

2015

# Postgraduate studies in Grapevine & Wine Biotechnology



## TABLE OF CONTENTS

1. Introduction	1
2. Research	1
3. Postgraduate programme	3
4. Short courses	6
5. Postgraduate bursaries	6
6. Application and selection	7
7. Frequently asked questions	8
8. Enquiries	9

# 1. Introduction

The Institute for Wine Biotechnology (IWBT), part of the Department of Viticulture and Oenology, was established at Stellenbosch University in 1995. The IWBT is an **internationally recognised** postgraduate training and research institute offering **visionary training** and **innovative research** to support the South African wine and grapevine industries.

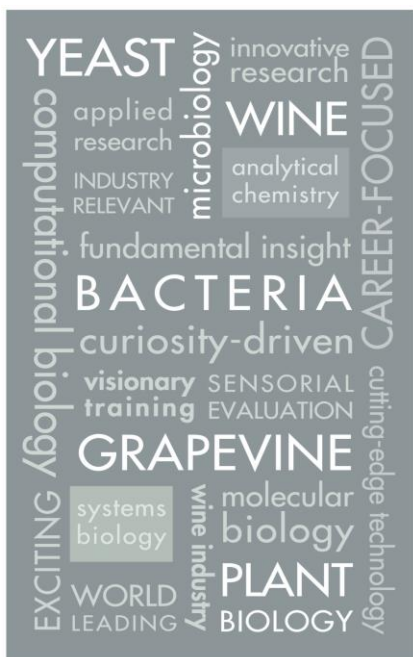
It is led by an academic management team. Additional staff consists of part-time extra-ordinary academics, post-doctoral researchers, as well as technical, administrative and other support staff.

The IWBT is situated in the JH Neethling Building and has several modern and fully equipped molecular and chemical research laboratories. A greenhouse for transgenic grapevine plants and an experimental cellar are also available. The building also houses the Central Analytical GC-MS Facility of Stellenbosch University. In addition to lecture theatres and conference rooms, students and researchers benefit from dedicated study areas and laptop computers are available to students on request.

The IWBT also accommodates the South African Research Chair in Integrated Wine Sciences.



# 2. Research



## 2.1 Approach to research

The IWBT's research program follows a globally unique, integrated and multidisciplinary approach, combining **cutting edge high-throughput** and **systems-based approaches** derived from the core sciences of biology and chemistry with the traditional wine sciences of viticulture and oenology.

This programme focuses on **cellular and molecular biology and biotechnology** of all wine-related organisms: **grapevine, yeasts and bacteria**. Its **multidisciplinary nature** results in close co-operation with several departments at Stellenbosch University, as well as with other role players within and beyond the country's borders.

The entire research value chain of complex interactions within the elaboration process of a wine, from the vine to the final product is investigated through an integrated systems-based approach combining traditional molecular biology and chemistry techniques with cutting-edge techniques from fields such as genomics, transcriptomics, proteomics and metabolomics.

## 2.2 Project leaders and respective fields of expertise



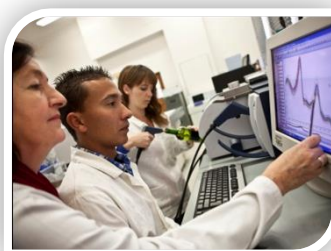
### Grapevine molecular biology and biotechnology

- Functional genomics; grapevine field-omics; grapevine abiotic and biotic stress biology; cell wall profiling
- Prof Melané Vivier  
Dr John Moore  
Dr Philip Young



### Wine microbiology and molecular biology

- Yeast molecular and cellular biology
  - Microbial interactions and spoilage – impact of microorganisms on wine properties
  - Molecular biology of wine lactic acid bacteria and interaction with wine yeasts
  - Using metagenomic and metatranscriptomic approaches to study diversity and mine novel biocatalysts
- Prof Florian Bauer  
Dr Benoit Divol  
Prof Maret du Toit  
Dr Evodia Setati



### Analytical chemistry

#### Advanced chemical-analytical techniques in viticulture, oenology and biotechnology

- Focus on rapid analytical techniques and data processing, wine sensory profiling, sensometrics, consumer preference mapping
  - Flavour chemistry focus on the chemical definition to wine quality. metabolomics
- Dr H el ene Nieuwoudt  
Prof Antonio Ferreira



### Computational biology and biomathematics

- Focus on the use and development of new high performance computing methods for the analysis and integration of genomics, phylogenomics, transcriptomics, proteomics, metabolomics, interactomics, sensoromics, microbiomics, chemiomics and fieldomics data.
- Dr Dan Jacobson

The research value chain involves the use of highly characterised existing vineyards to assess the impact of viticultural practices on the vine on molecular and metabolite levels (Program leader: Prof Melané Vivier). The grapes and grape juice are chemically characterised, and the impact of the different oenological factors on the final wine composition and sensorial quality are analysed through system-wide approaches (Program leaders: Profs Maret du Toit and Florian Bauer). Microbial diversity associated with grapes in vineyards under different management practices (conventional, organic and biodynamic - Project leader: Dr Evodia Setati), the influence of non-*Saccharomyces* yeasts and new enzymes from these yeasts (Project leader: Dr Benoit Divol) are also studied and available as topics.

Prof Florian Bauer is the South African Research Chair in Integrated Wine Sciences. The work done through the Chair focuses on developing novel approaches to wine sciences with a strong emphasis on the yeast *Saccharomyces cerevisiae* as a model organism and as the main biological agent of the wine making process.



Chemical analyses are performed for samples obtained throughout the value chain – from vineyard to the final product. Methods using state-of-the-art instrumentation for chromatography, mass spectrometry (Prof Antonio Ferreira) and infrared spectroscopy (Dr H Nieuwoudt) are continuously developed to support the various research projects mentioned above. At present, a database for volatiles, Infrared spectroscopy is used for rapid and low-cost process monitoring, as well as quantification of grape-fermenting must and wine compounds, as well as classification studies based on infrared spectra of various products. Sensory studies (Project leader: Dr H el ene Nieuwoudt) include descriptive profiling of commercial wines using trained panels, as well as an investigation into the effects of different vinification techniques on the sensory profiles of wine. The current research focus is on development and optimisation of sensometric techniques. Rapid consumer-based

sorting and napping techniques, as alternative to the classical profiling, are applied using expert and novice consumers. In addition, consumer liking and preference mapping of experimental and commercial wines are also done.

The Computational Biology group (Program leader: Dr Dan Jacobson) develops novel methods in order to analyse data from virtually all of the Omics, including Genomics, Phylogenomics, Transcriptomics, Proteomics, Metabolomics, Interactomics, Sensoriomics and Microbiomics. In addition, we are developing methods that are allowing us to create two new Omics fields, namely, Chemiomics/Systems Chemistry and Fieldomics. The group also has interests in the Theory of Sampling and is leading an effort to develop multivariate sampling design and optimisation for biological systems. It uses a variety of areas of mathematics for our methods including network theory, multivariate statistics (chemometrics), linear algebra, machine learning, state-space models, Markov processes, wavelets, molecular set analysis as well as parametric and non-parametric statistics to name but a few. The problems that are tackled tend to be of fairly large scale so a considerable amount of high performance computing is performed (together with two labs from Engineering we own Stellenbosch's High Performance Computing environment).



Further information on our research program can be obtained from our web site: [www.sun.ac.za/wine\\_biotechnology](http://www.sun.ac.za/wine_biotechnology)

## 2.3 Research outputs and collaboration network



### Track record for research outputs (since 1995)

- 213 scientific publications in refereed journals
- 11 chapters in books
- 655 papers at scientific conferences (384 international and 271 national)
- 9 patents



### Wide research collaboration network

- The IWBT has a strong and established network of research collaborators to ensure active national and international research collaboration

### 3. Postgraduate programme



The IWBT's postgraduate programmes in Grapevine and Wine Biotechnology are **unique to Stellenbosch University** and can be followed to obtain the following degrees: HonsBSc, MSc or PhD.

#### HonsBSc (Wine Biotechnology)

**Entrance requirements:** A BSc, BScAgric or BEng degree that is accepted by the Senate with any relevant discipline as major subject, e.g. Biochemistry, Botany, Chemistry, Genetics, Physiology, Microbiology, Plant Pathology, Food Science, Viticulture, Oenology, Chemical Engineering, etc. Only students who have attained an average of at least 60% in these subjects in the final year will be considered for admission to the honours programme.

**Programme composition:** The programme comprises formal lectures, as well as a seminar, independent study and experimental work in Wine Biotechnology; supplementary study or competence in other subjects or specific topics may be required. The formal lectures will be presented as modules. The final mark for the modules will be determined by means of continuous assessment.

**Programme content:** The programme consists of the following modules:

- Year modules:

WBT 771 (40 credits)		WBT 773 (30 credits)	
Project proposal	(10%)	Prof FF Bauer	(35%)
Written seminar	(10%)	Dr BT Divol	(10%)
Seminar oral presentation	(10%)	Prof MG Lambrechts	(35%)
Research project: report	(50%)	Prof M du Toit	(20%)
Research project : oral	(20%)		
WBT 772 (25 credits)		WBT 774 (20 credits)	
Laboratory work and techniques course	(75%)	Dr AE Strever	(20%)
Winemaking techniques	(25%)	Prof MA Vivier	(30%)
		Dr JP Moore	(20%)
		Dr PR Young	(30%)

- First semester module

WBT 714 (5 credits)

#### 771 Research methodology for grapevine and wine biotechnology (40 credits)

Project planning, communication and writing skills; oral presentation of research project proposal; carrying out experimental research; data processing; written reporting on and oral presentation of research results; writing and presenting a seminar.

**Seminar.** Honours students have to submit one typed seminar that has been written in the acknowledged scientific writing style. The written seminar is presented as a mini-review and the oral seminar as a presentation at a subject congress or symposium. The use of visual aids (powerpoint presentation) is therefore a prerequisite. The evaluation of seminars is therefore done on the basis of the typed seminar (with the emphasis on the content, style and ability to select material from the literature), as well as the oral presentation thereof (with the emphasis on the content, use of visual aids, ability to logically convey information in a manner that will retain the interest of the audience throughout).

**Practical project.** The greatest emphasis is placed on practical laboratory work. Students will work in a laboratory with daily supervision from senior postgraduate students and researchers. At the beginning of the year students present a project proposal during which a complete motivation and project plan is submitted. At the end of the year students submit a written report on their projects in the form of a scientific article and present an oral report.

#### 772 Techniques in grapevine and wine biotechnology (25 credits)

General laboratory safety and etiquette, biological calculations; project planning; general molecular biology techniques and microbiology, as well as other relevant techniques. Winemaking techniques and introduction to oenology, including wine tasting.

**773 Biotechnology of wine-related microbes (30 credits)**

Isolation, identification and classification of wine-associated yeasts and bacteria. Fermentation biochemistry and kinetics; metabolic end products; nitrogen and sulphur metabolism during fermentation; fermentation problems; ethanol tolerance; fermentation bouquet and other volatile esters. Biotechnology of lactic acid bacteria; malolactic fermentation and microbial spoilage of wines. Techniques and targets for the genetic improvement of wine yeasts; legal, ethical and consumer aspects relating to the use of genetically manipulated wine yeasts. Role of enzymes in vinification.

**774 Vine structure and the concepts of vine balance / Grapevine improvement (20 credits)**

General viticultural concepts, including the vegetative structure and function; reproductive structure and development as well as integration into the establishment and management of vine balance in the viticultural system. Biotechnological aspects of vine plant diseases; molecular-genetic aspects of plant-pathogen interactions; use of recombinant DNA technology to genetically improve plants; techniques and targets for the genetic improvement of plants.

**714 Chemical components of grapes and wine (5 credits)**

General description of the chemical composition of wine.

**Allocation of marks.** A system of continuous evaluation is used to evaluate the students' knowledge and level of proficiency. An examination will be written on completion of each module. Students must obtain a minimum of 50% for each examination, failing which a supplementary exam must be written. The final mark for the whole honours course (120 credits) is calculated by allocating the following credits to the mark obtained for each module. All modules must be passed, as well as a **final mark of 50%** achieved to pass the honours course. A final mark of 75% or higher serves for a distinction (*cum laude*).

**MSc (Wine Biotechnology)**

**Entrance requirements:** An HonsBSc degree in Wine Biotechnology 778; or any HonsBSc, HonsBScAgric or BEng degree that is acceptable to the Senate. Students who completed a four-year Bachelor degree (e.g. BScAgric; BSc FoodScience, BEng) also qualify to enrol directly for the MSc degree.

**Programme content:** For the MSc degree, the student must do independent research on an approved topic in Wine Biotechnology and submit the results in the form of a publishable thesis. Supplementary studies on specific topics may be required. The programme for each student is determined by the supervisor concerned. An oral defense is conducted.

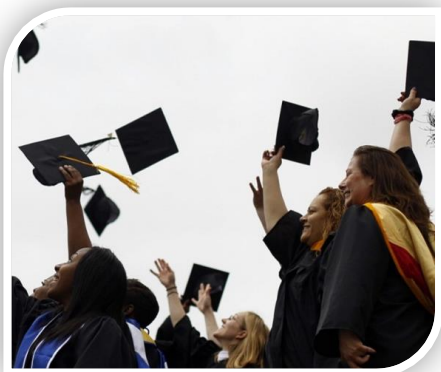
All research projects of postgraduate students fall within the broader research programme of the IWBT.

**PhD (Wine Biotechnology)**

**Entrance requirements:** An MSc degree in Wine Biotechnology; or any MSc, MScAgric, MEng or MScEng degree that is acceptable to the Senate.

**Programme content:** A dissertation on an approved topic in Wine Biotechnology that contains the results of original research is required for the PhD degree. An oral defense is conducted.

All research projects of postgraduate students fall within the broader research programme of the IWBT.

**Student outputs and career opportunities**

- **Registered postgraduate students:** 51 postgraduate students (24 doctoral, 15 master's and 12 honours students) are currently enrolled at the IWBT, including 9 international students.
- **The IWBT has an excellent graduation record:** We are committed to effective student teaching, and to providing an enabling environment. Since 1996, 226 students graduated at the IWBT (101 honours, 86 masters and 39 doctoral).
- **The IWBT is very successful in the placement of graduates in excellent positions in a wide variety of industries:**
  - *Industry* positions were taken up nationally and internationally, for example Research and Development, Quality-, Process and Laboratory managers, sales representatives and other technical assistants..
  - *Academic/research* positions like lecturers, researchers, senior technical officers and postdoctoral research fellows are occupied at many institutions (e.g. Stellenbosch University, University of Cape Town, NRF, CSIR, Agricultural Research Council).

## 4. Short courses

The IWBT promotes the development of our students, and therefore continually creates training and development opportunities for them. The focus of these actions is to enhance the development of our students to encourage personal growth, as well as academic excellence. The following short courses may be offered to the IWBT's postgraduate students on an *ad hoc* basis with the aim to equip them with core competencies to prepare them for the research field:

- Basic statistics
- Chemometric workshops
- Oenology sensory training sessions
- Laboratory safety course
- Project management course (with focus on a scientific project)
- Scientific communication and presentation skills

## 5. Postgraduate bursaries



### 5.1 From the IWBT

The IWBT may, at its discretion and subject to sufficient funding being available per project, award financial support to full-time registered students, **if they have not been awarded any other external bursaries.**

- Honours - up to R30 000 per annum (for 1 year)
- Masters - up to R57 000 per annum (for 2 years)
- Doctoral - up to R80 000 per annum (for 3 years)

Bursaries are awarded in terms of the regulations of Stellenbosch University. In exceptional cases the IWBT retains the right to make adjustments to bursary supplementations depending on the total value of the bursaries awarded, as well as the performance of the student.

### 5.2 Other institutions

Students are strongly encouraged to apply for competitive bursaries (e.g. NRF Free-standing Prestige Bursary, NRF Equity Bursary, US Postgraduate Merit Bursary, etc.) through the University's **Office for Postgraduate Bursaries**. Several private bursaries are also available, eg.:

- Harry Crossley bursary
- Murray bursary for full-time study
- CJ Theron bursary
- Andrew Mellon bursary

#### Office for Postgraduate Bursaries:

Tel: 021-808 4208

E-mail: [Beursnavrae\\_nagraads@sun.ac.za](mailto:Beursnavrae_nagraads@sun.ac.za)

Webpage: <http://www0.sun.ac.za/pgstudies>

#### Postgraduate International Office

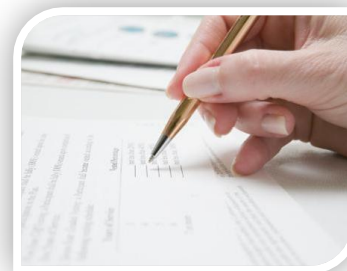
(for international students)

<http://www0.sun.ac.za/international/postgraduate-student-funding>

**NOTE:** Several bursary applications require a scientific project to be specified. You are welcome to contact Dr Benoit Divol, Academic Postgraduate Coordinator (see his contact details in this Prospectus under "8. Enquiries") or any of the other academics (see their contact details at [www.sun.ac.za/wine\\_biotechnology](http://www.sun.ac.za/wine_biotechnology)).



## 6. Application and selection



### Closing dates for applications:

**20 August** – for international students

**7 September** – for South African students

### 6.1 Application procedure

<p><b>STEP 1</b></p>	<p><b>Stellenbosch University's</b> application form</p>	<p><u>In person:</u> Mrs Ghafsa Gamiet; Administration A building, Room 2033, Van Ryneveld street, Stellenbosch, or</p> <p><u>Electronic:</u> online application at <a href="http://www.maties.com/apply/how-do-i-apply.html">http://www.maties.com/apply/how-do-i-apply.html</a></p> <p><u>Foreign students:</u> apply online at <a href="http://www0.sun.ac.za/international/prospective-students/full-degree-postgraduate.html">http://www0.sun.ac.za/international/prospective-students/full-degree-postgraduate.html</a></p>
<p><b>STEP 2</b></p>	<p><b>IWBT's</b> application form</p>	<p>Complete all sections of the <b>IWBT application form</b>. The application form can be requested from Ms Karin Vergeer (<a href="mailto:ccav@sun.ac.za">ccav@sun.ac.za</a>) or downloaded from the IWBT website (<a href="http://www.sun.ac.za/wine_biotechnology">www.sun.ac.za/wine_biotechnology</a>).</p> <p>Please attach the following documents to your form (pdf/scanned-versions are accepted if submitted by email):</p> <ul style="list-style-type: none"> <li>• A certified copy of your <b>academic transcripts (marks)</b> [and English translation if in a foreign language]</li> <li>• Certified copies of <b>degree(s)</b> obtained. (Please note: if you have been, or currently are, registered as a student at Stellenbosch University, the IWBT will request your academic transcripts from Administration. There is therefore no need to attach them to this application).</li> <li>• A complete <b>Curriculum Vitae</b> (only for master's and doctoral applications)</li> <li>• A copy of your <b>ID/Passport documents</b></li> <li>• Foreign students, whose mother tongue is not English, are requested to complete a <b>TOEFL test</b> and submit the results to the IWBT.</li> </ul>
	<p><b>Referees</b></p>	<p>MSc and PhD applicants are requested to nominate <b>at least TWO referees</b> and provide us with their contact details.</p>

### 6.2 Selection procedure

Candidates are selected by the IWBT on **merit** and according to the following **criteria**::

- undergraduate academic results
- postgraduate academic results (if applicable)
- practical proficiency
- personal motivation.

Feedback from referees (if applicable) is also taking into consideration to evaluate an applicant. All applications are subject to the availability of research funds and laboratory space.

Students who successfully meet the acceptance criteria, are firstly accepted **provisionally** if the current degree is not completed. The students must pass their exams or thesis with an minimum average of **60%**, before they can be *finally accepted* for the postgraduate study. A letter of acceptance from the IWBT will then be issued. The students are however required to wait for the official acceptance letter from the University to register for their studies.



## 7. Frequently asked questions

? **I am an international student who will be starting my degree at the IWBT. I was informed that I do not have any hostel accommodation. What can I do?**

The International Office have on their webpage a list of available private housing as well as a list of usefull websites.

<http://www0.sun.ac.za/international/accommodation-and-arrival/housing-private-housing-adverts>

? **I am an international student and want to know if someone will meet me at the airport when I arrive?**

The International Office does provide such a service, but you need to complete the arrival sheet and email it to them.

<http://www0.sun.ac.za/international/accommodation-a-arrival>

? **What will the cost of my degree be?**

Please enquire at the Student Account Office in person or phone Sean Davids at 021-808 3530.

**For international students** it is different and they can enquire at

<http://www0.sun.ac.za/international/postgraduate/postgraduate-fees>.

? **When and how must I register for my degree?**

Online registrations via MYMATIES should be available during January or you can register with Mrs Cheryl Nieuwoudt in person at the Administration Building Block A, room 2034, Van Ryneveld street.

HonsBSc students need to register by the end of January.

Master's and Doctoral students can register until the end of March.

New Doctoral students can only register after a Faculty meeting was held in February and that they have been informed.

**For international students** it is mostly the same, but they register at the International Office.

? **Will I receive a bursary from the IWBT?**

Yes, in most cases. Please see details in this Prospectus under "5. Postgraduate bursaries".

? **This is my first time in Stellenbosch. What will the living costs be?**

It all depends if you are accommodated in a hostel or private housing. Stellenbosch is very expensive, so for living costs you will approximately need about R5 000 per month (including accommodation).



## 8. Enquiries

### At IWBT

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- **Web site:**  
[www.sun.ac.za/wine\\_biotechnology](http://www.sun.ac.za/wine_biotechnology)
- **Academic enquiries on postgraduate programme:**  
Dr Benoit Divol: Senior Lecturer  
Tel. 021-808 3141 (international: +27-21-808 3141)  
E-mail: [divol@sun.ac.za](mailto:divol@sun.ac.za)
- **Administrative enquiries on postgraduate applications:**  
Ms Karin Vergeer: Postgraduate Coordinator  
Tel. 021-808 3770 (international: +27-21-808 3770)  
E-mail: [ccav@sun.ac.za](mailto:ccav@sun.ac.za)

### At Stellenbosch University

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- **Web site**  
[www.sun.ac.za](http://www.sun.ac.za)
- **Division for Admissions (Stellenbosch University)**  
Mrs S Blanché  
Tel. 021-808 4515 (international +27-21-808 4515)  
E-mail: [seb@sun.ac.za](mailto:seb@sun.ac.za)
- **Division for Accommodation (Stellenbosch University)**  
Ms M Hendrikse  
Tel. 021-808 3892 (international +27-21-808 3892)  
E-mail: [mary@sun.ac.za](mailto:mary@sun.ac.za)
- **Division for Student Fees (Stellenbosch University)**  
Tel. 021-808 4913 (international +27-21-808 4913)  
<http://www.maties.com/what-will-it-cost.html>
- **Division for Postgraduate Bursaries**  
Tel. 021-808 4208  
Email: [Postgradfunding@sun.ac.za](mailto:Postgradfunding@sun.ac.za)
- **Postgraduate and International Office**  
Tel. +27-21-808 2565  
E-mail: [interoff@sun.ac.za](mailto:interoff@sun.ac.za)  
<http://www0.sun.ac.za/international/prospective-students/full-degree-postgraduate.html>

