Department of Plant and Soil Sciences

Honours Project Guide

BScHons Crop Science
BScHons Medicinal Plant Science
BScHons Plant Science
BScHons Soil Science-Environmental Soil Science

Contents

Information on the Department of Plant and Soil Sciences

The Department of Plant and Soil Sciences is an entity formed out of the merger of the Departments of Plant Science and Plant Production and Soil Science. With over 30 academics, the department has a committed team of staff who aim to provide the very best undergraduate and postgraduate education in the broad arena of Plant Sciences, including plant taxonomy, ecology, medicinal plant science, biotechnology, agronomy, plant pathology, horticulture, and soil science. In addition, staff carry out locally relevant but internationally competitive research. Several staff are prominent leaders in these fields and are active members of relevant professional societies.

The department also co-hosts the DTS-NRF Centre of Excellence in Food Security, the SAFCOL Forest Chair and Director of the Forest Programme, and the DST/NRF SARChI chairs in Plant Health Products from Indigenous Knowledge Systems. In addition, several staff are affiliated with the Forest and Agricultural Biotechnology Institute (FABI).

We are housed in two buildings on the Hatfield Campus; the recently constructed Plant Sciences Complex, which is built with pioneering “green” architecture and state-of-the-art research facilities, and the Agricultural Building with associated labs and greenhouse facilities. The Department also has access to substantial plant growth and field trial facilities on the Innovation Africa@UP Experimental Farm.

The Department offers the following undergraduate programmes:

- BScAgric in Applied Plant and Soil Sciences
- BSc in Biotechnology (with the Department of Biochemistry, Genetics & Microbiology)
- BSc in Ecology (with the Department of Zoology and Entomology)
- BScAgric in Plant Pathology
- BSc in Plant Science

General Information on our Plant and Soil Sciences Honours Programmes

1. Programme coordinators

BScAgricHons *Crop Science* - Dr D. Marais: diana.marais@up.ac.za

BScHons *Plant Science* - Dr N. Creux: nicole.creux@fabi.up.ac.za

BScHons *Soil Science - Environmental Soil Science* - Mrs L. Mudaly: leushantha.mudaly@up.ac.za

2. Background and Objectives of the Honours programme

The Honours programs in Plant Sciences, Soil Sciences – Environmental Soil Sciences, and Crop Sciences at the University of Pretoria aim to produce graduates who are well-equipped to contribute to research, industry, and policy-making in the agricultural and environmental sectors, ultimately supporting sustainable development and conservation efforts. Each program is designed to build on the foundational knowledge gained during your undergraduate studies and to provide specialized training that prepares you for both research and practical applications in these respective fields, aligning with both national and global priorities.

The **Crop Sciences** Honours program is centered around improving agricultural productivity and sustainability. It covers advanced topics in crop physiology, agronomy, and plant breeding. The program equips you with the skills to tackle challenges in food security and crop production, focusing on innovative methods to enhance crop yields and resilience in varying environmental conditions.

The **Medicinal Plant Sciences** Honours program equips graduates with essential skills for the thriving and dynamic herbal product industry. A strong foundation in herbal medicine, including plant and human anatomy, physiology, and herb-body interactions, is crucial for effective product development and customer consultation. Students gain familiarity with globally and locally relevant medicinal plants, their properties, and uses. The program emphasizes practical skills in product development, GMP, quality control, stability strategies, and plant identification, harvesting, and processing. Graduates learn to apply scientific research to evaluate the efficacy and safety of herbal products, with a focus on analytical chemistry and phytochemistry. Problem-solving and innovative thinking are encouraged to navigate the rapidly evolving industry. Strong communication skills are developed for interacting with clients and educating them about medicinal plant products, with exposure to various formats of scientific communication.

The **Plant Sciences** Honours program focuses on areas such as plant diversity, plant ecology, plant physiology/biotechnology, and medicinal plant science. Students engage in research that contributes to

the understanding and improvement of agricultural crops, plant diseases, and the sustainable use of plant resources. The program emphasizes the application of molecular tools and conservation strategies for South Africa's rich and diverse vegetation.

The **Soil Sciences - Environmental Soil Sciences** Honours program aims to deepen your understanding of soil properties, management, and conservation. It covers critical areas such as soil chemistry, soil physics, soil fertility, microbiology, and sustainable land use. The program prepares graduates for roles in environmental management, agricultural development, and research, addressing a range of environmental challenges, and equipping students with tools to manage issues emanating from these, as well as decision-making skills for land use and management practices.

3. Study programme

The programme should be completed over one year (full-time, recommended) or two years (part-time, only under exceptional circumstances in BScHons Plant Sciences and BScHons Environmental Soil Sciences), depending on the time available for study. Students are required to register as full-time students and be present at the Department full-time to complete the Honours programme. Modules include theoretical work (presented mostly as contact modules and occasionally online) and complimentary practical work, which will be done under guidance during practicals. Students are also expected to carry out a practical project involving either laboratory or field work. The total number of credits should add up to 135.

Our Department offers several specialized Honours courses:

BScAgricHons in Crop Science (02241004)

BScHons in Medicinal Plant Science (02240706)

BScHons in Plant Science (02240707)

- Specializations include:
    - Plant Diversity
    - Plant Ecology
    - Plant Pathology
    - Plant Physiology / Biotechnology

BScHons in Soil Science - Environmental Soil Science (02240600)

BScHons in Biotechnology (02240393)

- This is an inter-departmental program available to suitably qualified students, with a Study Leader from the Department of Plant and Soil Sciences. For more details on the Biotechnology program, please contact Prof D. Nsibo at david.nsibo@up.ac.za or 012 420 4676. Additional information can be found here.

4. Outcomes

The outcomes of an Honours degree in our Department are determined by the field of study and the combination of modules selected. Common outcomes across all programs include conducting research, applying scientific reasoning, and effectively developing and improving verbal and written communication skills. Graduates from our Honours programs are well-equipped to pursue master's and subsequently doctoral degrees, enhancing their expertise and opening up further career opportunities in academia, research, and industry.

Below is an overview of the specific outcomes:

Crop Sciences

- In-depth knowledge of crop production, agronomy, and plant breeding
- Ability to enhance agricultural productivity and sustainability
- Preparedness for specialization in Agronomy, Horticulture, and Pasture Science at the master's and doctorate levels

Medicinal Plant Sciences

- Develop a foundational knowledge of herbal medicine, including how herbs interact with the human body, which is essential for effective product development and customer consultation.
- Gain familiarity with various plants, their properties, and uses, particularly understanding different species and their specific applications in products.
- Acquire skills necessary for herbal product development, including creating and formulating herbal products, as well as knowledge of good manufacturing practices (GMP), quality control, and product stability strategies.
- Obtain practical experience in identifying, harvesting, and processing medicinal plants.
- Apply scientific research to evaluate the efficacy and safety of herbal products, with an understanding of bioassay techniques, analytical chemistry, and phytochemistry.
- Understand business operations, marketing, and sales strategies, which are important for those looking to start their own herbal product businesses or work in commercial settings.
- Become familiar with national regulations and compliance related to indigenous knowledge and medicinal plant products to ensure that products meet legal standards.
- Develop strong communication skills to effectively interact with clients and educate them about herbal products and their benefits.

Plant Sciences (including Biotechnology):

- Expertise in environmental impact assessments (EIA),
- Plant identification and classification
- Extraction and isolation of bioactive compounds from medicinal plants
- Use of molecular biological techniques for the breeding of new crops and advanced crop protection,
- Deep understanding of the complex phytodiversity of southern Africa and its economic potential,

- Sustainable utilization of the diversity
- Consulting on matters ranging from environmental impact studies and wildlife management to genetically modified (GM) plants.

Soil Sciences-Environmental Soil Sciences

- Advanced understanding of soil science and its environmental applications
- Competence in sustainable soil management and practices
- Ability to apply scientific principles in addressing environmental challenges

5. Aim of the degree

After completion of the Honours degree, the student must have sufficient intensive theoretical subject knowledge to apply it independently, show insight, and be capable of discussing the subject with confidence. The student must be able to identify and formulate a problem, compile a project proposal with the necessary literature survey, conduct research under guidance, and present a report in the form of a mini-dissertation.

4.1. Prerequisites

A BSc degree with several relevant Plant Science modules at third year level is a requirement. It is strongly recommended that applicants have obtained at least 60% for 300 level modules, though this is not an absolute requirement to be accepted for the Plant and Soil Sciences Honours programmes. Each application will be considered individually, and the Head of Department will, after an academic staff meeting, make a final decision on whether an applicant will be accepted for the Honours program in Plant and Soil Sciences.

A minimum of at least 60% in Phytomedicine (or equivalent) is required for acceptance into Medicinal Plant Sciences Honours programmes. An admission examination may be required for entrance into the same.

4.2. Closing date

All applications for admission to the BScHons or BScAgricHons degree must reach the course co-coordinators BEFORE, OR ON THE **31st of OCTOBER** of the year preceding the intended study.

4.3. Duration of the degree

The degree extends over one academic year for **FULL-TIME STUDENTS** registered in all BScHons programs.

Only under exceptional circumstances, and with permission from the HoD, **PART-TIME STUDENTS** may register over one and a half to two consecutive years in BScHons *Plant Sciences*, BScHons *Biotechnology*, and BScHons *Soil Sciences-Environmental Soil Science*.

4.4. Nature of the Honours programme

The theoretical component of most modules is contact-based. All the study objectives and outcomes, literature references and assignment information for each module are available on the modules' ClickUP page. These pages become accessible to the student once you have registered for the particular module. E-mail is used, where students can communicate with fellow students and most importantly, the lecturers. The practical component of each module is completed during contact sessions in the course of the year.

For more information see:

BScHons *Biotechnology*

02240393 |Yearbook 2024 | University of Pretoria

BScAgricHons *Crop Science*

02241004 | Yearbooks 2024 | University of Pretoria

BScHons *Medicinal Plant Science*

02240706 | Yearbooks 2024 | University of Pretoria

BScHons *Plant Science*

02240707 | Yearbooks 2024 | University of Pretoria

BScHons *Soil Science-Environmental Soil Science*

02240600 | Yearbooks 2024 | University of Pretoria

Academic Staff Directory

This directory provides a comprehensive list of all academic members in the Department of Plant and Soil Sciences, including their sections and roles. The purpose of this is to facilitate easy communication within our Department by allowing you to quickly find and connect with Study Leaders. Each profile includes information to help you understand their research focus and expertise.

Should you be interested in pursuing your BScHons research in any of these areas, you are encouraged to contact the relevant Study Leader directly for more information.

- Plant Diversity
  - Prof Nigel Barker
  - Prof Peter le Roux
  - Prof Michelle Greve
  - Dr Kenneth Oberlander
  - Dr Angelique Kritzinger
- Plant Ecology
  - Prof Nigel Barker
  - Prof Peter le Roux
  - Prof Michelle Greve
  - Dr Kenneth Oberlander
- Plant Pathology
  - Prof Quenton Kritzinger
  - Prof Jacquie van der Waals
  - Dr Khumbuzile Bophela-Dimpe
  - Dr Jarishma Gokul
  - Dr Tshima Ramakuwela
- Plant Biotechnology / Physiology
  - Prof Dave Berger
  - Dr Nicky Creux
  - Dr David Nsibo
- Medicinal Plant Science
  - Prof Namrita Lall
  - Prof Emmanuel Tshikalange
  - Prof Quenton Kritzinger
  - Dr Johanna Bapela
  - Dr Gary Stafford
- Crop Science
  - Prof John Annandale
  - Prof Martin Steyn
  - Prof Eyob Tesfamariam
  - Prof Elsa du Toit
  - Prof Juan Vorster
  - Dr Robert Mangani
  - Dr Diana Marais
  - Dr Nicky Taylor
- Soil Science - Environmental Soil Science

    - Prof John Annandale
    - Prof Martin Steyn
    - Prof Eyob Tesfamariam
    - Dr Jarishma Gokul
    - Mrs Leushantha Mudaly
- Biotechnology (inter-departmental degree)
    - Prof Dave Berger
    - Prof Juan Vorster
    - Dr Nicky Creux
    - Dr Jarishma Gokul
    - Dr David Nsibo
- Bioinformatics (in BGM)
    - Prof Dave Berger
    - Dr Nicky Creux
    - Dr Jarishma Gokul
    - Dr David Nsibo

Prof Dave Berger
Professor | Head of Department
BSc (Hons) PhD (UCT)
dave.berger@fabi.up.ac.za

Profile Prof Dave Berger

MPPI research group website

Projects offered in:
BScHons *Plant Science* (Plant Physiology / Biotechnology specializations)
BScHons *Biotechnology*
BScHons *Bioinformatics*

Prof Berger's general research field is molecular plant pathology. His research seeks to gain a molecular understanding of host-pathogen interactions in crops important for food security in Africa. He is principal investigator of the Molecular Plant-Microbe Interactions (MPPI) research group, which is also affiliated with the Forestry and Agricultural Biotechnology Institute (FABI) at the University of Pretoria.

His current research programme is focused on foliar diseases of maize, particularly grey leaf spot (GLS) of maize caused by the fungus *Cercospora zeina*. GLS is a globally important disease prevalent in the Americas, Asia, and throughout sub-Saharan Africa including South Africa. Research on the pathogen addresses the question: "What is the diversity and molecular basis of pathogenicity in the fungus *Cercospora zeina*?" The strategy includes population genetics, comparative genomics and functional genomics approaches with the aim to develop innovative control methods. His research has a strong collaborative element, both locally and internationally, and this extends to projects on important crops outside the maize-GLS research programme. Currently, he has a genomics project on an endemic tree with medicinal value, working with international partners.

Prof Berger was the recipient of the National Science and Technology Forum (NSTF) – South32 award in "Crop Science and Food Security" in 2016, and two awards for Capacity Building in Biotechnology from the Department of Science and Technology, and the Gauteng Provincial Government.

Prof Berger currently holds a B2 rating from the NRF that reflects him as an internationally acclaimed researcher.

Prof Quenton Kritzinger
Associate Professor | Chair: Teaching and Learning
BSc (Hons) MSc PhD (UP)
quenton.kritzinger@up.ac.za

Profile Prof Quenton Kritzinger

Projects offered in:
BScHons *Medicinal Plant Science*
BScHons *Plant Science* (Plant Pathology specialization)

Prof Kritzinger's research integrates mycology, seed pathology, and medicinal plant sciences. He leads the MycoBio research group and focuses primarily on mycotoxin-producing fungi, the mycotoxins they produce, and their impact on orphan crops. His research delves into the phytotoxic properties of various mycotoxins, particularly examining their effects on cowpea (*Vigna unguiculata*) at molecular, physiological, and biochemical levels. Additionally, he investigates how storage systems - especially those used by smallholder farmers - affect seed quality in various legume and grain crops.

Prof Kritzinger also explores the antimicrobial potential of extracts and isolated compounds from indigenous South African plant species against plant pathogens, especially mycotoxin-producing fungi. His goal is to develop botanical fungicides from these plant extracts as a sustainable and environmentally friendly alternative for preventing and controlling fungal infestations and mycotoxin contamination in stored grains. Most of his research projects aim to enhance food security for smallholder farmers and rural communities in South Africa and across the African continent.

He has supervised/co-supervised 23 BScHons students, 19 MSc students, and 4 PhD students.

Prof Kritzinger currently holds a C2 rating from the NRF that reflects him as an established researcher.

Prof Martin Steyn
Professor | Chair: Postgraduate Studies and Research
BSc (Agric) BSc (Agric) Hons MSc (Agric) (UFS) PhD (UP)
martin.steyn@up.ac.za

Profile Prof Martin Steyn

Projects offered in:
BScHons *Crop Science*
BScHons *Soil Science-Environmental Soil Science*

Prof Steyn's research focus is on the agronomy and water requirements of field crops. He specializes in potatoes and has been involved in potato research for the past 37 years, first at the Agricultural Research Council (ARC), and since 2001 at UP. His current research focus is on the improvement of irrigation management practices, potato production in a changing climate and the development of more sustainable crop production practices.

Prof Steyn collaborates with scientists, research organisations and companies nationally and internationally. He has presented numerous lectures as speaker and invited speaker at international congresses. He served on the council of the South African Society of Crop Production for several terms and in various positions, including president of the society. He is a processing editor (Agronomy section) of the international journal Potato Research.

He has supervised/co-supervised 25 PhD and 46 Masters studies and he currently acts as the supervisor and co-supervisor of a further 13 postgraduate students. He authored and co-authored >80 scientific papers in peer-reviewed journals, 11 book chapters and > 65 semi-scientific and popular articles.

Prof Steyn currently holds a C1 rating from the NRF that reflects him as an established researcher.

Prof John G Annandale
Professor
BScAgric (Hons) MScAgric (UP), PhD (WSU)
john.annandale@up.ac.za

Profile Prof John Annandale

Projects offered in:
BScHons *Soil Science-Environmental Soil Science*
BScHons *Crop Science*

Prof Annandale is part of a very active Water Research Group in the Department that is well supported by the Water Research Commission (WRC) and industry. This group has developed the Soil Water Balance model (SWB), which has been used and further developed by many staff and students over the years.

His group have recently updated the South African Irrigation Water Quality Guidelines, and developed a user-friendly decision support system (IrrigWQ) that produces multi-tier, risk based guidelines to determine fitness for use or objective setting. In addition, after more than a decade of research in the mining industry, they are once again demonstrating the feasibility of large scale mine water irrigation, on both unmined and rehabilitated mine land. They have developed Technical Guidelines for mine water irrigation and have just completed the first draft of Guidelines on the Irrigation of Rehabilitated Mined Land. His research covers the Coalfields of Mpumalanga, and the Goldfields of the Witwatersrand. A dynamic group of students are involved in these projects, covering aspects of Soil Chemistry, Soil Physics, Plant Nutrition, Water and Solute Balance Modelling, the Economics of Mine Water Irrigation, and the Movement of Salts through the Landscape (surface and groundwater flows).

Prof Annandale currently holds a C1 rating from the NRF that reflects him as an established researcher.

Dr Johanna Bapela
Lecturer
BSc (Hons) MSc PhD (UP)
johanna.bapela@up.ac.za

Profile Dr Johanna Bapela

Projects offered in:
BScHons *Medicinal Plant Science*

Dr Bapela's research area is mainly focused on bioprospecting indigenous plants for antiprotozoal and antimicrobial plant products, in close co-operation with French, Swiss and South African collaborators. South Africa, with its rich biodiversity and cultural diversity, could serve as a resource base of therapeutic plant leads with new mechanisms of action. Screening plants based on ethnopharmacological approaches seems to increase the likelihood of finding novel compounds due to their long history of safe use and may therefore increase the prospects of finding novel chemotherapeutic agents.

Current projects include ethnobotanical surveys of medicinal plants used by indigenous South Africans, *in vitro* screening of the selected plants against pathogens of interest, and phytochemical analyses of the bioactive principles in herbal remedies. In addition, metabolomics is being explored as a valuable tool for rapid discovery of phytotherapeutics.
Dr. Bapela has published articles in peer-reviewed journals and is supervising/co-supervising postgraduate students. She is also a member of University of Pretoria Institute For Sustainable Malaria Control (UP ISMC).

Prof Nigel P Barker
Professor
BSc (Hons) MSc (Wits) PhD (UCT)
nigel.barker@up.ac.za

Profile Prof Nigel Barker

Projects offered in:
BScHons *Plant Science* (Plant Ecology specialization)

Prof Barker has an interest in DNA-based methods applied to the systematics and population biology of a range of plant (and previously also animal) species, including grasses, legumes, Proteaceae and daisies. He established the Great Escarpment Biodiversity Programme (GEBP) in 2006, a multidisciplinary research group which documents the plant and animal diversity, abundance and distribution across the main mountain range of southern Africa, from Angola through Namibia, South Africa, Lesotho to Zimbabwe. He is currently the Principal Investigator of a similar research project to document the diversity of the Waterberg in Limpopo province. His current research interests continue to be focused on plant systematics (especially of groups of plants that are orphan crops), montane biodiversity but he also has interests in the mite – plant mutualism as mediated by leaf domatia, and an interest in soil microbial biodiversity, plant genomics and orphan crops.

His current research interests span the genetic diversity, taxonomy, and ecological management of various plant species. He is investigating the genetic diversity of *Englerophytum magaliesmontanum*, a unique tree species endemic to rocky ridges in Mpumalanga, Gauteng, and Limpopo, using DNA sequence data to understand its variability across its distribution range. In collaboration with Dr Robert McKenzie and Prof Per-Ola Karis from Stockholm University, he is reassessing species complexes within the genus *Berkheya* (Asteraceae) to address taxonomic issues identified in ongoing molecular phylogenetic studies and fruit morphology assessments. Additionally, he is looking into the germination requirements and seedling growth of *Stoebe vulgaris* (bankrotbos), an invasive species that transforms agricultural land into "green deserts." This research aims to identify factors influencing seed germination and seedling growth to inform effective control measures.

Prof Barker currently holds a C1 rating from the NRF that reflects him as an established researcher.

Dr Khumbuzile Bophela-Dimpe
Lecturer
BSc (Hons) MSc PhD (UP)
khumbuzile.bophela@up.ac.za

Profile Dr Khumbuzile Bophela-Dimpe

Projects offered in:
BScHons *Plant Science* (Plant Pathology specialization)

Dr Bophela-Dimpe has a research focus on sustainable disease management, i.e., developing management strategies that are economically and environmentally friendly to control soilborne- and foliar diseases of agriculturally significant crops (e.g., citrus, maize). Her other research interests include the biology and ecology of plant pathogenic bacteria; plant-pathogen interactions, i.e. involving single species or polymicrobial interactions; molecular biology; plant disease epidemiology; soil and plant health.

In 2021, she was nominated and won the Inspiring Fifty award, a non-profit initiative that benchmarks the 50 most inspiring women in STEM fields as important role models to encourage more girls and women to follow careers in STEM. She has presented her research at both local and international conferences as well as at industry symposia. She is the current northern branch chairperson of the Southern African Society of Plant Pathology.

Dr Bophela-Dimpe has successfully mentored 2 honours students and 2 BSc.Agric final year students. She continues to supervise and mentor 2 masters and 3 honours students in the biological and agricultural sciences. Dr Bophela-Dimpe has published research papers in ISI-rated journals comprising work completed in her master's and PhD, co-authored a book chapter and two publications.

Dr Nicky Creux
Senior Lecturer
BSc (Hons) MSc PhD (UP) PDF (UC Davis)
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Profile Dr Nicky Creux

Crop Floral Biology and Environments website

Projects offered in:
BScHons *Plant Science* (Plant Physiology / Biotechnology specializations)
BScHons *Biotechnology*
BScHons *Bioinformatics*

Dr Creux's research combines both molecular genetics and plant/flower physiology to understand how crop biology is influenced by and responds to extreme weather events, which are predicted to become more frequent and more severe as climate change progresses. Her research focuses on understanding how these weather changes will impact the timing of flower maturation, pollinator visits, pollination and ultimately crop yield both on a physiological and molecular level. Dr Creux's research team currently has three main projects running. The first is focused on understanding the gene networks and molecular pathways modulating sunflower's floral response to elevated temperature. Under these conditions sunflowers present their pollen earlier which coincides with earlier pollinator visits and facilitates pollination even under adverse conditions. Sunflowers are often planted as a backup crop when the rains come too late to plant maize or soy. The research shows that planting date can have a significant impact on Sclerotinia head rot progression. This is a major disease limiting sunflower production in South Africa and they show that plantings that facilitate flowering during the warmer months are more likely to limit disease progression. Her team is also working to develop escape strategies for Sclerotinia head rot using plant growth regulators.

As part of the GrainSA's Climate Resilience Consortium, a large collaborative project that includes members from the ARC and the University of the Free State, she is involved in investigating the factors limiting yield at later planting dates including, water, temperature, pollination and disease incidence.

Being a part of this team will teach several important skills including plant cultivation (indoor and field settings), plant physiological measurements, plant molecular biology, bioinformatics and data analysis. The combination of the skills learnt will depend on the project design which will be designed with the student to include student interests. Other skills, e.g., reading or writing skills and soft skills, such as teamwork or time management are also taught when the student joins this dynamic research team.

Prof Elsa S du Toit
Professor
BScAgric (Hons) (*Cum Laude*) MScAgric (*Cum laude*) PhD (UP)
elsa.dutoit@up.ac.za

Profile Prof Elsa du Toit

Projects offered in:
BScHons *Crop Science*

Prof du Toit's research group is particularly focused on rootstock micropropagation, contributing to the sustainable growth and development of avocado crops. Over a 20-year period her research group developed best horticultural practices for multipurpose crops, including herbs, medicinal plants and undomesticated tree crops, such as moringa. Propagation, including in vitro culture, cultivation, seed longevity, reproductive biology, and sustainable production of bio-activity in leaves form the present focus for her research in crop improvement.

She teaches undergraduate courses: Nursery Management: Principles and Practices (3rd year course) and Ornamental Horticulture (4th year course). She also manages and supervises students in her tissue culture laboratory at the University of Pretoria, which is supported by the Avocado industry.

Prof du Toit currently holds a C2 rating from the NRF that reflects her as an established researcher.

Dr Jarishma K Gokul
Lecturer
BSc (UCT) BTech (Hons) (DUT) MSc (UWC) PhD (AberU) PDF (UP)
jarishma.gokul@up.ac.za

Profile Dr Jarishma Gokul

AgriMicrobiome Research Group website

Projects offered in:
BScHons *Plant Science* (Biotechnology / Plant Pathology specialization)
BScHons *Soil Science-Environmental Soil Science*
BScHons *Bioinformatics*

Dr Gokul is an early career researcher whose research is focused on investigating communities of microorganisms - like bacteria, fungi, archaea and viruses - that live in soil, water, plants, or animals. Her research explores how these microbes interact with each other, their environment, and their host, and how they can influence health, disease, and ecosystem functions. Using cutting edge high-throughput DNA sequencing techniques combined with sophisticated bioinformatics tools, we can understand the diversity and putative functions of the microbial community present using vast datasets.

Dr Gokul developed the AgriMicrobiome Group (AMG) in 2021. She and her team of postgraduate students investigate the microbial ecology of soil, water, and commercial and indigenous plant microbiomes to understand the contribution of these communities to food production and security, health and wellbeing. She also contributes to previous and ongoing research towards understanding the impacts of climate change on Drakensberg soils, Arctic glaciers, Antarctic soils and permafrost, and Namib soils. In 2024 Dr Gokul was selected to be in the inaugural cohort of ACGT stakeholders to form the Consortium for Integrative Microbial and Omics Research (CIMOR). She was a fellow in the 2021 - 2022 cohort of the ARUA-UKRI GCRF Food Systems Research Network for Africa (FSNet-Africa) and received an award for Inspiring Fifty SA women in STEM in 2021.

She supervises/co-supervises 1 BScAgric student, 2 BScHons students, 4 MSc students and 7 PhD students since 2021 and mentored >25 students. She has authored/co-authored 15 peer-reviewed articles in internationally recognised journals and written 2 popular articles, in addition to regularly participating in local and international conferences and events on microbiology and microbial ecology.

Dr Gokul currently holds a Y2 rating from the NRF that reflects her as a promising young researcher.

Prof Michelle Greve
Associate Professor
BSc (Hons) MSc (SU) PhD (AarhusU)
michelle.greve@upac.za

Profile Prof Michelle Greve

Projects offered in:
BScHons *Plant Science* (Plant Ecology specialization)

Prof Greve's research reflects her interest in biogeography, i.e., understanding how patterns of diversity and distribution of organisms have come about, what these patterns tell us about the evolutionary drivers of these patterns, and how we can use this information for conservation prioritisation, with a particular focus on the Southern Hemisphere. She links these interests to understanding functioning, structure and diversity in savanna and grassland systems, and on the Prince Edward Islands.

Other projects relating to GIS applications such as modelling species distributions, mapping habitat loss across southern African savannas, as well as understanding woody encroachment could also be tackled.

She has published in high-ranking journals such as *Nature Communications*, *Global Ecology and Biogeography* and *Journal of Biogeography*, and her work has been featured in *Science* and in the popular media

Prof Greve currently holds a C2 rating from the NRF that reflects her as an established researcher.

Dr Angelique Kritzinger
Lecturer
BSc (Hons) MSc PhD (UP)
angelique.kritzinger@up.ac.za

Profile Dr Angelique Kritzinger

Projects offered in:
BScHons *Plant Science* (Plant Physiology specialization)

Dr Kritzinger has research interests in plant anatomy and pollination biology of macadamia and pecan nut crops. Her research focuses on industry applications related to nut production, alternate bearing, and out-of-season flowering.

She is driven by a passion for bridging scientific research and practical industry applications, and she actively collaborates with agricultural stakeholders. Her current research aims to optimise nut production, increase crop yield, and enhance profitability for growers.

Dr Kritzinger is currently supervising 1 PhD, 5 MSc and various honours students. In addition, she has authored and co-authored two peer reviewed papers and some popular science articles for industry. She also engages with industry role players on a regular basis and attend national and international conferences related to reproductive biology.

Prof Namrita Lall
Professor
BSc (Hons) MSc (WSU) PhD (UP)
namrita.lall@up.ac.za

Profile Prof Namrita Lall

Projects offered in:
BScHons *Medicinal Plant Science*

Prof Lall is one of the founders of the development of a new, one-of-a-kind, specialized field, called "Medicinal Plant Sciences" at the postgraduate level in January 2007 at the University of Pretoria. She has been working on medicinal plants for over 20 years and has succeeded in validating traditional knowledge using science to prove the efficacy of these plants. Prof Lall's research area involves antituberculosis natural product leads from medicinal plants, cytotoxicity of plant extracts/compounds, anticancer activity of medicinal plants, medicinal plants for skin disorders, periodontal diseases, and isolation and purification of bioactive chemical compounds from plants. One pharmaceutical product has been commercialised and another 13 pharmaceutical and cosmeceutical products which have resulted from her research programme are close to commercialization.

She holds a National Research Chair in Plant Health Products from Indigenous Knowledge Systems, which was awarded by the NRF/DST in 2016. She has received funding from the National Research Foundation, Medical Research Council, Water Research Commission and the Department of Science and Technology for many years.

She has supervised 34 MSc students and 26 PhD students. Majority of them were South Africans and a few with other nationalities (German, Cameroonian, Mozambican, Indian, Iranian and Egyptian). At present, she is the supervisor/co-supervisor of seven Masters, 8 PhD students.

Prof Lall currently holds a C1 rating from the NRF that reflects her as an established researcher.

Prof Peter C. le Roux
Professor
BSc (Hons) (UP) MSc PhD (SU)
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Profile Prof Peter le Roux

Projects offered in:
BScHons *Plant Science* (Plant Ecology specialization)

Prof le Roux's research chiefly focuses on understanding the biotic and abiotic determinants of species distributions, with a particular interest in how interspecific interactions might mediate, and be affected by, the ecological impacts of climate change. His research has largely been conducted within abiotically extreme environments, including sub-Antarctic islands, sub-Arctic tundra and alpine grasslands.

Current projects investigate

- how biotic and abiotic conditions affect the performance or distribution of plant species,
- how environmental conditions impact the expression of functional traits,
- forecasting the effects of changing climatic conditions on community composition and ecosystem functioning, or
- predicting how ecosystem engineers affect grazing quality and grazing capacity.

Several datasets that could be the basis for Honours projects have already been collected, but whenever possible students will have opportunities to collect their own data and will likely assist with the collection and processing of other datasets being developed in the research group.

His research has resulted in 3 book chapters and > 75 publications in ISI-accredited journals.

Prof le Roux currently holds a B3 rating from the NRF that reflects him as an internationally acclaimed researcher.

Dr Robert Mangani
Lecturer
BSc (Hons) MSc PhD PDF (UP)
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Profile Dr Robert Mangani

Projects offered in:
BScHons *Crop Science*

Dr Mangani is an early career researcher whose interests include agronomy, agro-meteorology, crop modelling, climate change, rural development and food security. His area of research focuses on how climate change will impact crops and how we can come up with measures to help reduce its impact. This includes the use of crop modelling. Also included are field and chamber studies that evaluate how elevated temperatures, carbon dioxide, and both limited and excessive rains might influence yields. In his work, he enjoys addressing problems facing farmers (especially subsistence farmers) through community-based projects.

He is currently working on the following two projects:

1. Impact assessment of climate change on soybean yield and water productivity in South Africa.

2. Prediction of phenology and grain yield of irrigated soybean (Glycine max L. Merr.) in southern Africa under different planting dates and maturity groups.

Dr. Mangani is an alumnus of the Tuks Young Leadership Programme which aims to grow early career academics at the University of Pretoria in the areas of thought leadership, team development, engagement, and collaboration, to enable them to solve the complex issues faced by society. He has received awards for his research, namely, the Early Career Conference Grant in 2024 to attend the 13th Congress of the African Crop Science Society funded by the Association of Commonwealth Universities (ACU) to be held in Mozambique in September 2024.

Dr. Mangani has published research papers in ISI-rated journals and presented his research at both local and international conferences, as well as at industry symposia. He has supervised 3 BScHons students to completion with a further 1 BScHons student, 4 Master's students, and 2 PhD students.

Dr Diana Marais
Senior Lecturer
BScAgric (Hons) MScAgric PhD PGCHE (UP)
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Profile Dr Diana Marais

Projects offered in:
BScHons *Crop Science*

Dr Marais coordinates the BScAgric(Hons) in Crop Science programme with an average of 5 students per year. Her research mainly focuses on the general agronomic practices of crop production in the various crops, but most of the work involves either plant nutrition or water use, water-use efficiency and nutrient water productivity. Current research crops include commercial and wild ginger, various vegetables and maize. She is also involved with the long term maize fertilizer trial at UP which was started in 1939 by Prof Haylett. In her most recent research, she has also worked closely with food security which has sparked her interest in the field of addressing human nutrition through legume and vegetable crops.

During her 28 year journey at UP she had the privilege of working with researchers and students from all over the world, doing research on industrial, grain and vegetable crops. She is an active member of the South African Society for Crop Production (SASCP) and African Crop Science Society (ACS). She is also serving on the ACS as the Southern African representative.

Her teaching activities are AGR 410 Vegetable crops, AGR 361 Field and industrial crops, AGR 785 Crop production systems I – Field crops and AGR 786 Crop production systems II – Vegetable crops.

She has supervised/co supervised 27 MSc students and 6 PhD students, with 5 MSc and 1 PhD currently in the system.

Mrs Leushantha Mudaly
Lecturer
BSc (Hons) MSc (UP)
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Profile Mrs Leushantha Mudaly

Projects offered in:
BScHons *Soil Science-Environmental Soil Science*

Mrs Mudaly is an early career researcher who co-ordinates the Soil Science Honours programme. Her broader research interest is in soil and water science. Current research involves nutrient modelling at field and catchment scale, specifically looking at the fate of non-point source pollution. Other specific interests include soil redox chemistry, soil manganese chemistry, and monitoring and modelling nutrient pollution of freshwater resources. She is currently a PhD candidate, studying the contribution of non-point source pollution to freshwater resources and the role that phosphorous plays in this.

Modules that she presents and is involved in include Soil classification, Introductory soil science and Plants and Society. In 2015, she received the award for the best paper by a young author by the Soil Science Society of South Africa at the Combined Congress.

She has supervised 16 BSc Hons students and 1 MSc student and is currently supervising 2 honours students. Her recent publication looks at interactions between irrigated agriculture and surface water quality with a focus on phosphate and nitrate in the Middle Olifants catchment in South Africa.

Dr David L Nsibo
Lecturer
BSc Agric (Hons) (Mak) MSc (WUR) PhD (UP)
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Profile Dr David Nsibo

Projects offered in:
BScHons *Plant Science* (Plant Physiology / Biotechnology specializations)
BScHons *Biotechnology*
BScHons *Bioinformatics*

Dr Nsibo is an early career researcher whose current research is aimed at determining the extent and patterns of genetic variation in populations of foliar pathogens of cereals and to understand how these pathogens cause disease using an array of innovative molecular-based and genomics-based tools.

Currently, he is investigating the population genetics, host-pathogen interactions and fungicide-pathogen interactions of *Exserohilum turcicum*, a foliar fungal pathogen of maize and sorghum. Taking a multifaceted approach utilizing genetics, molecular biology, and evolutionary biology, they will understand its interactions with hosts and management strategies. Questions explored relate to the evolutionary factors influencing the pathogen's genetic diversity, dispersal mechanisms, migration patterns, and fungicide sensitivity. Ultimately, these studies will foster the development of efficient management strategies for the pathogen, thereby promoting increased maize production.

He is currently supervising/co-supervising 4 BSc Hons students, 4 MSc students and 2 PhD students.

Dr Kenneth Oberlander
Senior Lecturer
BSc (Hons) MSc PhD (SU)
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Profile Dr Kenneth Oberlander

Projects offered in:
BScHons *Plant Science* (Plant Diversity specialization)

Dr Oberlander is currently the curator of the H.G.W.J. Schweickerdt Herbarium in the Department. He is an expert in the biologically fascinating plant family Oxalidaceae and his research focus is on the phylogenetics and evolutionary history of the Cape Flora of South Africa, a globally recognised centre of plant diversity and endemism and one of the country's greatest biological assets. The Flora holds nearly a quarter of Africa's vascular plant diversity in 1 % of its area and has been a source of fascination to biologists for centuries.

Key additional areas of interest are:
Polyploidy, or whole genome duplication, is a biologically important process with major economic importance as a large proportion of humanity's crops are polyploid. Recently its evolutionary impact has gained new attention. Flow cytometry for genome size estimation has greatly accelerated the depth and breadth to which polyploidy can be studied. Interestingly, despite the Cape Flora's immense species richness, it appears to have few polyploid species, with many key groups still unexplored for ploidy variation. The African Flora as a whole is very poorly explored for ploidy variation, and this is an area of great promise for future research.

Phylogenomics driven by the current sequencing revolution has greatly impacted the study of phylogenetics (evolutionary relationships between species), and species trees using hundreds or thousands of genes are becoming routine. While the benefits and challenges of this tsunami of data are an exciting field going forward, very few of South Africa's plant lineages have been involved. Taxonomy, the essential methodology of naming and circumscribing a biological lineage is fundamental but is desperately understaffed and underfunded in Africa. Many plant groups urgently require systematic attention.

He has authored 49 peer-reviewed papers and supervised 3 PhD, 5 MSc and 9 Hons/4th-year students.

Dr Oberlander currently holds a C3 rating from the NRF that reflects him as an established researcher.

Dr Tshima Ramakuwela
Lecturer
NDip (TW) BTech (VUT) MSc PhD (UKZN)
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Profile Dr Tshima Ramakuwela

Projects offered in:
BScHons *Plant Science* (Plant Pathology specialization)

Dr Ramakuwela is a nematologist. Her research focuses on developing biocontrol agents based on the entomopathogenic nematode (EPN) bacterial complex for managing agricultural pests and pathogens. Much of the EPN research in SA focuses on evaluating the efficacy of indigenous EPNs for managing insect pests. Very few studies have been conducted for testing the effectiveness of symbiotic bacterial metabolites for control of plant pathogens.

Dr Ramakuwela has initiated nematology research in the Department of Plant and Soil Sciences with a strong focus on:

- evaluating the potential use of EPN endosymbiotic bacterial metabolites as a biological control against root-knot nematodes (*M. incognita* and *M. javanica*) and plant pathogens (*R. solani* and *B. cinerea*) on tomato.
- characterising nematode species that affect industrial hemp and explore their control using metabolites derived from symbiotic bacteria of EPNs.

This addresses issues of development of resistance against chemicals, safety against humans and the environment and maximum residue levels, contributing to food security and improved livelihoods.

She has supervised/co-supervised 2 Hons students, and 4 MSc students.

Dr Gary I Stafford
Senior Lecturer
BSc (Hons) MSc PhD (UKZN)
gary.stafford@up.ac.za

Profile Dr Gary Stafford

Projects offered in:
BScHons *Medicinal Plant Science*
BScHons *Plant Science* (Plant Diversity specialization)

Dr Stafford has been conducting research on various aspects of African Traditional Medicine. As an ethnobotanist and ethnopharmacologist his main research interests have been on the utilization, production and development of plants used in indigenous medicine in South Africa, but he is also interested in policy development, chemotaxonomy, chemical ecology, plant systematics and evolution. His current research explores four main areas which could form potential BSc Honours projects:

1) The evolution of plant secondary metabolites through studies of potential correlations between phylogeny, population genetics, and biological interactions, such as herbivory or endosymbionts, on the quantity and quality of natural products (chemical functional traits).

2) The development and applications of functional foods by exploring species on the food-medicine continuum.

3) The ethnobotany, chemistry, and biological activity of plant-derived smoke.

4) The ethnobotany, chemistry, and biological activity of plants used to treat central nervous system-related ailments, such as epilepsy, anxiety, depression, Alzheimer's, and Parkinson's disease.

He has supervised/co-supervised several BSc Hons students, 3 MSc students and a PhD student.

Dr Stafford currently holds a C3 rating from the NRF that reflects him as an established researcher.

Dr Nicky Taylor
Senior Lecturer
BSc MSc PhD (UKZN)
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Profile Dr Nicky Taylor

Projects offered in:
BScHons *Crop Science*

Dr Taylor's research interests include water use, water relations and modelling water use of fruit tree species. She is currently involved in research projects on citrus, apple, avocado, macadamia and pecan water use. This involves quantifying transpiration using sap flow systems and evapotranspiration with micrometeorological methods and the driving variables for water use. Ecophysiological measurements (leaf and stem water potential, stomatal conductance and photosynthesis) are also conducted to understand the control over transpiration by the tree. She is also interested in the carbon partitioning dynamics in low chill peach cultivars grown in areas with warm springs.

She collaborates with the University of Stellenbosch, University of KwaZulu-Natal and the CSIR.

Dr Taylor currently holds a C2 rating from the NRF that reflects her as an established researcher.

Prof Eyob H Tesfamariam
Associate Professor
BSc (Hons) (Asmara Uni.), MSc PhD (UP)
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Profile Prof Eyob Tesfamariam

Projects offered in:
BScHons *Crop Science*
BScHons *Soil Science-Environmental Soil Science*

Prof Tesfamariam's expertise lies in agricultural systems modeling, focusing on water, gas, and solute dynamics in agricultural ecosystems. Currently, his research centers on the sustainable use of biosolids in agricultural lands within a circular economy framework, greenhouse gas emissions from agricultural systems, climate change impacts on agricultural production systems, and water and nutrient management in crop production systems.

He collaborates nationally and internationally with scientists, research organizations, and companies, including the French National Institute of Agricultural Research (INRAe). He has been involved in multidisciplinary research projects funded by the European Union under the FP7 program. Additionally, he successfully completed research projects funded by the Department of Science and Technology, Water Research Commission (WRC), and East Rand Water Care Company (ERWAT) over the past 14 years. During this time, he developed a user-friendly decision support tool for sludge application in South African agricultural lands across different agro-ecological zones (SARA model).

Prof Tesfamariam is a full member of the Soil Science Society of South Africa, Soil Science Society of America, Agronomy Society of America, South African Society of Crop Production, and Water Institute of South Africa. He is currently serving on the council of the Soil Science Society of South Africa, where he coordinates the scientific committee. Additionally, he is an associate editor of the Journal of Urban Agriculture and Regional Food Systems.

Over the past 14 years, Prof Tesfamariam has supervised/co-supervised 15 MSc and 10 PhD students to completion and a further 7 PhD students. His scholarly work includes 49 scientific articles in peer-reviewed ISI-rated journals, 1 book, 2 book chapters, and 6 technical reports. He has also presented 61 papers at national and international congresses.

Prof Tesfamariam currently holds a C2 rating from the NRF that reflects him as an established researcher.

Prof Emmanuel Tshikalange
Associate Professor
BSc (Hons) MSc PhD (UP)
emmanuel.tshikalange@up.ac.za

Profile Prof Emmanuel Tshikalange

Projects offered in:
BScHons *Medicinal Plant Science*

Prof Tshikalange is particularly interested in ethno-botanical medicinal plants traditionally used in the treatment of sexually transmitted diseases (including HIV/Aids), oral pathogens, and wild, edible plants. His current research is focused on investigating the biological activity of medicinal plants as possible treatments for sexually transmitted diseases. Bioassay-guided fractionation of medicinal plants containing promising activity are followed by *in vitro* mechanistic, toxicological, formulation, and quality control studies.

Other projects include the following:

- *In vitro* analysis of anti-plasmodial and anti-gonococcal bioactivity of South African indigenous Ziziphus species.
- Characterisation of chemical compounds, molecular docking studies and the antimicrobial potential of Argemone spp.

He has published articles in peer-reviewed national and international journals, such as the South African Journal of Botany and the Journal of Ethnopharmacology and has co-authored chapters in the book Medicinal Plant Research in Africa: Pharmacology and Chemistry. He is currently an associate editor of BMC Journal, Evidence-based Complementary and Alternative Medicine. Several postgraduate students have completed their studies under his supervision.

Prof Tshikalange currently holds a C2 rating from the NRF that reflects him as an established researcher.

Prof Jacquie van der Waals
Extraordinary Professor
BScAgric MScAgric PhD (UP)
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Profile Prof Jacquie van Der Waals

Citrus Research International Programme Manager: Preharvest Diseases

Projects offered in:
BScHons *Plant Science* (Plant Pathology specialization)

Prof van der Waals is the Programme Manager of Preharvest Disease Research at Citrus Research International. Her research is fully funded by Citrus Research International, with an emphasis on the sustainable management of important preharvest citrus diseases in South Africa. The increased pressure on South African agriculture from the EU Green Deal, particularly on export crops such as citrus, necessitates the need to focus research on developing effective Integrated Disease Management strategies. The diseases currently under consideration in this programme are Phytophthora root rot, Botrytis grey mould and Alternaria brown spot.

She has supervised/co-supervised 26 BSc Hons / BSc (Agric) final year, 22 MSc and 7 PhD students, and is currently supervising nine MSc and one PhD students. She has authored or co-authored 54 peer-reviewed articles, written chapters or sections for three books and >45 lay articles.

Prof van der Waals currently holds a C1 rating from the NRF that reflects her as an established researcher.

Prof Juan Vorster
Associate Professor
BSc (Hons) MSc (*Cum laude*) PhD (UP)
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Profile Dr Juan Vorster

Projects offered in:
BScHons *Crop Science*
BScHons *Plant Science* (Biotechnology specialization)

Prof Vorster currently leads the Plant Molecular Physiology group, and their main focus is on understanding plant stress. His focus in particular on the interaction between cysteine proteases and cysteine protease inhibitors and the involvement of this protease-protease inhibitor system in soybean nodule development. Root nodules are important to fix nitrogen in legumes such as soybean. Since cysteine proteases have been previously identified to play an important role in plant senescence, a specific research target is the identification of inhibitor involvement in preventing cysteine protease activity, in particular, during premature stress-induced nodule senescence.

Prof Vorster is also a co-lead in the South African Herbicide Resistance Initiative where they investigate herbicide resistance mechanisms in different weeds towards the commonly used herbicide Glyphosate as well as other herbicides. Currently they have a strong focus on the newly invasive weed *Amaranthus palmeri* that has been shown to be resistant to multiple herbicides.

He has supervised/co-supervised 15 completed MSc and 6 PhD studies and is currently president of the South African Society of Crop Production (https://sascp.org.za/).

Prof Vorster currently holds a C3 rating from the NRF that reflects him as an established researcher.