strengthening agriculture, forestry and the environment, and the people who are to work in and influence these sectors.

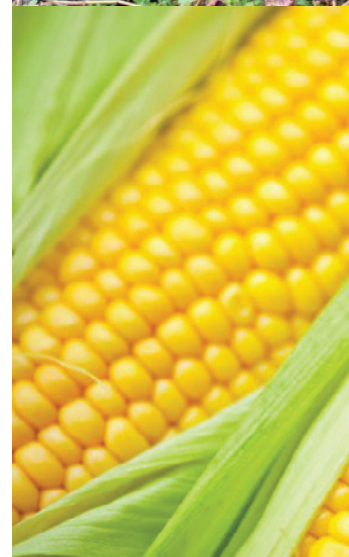
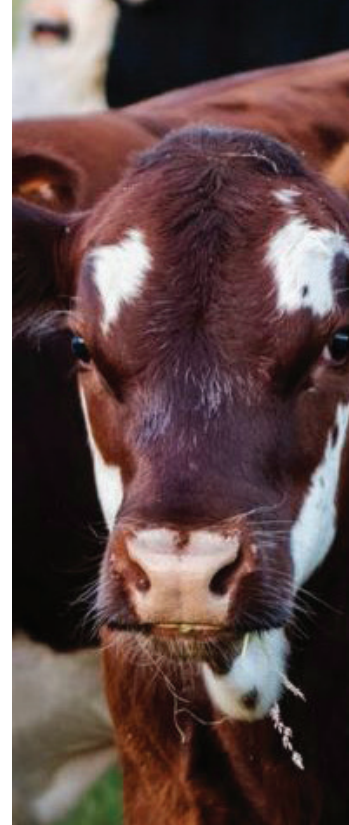
Our faculty is **home to:**

- 57 of Stellenbosch University's 485 nationally (NRF) rated researchers
- 97% academics with doctorates
- 104 academics and a support team of 127 people
- 1623 undergraduate students
- 555 postgraduate students

We are **proud that:**

- 75% of our postgraduate students consistently receive their degree within three years (Masters) or four years (PhD)
- 45 students received PhD degrees (2018)
- 98 students received Masters degrees (2018)

As a postgraduate student, you will be able to tap into the research funding made available by our industry partners and government. We also have a bursary scheme for at risk students.



Among the latest **research themes funded** by our industry partners are:

- Barley cultivation
- Food safety
- Eucalyptus tree research
- Wheat breeding
- Sheep nutrition

The Faculty's multiple national and international research alliances include sector specific and commodity groups in the local wine, wheat, food and fruit sectors. We have strong South African and multiple international research partnerships in Africa, Europe and North America. Our network of collaborators is also expanding to Asia and South America.

Our **research**

The Faculty's research responds to rapid changes in agriculture and the related fields by launching regularly new interdisciplinary initiatives on plant health, combining the specialised disciplines of ecology, plant pathology, entomology, virology and weed science; through agro-informatics, the facilitation of the uptake of data science across agricultural value chains and related services; and through post-harvest technologies, expanding the existing knowledge base by means of the incorporation of economics, engineering and food science.

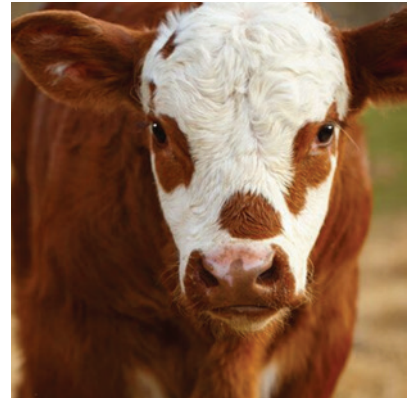
Other research focus areas also include livestock nutrition, aquaculture, genetic analysis, sustainable agriculture, agricultural policy, agribusiness development, climate change, conservation management, food science and product development and food safety management to name but a few.

Recent multidisciplinary postgraduate programmes include a MSc in Food and Nutrition (in collaboration with the Faculty of Medical and Health Sciences) and a MSc in Sustainable Agriculture (Multidisciplinary degree programme within the Faculty of AgriSciences).



DEPARTMENT OF **AGRICULTURAL ECONOMICS**

T: +27 (0)21 808 4758 | ekvw@sun.ac.za | www.sun.ac.za/english/faculty/agri/agricultural-economics



Focus areas include agribusiness management, farm management, rural and agricultural policy, agricultural marketing, environmental management and resource economics, agricultural production and resource management, international trade, marketing and econometrics.

Many of the Department's activities stem from the Agrifutura project and BFAP (Bureau for Food and Agricultural Policy), a cooperative project with the University of Pretoria and the Department of Agriculture: Western Cape. Research is aimed at developing understanding of how the environment affects agriculture, and making research results and information available to managers and policymakers in agriculture. Research focuses on improving the competitiveness of South African agriculture, on the effects of policy reform and on the optimal use of our natural resources.

POSTGRADUATE **QUALIFICATIONS**

BAgricHons (coursework); MAgric (coursework, research);
MScAgric in Agricultural Economics and Management (coursework, research);
PhD (Agric) (research); PhD (research)

VISIT US **ONLINE** >>>

DEPARTMENT OF **AGRONOMY**

T: +27 (0)21 808 4803 | agronomie@sun.ac.za | www.sun.ac.za/english/faculty/agri/agronomy



The research in this department focuses mainly on annual grain crops and pastures, intensive vegetable plant production systems and weed management. Conservation Agriculture (no-tillage, crop rotation and soil cover/cover crops) and other techniques for the sustainable production of crops (such as winter cereals, legume pastures and oilseed crops) in a Mediterranean climate are intensively researched.

Dairy-pasture research and integration of livestock in cropping systems are also focus areas. More recently the department has been engaging in climate change studies. Intensive plant production includes research on the physiology, yield and quality of crops grown in soil-less cultures in greenhouses and tunnels. Research on weed management includes aspects of identifying and managing herbicide resistant weeds as well as integrated weed management systems.

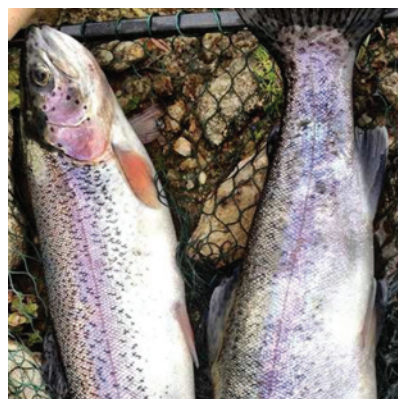
POSTGRADUATE **QUALIFICATIONS**

MScAgric (research); PhD (research); DSc (research)

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DEPARTMENT OF **ANIMAL SCIENCE**

T: +27 (0)21 808 4742 | talitha@sun.ac.za | www.sun.ac.za/english/faculty/agri/animal-science



The Department focuses its research mainly on basic and advanced aspects of applied animal nutrition, animal breeding, reproduction physiology and the management of domesticated farm animals, wildlife species and aquatic species to ensure the production of quality products from the species. Research is conducted on ruminant animals (i.e. dairy cattle, beef cattle sheep and goats; monogastric animals (i.e. poultry, pigs, ostriches and aquatic animals) as well as certain wildlife species. Emphasis is placed on the improvement of the production efficiency of farm animals by utilising technologies from the above-mentioned focus areas and by conducting research on aspects of the product quality of the respective animal products.

Students interested in a master's degree can register for the MSc(Agric) in Animal Science in one of the following specialist fields of study: animal nutrition, animal breeding, animal physiology or animal product sciences.

Prospective postgraduate students holding a relevant three-year BSc or B degree can apply for the Postgraduate Diploma in Aquaculture.

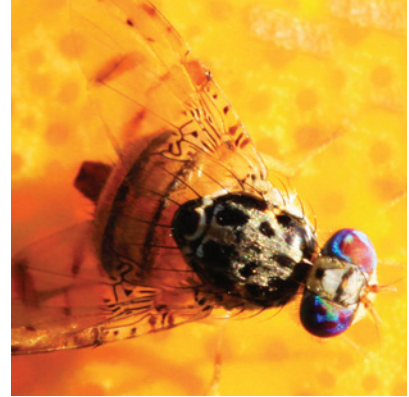
POSTGRADUATE **QUALIFICATIONS**

PGDip (coursework); MScAgric (coursework, research); PhD (research); DSc (research)

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DEPARTMENT OF CONSERVATION ECOLOGY AND ENTOMOLOGY

T: +27 (0)21 808 4775 / 3304 | collouw@sun.ac.za | mwenn@sun.ac.za | www.sun.ac.za/english/faculty/agri/conservation-ecology



CONSERVATION ECOLOGY:

We specialise in the sustainable management of plant and animal species, ecosystems and the goods and services they provide, primarily in production landscapes. We conduct research in, and train students to apply an understanding of the function and ecology of plant and animal populations, and of the complex living communities in the management of natural resources and landscapes. This includes the conservation and sustainable use of forest trees, natural grazing and fire regimes, large game species, the role of parasites, fungal-plant interactions, invasive alien plants and problem animals, the management of species, ecosystems and environmental processes in both formal and private protected areas, especially those in fragmented landscapes. Major research thrusts are the mitigation and restoration of ecological damage caused by agriculture (e.g. overgrazing), development, alien invasives and mining, as well as social assessment of rural communities, spatial prioritisation for improved decision-making for conservation activities, and the implementation of social learning institutions for the adaptive management of production landscapes.

ENTOMOLOGY:

The applied research focuses mainly on the integrated management of mite and insect pests and the concepts, rationale, and application thereof, especially to deciduous fruit, fruit fly management in the fruit industry, post-harvest entomology and plant nematological pests. Basic research is done on morphology and systematics, and the physiology and ecology of fynbos insects. We also explore the value of insects in the agricultural and forestry landscapes, both their diversity for conservation purposes and their function for agriculture. Agroecology forms an important part of this department with an emphasis on function of agroecosystems, especially through pollination, soil health and pest regulation. The Department houses an extensive collection of insects for study.

POSTGRADUATE QUALIFICATIONS

MSc in Conservation Ecology (research); MSc in Entomology/Nematology;
DSc in Entomology/Nematology; PhD in Entomology/Nematology; PhD in Conservation Ecology (research)

VISIT US **ONLINE** >>

DEPARTMENT OF FOOD SCIENCE

T: +27 (0)21 808 3578 | voedselw@sun.ac.za | www.sun.ac.za/foodsci



The Department of Food Science has a strong research culture based on the application of fundamental scientific principles and focuses on expanding our understanding of foods as biomaterials. The research initiatives cover a range of topics including chemical, processing, sensory, microbiological and safety aspects. Food science is an exciting field of study that applies the basic sciences to improve the flavour, appearance, shelf-life, quality, safety and nutritional benefits of our food supply.

- **Food and water Safety:** The food safety team conducts research in the multidisciplinary sphere of the food, environmental and public health nexus. Research focuses on the detection and identification of a diversity of microbial populations present in fruit, fruit juices, vegetables, dairy products, cereals, processed meat, livestock and fermented foods. The occurrence, identity, survival and control of spoilage organisms as well as food-borne pathogens, in the pre- and post-harvest processing environment are investigated. A One Health approach is followed to minimise the effects of foodborne pathogenic organisms on public health.
- **Cereal Quality:** The cereal quality research programme aims to develop greater understanding of the underlying factors determining and affecting cereal quality, using conventional cereal quality analysis techniques. In addition, non-destructive techniques such as X-ray microcomputed tomography are applied to characterise the microstructure of cereal grains as well as the bubble structure of doughs and baked products. Technology for automated grading of cereals for rapid defect detection is also investigated.
- **Vibrational spectroscopy and Chemometrics:** Conventional near infrared (NIR) spectroscopy and NIR hyperspectral imaging are used, in conjunction with chemometrics, for quantitative, qualitative and authentication studies. Advanced image analyses are applied to study spatially resolved hyperspectral images (chemical maps) of food and agricultural products. The newly established Vibrational Spectroscopy Unit of the Central Analytical Facility of SU is housed in the Department.
- **Sensory Science:** Sensory science research is often multidisciplinary, correlating chemical, sensory and physical quality of food products. Sensory quality is ascertained using trained panels and standard sensory profiling techniques such as descriptive analysis (DA). Rapid profiling techniques such as projective mapping, free sorting and polarised sensory positioning are validated for industry applications. These methods are extremely flexible and less time-consuming than DA, and are thus ideal for researching industry-related problems.
- **Sensometrics:** Sensory science research is complimented by sensometrics, advanced statistical methods to model sensory, chemical, physical, and/or consumer-liking data. Techniques such as partial least squares (PLS) regression are used to predict sensory bitterness of plant material, such as honeybush, using its phenolic composition.

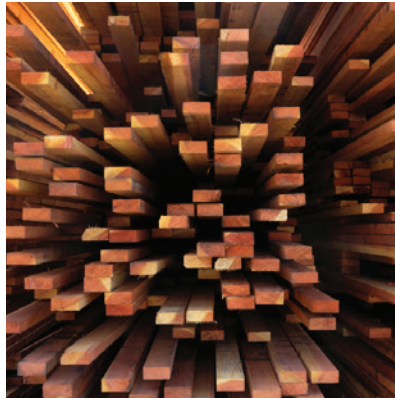
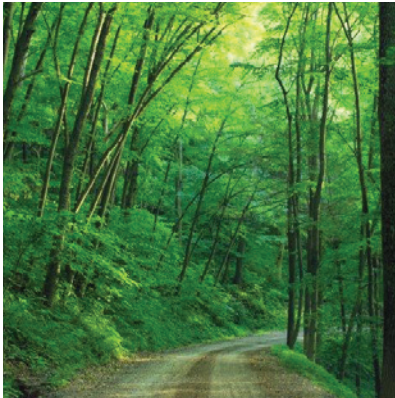
POSTGRADUATE QUALIFICATIONS

MSc in Food Science (research); MSc in Food and Nutrition Security (coursework and research);
PhD or PhD (Agric) in Food Science (research); DSc in Food Science (research)

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DEPARTMENT OF FOREST AND WOOD SCIENCE

T: +27 (0)21 808 3323 | wood@sun.ac.za | www.sun.ac.za/forestry



FOREST SCIENCE

Research to support resilient, sustainable forests include:

- The genetic improvement of trees, propagation of trees, site-species matching,
- Plantation silviculture, forest nutrition, forest ecophysiology and water use, agroforestry, carbon sequestration,
- Sustainable management of indigenous forests and woodlands as well as forest fire and fuel load management,
- Forest enterprises, product and markets.

Precision forestry research cover the following fields:

- Forest inventory, growth and yield modelling of natural and commercial plantation forests, process-based modelling, GIS and informatics, remote sensing and natural resource assessments
- Logistics and supply-chain management, operations research, harvesting systems optimisation,
- Optimal practices for forest road networks, and timber transport, costing and work-study protocols.

WOOD SCIENCE

- **Wood formation:** The formation of wood cells with a focus on the effect of environment on wood properties. The influence of climate, water availability, forest management practices, soil, and other environmental factors on wood cells and subsequently wood quality.
- **Wood and wood products properties:** Deepening study of the biological, physical and chemical properties of importance during the processing as well as the use of wood-based products. Include amongst others, micro and macro structures, biodegradation, wood/water relationship, thermal behaviour, mechanical strength, and electrical and acoustic properties.
- **Wood processing:** Further studies of the processes, economics and management of primary and secondary wood processing industries.
- **Green building:** The use and performance of wood based products in low cost, medium rise and residential housing construction. Included are engineered wood products, mass timber products, composite and wood plastic products in buildings.

POSTGRADUATE QUALIFICATIONS

PgDip (Forest and Wood Science) (coursework and research); MScFor (research);
PhD (For) (research); DSc (For) (research)

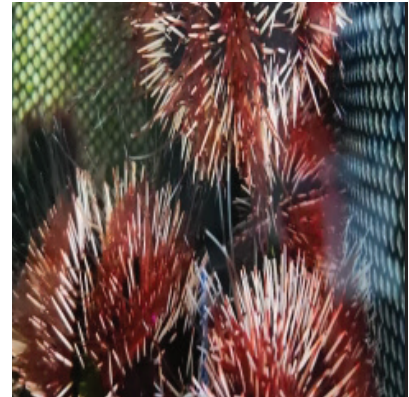
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DEPARTMENT OF GENETICS

T: +27 (0)21 808 5839 | mmeng@sun.ac.za | www.sun.ac.za/genetics

Institute for Plant Biotechnology (IPB)

T: +27 (0)21 808 3834 | pauliane@sun.ac.za | www.sun.ac.za/ipb



The Department of Genetics has well-developed research projects covering a wide range of topics.

In Plant Genetics, research includes, among others: molecular characterisation of grapevine virus diseases and development of virus resistance, rye and triticale breeding, cereal genomics and plant-insect interactions as well as fruit breeding and germplasm characterisation.

In Human Genetics research focuses characterising the molecular aetiology of mental health disorders and the underlying pharmacogenetics contributing to differential treatment outcomes.

In Animal Genetics research is conducted on various aquatic and other live-stock animals and involves determining genetic diversity and population dynamics for better management and conservation of these species.

The Institute for Plant Biotechnology is multidisciplinary environment with research focus areas involving the (i) dissection of carbohydrate metabolism in plants and microbes, (ii) genetic engineering of abiotic stress tolerance pathways into plants, (iii) use of functional metagenomic approaches in novel enzyme discovery and, (iv) study of plant growth promoting substances toward enhancement of crop yield and productivity.

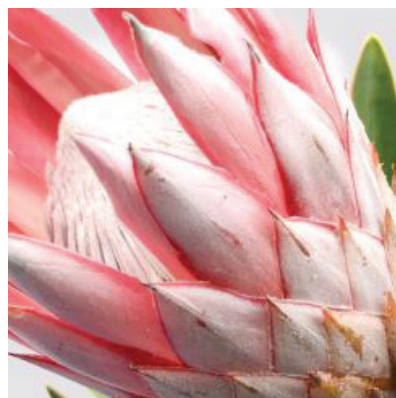
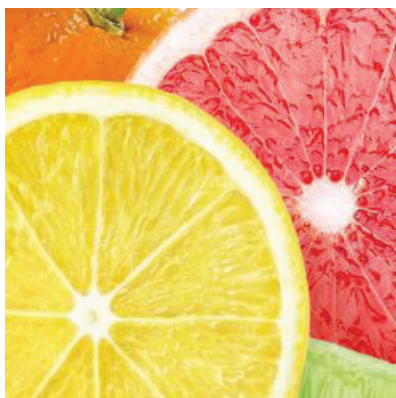
POSTGRADUATE **QUALIFICATIONS**

MScAgric (coursework, research); MSc (research); PhD (research); DSc (research)

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DEPARTMENT OF **HORTICULTURAL SCIENCE**

T: +27 (0)21 808 4900 | esmelouw@sun.ac.za | www.sun.ac.za/horticulture



The focus of our pre-harvest research is on the growth and reproductive development of fruit and nut trees, fynbos, fruit and flower quality, postharvest physiology and the transfer of technology. The underlying physiological mechanisms of winter dormancy and budbreak, tree training and pruning, fruit set and thinning, and fruit development and quality are explained and practical techniques for enhancing yield of high-quality fruit, nuts and flowers are tested in the orchard.

Postharvest research focuses on the investigation of fruit, nut and flower handling protocols, cooling and storage conditions for the optimisation of the shelf life and quality, as well as the underlying physiology of cell walls and membranes.

All research conducted by the Department is aimed at increasing the competitiveness and profitability of the economically important fruit, nut and flower industries of South Africa by providing value-adding science and technology.

POSTGRADUATE **QUALIFICATIONS**

BScHons in Applied Plant Physiology (coursework, research);
MScAgric (coursework, research); PhD (research); DSc (research)

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DEPARTMENT OF **PLANT PATHOLOGY**

T: +27 (0)21 808 4799 | ls3@sun.ac.za | www.sun.ac.za/plantpath



Research and training at the Department of Plant Pathology deal with some of the most important plant diseases of agricultural crops in South Africa and internationally. These include diseases of grapes, deciduous fruit, citrus, vegetables and grain crops. Our students are trained to investigate biotic and abiotic factors that contribute to the development of these diseases, and to manage them appropriately.

Our Department studies diseases that occur in farmer fields before crops are harvested, as well those that cause damage to crops after their harvest, such as decay of export fruits and contamination of grain crops with mycotoxins. We focus our research on the accurate identification and detection of fungal pathogens, and on the use of environmentally sound and sustainable ways to control them. These methods include targeted fungicide application, management of microbial and plant habitats, and the exploitation of plant defence responses for improved disease resistance.

Use is made of the latest technologies available in molecular biology, genetics and genomics, microscopic and computer analysis, and epidemiological modelling. By reducing plant diseases, the Department aims to increase the production of healthy and safe food to feed the South African population and to provide agricultural products for trade at local and international markets.

POSTGRADUATE **QUALIFICATIONS**

BScHons (coursework); MSc or MScAgric (research); PhD or PhD (Agric) (research); DSc (research)

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DEPARTMENT OF **SOIL SCIENCE**

T: +27 (0)21 808 4794 | grond@sun.ac.za | www.sun.ac.za/soil



Our teaching and research cover all aspects of soil science (pedology, soil chemistry, soil physics, hydrology and soil biology) as applied in agriculture, forestry, ecology and environmental science.

The postgraduate research projects deal mainly with the application of soil science to production-related disciplines (viticulture, horticulture, agronomy and forestry) and environmental and ecological studies (soil health, soil carbon sequestration, water quality, impact of invasive and natural vegetation on soils, and environmental impact studies). Recently, we established a multidisciplinary research project investigating the use of biochar as a sandy soil improver and carbon sequestration agent.

We are also well-equipped for fundamental research on pedology (formation and classification of soils) and on land evaluation, and are the only university department in the Western Cape offering a full range of programmes in Soil Science, including irrigation and water management.

POSTGRADUATE **QUALIFICATIONS**

MScAgric (coursework, research); PhD (research); DSc (research)

VISIT US **ONLINE** >>

DEPARTMENT OF VITICULTURE AND OENOLOGY

T: +27 (0)21 808 3770 | lorette@sun.ac.za | www.sun.ac.za/viti_oenol & www.sun.ac.za/wine_biotechnology

The South African Grape and Wine Research Institute



THE SOUTH AFRICAN GRAPE AND WINE RESEARCH INSTITUTE

Postgraduate Training and Research in Grapevine and Wine Sciences and Biotechnology at the Department of Viticulture and Oenology (DVO) are coordinated by the South African Grape and Wine Research Institute (SAGWRI) at Stellenbosch University. Students with a range of undergraduate backgrounds (Agricultural Sciences, Natural Sciences, Engineering etc) can be accommodated. The following programmes are included in the Department's' research portfolio:

- **The Grapevine x Environment x Management Interactions (GEMs) programme** involves the study of grapevines in interaction with their biotic and abiotic environments. In this GEMS programme research is being conducted that integrates aspects of vineyard characterization in terms of the site and climate, as well as the performance of the grapevines in terms of growth and fruit production and ripening. Very often, model vineyards are used to evaluate the impacts of particular abiotic, or biotic stresses to inform, or improve management practices. These projects typically span from the vineyard to the final products (wine or table grapes) and is therefore integrating different types of data. The use of remote sensing tools and/or the development of novel sensors to monitor the grapevine responses is also a key driver. Several academics contribute to this programme and a range of viticultural, physiological, molecular, analytical and advanced data analyses tools are routinely used. Students from diverse backgrounds (even without a background in Viticulture and Oenology) would be able to contribute to the research of this programme.
- **The Grapevine Biology/Biotechnology and Improvement programme** includes aspects of Grapevine Genetics, Genomics and Metabolomics. Projects in this programme may be co-supervised by several researchers as the projects are typically cross-cutting in their scope. In general, all research makes use of a combination of molecular tools, plant tissue culture, analytical techniques and computational approaches to answer questions surrounding grapevine cellular physiology in response to environmental and developmental cues.
- **The Digital Viticulture "New Tools for Precision Management" programme** focuses on improving the efficiency and quality of wine and table grape production through sensors, robots and advanced analytics. Our projects are related to climate change impacts on agriculture, estimations of water consumption using models and micrometeorological techniques, development of new computational and technological tools for precision viticulture and plant physiology and detection of water stress using Thermography, Remote sensing and Unmanned Aerial Vehicles.

- **The Spectroscopic Applications in Grape and Wine Sciences programme** works towards non-destructive analytical methods for process monitoring and quality control in Viticulture, Oenology and Wine Biotechnology. The analytical technologies used are near- and mid-infrared spectroscopy coupled with multivariate data analysis tools. Applications, mostly in the form of classification and regression models, using multivariate classification and calibration algorithms, are developed and transferred to industry. Infrared spectra are coupled to flavour chemistry (using mass spectrometry and chromatography) and sensory data on same samples for multi-block analysis. An important application area of infrared spectroscopy is multi-scale quality monitoring of table grapes – in the vineyard, at the packhouse and during cold storage. In another application the combination of spectroscopy, chemometrics and process control strategies can be used to implement process engineering solutions during wine fermentations.
- **The Wine Production programme** focusses on processes that can influence the quality and composition of wine in a cellar environment. These can include, among others, grape processing, juice treatments, fermentation and oxidation control and ageing regimes of wine. The aim of this program is to generate results that could be applied in a cellar set up to positively influence wine production and composition.
- **The Sensory and Consumer Science of Wine programme** involves the development and application of fit-for-purpose methods to obtain sensory profiles of wines; research into consumers' perceptions, acceptance of products; and rejection thresholds for off-flavour compounds in wine; chemical profiling of wines related to sensory studies and interaction studies within wine matrices.
- **The Wine Microbial Ecosystems And Biotechnology programme** is a multidisciplinary, integrated program and uses diverse complementary tools to assess the diversity of microorganisms in vineyards and wine fermentation processes and further explores the impact of mono- and mixed-cultures on wine properties. The molecular mechanisms underpinning interspecies interactions in diverse settings are investigated using a combination of microbiology, molecular biology and systems biology approaches. The current research topics include: Influence of viticultural practices on vineyard and fermentation microbiome; Yeast-yeast and yeast-bacteria interaction during fermentation; Yeast-microalgae for wine wastewater bioremediation; Using omics technologies to study microbial physiology and metabolism; Microbial strain improvement using biotechnology, breeding and directed evolution approaches; and Biochemical and oenological characterization of strains.

POSTGRADUATE QUALIFICATIONS

BScHons (Wine Biotechnology) (coursework and research project); MScAgric in Oenology, Viticulture or MSc in Wine Biotechnology (research); PhD and PhD (Agric) (research); DSc (research)

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