

# WHAT COULD THE **FUTURE** HOLD FOR YOU? DO THE **4 QUESTION QUIZ** AND FIND OUT!

**1**

Would you like to do something new in your free time?

You are obviously energetic, interesting and dynamic. Congratulations - that makes you a special kind of person!

**YES**

NOT? HOW BORING...

You are missing out BIG time!

**4**

WOULD YOU LIKE TO GO TO UNIVERSITY AND GET YOUR TUITION FREE?

**YES**

**NO**

You don't? Get real!

If you answered yes to all of the four questions, then you should most definitely get more information from your teacher, because you are an ideal candidate for the University of Pretoria's exciting UP with Science enrichment programme!

**UP WITH SCIENCE**

Ask your science teacher or school principal **NOW** for a brochure and application form for the 1999 **UP with SCIENCE** programme

For more information phone (012) 420-2644 or visit the Faculty of Science's web site at <http://www.up.ac.za/science/welcome.html>

**2**

Would you like to discover the wonders of the world around you?

**YES**

**NO**

You are a creative problem solver and would probably like to spend some of your free time doing all kinds of fun activities dealing with science, design and management.

Will you be in Grade 10 (Standard 8) in 1999 and taking mathematics and science?

**3**

YOU WON'T!  
WHAT A PITY!

**NO YES**

You have three years left to do all kinds of science-related fun things in your free time. You are also on the right track for a career in the wide and varied field of science, technology, design and management.



University of Pretoria

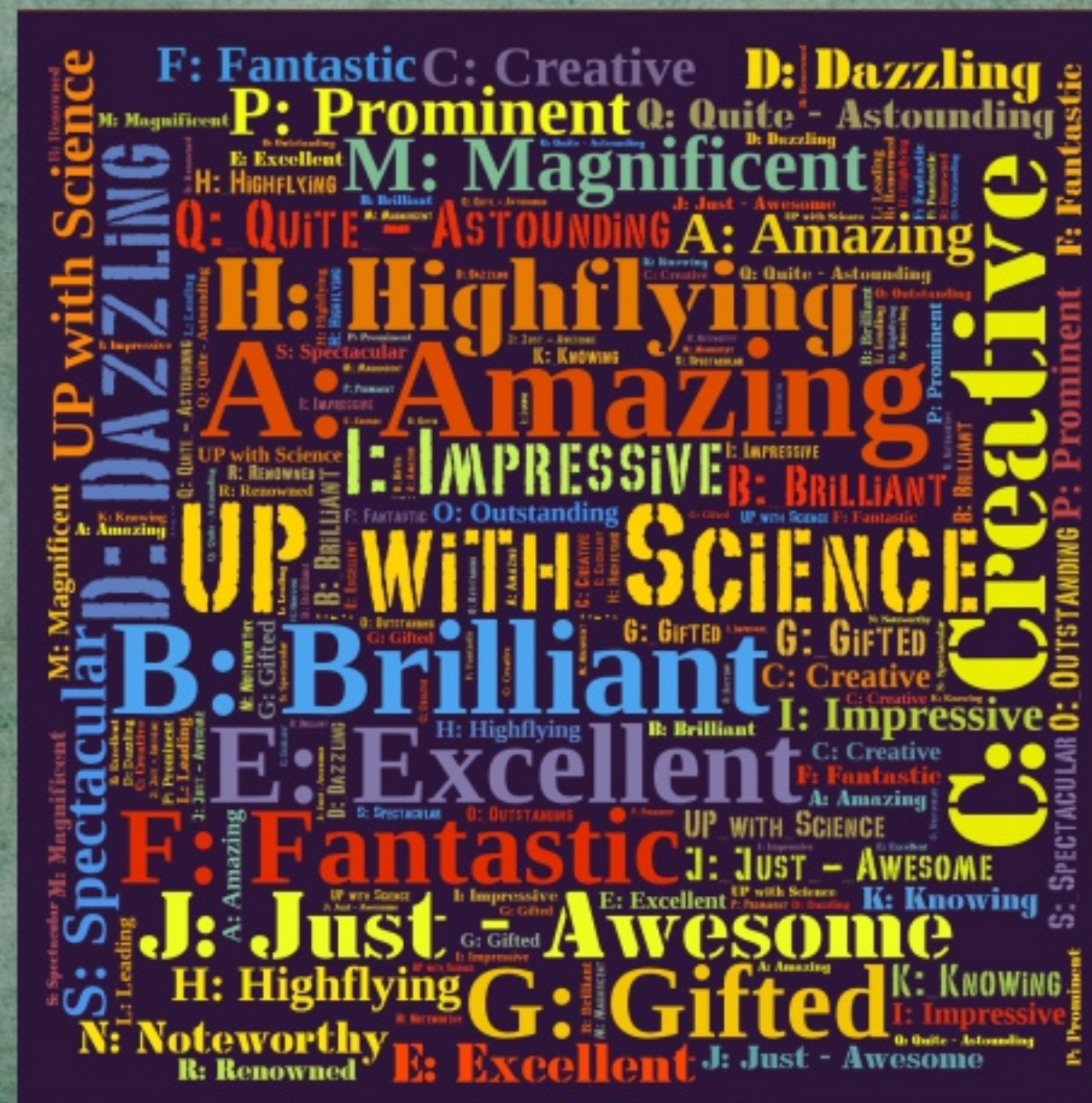
UP with Science

1998 - 2016

Group A to Group S

## UP with **SCIENCE**

The Programme, the Posters, the People with Passion & the Projects



The 'UP' in UP with Science is a wordplay on the abbreviation of the University of Pretoria (UP) and the word 'up' meaning 'upward' or 'forward'.





## How it started

### Recollections from Prof John Rogan

*Not long after I arrived at UP in 1997 I was taken by Max to meet the head of the Physics Department, Prof Friedland. He asked if I had any ideas on how to attract more students to his department. That might have started the wheels turning. Also I seem to remember that Prof Erasmus was keen for UP to make some kind of contribution to the Year of Science.*

*I then began to draw on my experiences in the USA. Many universities there, including some in Montana, run summer camps for high school students with the aim of getting them excited and interested in science. Summer is not a good time to run such a programme in South Africa, but Saturdays seemed to be a viable option. It is also not unusual for US universities to offer tuition scholarships to high performing high school students.*

*Based on these challenges and experiences, Max and I sat down and wrote a proposal for the UP with Science programme, and submitted it to Prof. Erasmus. When it was approved, all that was left was to get the show on the road. We submitted the idea to each department in the two science faculties, and invited them to send a delegate to an exploratory meeting. It was here that the content and structure of the programme was hammered out.*

*We then circulated information and application forms to all schools in the Pretoria area, selected candidates, and got the show on the road.*

2016

## UP with Science

### Science Enrichment Programme for a group of Grade 10-12 learners

#### Purpose of the project

South Africa is faced with a severe shortage of students from disadvantaged backgrounds studying science, and an even greater shortage of qualified science teachers, regardless of background. Many students from disadvantaged backgrounds have no scientists as role models. By-and-large the only professional role models visible are lawyers, doctors and teachers. Hence induction into this culture is a vital prerequisite to the selection of a scientific career.

The goal of this long term intervention "UP with Science" is to contribute to the solution of these two shortfalls, as well as to foster a more inquiry-based approach to the learning and teaching of science.

UP with Science is an intensive three-year enrichment programme beginning with pupils selected in their Grade 10 year. The project presents a Saturday school and winter week where pupils spend time with university staff. While in the programme they:

- are exposed to an inquiry-based approach to science, science researchers and careers;
- carry this vision of science into other classrooms during their second year, thereby experiencing first hand the joy and satisfaction of teaching; and
- are assigned to a mentor, a researcher at the University of Pretoria, to assist with real science while being inducted into the culture of science in their school-leaving year.

Pupils who stay with the programme and gain admission to courses in the Faculty of Science or Biological and Agricultural Sciences are granted tuition scholarships by the University for the period of their first (bachelor) degree.

Prof Max Braun, 1999



Photo: UP Archive

*"I support the UP with Science programme - It's what we must do. Only a few of South Africa's universities can make a difference to South Africa - and UP is one of them. We will make the difference - only by training gifted scientists from all population groups."*

Prof van Zyl, Rector of the University of Pretoria during an interview on 15 May 1998.



## UP with Science

### Structure of the programme

#### Group A

Grade 10: Visits to departments: broad exposure to different science fields

Grade 11: Computer literacy and ThinkQuest

Grade 12: Research project ('real science') and Expo participation

*It was found that the matric learners are under considerable pressure from their school work and can't spend enough time on their research projects. Therefore it was decided to move the research projects in small groups to the second (grade 11) year and the "ThinkQuest" in the final (matric) year.*

#### Group B & C

Grade 10: Visits to departments: broad exposure to different science fields

Grade 11: Research project ('real science') and Expo participation

Grade 12: Computer literacy and ThinkQuest

*From 2003 the Grade 12 learners did short science projects instead of participating in the ThinkQuest competition to move the emphasis from computer studies back to science.*

#### Groups D to I

Grade 10: Visits to departments: broad exposure to different science fields

Grade 11: Research project ('real science') and Expo participation

Grade 12: Computer & Internet literacy and a short science related projects

#### Groups J to S

Grade 10: Visits to departments: broad exposure to different science fields

Grade 11: Research project ('real science') and Expo participation

Grade 12: Computer & Internet literacy, Science Communication and a 'student skills' development

## UP with Science

### Aim of the programme

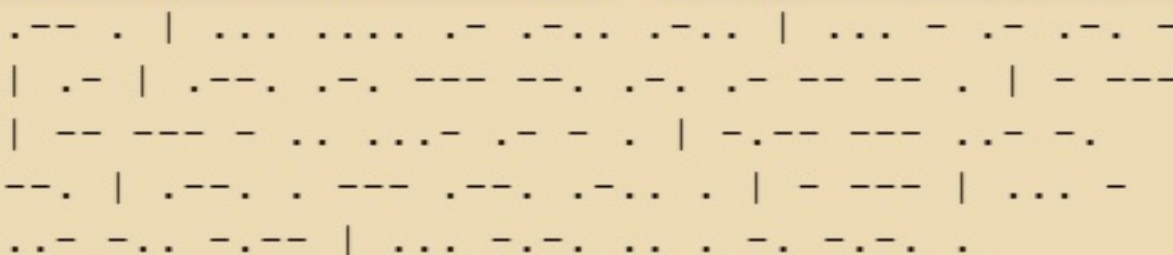
The programme plans to ensure that talented pupils from primarily disadvantaged regions within 80 km of the University of Pretoria, but racially, gender and economically balanced:

- use computer technology and the Internet productively,
- create and contribute to the development of Internet resources for introductory mathematics, science and technology,
- have an interest in scientific fields or science teaching as a career strongly stimulated,
- have a real opportunity to enter tertiary studies by committing the University to providing tuition scholarships for participants.

1999



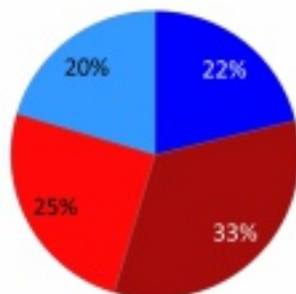
The UP with Science programme was started in 1998 in the Centre for Science Education under the guidance of Prof John Rogan and Prof Max Braun. In 2000 Helga Nordhoff joined the team and when the Centre for Science Education was restructured in 2003 the UP with Science programme and Helga were transferred to the Discovery Centre @ TUKS, now Sci-Enza. From 2003 until her retirement at the end of 2016, Helga Nordhoff was the UP with Science programme manager.



# UP with Science Statistics

UP with SCIENCE intake

Male: Black/Asian Female: Black/Asian  
Female: White Male: White

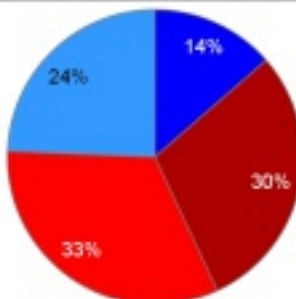


From 1998 to 2016, 673 learners from Groups A to Q successfully completed the UP with Science programme; 470 of these learners enrolled at the University of Pretoria, 265 in the Faculty of Natural and Agricultural Science. As can be seen from the graph below, most other courses are science related.

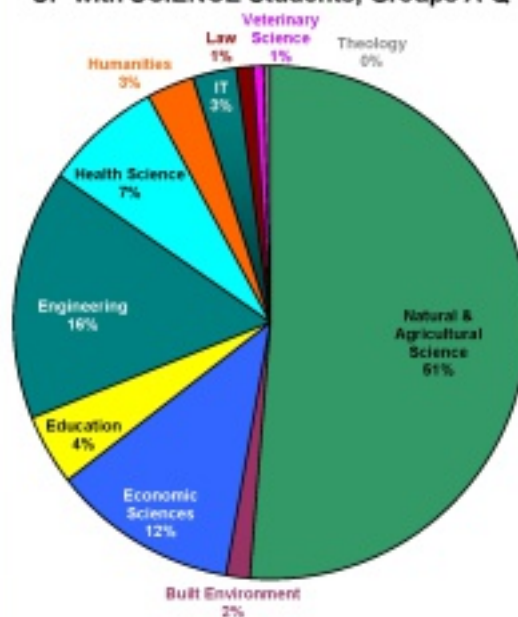
Few UP with Science students drop out and 111 students from the first 13 UP with Science groups continued with a post graduate course after completing their first degree.

Students- undergraduate

Male: Black/Asian Female: Black/Asian  
Female: White Male: White



UP with SCIENCE Students, Groups A-Q



*"The experiments we conducted made me feel like a real scientist, but most importantly it made me realise that am alive with possibilities to become a real scientist and made me spread the love of science at my community. The programme was not all work and no play. I made real friends who are involved in the program. It was my first time ever being in a multiracial environment, and I made strong connections. Every month that I got to come here, I was excited because I got to go to town once in a while, and at the university you feel how wonderful varsity life is, but most importantly I was looking forward to the fun activities of the day and meeting my friends.*

*In conclusion I would like to say that, as small as we are, we are worth to be spent on. For some this programme does not only benefit an individual by their communities at large."*

Obakeng

The following pages aim to show the diversity of the UP with Science programme; the recruitment posters, departments visited, science related activities, excursions, challenges, talks and workshops. The photos show activities that were unique for each group in an effort to cover most of the topics the learners were exposed to.

Book compiled by Helga Nordhoff.





**In the Lab**



**Visit to Sterkfontein**



**At FABI**



## Pretoria News, 1998

Budding scientists Bea Erasmus and Molemo Mosupye put their new-found scientific knowledge to the test at the University of Pretoria over the weekend. PICTURE: NICOLENE OLOGERS

# New programme for budding scientists

This weekend saw Tuks launch a new science-enrichment programme for high school pupils – the first of its kind in South Africa.

The programme, called UP with Science, is aimed at expanding pupil's interest in knowledge and skills in science, and includes Saturday classes and a winter camp.

Nearly 50 grade 10 pupils were

selected for the course.

After completing the programme successfully, candidates who wish to study science courses at the University of Pretoria will get free tuition if they are accepted into one of the study programmes offered by participating departments of the faculties of science, biology or agriculture.

"Apart from submitting academic records and a letter of recommendation from their science teacher, applicants also had to write an essay stating why they wished to take part in UP with Science," said Professor Max Braun, director of the Centre for Science Education.

"Participants were chosen in such a way that the group reflects

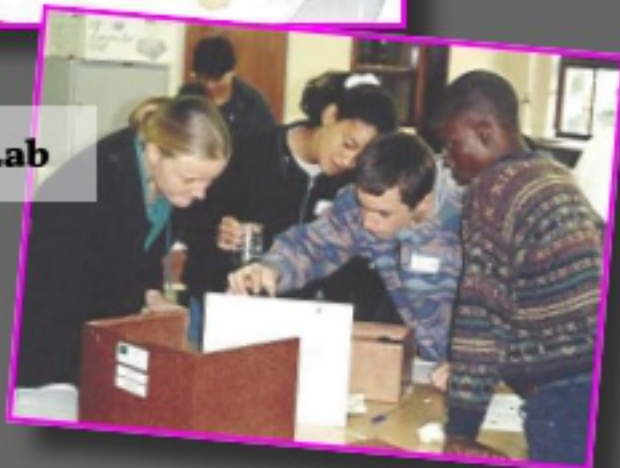
the racial and gender diversity of the South African population."

Activities over the next three years will include hands-on laboratory work, presentations by practising scientists, working with problem-solving science and maths software, becoming familiar with the Internet and participating in on-going research. – Staff Reporter





**In the Lab**



**Visit to the  
Electron microscope**

*"In the 3 years I learnt the most from the Thinkquest challenge; the study of a specific subject matter and the web site design experience."*

Namosha

## Group A (1998 intake)

Maseeha Ansermeah  
Haseel Bhima  
Robert André Brink  
John Chuchu  
Hendrik Coetsee  
Didi Coetzee  
Jaco De Witt  
Karen Dieterich  
Michael Ellis  
Beulah Erasmus  
Petrus Ferreira  
Faaiza Haffjee  
Geraldine Hattingh  
Gasenna Kungwane  
Schalk le Roux  
Johanna Letwaba

Donald Sibusiso Mabuza  
Innocentia Maduma  
Carmen Magardie  
Ntebaleng Makgalemele  
Canon Mametse  
Junior Maswanganye  
Malcolm McLean  
Karen Milford  
Molemo Mosupye  
George Moyo  
Sarafina Mpapele  
Regina Mtshweni  
Lucky Nemakwarani  
Dikgang Ngcobo  
Sindiswa Nkabinde  
Theo Thulani Phantshwa  
Jeffrey Pitsi

Ziyaad Shaboddin  
Johannes Shihlane  
John Shirindi  
Shabana Shivani  
Thulane Sikhakhane  
Lawrence Skhosana  
Nontlantla Skosana  
Riaan Smit  
Edward Stroebe  
Lizette van der Merwe  
Fransie van der Merwe  
Catharina van Harmelen  
Namosha Veerasamy  
Elizabeth Venter  
Susan Bonisile Vilakazi  
Ilse Viljoen





## Research project presentations







## Group A Research Projects

- Biochemistry:** TB or not to be ... Who needs AIDS?
- Earth Science:** Rocks: where they come from and what they consist of.
- Food Science:** Utilisation and preservation of traditional African foods.
- Genetics:** White grubs expose and their ... genes.
- Physics:** Investigation of mechanical properties of polycrystalline copper.
- Plant Pathology:** Preserving fruits with natural products.
- Plant Production & Soil Science:** Biological methods of decreasing fruit rot.
- Zoology:** The Highveld mole rat - a nutritional study.

## Research project presentations



### UP alumnus receives prestigious medal in Science

By Marie Morris  
Posted on 25 October 2010



Michael Ellis

An alumnus of the University's Faculty of Natural and Agricultural Sciences, Michael Ellis was recently awarded the Junior Captain Scott Memorial Medal in Zoological Sciences.

The South African Academy of Science (SAAS) (South African Academy for Science and Art) awarded this medal annually for the best MSc dissertation submitted at a South African university in either the Zoological or Botanical Sciences. The title of his dissertation is *Honeybees: Humidity and water relations in honeybee colonies (Apis mellifera)*. His supervisors were Dr Vincent Dietemann, Prof Sue Neebhan and Prof Robin Cowie.

His dissertation showed that honeybee colonies are able to regulate humidity in the hive, in essence acting like the fans that we use in our homes and workplaces. Although, rather than struggling with too low humidity as we often do in our homes, honeybee colonies struggle with excessively high humidity. In the process of making honey, bees evaporate an incredible amount of water from the gathered nectar. Michael showed that worker bees expel this humid air from the hive by using their wings for fanning the air much like an air-conditioning system in a building.

### Meet the new lead science communicator at SAASTA, Michael Ellis

By South African Science & Technology Advancement (SAASTA)



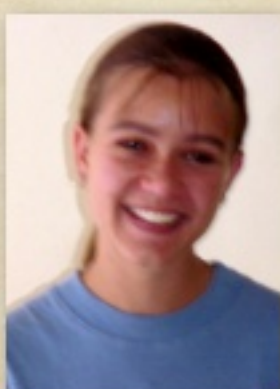
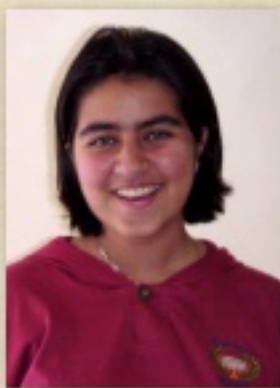
Michael Ellis speaks for a poster about climate change during the SAASTA event.



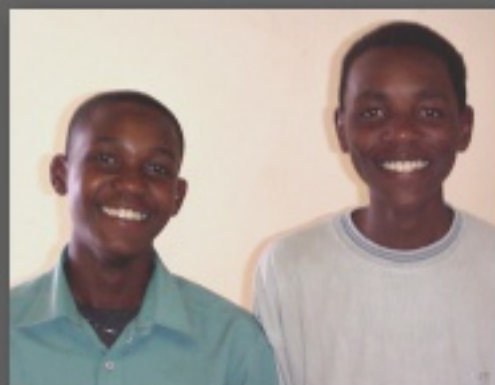
Michael Ellis and the model of a satellite.

Establishing dialogue between science and society is one thing that Michael Ellis, the new Science Communication Manager at the South African Agency for Science and Technology Advancement (SAASTA), is passionate about. It was, therefore, a no-brainer that he would embrace an opportunity to join SAASTA, which is at the forefront of the country's national science engagement efforts. He believes that industry involvement and multi-stakeholder partnerships will be crucial in strengthening the national science engagement initiatives. When not consumed by his day, this married father of two finds enjoyment and purpose in his faith, family and freedom, he says.









*"Although I am not specifically interested in Astro science,  
I found the trip (to HartRAO) really interesting.  
It was also fun to hang out a bit more with the other kids."*

Marja



## Group B (1999 intake)

Brenda Behle  
Jasper Buys  
Theuns Cloete  
Carlo Combrinck  
Thea de Villiers  
Gerald Delebo  
Tanya Groenewald  
Lilla Haynes  
Bianca Hinze  
Renee Hlozek  
Zakiya Ismail  
Zaheer Ismail  
Zack Jansen van Rensburg  
Rencia Joubert  
Yolande Khutlisi

Tsholofelo Kibido  
Rudi Kraft  
Robert Langa  
Ling-Ling Lee  
Edmund Magalanyane  
Haseena Mahomed  
Elrike Malan  
Lesego Mamabolo  
Patrick Manganyi  
Susann Marais  
Ruth Mathale  
Lucratia Mathe  
Christopher Medlin  
Jacob Modiba  
Hazel Mogadi

Phenyo Molefe  
Fatima Moosa  
Thomas Mthombeni  
Lawrence Ngalela  
Marja O'Neill  
Wessel Oosthuizen  
Nadarajan Padayachy  
Wilma Prinsloo  
Cindy Schoeman  
Goitseone Sere  
Marlize van der Berg  
Cornelius Viljoen  
Nesime Vural  
Madelaine Weideman  
Gloria Zwane





Renée Hložek

## Students

### Passionate to make Science accessible for all

Fascinated by the burning questions about the universe – its origin, fate and evolution – Renée Hložek gravitated towards Science at school. In the hope of one day being able to answer them, it seemed destined because, through various programmes, scholarships and natural aptitude, the universe steadily opened up to her.

In 2012 she was selected as one of the Mar & Gordon's 2011 Young South Africans under the age of 30, who are doing extraordinary things. She is seen as a future leader. Renée is currently conducting postdoctoral research in cosmology at Princeton University as a Lyman-Spitzer Jr. Postdoctoral Fellow in Theoretical Astrophysics, analysing light originating just 380 000 years after the Big Bang. She is also the Spitzer-Cohen Fellow in the Princeton Society of Fellows in the Humanities. She was recently named a TED Fellow for 2013, a fellowship which focuses on both her Science and the communication of Science to the public.

Renée kicked off her Academic Career in Science through the "UP with Science" programme whereafter she completed a BSc degree in Mathematics in 2001 in the Faculty of Natural and Agricultural Sciences at the University of Pretoria (UP). She completed her honours in Applied Mathematics in 2004 at the University of Cape Town, as part of the Historical Astrophysics and Space Science Programmes (HASSP). A master's degree followed and her studies were funded by the BSA Human Capital Development Programme. Between 2008 and 2011, as a Rhodes scholar, Renée read for her DPhil in Astrophysics at Oxford University.

Renée recently visited the "UP with Science" programme, which is still flourishing after almost 15 years. She was delighted to meet the current students and gave them a talk about her research. She is also going to work with them in an upcoming Science-outreach initiative, where learners use video technology to communicate science ideas and questions.

Just as passionate as she is about making Science accessible, she is about giving back. Therefore she is involved in several outreach programmes, including teaching Mathematics in prisons and Informing at schools. "I am passionate about science communication, allowing Science to open the minds of young people. I believe in the power of Science to enrich as well as to educate. I'm passionate about Africa."

Renée emphasised how fascinated she is by our universe – "How it started, how it evolves with time and how it will end."

"The UP with Science Programme is a science enrichment programme for senior secondary school pupils, presented by the University of Pretoria. Approximately 50 grade 10 school learners who have high potential and a keen interest in Science are annually selected to participate in the science enrichment programme. While in the Programme, they are exposed to an enquiry-based approach to Science. It runs over three years, and thereafter the learners may qualify for a bursary scholarship, valid for most of the study programmes that are offered in the Faculty of Natural and Agricultural Sciences, provided that they meet the normal admission requirements. This Programme includes Saturday meetings once a month and a project week during the holidays, once per year. The Programme is aimed at increasing young people's interest in, knowledge of, and skills in Science."

Visit <http://www.upwithscience.up.ac.za/> for more information on the UP with Science programme.

Credit: Mar and Gordon, and Renée Hložek



During her visit to South Africa in April 2013, Renée Hložek presented an Astronomy Workshop to the Grade 12 UP with Science learners of Group N.

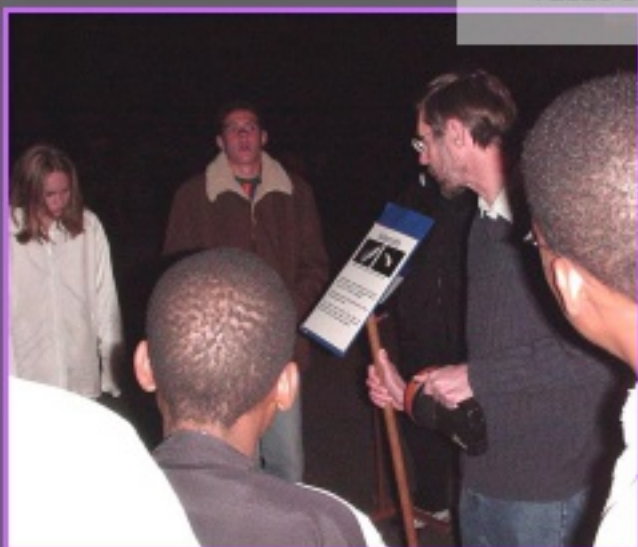








**Visit to HartRAO**



**Jacob Modiba and Edmund Magalanyane:** winners of the special award for the best ThinkQuest web site of a Telkom 1000 school.





**In the Lab**





2000

# Give Your future a high five

Answer the following five questions and find out what the future holds for you

1. Are you currently in Grade 10 and taking Maths and Science on the higher grade?
2. Are you interested in a career in science?
3. Would you like to spend 3 years in the University of Pretoria's UP with SCIENCE programme?
4. Would you like to participate in Saturday classes, a winter school and mini-research projects?
5. Would you like to receive free university tuition?

If you answered YES to all the above questions, A WORLD OF OPPORTUNITY awaits you...

**BUT BE WARNED!**

DO NOT read the reverse side of this poster unless you are REALLY SERIOUS about your future and are VERY INTERESTED in science!

Faculty of Natural, Agricultural and Information Sciences  
Tel: 430-2666 / 430-2666

SCIENCE



# Up With Science

A Science Enrichment Programme for High School learners presented by the Centre for Science Education University of Pretoria

For students who are currently in Grade 10 and taking Maths and Science on the higher grade, and who are interested in a career in science, the UP with SCIENCE programme offers a world of opportunity.

The programme is designed to provide students with a solid foundation in science and to develop their problem-solving skills. It includes a variety of activities, including laboratory work, field trips, and mini-research projects.

## Objectives of the Programme

To provide students with a solid foundation in science and to develop their problem-solving skills.

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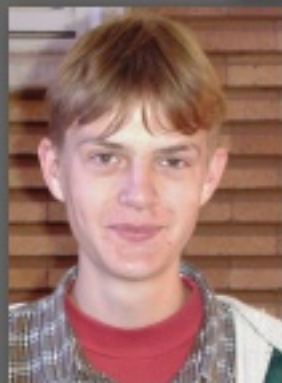
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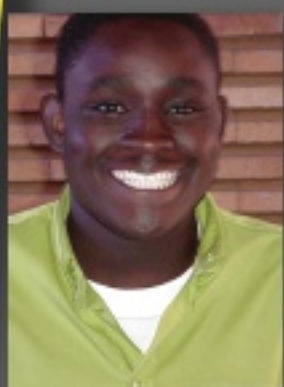
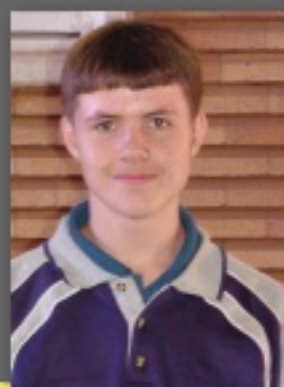
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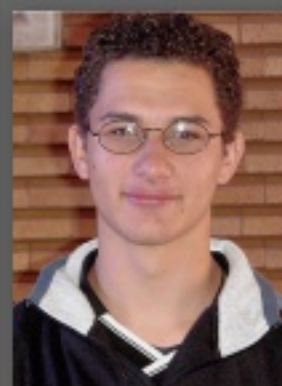






### Departments visited

Botany  
 Chemistry  
 Earth Sciences  
 Electron Microscopy  
 Food Science  
 Genetics  
 Physics  
 Plant Production  
 Soil Science  
 Tswaing Crater  
 (Geology & Botany)  
 UP Farm  
 Zoology



*"I learned the most from the activity of building the AM radio; I had some knowledge of electronics prior to the activity but it was more interesting to learn from a practical experience."*

Waheed

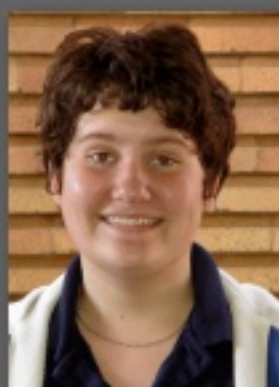
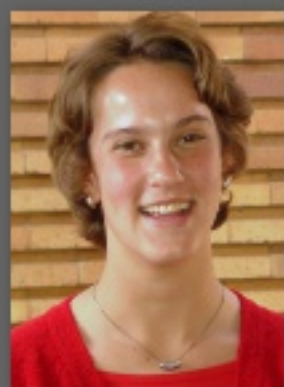




## Group C (2000 intake)



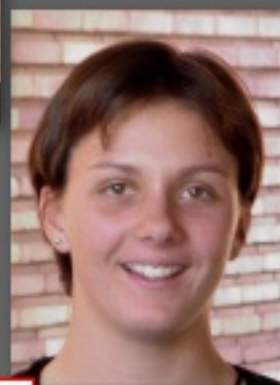




## Group C Research Projects



- Biochemistry: Science of vaccination  
Chemistry: Crystal growth on rough surfaces.  
Earth Science: Soils: Where do they come from, what do they consist of and how do they affect plant life.  
Food - & Consumer Science:  
1. What I eat.  
2. Food security in urban and peri-urban areas in Gauteng  
Physics: Getting to know semi-conductors.  
Plant Production & Soil Science: Use of tissue culture to grow an ornamental plant.  
Zoology & Entomology: Evaluating the taxonomy of two medically and agriculturally important species of mice.



Martin Ackermann  
Rubina Adam  
Nadine Chambers  
Susan Didiza  
Kabelo Ditshego  
Aboobaker Gani  
Joao Goncalves  
Izanda Grobler  
Jason Hübner  
Anjli Kala  
Modiba Khomotso  
Karien Labuschagne  
Marius Lategan

Patrick LeBepe  
Lerato Mabena  
Waheed Mahomed  
Matlhodi Makena  
Jane Makgoba  
Jacqueline Meyer  
Mfundo Mlambo  
MMakoma Charlotte Mlangeni  
Rethabile Selekani Mohapi  
Baleseng Mokone  
Moses Mokwena  
Jafta Mthimunya  
Zika Myeni  
Letta Kuki Ndala  
Bongile Nethanonda  
Priscilla Ngomane  
Bobby Ramagwede  
Kenosi Rapoo  
Suné Rossouw  
Tshegofatso Sebapu  
Macdonald Selahle

Marius Snyman  
Ruan Snyman  
Carmen So  
Amitha Thomas  
Cynthia Ned Tjatji  
Carel van Dam  
Neline van der Merwe  
Morné van der Waltsleben  
Elana van der Wath  
Sonica van der Westhuizen  
Louise van Niekerk  
Jacques van Wyk  
Kamantha Veerasamy  
Vittorio Vorster  
Adell Vorster  
Elizabeth Maria Walters  
Maryke Wolmarans





## Group C at the Tswaing Crater





## team



The creators of this site are Louise van Nieuwen and Adell Verster.

We are two enthusiastic teenagers, believing that science will pave the roads for generations to come. Having spent our time in sunny South Africa this far, we now know that energy sources and fuel refineries are needed. Thus ...

HOW ABOUT USING SUNLIGHT FOR ENERGY?

After realising it had already been done, we thought we'd give people the opportunity to gather information on solar energy and the conversion of our fantastic subjects, where we elaborate on God's divine gift to mankind.

### ACKNOWLEDGEMENTS:

Thanks to the following people:

Prof. Z. Bagan  
Hugo van der Hoff  
Michael McLean  
Michael Boud

## did you know?

- Kalahari is the second biggest African desert
- It takes up one thirds of the Botswana country
- Kalahari is flat, covered with thorn trees and long grass
- Kalahari desert is located in Botswana, it is a very beautiful and dry desert
- Botswana is Southern Africa's largest and authentic wilderness, and it is a land of great contrast
- During summer it is hot to very hot with temperature sometimes exceeding 38 degree Celsius
- Winter daytime temperatures are normally warm, the rainy days are often extended from November to April
- Even the San people can be found in Botswana
- Accessories and clothes are essential to accommodate the weather
- Before visiting the Kalahari desert you have to consult your doctor for more precautions for the disease of Malaria, there has been an increase on the incidence of this disease amongst the visitors and residents.

get 2 homepage

## Peat Thiel



CLICK ON THE PICTURE TO ENTER OUR SITE

Images obtained from the work of Chesapeake University (see Bibliography)

## INTRODUCTION

A tribe is a group of people living in a particular place. In South Africa we have various tribes.

These tribes differ according to their names, the way they live(lifestyle), their customs, the foods which they eat, the way they dress and their traditions.

## VARIOUS TRIBES

 [BATSONGA TRIBE](#)

 [XHOSA TRIBE](#)

 [BATSWANA TRIBE](#)

 [ZULU TRIBE](#)

 [BAPEDI TRIBE](#)

 [NDEBELE TRIBE](#)

 [VENDA TRIBE](#)

# ThinkQuest

## Grade 12 Project



## EDIBLE WORM

Wandering My Way Into Your Mouth!

Choose the worm that matches the description.



### DESCRIPTION

This worm is called *Gonimbrasia belina*. The body of the worm is segmented and hairy. It grows around to 10cm in length. Its native name, given by those who eat it is a *Mopani Worm*. It is found on Mopani trees (*Colophospermum*). In South Africa it is found mostly in Vanda which is in the Limpopo Province and in Mpumalanga.

Answer:

We'll dare if you got that right. If you got it wrong don't worry you can have a shot at the next quiz.

## MaRiUs'S HoMePaGe



This is Me!



SoMacBookLabs.com

- I am 16 years old and in GSE 12
- My subjects are: Afrikaans, English, Maths, Science, Electronics and Computer Science.
- I live in Pretoria and intend on staying here!



My Desktop

## Take five !

A Journey into the lives of south africa's big five...



## REFLEXOLOGY



## AROMATHERAPY



TREATMENT  
THERAPY  
ACCOMPLISHED  
HOW EFFECTIVE  
SEE A DOCTOR OR  
ABOUT US  
REFERENCES

## ALTERNATIVE MEDICINE

### AYURVEDA



### MEDITATION





Give your future a high five  
Faculty of Natural & Agricultural Sciences

5

- 
- A collage of images including zebras, a yellow flower, a blue architectural structure, and the text 'UP ENCE'.



UP with SCIENCE

Visit our web site at: [www.um.ac.za/academic/2005/may/](http://www.um.ac.za/academic/2005/may/) or phone: +27 (0)21 470-2644 / 3244

Biochemistry  
Botany  
Chemistry  
Consumer Sciences  
Genetics  
Hydrotech  
Lab for Microscopy  
Mathematics  
Physics  
UP Farm (Plant Production)  
Sterkfontein Caves  
Tswaing Crater  
(Geology & Botany)  
Town & Regional Planning  
Zoology

*"This year was fun, exiting, eventful & educational. I enjoyed myself, the food was excellent and I made new friends."*

Sadiyah

[illegible]





## Group D Research Projects



### Biochemistry & Microbiology:

The science of antibiotic drugs.

### Botany:

A Biological Inventory of two *Hypoxis* species in the Rietvlei Nature Reserve.

### Chemistry:

Fire in Africa.

### Earth Science, Plant Production & Soil Science:

Soils: Where they come from, what they consist of and how they affect plant life.

### Genetics:

Can DNA be used to detect differences in *Clivia*?

### Meteorology & Mathematics:

Meteorology, Mathematics and Marion Island.

### Physics 1:

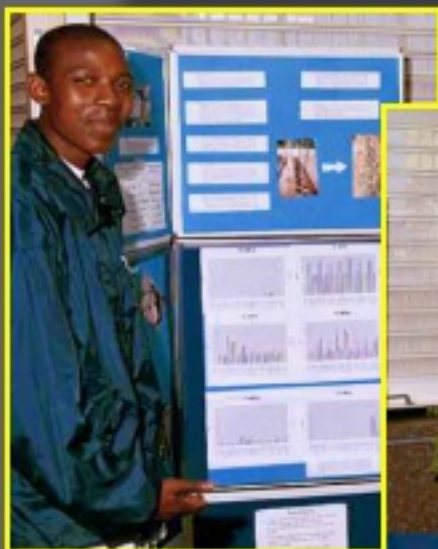
Radiation Physics.

### Physics 2:

Study of materials.

### Plant Pathology:

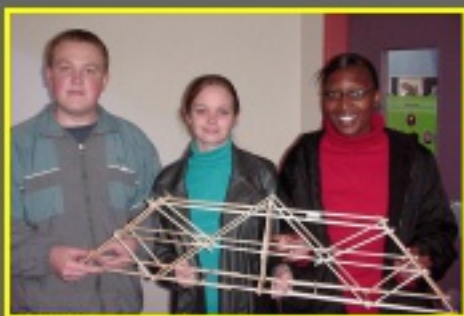
The use of indigenous plant extracts to control bacterial and plant pathogens.



## Research project presentations







## Grade 12 Projects

Bridge building  
Kite designing  
Sundial  
Science Shop







## Group D (2001 intake)

Izak Bisschoff  
 Magda Booyens  
 Piet Bopape  
 Simphiwe Chabalala  
 Khanyisa Chauke  
 Gareth Chilton  
 Mark Coote  
 Jennilee Damons  
 Naomi de Beer  
 Marcia Dlamini  
 Shanie Emslie  
 Thasnie Govender  
 Wilma Janse van Rensburg  
 Kenalemang Kgarume  
 Amelia Kruger  
 David Laolang

Thato Letlape  
 Leon Lombard  
 Blantina Matheka  
 Yoliswa Matu  
 Edwin Mhlongo  
 Charity Mngube  
 Victoria Moleya  
 Vivian Möller  
 Kgaogelo Moloko  
 Georgina Motha  
 Makatu Murulana  
 Nomxolisi Ngubane  
 Leana Opperman  
 Sadiyah Patel  
 Nikolaas Pienaar  
 Lüka Potgieter

Adinda Preller  
 Liezl Prinsloo  
 Tsheko Ramantshane  
 Bronwyn Retief  
 Jean Saayman  
 Tidimalo Seboane  
 René Sissing  
 Thipe Solomon  
 Robert Steen  
 Raesa Suliman  
 Tsholo Talane  
 Khutso Tlaka  
 Leonardo Tommassini  
 Maryke van Vuuren  
 Isabel Venter  
 Barbara Vilakazi





© 2000 Blackwell Science Ltd *Journal of Internal Medicine* 247: 111–117

UP with  
**SCIENCE**



Give your future a high five

- 1 Are you currently in Grade 10 and taking Maths and Science on higher grade?
- 2 Are you interested in a career in science?
- 3 Would you like to spend three years in the University of Pretoria's **UP with Science** programme?
- 4 Would you like to participate in Saturday classes, a winter school and mini-research projects?
- 5 Would you like to receive free university tuition?

If you answered "Yes!" to all of the above questions, a world of opportunity awaits you.

A Science-Enrichment Programme for High School learners presented by the Centre for Science, Mathematics and Technology Education, University of Pretoria

the Institute for Genetic Mathematics and Technology Education and the Institute of the University of Bremen's Faculty of Science and Agricultural Science promote their science programs for high school teachers.

A teacher's effectiveness is evaluated annually to take part in the career progression programme (from Grade 12 to Grade 15) which includes learning about how a school and a teacher perform over a year. The programme is aimed at increasing every teacher's knowledge of current standards in science. It helps to see the need for improvement in the classroom.

[illegible]

**Participants** Fifty-four participants were selected from various high schools in the greater Phoenix area. The students all had classes in the fine arts which the first author was instructing during the study period. Participants were selected on the basis of an important criteria: their consistent academic and artistic interest in various indicators of their talents include: membership in the arts club, to be selected for the national student achievement assessment (National Achievement Test) in Grade 8 and to serve as the captain of the school sports team (voluntary).

A noteworthy achievement is a reduction of 8 barriers that is recognized across all major organizations. There are also other barriers that are not shown in the chart.

What does the GP with business programme  
involve?

**Year One 1999 - Grade 10**  
 Science educators and 47 elite science program students participate in science enrichment activities and experiences that the University of Puerto Rico's Center for Science, Mathematics, and Technology Education is organizing. These

- *Students will:*
  - *Identify an alternative work*
  - *Propose steps for gathering evidence from various experiments in the fields of Natural and Applied Sciences*
  - *Working with problem-solving students will work effectively*
  - *Building the Mathematical model and using alternative work*

**Year: 2002 - Grade: 10**  
The second year follows the same pattern as the first. The participants spend some time working with a religious leader. The University's religious literacy staff assist.

**Year Three (2004) - Grade 9**

Students in the third year include all of the above plus:

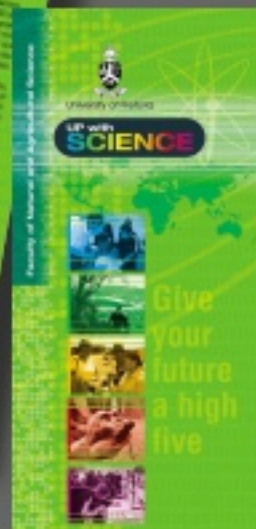
- Designing science-related web-pages and
- Designing and giving presentations for science-related

**Notes:** Four in five (80%) in 1987. University participants satisfied minimum requirements of a first class pass of the 1987-1988 University programme who fulfil the admission requirements and attend for one or more relevant courses in the Faculty of Education and Professional Studies at the University of Pretoria will receive a 40% discount on the fee.



### Departments visited

- Biochemistry
- Chemistry
- Consumer Science
- Food Science
- Genetics
- Geography
- Lab for Microscopy
- Mathematics
- Plant Pathology
- Physics
- Plant Production & Soil Science
- Tswaing Crater (Geology & Botany)
- Town & Regional Planning
- UP Farm
- Zoology



*"I enjoyed my Grade 11 project on Meteorology. It was great fun putting the project together and I enjoyed our trip to the SA Weather Service. I learnt a lot!"*

Albert



| 1  | 2  | Periodic Table of the Elements |    |                                    |    |    |    |    |    |    |    |  |  |  |  |  |  | 13  | 14  | 15  | 16  | 17  | 18  |
|----|----|--------------------------------|----|------------------------------------|----|----|----|----|----|----|----|--|--|--|--|--|--|-----|-----|-----|-----|-----|-----|
| H  | He |                                |    |                                    |    |    |    |    |    |    |    |  |  |  |  |  |  | B   | C   | N   | O   | F   | Ne  |
| 3  | 4  |                                |    |                                    |    |    |    |    |    |    |    |  |  |  |  |  |  | 5   | 6   | 7   | 8   | 9   | 10  |
| Li | Be |                                |    |                                    |    |    |    |    |    |    |    |  |  |  |  |  |  | Al  | Si  | P   | S   | Cl  | Ar  |
| 11 | 12 | 3                              | 4  | 5                                  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |  |  |  |  |  |  | 13  | 14  | 15  | 16  | 17  | 18  |
| Na | Mg | Sc                             | Ti | V                                  | Cr | Mn | Fe | Co | Ni | Cu | Zn |  |  |  |  |  |  | Ga  | Ge  | As  | Se  | Br  | Kr  |
| 19 | 20 | 21                             | 22 | 23                                 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |  |  |  |  | 31  | 32  | 33  | 34  | 35  | 36  |
| K  | Ca | Sc                             | Ti | V                                  | Cr | Mn | Fe | Co | Ni | Cu | Zn |  |  |  |  |  |  | Ga  | Ge  | As  | Se  | Br  | Kr  |
| 37 | 38 | 39                             | 40 | 41                                 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |  |  |  |  |  |  | 49  | 50  | 51  | 52  | 53  | 54  |
| Rb | Sr | Y                              | Zr | Nb                                 | Mo | Tc | Ru | Rh | Pd | Ag | Cd |  |  |  |  |  |  | In  | Sn  | Sb  | Te  | I   | Xe  |
| 55 | 56 | 57                             | 58 | 59                                 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |  |  |  |  |  |  | 67  | 68  | 69  | 70  | 71  | 72  |
| Cs | Ba | La                             | Ce | Pr                                 | Nd | Pm | Sm | Eu | Gd | Tb | Dy |  |  |  |  |  |  | 73  | 74  | 75  | 76  | 77  | 78  |
| 87 | 88 | 89                             | 90 | 91                                 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |  |  |  |  |  |  | 81  | 82  | 83  | 84  | 85  | 86  |
| Fr | Ra | Ac                             | Th | Pa                                 | U  | Np | Pu | Am | Cm | Bk | Cf |  |  |  |  |  |  | 113 | 114 | 115 | 116 | 117 | 118 |
|    |    | Atomic number                  |    | 8                                  |    | O  |    |    |    |    |    |  |  |  |  |  |  |     |     |     |     |     |     |
|    |    | Symbol                         |    |                                    |    |    |    |    |    |    |    |  |  |  |  |  |  |     |     |     |     |     |     |
|    |    | Atomic weight                  |    | 15.999                             |    |    |    |    |    |    |    |  |  |  |  |  |  |     |     |     |     |     |     |
|    |    | Electronegativity              |    | 3.5                                |    |    |    |    |    |    |    |  |  |  |  |  |  |     |     |     |     |     |     |
|    |    | Electron configuration         |    | He 2s <sup>2</sup> 2p <sup>4</sup> |    |    |    |    |    |    |    |  |  |  |  |  |  |     |     |     |     |     |     |



Pupils conducting a science experiment in the school's science lab.

## Experiencing the wonders of science

This year, for the fifth consecutive year, the Centre for Science, Mathematics and Technology Education and the school of the University of Pretoria's Faculty of Science and Agriculture Sciences are once again presenting their science symposium programme for high school learners, UP with Science.

Approximately 30 grade 10 learners from high schools in and around the greater Pretoria area are selected annually to participate in the symposium programme which includes monthly Saturday classes and an annual winter school.

There is tough competition for the 30 available places.

A school may recommend a maximum of only two learners and only to exceptional cases will more than one learner from any one school be selected.

This year Lynton Manor High School took the pleasure and motivated two of its learners to represent the school. This resulted in a delightful outcome for us.

This year, we are taking part in all sorts of exciting and wonderful science enrichment activities and experiments that the University of Pretoria's Centre for Science, Mathematics and Technology Education arranges.

These activities include hands-on laboratory work, being part of an audience for presentations by pioneering scientists from various departments in the Faculty of Natural and Agricultural Sciences, working with problem-solving scenarios and making software and exploring the world wide web and using electronic mail.

It gives the great pleasure to represent Lynton Manor High at UP with Science.

It is also to encourage all those "science buff" learners to grade 10 to seriously consider taking up the opportunity, when it comes again next year, to be a part of UP with Science and join in the fun.

Deborah Reynolds, grade 10

## Group E Research Projects



- Biochemistry:** Biosensors - Biosense or Baie Nonsens?
- Chemistry:** Colours, Pigments and Dyes
- Genetics:** Tea-extracts used to control pathogenic fungi
- Meteorology & Mathematics:** Mathematical modelling in Finance and Meteorology
- Physics:**
  1. Radiation Physics
  2. Study of materials
  3. Efficiencies of rechargeable batteries
- Plant Pathology:** Antimicrobial activity of tea (*Camellia sinensis*) extracts against plant pathogenic fungi on vegetable crops





## Grade 12 Project

"Touch Me!"  
Drawers for  
Sci-Enza



"Creating the boxes was really awesome!"  
Sherwin







## Group E (2002 intake)

Etienne Ackermann  
 Imke Birkenstock  
 Charisse Buchanan  
 Brümilda Cloete  
 Francois Conradie  
 Robyn de Jager  
 Bernard Erasmus  
 Fiona Ferris  
 Sherwin Gabriel  
 Neo Gomba  
 Trevor Hansen  
 Sadika Ismail  
 Jaco Jansen van Rensburg  
 Haseena Khan

Rose Khoza  
 Burr Knott  
 Leigh-Anne Koekemoer  
 Jaco Kok  
 Christoffel Kriel  
 Esther Lietsiso  
 Obakeng Maema  
 Calvin Maleka  
 Marcia Maluleke  
 Busisiwe Masuku  
 Agrinatte Mbatha  
 Schalk Meintjes  
 Jan Nagel  
 Kutlo Ndabambi  
 Fezeka Ndhlovu

Jaco Nieuwenhuijs  
 Tryphina Nyalungu  
 Jané Peens  
 Letlhogonolo Pitse  
 Dalene Prinsloo  
 Cynthia Seemane  
 Mohamed-Naeem Shaboddin  
 Denise Snyman  
 Louisa Steenkamp  
 Zuleikha Suliman  
 Ben Tjibe  
 Albert van Heerden  
 Liesl van Rooyen  
 Evett Vorster



# 2003

## Departments visited

Biochemistry  
Chemistry  
Genetics  
Geography (Meteorology)  
Lab for Microscopy  
Mathematics  
Physics  
Plant Pathology  
Sterkfontein Caves  
Tswaing Crater  
(Geology & Plant Science)  
Veterinary Science  
Zoology

Faculty of Natural and Agricultural Sciences

UP with **SCIENCE**

A Science Enrichment Programme for High School Learners

The sciences offer bright sparks bright futures

If you are:

- in grade 10 and taking Science and Mathematics on higher grade;
- considering a career in science;
- inquisitive and experimental;
- keen to learn and experience new things;
- interested in your surroundings and caring about the environment and social issues;
- able to clearly communicate thoughts; and
- able to work in a team,

you fit the profile of an UP with Science learner.

A world of opportunities awaits those who explore it

For more information about the programme visit the UP with Science website at <http://www.up.ac.za/science> or contact the programme coordinator, Dr. Hugo van der Merwe, at 011-450-2020 or 011-450-2021.

For more information about careers and study programmes in science visit the Faculty of Natural and Agricultural Sciences website at <http://www.up.ac.za/faculty-natural-agricultural-sciences> or phone the public relations officers at 011-450-2024.

A Science Enrichment Programme for High School Learners

UP with Science

What does the UP with Science programme offer?

UP with Science is a science enrichment programme for high school learners. It is a programme that aims to provide learners with a hands-on experience of science and to develop their interest in the subject. The programme is designed to be a fun and challenging experience for learners, and it is open to all high school learners who are interested in science.

UP with Science is a science enrichment programme for high school learners. It is a programme that aims to provide learners with a hands-on experience of science and to develop their interest in the subject. The programme is designed to be a fun and challenging experience for learners, and it is open to all high school learners who are interested in science.

UP with **SCIENCE**

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"From my point of view, I think the UP with Science project is really helping us to become better heroes for the future and also to make our country a better place for everyone."

Pretty





Genetics



At the Tswaing Crater



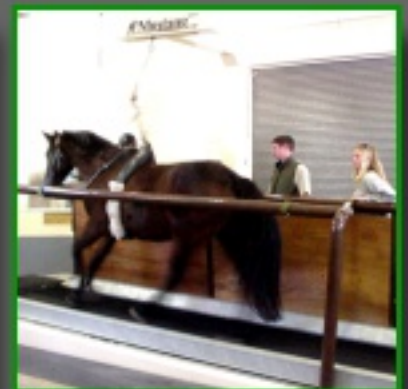
Biokinetics



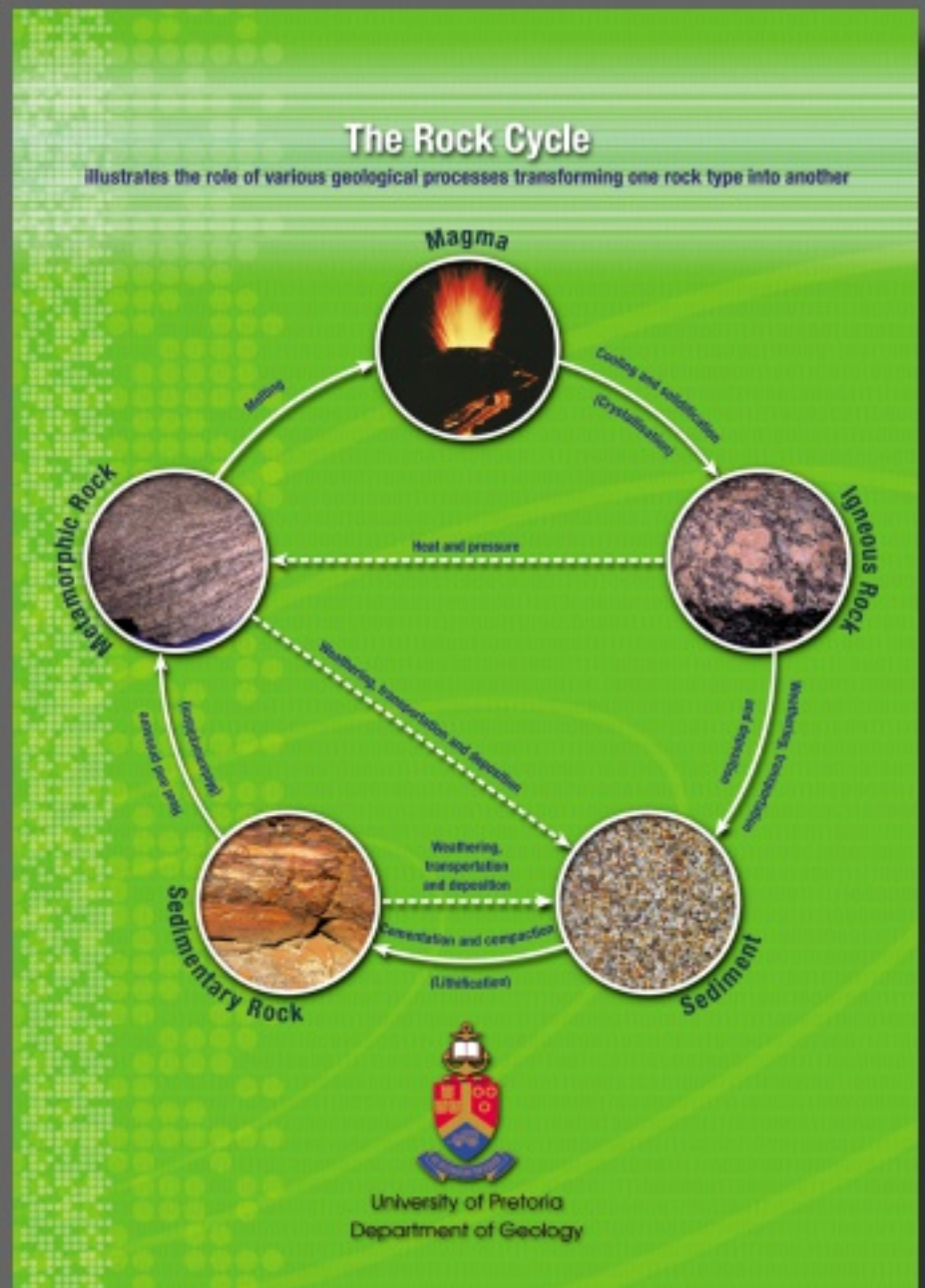
Building a radio



Chemistry: Tie dying



At Onderstepoort





## Group F Research Projects



- Biochemistry: Science against crime.
- Chemistry: Environmental Chemistry.
- Genetics: Mushrooms - Food or Hallucinogen?
- Mathematics: Is the fourth dimension really time?
- Meteorology: Predicting the weather with a mathematical algorithm.
- Physics: Evaluation of solar energy devices for use in rural South Africa
- Plant Pathology: Aflatoxin in Peanuts and Peanut Butter.
- Plant Production and Soil Science: Response of lettuce transplants to nitrogen nutrition in a floatation production system.
- Town & Regional Planning: A settlement analysis of Hatfield.



Town & Regional Planning project



Plant Production group



## From Newton to Einstein A card game - Grade 12 Project



Conrad receiving his certificate of participation





## Group F - Russells (2003 intake)

Karimi Barnard  
 Petro Bester  
 Danica Botha  
 Darrel Chilton  
 John de Jager  
 Susan du Raan  
 Chanél Fourie  
 Juan Gijzelaar  
 Conrad Gohl  
 Thiloshni Govinder  
 Helinka Hager  
 Christy Holloway  
 Naeema Ismail  
 Thobile Jiyana  
 Abinaar Khunou  
 Anina Kleynhans

Alinke Labuschagne  
 Pretty Langa  
 Michael Louw  
 Phethang Mabeba  
 Malesotse Makgalemele  
 Relebogile Malele  
 Robert Mangwane  
 Lesego Marumo  
 Ntombifuthi Masango  
 Thapelo Mokau  
 Oleboge Mokoka  
 Refiloe Morailane  
 Koketso Ndukula  
 Gabangaye Ndwandwe  
 Riaan Nel  
 Romeo Nkwane

Thabang Noge  
 Ian Pelser  
 Petria Rademeyer  
 Precious Ramushu  
 Kabelo Raphotle  
 Francois Saayman  
 Kyla Steenveld  
 Ntsako Valoyi  
 Christene van Niekerk  
 Martin van Niekerk  
 Rushka Venter  
 Wilandi Visser  
 Arifa Vorajee  
 Chantelle Vorster  
 David Weatherhead  
 Wolfgang Wehrmeyer





# UP with SCIENCE



A world of opportunities awaits those who explore it

## The sciences offer bright sparks bright futures

If you are:

- in grade 10 and taking Science and Mathematics on higher grade;
- considering a career in science;
- inquisitive and experimental;
- keen to learn and experience new things;
- interested in your surroundings and caring about the environment and social issues;
- able to clearly communicate thoughts; and
- able to work in a team.

**you fit the profile of an UP with Science learner. Become part of the Innovation Generation.**

For more information about the programme visit the UP with Science web site at: <http://www.upwithscience.co.za> or email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

For more information about careers and study programmes in science visit the Faculty of Natural and Agricultural Sciences' web site at: <http://www.up.ac.za/facultyofnaturalandagriculturalsciences> or phone the public relations practitioners at 012-320-2004/2005.

# 2004

## Departments visited

Biochemistry  
Chemistry  
Food Science  
Genetics  
Geography (Meteorology)  
Mathematics  
Microbiology  
Physics  
Tswaing Crater  
(Geology & Plant Science)  
Veterinary Science  
Zoology

*"With all these really clever people around me, I'm inspired to work harder to equal them."*

Anonymous

**A Science Enrichment Programme for high school learners sponsored by the Discovery Centre @ TUKS, University of Pretoria**

The Discovery Centre @ TUKS and its members at the University of Pretoria are proud to present the UP with Science programme. This programme is designed to provide high school learners with a world of opportunities to explore the sciences and to experience the excitement of discovery.

**Selection of Candidates**

Candidates for the UP with Science programme are selected from schools in the TUKS region. The programme is open to all high school learners in the TUKS region who are in grade 10 and taking Science and Mathematics on higher grade. Candidates are selected on the basis of their academic performance, their interest in science, and their ability to work in a team.

**What does the UP with Science programme entail?**

For the 2004 - 2005 year, the UP with Science programme entails the following:

- A series of workshops and seminars on various scientific topics.
- A series of field trips to various scientific sites.
- A series of projects and assignments.
- A series of presentations and posters.
- A series of competitions and challenges.

For the 2004 - 2005 year, the UP with Science programme is open to all high school learners in the TUKS region who are in grade 10 and taking Science and Mathematics on higher grade. Candidates are selected on the basis of their academic performance, their interest in science, and their ability to work in a team.

For the 2004 - 2005 year, the UP with Science programme is open to all high school learners in the TUKS region who are in grade 10 and taking Science and Mathematics on higher grade. Candidates are selected on the basis of their academic performance, their interest in science, and their ability to work in a team.

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At the Expo 2005





Department of Geography, Geoinformatics & Meteorology



**Lunch!**



**Food Science**



**Genetics**



## Group G Research Projects



- Biochemistry:** White Ant-i-freeze:  
Survival of the fittest.
- Botany:** An Eco-Physiological  
Investigation of Black  
Wattle (*Acacia mearnsii*) in  
the Rietvlei Nature Reserve
- Chemistry:** Synthesis of Aspirin.
- Genetics:** Fungal genetics.
- Mathematics:** Is the stock market a casino?
- Physics:** Forensic investigation of car  
headlight filaments  
involved in accidents.
- Plant Pathology:** Fungi, bacteria, yeasts and  
viruses
- Plant Production and Soil Science:**  
Tissue culture of banana  
plants.
- Zoology:** Reconstruction of an  
African mammal.



## Zoology - reconstruction of an Aardvark skeleton



## Every day is different with Science

"The UP with Science Programme definitely broadened my interest in Science. Science taught me to ask questions and I am still asking questions." This thought was shared by Jacques Pieter, 27, a Rutgers scholar at Rutgers University, a major research university located in Indiana, United States.

He is one of the many success stories of the UP with Science program in the Faculty of Natural and Agricultural Sciences, Jacqui is currently pursuing his PhD at Rutgers University after completing his masters degree in 2010 at the same university.

"The Grade 10 Science part of the UP with Science Programme, which fuelled my interest in Science, I also had very good Science teachers who encouraged my interest in Science. I must admit, I always found science fun."

"With Science, and sports, Physics was one day in the same. Every day is different," Jacques said.

In his master's year project as a senior Honours student, Jacques was tasked with achieving the best results for a new selected to visit the USA to study particle physics at Stanford University for a month. There already he had been asked to study Physics and he enrolled at the University of Pretoria. Jacques studied Physics at UP from 2007 to 2010, and completed his Honours in Physics.

Jacques' undergraduate study, which is partially funded by the National Research Foundation, focuses on ultra-cold physics, with the emphasis on dark matter. "The same techniques which are used in high energy physics are also used to detect dark matter. I love what I am doing. As part of my research I am working in an underground laboratory (the XENON1T detector) is located at the Gran Sasso Underground Laboratory in Italy, where it may capture signatures of dark matter that flow through the Earth as it flows through space."

"Whether I spend most of my free time in some of the big beautiful parks and lakes, hiking and enjoying nature!"

Jacques plans to complete his PhD by the end of 2016, after which he hopes to continue his postdoctoral research in an international research group. He is already collaborating with about 20 institutions through his research.

He recently visited the UP with Science programme, which still functions excellently after almost 10 years. He was delighted to meet the current students and deliver a speech to them about his research.

Jacques was recently also a guest on Orkney, KwaZulu's premier science investigation series on television, where he spoke on dark matter.

The UP with Science Programme is a science enrichment programme for senior secondary school learners, presented by the University of Pretoria. Approximately 1000-1500 learners who show a high potential for and a keen interest in Science are annually selected to participate in the science enrichment programme. A large part of the Programme they are exposed to an inquiry-based approach to Science. It runs over a period of three years, after which the learners may qualify for a scholarship valid for most of the study programmes that are offered in the Faculty of Natural and Agricultural Sciences, provided that they meet the normal admission requirements. The Programme includes laboratory visits once a month and a project week during the holidays once a year. The programme is aimed at increasing young people's interest in, knowledge of, and skills in Science.

Visit: <http://www.upwithscience.co.za/> for more information on the UP with Science Programme.







## Group G (2004 intake)

Jonathan Alston  
 André Bekker  
 Nelda Breedt  
 Tshegofatso Chauke  
 Thobile Chemese  
 Reinardt Cromhout  
 Jacqueline du Toit  
 Pieter du Toit  
 Barend Engelbrecht  
 Toni Fernandes  
 Mohammed Gani  
 Nastasha Glenewinkel  
 Nicolle Gomba  
 Tinyiko Gumede  
 Shelagh Hartley  
 Nabila Ismail

Sumaya Kassim  
 Tshegofatso Kekana  
 Lehlohonolo Lehasa  
 Muzi Madaure  
 MacDonald Mampuru  
 Reneilwe Mathebula  
 Vusi Mathebula  
 Sinah Matshego  
 Mpumelelo Mdlalose  
 Rearabilwe Mogashoa  
 Keikweditse Mogoba  
 Raesah Moosa  
 Kaneez Moosa  
 Kelebogile Mophatlane  
 Neo Mosupi  
 Tumelo Motaung  
 Busisiwe Mtsweni

Lloyd Naidoo  
 Debby Nixon  
 Lindiwe Nkosi  
 Jacques Pienaar  
 Michelle Prinsloo  
 Sarah Ramage  
 Tjaart Schutte  
 Sheila Sikhale  
 Madelein Smit  
 Marc Stocks  
 Lorraine Swanepoel  
 Robyn Thomas  
 Keotshepile Tladi  
 Thabiso Twala  
 André van Greuning  
 Paul Whelpton





## At the FabLab



*"Oh, I have met the State Herald! I never knew there were so many sciences behind the making of a new National Flag".*

Marika

State Herald Fred Brownell,  
designer of the new South  
African Flag

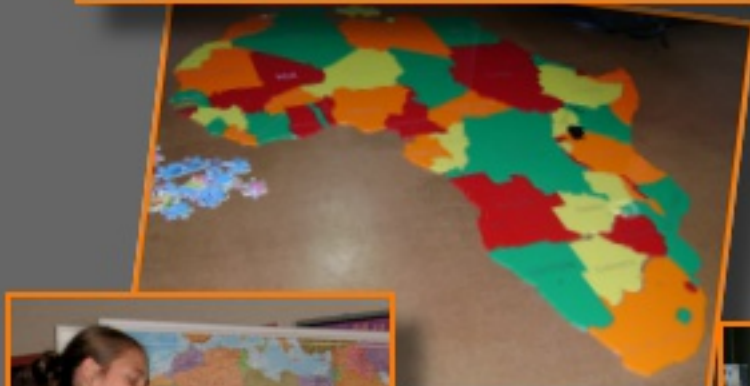


Fred Brownell, Prof Alex Duffey with a moon rock, ?, Helga Nordhoff and Rudi Horak





# Africa: a Grade 12 project



The Africa puzzle pieces were cut at the FabLab by Helga



Prof Cheryl de la Rey at Sci Enza





## TREE PROTECTION NEWS

Newsletter of the Tree Protection  
Cooperative Programme  
University of Pretoria

NO 8

NOVEMBER 2004



*"We had to get our hands dirty by making slides to view under a microscope. Some used protein as a specimen, others bread mould".*

Sibusiso



At Food Science

# UP with Science in the News

## Fun with science! UP with Science day – 30 June 2004

The UP with Science programme is a science enrichment programme for secondary school learners who show an interest in science as a career. Selection of the learners to participate in this programme is fairly competitive. Each secondary school in the Pretoria region may nominate two learners based on their academic potential and interest in science. From those nominations 50 learners are selected each year to participate in the programme.

The UP with Science programme is designed to run over a period of 6 years. The first 3 years are completed in Grade 10-12 and consist of monthly classes on Saturdays and a winter school during the June-July holidays. Upon successful completion of this phase the learners can enroll in a course of their choice in the Faculty and Natural and Agricultural Sciences. The University of Pretoria covers the tuition fees of these students.

Staff and students of FABI and the TPCP have always actively participated in this event. On 30 June 2004, we

hosted the Grade 10 learners for, in some cases, their first exposure to Genetics and Mycology. Forty-eight learners from a number of schools in the greater Pretoria region arrived at FABI at 8h30 in the morning. While loads of fun, the activities were designed to give learners an idea of what "real scientists" do in FABI. These included DNA extractions, Mendelian genetics, mushroom tasting and fungus watching.

Renee and Sabine presented a hands-on DNA extraction using household chemicals. Every learner was given a lab coat and had to extract DNA from wheat germ using common household chemicals. This proved to be a huge success with the learners and everybody enjoyed it. After completion of the experiment, everybody could take an appendage tube with DNA home. Learners were also taken on a tour of the state of the art sequencing facility at the University of Pretoria.

The second activity was an explanation of Mendelian genetics in which learners were taught how inheritance works. Prof. Brenda Wagfield presented this in a fun and practical way. Each learner had to draw a "family" tree based on a number of given characters. These characters were determined by flipping a coin to determine if the given character for the parents are dominant or recessive. Learners were impressed by the number of different options that can result from a single set of parents.

The mycology section was presented by Dr. Karin Jacobs. Most of the learners only had exposure to the world of fungi through their contact with bread mould. The mycology course started with a short talk on edible and harmful fungi, followed by a film on the dispersal methods and ecology of fungi. Most learners enjoyed this as it opened up a new microscopic world to them that they did not know existed. A number of common moulds were shown to them under the microscopes. The activity was ended with a mushroom tasting event. A number of edible mushrooms are available in South Africa, although very few people are aware of this and linear have tried these. A team of "chefs" which included Karin Muller, Renee, Tina, Melissa and Dr. Jacobs prepared some dishes with the mushrooms.

the previous evening. These included Penstemon mushrooms with Tata, Pretoria



Mohammed Abdo (middle) explaining DNA extraction protocol to the learners.



At Genetics





## Communications Challenge



Morse code (audio)  
Flag semaphore  
Morse code (heliograph)



**in** die jaar van Risko, ontwerp hoërskoolleerlinge heel gepas 'n heerlike kwartspeeltje waarmee kinders van alle ouderdomme speel-speel kan leer oor die wetenskap, van Newton tot Einstein.

Heerde is maar een van die talle inisiatiewe wat voortvul uit die UP with Science-program. 'n Wetenskaplike veringsprogram wat deur die Ontdekkingsentrum @ Tuke en die onderskeie skole van die Universiteit se Fakulteit Natuur- en Landbouwetenskappe vir hoërskoolleerlinge aangebied word.

Sowat 50 Graad 10-leerders wat potensiaal en 'n belangstelling in wetenskap toon, word jaarliks gekies om aan die UP with Science-program deel te neem. Vir drie jaar neem hulle deel aan die program wat 'n Saterdagklas een keer per maand, soek 'n jaarlikse winterskool insluit. Die fokus is daarop om die wetenskaplike lewensproses kleiner en vir pret te maak. Leerders versuut onder meer Pretoria, Sothaburg, Bronkhorstspuit, Enslinut en Laudum neem deel aan die program. Bufonding, onder meer vir middagetes en vervoer, kom van borge soos First National Bank, Fochini, Murray & Roberts, Russels, Standard Bank en ander.

Heerde program van die Universiteit van Pretoria (his gekoppel aan die skoolkurikulum nie) is daarop gemik om jongmense se wetenskaplike kennis, belangstelling en -vaardighede te verbreed en in die proses, studente vir UP se Fakulteit Natuur- en Landbouwetenskappe te wett.

Volgens me. Heiga Nordhoff, UP with Science koördineerder, is die Fakulteit baie bevredig met die sukses van die program, wat in 1998 afgeskop het. Gemiddeld 60% van die leerders skryf na voltooiing van hulle skoolopleiding by UP in en die Universiteit kan spog met 18 nagrade studente wat deel was van die UP with Science-program. In 2004 het 27 van die oorspronklike groep van 50 Graad 10-leerders as studente by UP ingeskryf. In 2005 het 23 leerders as studente geregistreer. Wat verder verblydend is, is die toename in studente vanuit voorheen benadeelde gemeenskappe.

Indien leerders die UP with Science-program suksesvol deursooi het, kan hulle gratis ondertyp by UP in studieprogramme van die Fakulteit Natuur- en Landbouwetenskappe ontvang, mits hulle aan die gevare kwalifikasies voldoen.

In die eerste jaar neem Graad 10-leerders deel aan die wetenskap-veringskwalifikasie- en -verings wat UP se Ontdekkingsentrum @ Tuke sed. Dit sluit in praktiese laboratoriumwerk en die byvoering van aanbiedings deur wetenskaplikes vanuit die Fakulteit Natuur- en Landbouwetenskappe. Sommige departemente betrek nagrade studente, met wie die leerders sekerlik vind omdat hulle dieselfde taal praat.

In die program se tweede jaar, neem die Graad 11-leerders deel aan mini-navorsingsprojekte en 'regte wetenskap' saam met navorsers van UP in wetenskaplaboratoriums. Hulle kry ook die geleentheid om wetenskapaanbiedings te ontwerp en by leerders aan te bied.

Tydens die derde jaar, bykomend tot die eerste twee jaar se aktiviteite, kry Graad 12-leerders die geleentheid om wetenskaplike verskeie op te stel en word tussens gemaak ten opsigte van internetgeleentheid en skakelwerk.

Wie weet, dalk lever UP with Science nog 'n Newton op ...

UNIVERSITEIT VAN PRETORIA 7 UNIV



Eskom

With energy, anything is possible.



# 2005

## Departments visited

Biochemistry  
Chemistry  
Food Science  
Genetics  
Geography (Meteorology)  
Microbiology &  
Plant Pathology  
Physics  
Soil Science  
Tswaing Crater  
(Geology & Plant Science)  
Veterinary Science  
Zoology

*"The most interesting part of visiting the soil sciences building was when we were able to view the equipment used to test soils. It was amazing to see that there was so much more to soil science than I could ever have imagined."*

Jake

Faculty of Natural and Agricultural Sciences

UP with **SCIENCE**

A Science Enrichment Programme for high school learners presented by the Discovery Centre @ TUKS, University of Pretoria

The sciences offer bright sparks bright futures

If you are:

- in grade 10 and taking Science and Mathematics on higher grade;
- considering a career in science;
- inquisitive and experimental;
- keen to learn and experience new things;
- interested in your surroundings and caring about the environment and social issues;
- able to clearly communicate thoughts; and
- able to work in a team.

you fit the profile of an UP with Science learner. Become part of the Innovation Generation.

For more information about the programme visit the UP with Science web site at: <http://www.upwithscience.co.za>  
or email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

For more information about careers and study opportunities in science visit the Faculty of Natural and Agricultural Sciences web site at: <http://www.up.ac.za/naturalandagricultural/index.html> or phone the public relations practitioners at 012 435 2544-2545.

A world of opportunities awaits those who explore it

A Science Enrichment Programme for high school learners presented by the Discovery Centre @ TUKS, University of Pretoria

The Discovery Centre @ TUKS is the centre of the University of Pretoria's Faculty of Natural and Agricultural Sciences. It is a world of opportunities for high school learners to explore the sciences and to become part of the Innovation Generation.

Selection of Candidates

Each year the UP with Science programme selects candidates for its enrichment programme. The programme is open to all high school learners in grade 10 who are taking Science and Mathematics on higher grade. Candidates are selected on the basis of their academic performance, their interest in science, and their ability to work in a team.

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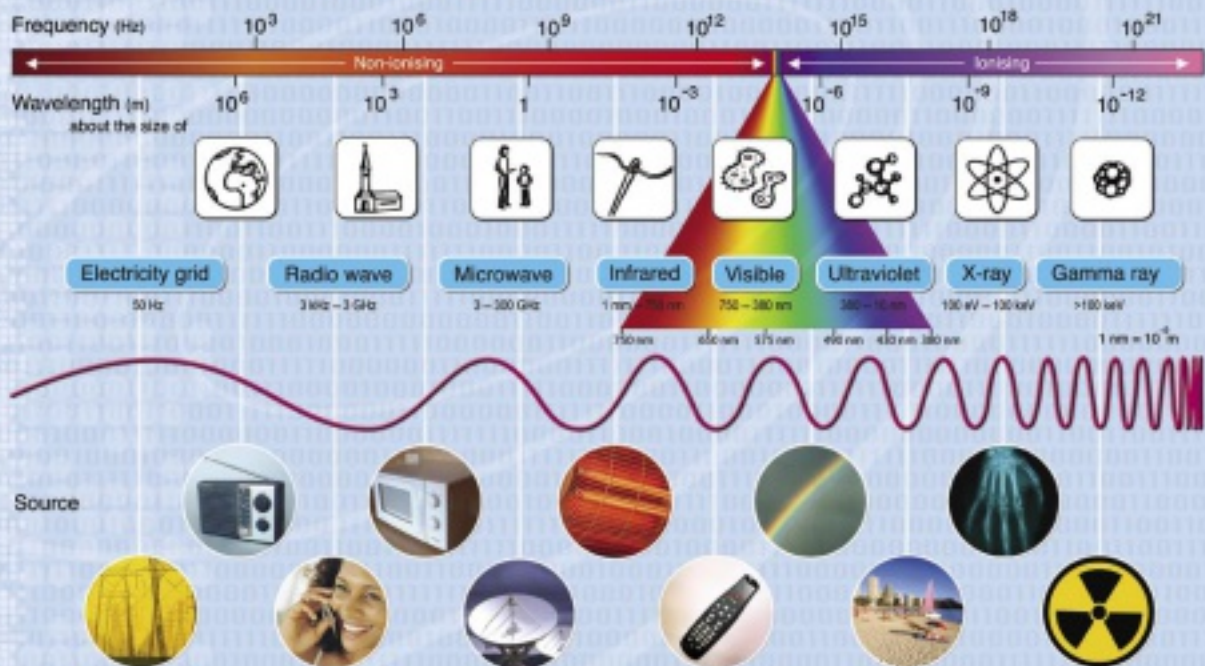
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# The Electromagnetic Spectrum



Department of Physics



**Housings for the radios built at Physics**





## Group H Research Projects



- Botany: Medicinal plants  
Do we sustainably harvest endangered plant species?
- Chemistry & Physics: The Electromagnetic Spectrum
- Genetics: Fungi @ FABI
- Geology: Rocks & soil
- Mathematics: Bits of linear algebra and graph theory; and the Google search engine.
- Plant Pathology: Soil-borne potato diseases
- Plant Production and Soil Science: Production of selected vegetables under shade netting
- Zoology: Entomology:  
Biodiversity and conservation

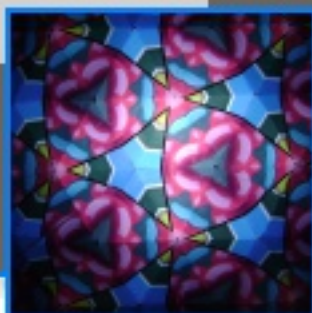


**At Ezemvelo**



## The Science of Toys Grade 12 Projects

- Ferrofluids
- Sundial
- Galilean Thermometer
- Drinking Bird
- Kaleidoscope
- Telescope







## Group H (2005 intake)

Yumna Abed  
 Brandon Allen  
 Chantal Beukes  
 Lesego Bogoshi  
 Karin Briel  
 Daan Burger  
 Kerry Callaghan  
 Izaan de Jager  
 Nola de Klerk  
 Mias de Lange  
 Suzan Diatshwana  
 Patience Diphofa  
 Nikita Edwards  
 Emile Giesler  
 Zama Hlabangane  
 Nomsa Jiyane

Clair Learmonth  
 Elliot Mabasa  
 Mduduzi Machika  
 Thembisile Mahlangu  
 Lennè Marnewick  
 Kearabetswe Mataboge  
 Tebogo Maubane  
 Oratile Mekgwe  
 Antoinette Moos  
 Kevin Mootane  
 Queen Mosoane  
 Piet Motaung  
 Sibusiso Msiza  
 Sumaya Mukadam  
 Cynthia Nkosi  
 Daniel Nowack

Courage Ratsoene  
 Madaleen Saaïman  
 Kavani Sanasi  
 Reinhard Schiel  
 Teresa Scott  
 Thabo Selemela  
 Christian Starke  
 Marisa Stols  
 Hannelie Sung  
 Adriaan Swanepoel  
 Fiona Tse  
 Jake van der Merwe  
 Hendrik van Niekerk  
 Brendan van Schoor  
 Johan van Staden  
 Channel Zietsman



# 2006

## Departments visited

Agricultural Economics  
 Biochemistry  
 Botany  
 Chemistry  
 Genetics  
 Geography, Geoinformatics  
 & Meteorology  
 Mathematics  
 Physics  
 Plant Pathology  
 Tswaing Crater  
 (Geology & Plant Science)  
 UP Farm  
 (Animal Science,  
 Plant pathology &  
 Plant production)  
 Zoology & Entomology

*"Goodness gracious, the mathematics was amazing! They are really clever. From encrypting a crypto message to the counting technique was really interesting. I will make sure myself that nobody will ever again play the Lotto, because you have a 1/13983816 chance to win."*

Marike

Faculty of Natural and Agricultural Sciences

UP with **SCIENCE**

Science Enrichment Programme for high school learners  
 University of Pretoria

**THE SCIENCES OFFER BRIGHT SPARKS BRIGHT FUTURES**

If you are:

- in grade 10 and taking Science and Mathematics at higher grade;
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- inquisitive and like experimenting;
- keen to learn and experience new things;
- interested in your surroundings and caring about the environment and social issues;
- able to clearly communicate thoughts; and
- able to work in a team,

you fit the profile of an UP with Science learner. Become part of the Innovation Generation.

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SCI-ENZA

UP with **SCIENCE**

Science Enrichment Programme for high school learners  
 University of Pretoria

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SCI-ENZA





# SCI-ENZA

WETenskap IN AKSIE! HANDS-ON SCIENCE!



Volunteering hours  
Weekdays: 8:30 - 16:00  
(excluding school holidays)

Contact & Bookings  
Tel: (012) 419 2805  
Email: [science200@up.ac.za](mailto:science200@up.ac.za)



## Group I Research Projects

- Botany: Devil's Claw:  
The People's Remedy
- Bio-informatics: Mutating Deca-alanine
- Chemistry: Rockets!
- Genetics: Answering *Ophiostoma* questions:  
PCR and beyond
- Geology: Earthquakes and the Earth's  
interior
- Mathematics: Reading characters with Markov  
chains
- Meteorology: Temperature lapse rates in the  
atmosphere
- Physics: The flight of a Coke bottle!
- Plant Pathology: Practical Plant Pathology
- Zoology: Urban Birds - There's a pigeon on  
my stoep!



## At Hydrotech





# Science of Photography

## Grade 12 Projects

The early days of photography

(from the camera obscura to a permanent image)

Black and white photography

(1850 - 1905: from glass plate to roll film)

Colour photography

(1905 - 1930: the science of colour film)

High speed photography

(1930 - : Strobe photography)

Digital photography



The learners are waiting patiently for their cyanotype prints to develop in the sun.







## Group I (2006 intake)

Mohammed Akbar  
 Harriet Baloyi  
 Kevin Barnes  
 Andrea Beyers  
 Cathrin Bissbort  
 Marike Bogenhofer  
 Iris Bokaba  
 Rixaka Chabalala  
 Robert Conrad  
 Cameron de Bruyn  
 Romandi de Jongh  
 Sven Dressler  
 Chantel du Raan  
 Reinette Ebersohn  
 Camilla Essop  
 Bernard Haasbroek  
 Nasreen Hamdulay

Malcolm Howse  
 Tineil Hurter  
 Raeesa Jeewa  
 Michael Koroma  
 Tebogo Machaka  
 Lethabo Maela  
 Portia Makhubedu  
 Tshegofatso Malatsi  
 Shoki Maleka  
 Duncan McDougall  
 Musa Mmotsa  
 Oarabile Mogase  
 Mmaphoko Mohlake  
 Laura Motiang  
 Thabiso Mwale  
 Monique Nieuwoudt

Naailah Parbhoo  
 Alex Pearce  
 Khanya Qabaka  
 Grace Radingoana  
 Safiyyah Razak  
 Roberto Rocha  
 Wilhelm Schönfeldt  
 Kabelo Sebothoma  
 Mmamagase Shaku  
 Sizongoba Sonny  
 Ryan Swart  
 Elna Swart  
 Diner Thipe  
 Karabo Tlaka  
 Marquerit van der Merwe  
 Tildie van der Westhuizen  
 Lourens Yzel



# 2007

## Experience real science!

### Grade 10's take note.

**UP with Science**, presented by the University of Pretoria, is a programme that will show you what science is really about.

- Meet scientists at work;
- do research;
- go on excursions;
- work in teams;
- design and present science shows;
- learn and experience new things relating to science; and
- get to know more about your environment and social issues.

The course runs over 3 years and thereafter you may qualify for a full tuition scholarship.

**UP with Science** is a Science Enrichment Programme for secondary school learners presented by the University of Pretoria, on the Hatfield Campus.



### Departments visited

Agricultural Economics  
Animal and Wildlife Sciences  
Chemistry  
Food Science  
Genetics  
Geography (Meteorology)  
Geology  
Mathematics  
Physics  
Plant Production & Soil Science  
Tswaing Crater (Geology & Plant Science)  
Zoology



**UNIVERSITEIT VAN PRETORIA**  
**UNIVERSITY OF PRETORIA**  
Faculty of Natural and Agricultural Sciences

Brochures and application forms are available from your science teacher.

Closing date for applications: **24 March 2007.**

Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)

Enquiries: Ms Helga Nordhoff tel: 012 420 2638/3767 e-mail: [upscience@up.ac.za](mailto:upscience@up.ac.za)

**UP with SCIENCE**

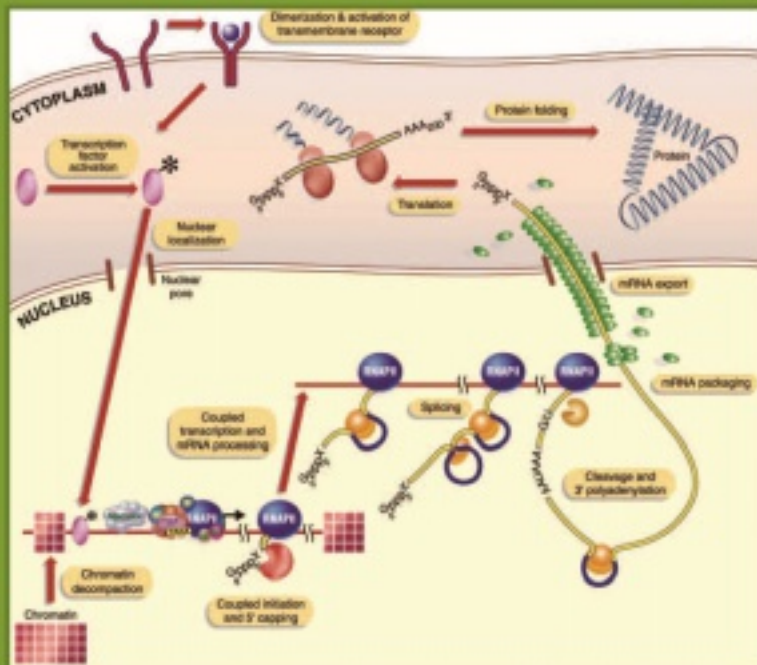
*"Everytime I learnt something new that I could apply in my school work. I also have a broader general knowledge; from learning about bats to doing a PCR test which helped me in biology."*

Anelle





# The Central Dogma of Molecular Biology DNA to RNA to Protein



Source: Figure 19.10, Campbell & Reece, 6th Edition, © 2005, Pearson Education, Inc. All rights reserved. This diagram is for educational use only.



Bioinformatics and Computational Biology Unit

UP with SCIENCE



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
Faculty of Natural and Agricultural Sciences



Photo  
Workshop,  
Exhibition  
sponsored  
by  
SAASTA







## Group J Research Projects



|                   |                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------|
| Botany:           | <i>Spirostachys</i> Uncovered                                                           |
| Chemistry:        | Natural soap - 'Natural' fragrances                                                     |
| Genetics:         | A Forensic investigation into a minute world                                            |
| Geology:          | Colours in Minerals                                                                     |
| Mathematics:      | Deriving Kepler's laws of motion of planets around the sun                              |
| Physics:          | Faraday's Law and a Basic Seismometer                                                   |
| Plant Pathology:  | Practical Plant Pathology                                                               |
| Plant Production: | Impact of light quantity and quality on the morphology and physiology of spinach leaves |



**Visit to the Sterkfontein  
Caves and Maropeng**





## Group J (2007 intake)

Mary Aphane  
 Anelle Barnardt  
 Pierre Basson  
 Kerry Bodenstein  
 Zachariah Bundred  
 Precious Chauke  
 Romeo Chauke  
 Lauren Damm  
 Duane de Villiers  
 Reamogetse Gill  
 Murray Heymann  
 Tiani Janse van Rensburg  
 Loreal January  
 Christian Jooste  
 Thato Kgapola  
 Ofentse Khoza  
 Marona Koshane

Jan Lombard  
 Hlalefi Mabotha  
 Seitebaleng Makgai  
 Makgosi Maleka  
 Keena Marima  
 Johannes Moatatse  
 Nthabiseng Mogashoa  
 Magouta Mphahlele  
 Sibusiso Mtshweni  
 Lungile Nduna  
 Craig Neuper  
 Langa Nhlapo  
 Elsie Nolte  
 Muhammad Adil  
 Nurmahomed  
 Thamsanqa Nxele  
 Kobus Oosthuizen

Jandré Potgieter  
 Jeanique Pretorius  
 Violet Rabalao  
 Merese Roos  
 Esmeralda Sayagues  
 Safiyyah Seedat  
 Aubrey Seroka  
 Lerato Sewelo  
 Nthabeuseni Sigidi  
 Mafelo Sikhali  
 Salndave Skosana  
 Marike Snyman  
 Thabiso Tsamai  
 Clement Tshoba  
 Carla Ubbink  
 Ilne van Niekerk  
 Mylennie van Straaten



# 2008

## Departments visited

Chemistry  
Earth Sciences  
Food Science  
Genetics  
Geography  
Mathematics  
Physics  
Tswaing Crater  
(Geology & Plant Science)  
UP Farm  
(Animal Science,  
Plant pathology &  
Plant production)  
Zoology

## Experience real Science!

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UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA  
Faculty of Natural and Agricultural Sciences

Information and application forms are available from your science teacher.

Deadline for applications: 20 March 2008.

Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)

Contact: Ms. Helga Nordhoff, tel: 012-420-2638 / 3767

Email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

UP with  
SCIENCE

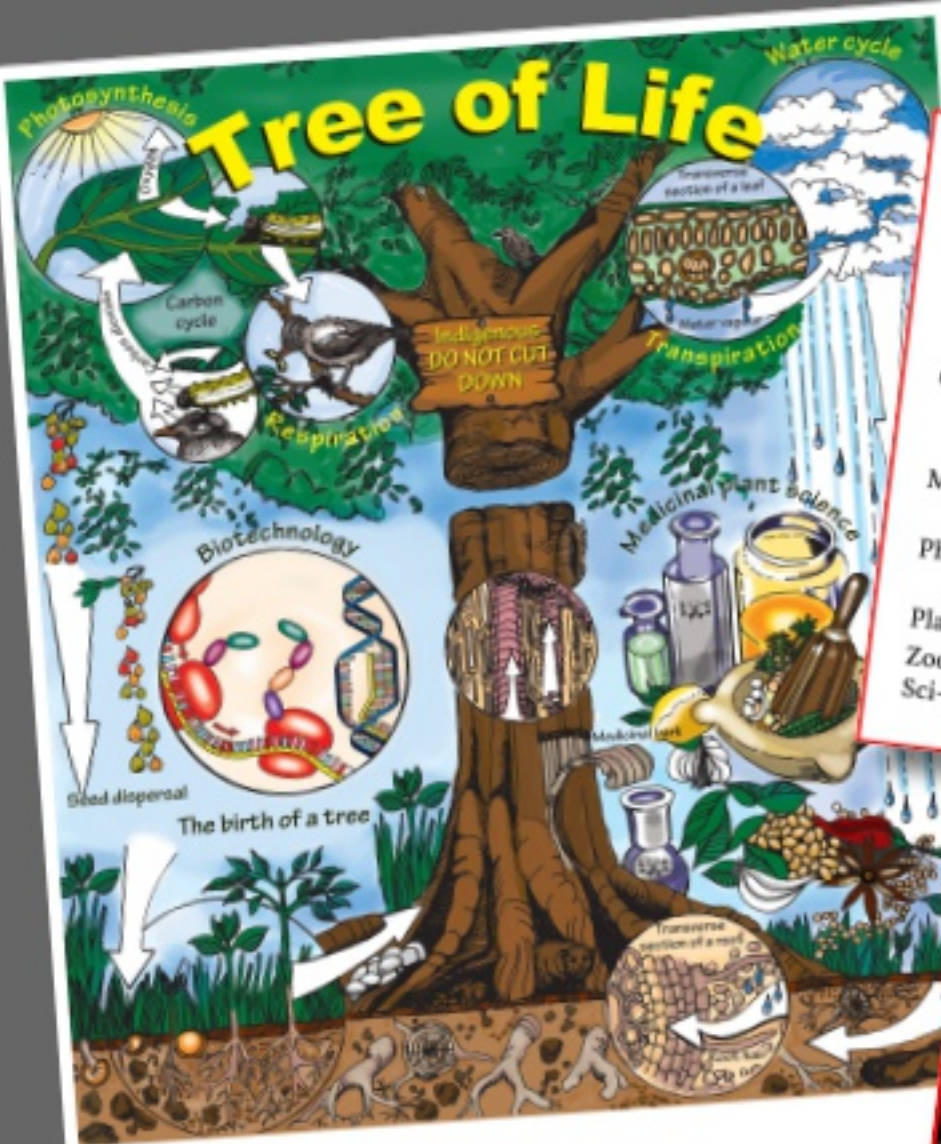


"It was truly amazing  
to know more about the  
insects I always see  
around the world."

Nelisiwe







## Group K Research Projects

- Biochemistry:** The chaos and order when oil meets water
- Genetics:** Funny mushrooms
- Geology:** Factors controlling the development of textures during crystallization
- Mathematics:** The mathematics of perspective
- Physics:** The Electric Field Mill & Earth's Electric Potential
- Plant Pathology:** Practical Plant Pathology
- Zoology & Sci-Enza:** Amalulwane (Bats)



UNIVERSITEIT VAN PRETORIA  
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UNIBESITHI YA PRETORIA



**Solving the bat problem on the Groenkloof campus**



## Tree planting with GreenUP at Klapperkop and Groenkloof Nature Reserve



*"I have learnt a lot from our mentors and it was an honour working with them. Helga, Puleng, Irene, Tumi and Nadine, I'd like to say thank you, for your time, efforts and your smiles."*

Kearabilwe







## Group K (2008 intake)

Radiyyah Ahmed  
 Bianca Booysen  
 Justin Briggs  
 Jacques Cloete  
 Sulette de Villiers  
 Jaco Delport  
 David Dixon  
 Jadine du Plessis  
 Miranda Erasmus  
 Yasmin Gafoor  
 Annemi Goosen  
 J.W. Hurter  
 Fadila Ismail  
 Nisanne Janse van Rensburg  
 Chanel Liebenberg  
 Sfiso Mahlangu  
 Olivia Makhafole

Charné Manten  
 Carla Maré  
 Evo Masango  
 Kamogelo Masupha  
 Christie Matsepe  
 Pamarin Meyer  
 Thabang Moeng  
 Itumeleng Mogoba  
 Irshaad Mokaddan  
 Matome Mokgetlhe  
 Mpho Molokomme  
 Amos Mosiane  
 Nanas Moyo  
 Nelly Mthimunya  
 Emanuel Naidoo  
 Kearabilwe Ngobeni  
 Fortunate Nkhwashu

Tahnee Otto  
 Tshego Pege  
 Emma Perridge  
 Daisy Ramantshwane  
 Louie Roux  
 Carlien Sadie  
 Prudence Sebothoma  
 Mpho Segoe  
 Candice Sharp  
 Keemetswe Shiang  
 Revelation Sithole  
 Hanaa Solomon  
 SriHari Swaminathan  
 Tshegofatso Tenehi  
 Anike Truter  
 Susan van Graan  
 Jandré van der Westhuizen



# 2009

## Departments visited

Chemistry  
Food Science  
Genetics  
Hartbeespoort Dam  
Hydrotech  
Mathematics  
Physics  
Tswaing Crater  
(Geology & Plant Science)  
UP Farm  
(Animal Science,  
Plant pathology &  
Plant production)  
Zoology

## Experience real Science

### Grade 10's take note!

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- Learn and experience new things relating to science;
- get to know more about your environment and social issues;
- design and present science shows;
- meet scientists at work;
- go on excursions;
- do research and
- work in teams.

The course runs over 3 years and thereafter you may qualify for a full tuition scholarship.

UP with Science is a Science Enrichment Programme for secondary school learners presented by the University of Pretoria, on the Naldorf Campus.



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Faculty of Natural and Agricultural Sciences



Brochures and application forms are available from your science teacher.

Closing date for applications: 28 March 2009.

Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)

Enquiries: Ms. Hilda Nordhoff Tel: 012-420-2030 / 3767. Email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

## Group L Research Projects



|                     |                                                        |
|---------------------|--------------------------------------------------------|
| Biochemistry:       | Egg-extraction, Ei-solation and Inn-Ova-tion           |
| Genetics:           | Murdered Biotech: Making a case for practical science! |
| Geology:            | Igneous and Metamorphic Rock Forming Minerals          |
| Mathematics:        | Euler's formula for polyhedra                          |
| Physics:            | The Physics of Stereoscopic Images                     |
| Plant Pathology:    | Practical Plant Pathology                              |
| Plant Science:      | Weedbusters: Taming the Lantana mONster                |
| Zoology & Sci-Enza: | Practical Zoology                                      |

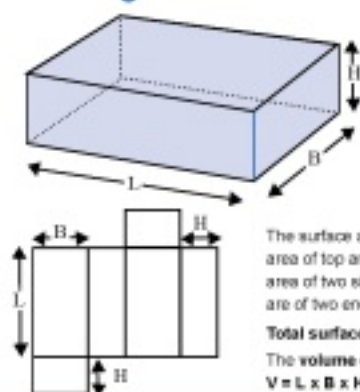


**With Jeanne de Waal,**  
one of the winners of the 2011 L'Oréal-UNESCO Regional Fellowships for Women in Science in Sub-Saharan Africa



# Solids: Surface Area and Volume

## Rectangular Prism

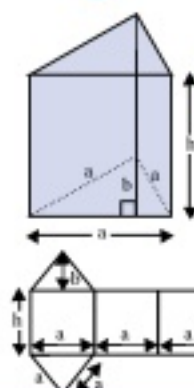


The surface area of a rectangular prism is:  
area of top and bottom =  $2(L \times B)$  plus  
area of two sides =  $2(L \times H)$  plus  
area of two end pieces =  $2(B \times H)$

**Total surface area:  $SA = 2LB + 2LH + 2BH$**

The volume of a rectangular prism is:  
 **$V = L \times B \times H = LBH$**

## Triangular Prism



The surface area of a triangular prism is:  
area of the three sides =  $3a \times h$  plus  
area of two end pieces =  $2 \times \frac{1}{2} a \times b$

**Total surface area:  $SA = 3ah + ab$**

The volume of a triangular prism is:  
 **$V = \frac{1}{2} abh$**

## Square-based Pyramid

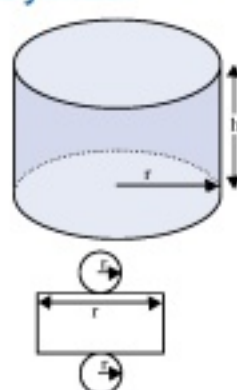


The surface area of a square-based pyramid is:  
area of the base =  $b \times b$  plus  
area of four triangular sides =  $4 \times (\frac{1}{2} b \times s)$

**Total surface area:  $SA = 2bs + b^2$**

The volume of a square-based pyramid is:  
 **$V = \frac{1}{3} b \times b \times h = \frac{1}{3} b^2 h$**

## Cylinder

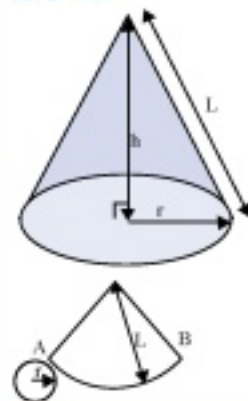


The surface area of a cylinder is:  
area of the top =  $\pi r^2$  plus  
area of the bottom =  $\pi r^2$  plus  
area of the side =  $2\pi rh$

**Total surface area:  $SA = 2\pi r^2 + 2\pi rh$**

The volume of a cylinder is:  **$V = \pi r^2 h$**

## Cone



The length of arc AB =  $2\pi r$ , the circumference  
of the base.

The curved surface area of a cone is:  $\pi r L$   
(where L is the slant height).

The base is a circle with the area:  $\pi r^2$ .

**Total surface area:  $SA = \pi r L + \pi r^2$**

The volume of a cone is:  **$V = \frac{1}{3} \pi r^2 h$**

## Tips:

When working with  
surface area and  
volume, remember  
that:

length  $\times$  length = area  
length  $\times$  area = volume  
area  $\times$  height = volume  
area  $\div$  length = length  
volume  $\div$  area = length  
volume  $\div$  length = area

## Formulas:

Some rules to help  
you when working  
with formulas for  
area or volume:

A formula, in which two lengths  
are multiplied, is for an area, for  
example  $l \times h$  or  $r^2$ .

A formula, in which three lengths  
are multiplied, is for a volume, for  
example  $l \times b \times h$  or  $r^3$ .



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Faculty of Natural and Agricultural Sciences

Department of Mathematics and Applied Mathematics

- Mathematics
- Applied Mathematics
- Financial and Actuarial Mathematics

Phone: 012 420 2520

E-mail: [maths@up.ac.za](mailto:maths@up.ac.za)

Website: [www.up.ac.za/math](http://www.up.ac.za/math)





**Removing aliens from  
the Innovation Hub koppie  
with GreenUP**







## Group L (2009 intake)

Hina Abdul Ghaffar  
 Sarah Adam  
 Thabo Aphane  
 Lee Bonehill  
 Chani Brits  
 Camille Castelyn  
 Sipho Congolo  
 Jaco De Lange  
 Eugene Duvenage  
 Dorett Erasmus  
 Martinus Green  
 Carli Grobbelaar  
 Nadia Grundlingh  
 Miznah Haji Abdul Karim  
 Marjeanne Hamman  
 Farhanaaz Ismail  
 Josua Joubert  
 Ya'eesh Khan  
 Kelefilwe Kungwane  
 Margaret Mabeleng  
 Elizabeth Mahlaola

Molebogeng Makgaka  
 Bafana Malatsi  
 Nabeela Mansoor  
 Thapelo Marema  
 Annah Mashego  
 Karabo Mathosa  
 Tregy Mokhabela  
 Nkamogeleng Mothobi  
 Lettah Mpayi  
 Mafori Mphahlele  
 Renée Myburg  
 Tebogo Ndala  
 Ndikhoda Nemutanzhela  
 Kagiso Nkwana  
 Thuso Ntamu  
 Tshegofatso Petje  
 Estian Rademeyer  
 Kgosithebe Sebeela  
 Sewela Selahla  
 Serena Shunmugam  
 Mpho Siteo

Kenneth Skosana  
 Aqueel Tayob  
 Mohloagae Tsiane  
 Jason van den Oever  
 Angelique van der  
 Westhuizen  
 Louis van der Westhuizen  
 Bianca van Rooyen  
 Ernest Yzel

*"The day ended off on a high note, as we were taken on an excursion to the farm. I managed to learn a lot of interesting facts about cows and sheep and was amazed to see the size of the cows. (They are a different breed, not the ones we get on our farms)."*

Farhanaaz



# Harties, Metsi a me - "My Water"

## Biological Remediation Programme









# 2010

## Departments visited

Agricultural Economics  
Chemistry  
Food Science  
Genetics  
Geography, Geoinformatics  
& Meteorology  
Human Physiology  
Mathematics  
Physics  
Tswaing Crater  
(Geology & Plant Science)  
UP Farm  
(Animal Science,  
Plant pathology &  
Plant production)  
Zoology

## Group M Research Projects

**Animal and Wildlife Science:**  
Milk goats for prevention of  
protein malnutrition in children in  
South Africa

**Biochemistry:** Egg-extraction, Ei-solation and Inn-  
Ova-tion

**Environmental  
Sciences:** TAP that  
(A closer look at bottled water)

**Genetics:** Fun with Fungi: DNA, PCR,  
Barcoding and Biodiversity!

**Geology:** Geology as a driving force in  
creation and shaping the Earth

**Mathematics:** The Matrix and the Symbol

**Plant Pathology:** Plant Health is Life - Too Hot to  
Handle?

**Physics:** Understanding Energy

**Plant Science:** GM Maize: Do you know what you  
are eating?



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- design and present science shows;
- meet scientists at work;
- go on excursions;
- do research and
- work in teams.

The course runs over 10 weeks and  
thereafter you may qualify for a full tuition  
scholarship.



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Faculty of Natural and Agricultural Sciences

Murray  
& Roberts

UP with  
SCIENCE

Brochures and application forms are available from your science teacher.  
Closing date for applications: 1 April 2010. Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)  
Enquiries: Ms. Hilda Hordt. Tel: 012-420-2630 / 2767. E-mail: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)



**Selection of Candidates**  
Applicants in the UP with SCIENCE programme are  
selected from secondary schools in the region.  
The selection process will be done in that the  
group of students who have the best scores in the  
school for the subject of Science, will be selected.  
The selection process will be done in that the  
group of students who have the best scores in the  
school for the subject of Science, will be selected.  
The selection process will be done in that the  
group of students who have the best scores in the  
school for the subject of Science, will be selected.

**Next Year (2011) - Grade 11**  
In the second year, participants spend time working with  
scientists from the University of Pretoria, who are involved in  
research projects and doing with "real science".  
They also get to experience the life of a scientist.

**Next Year (2012) - Grade 12**  
In addition to the 2009 cohort, there will be  
participants from the 2011 cohort.

**Next Year (2013) - Grade 13**  
Participants from the 2011 and 2012 cohorts will be  
selected for the 2013 cohort.



# The Life Cycle of Bilharzia (Schistosoma)



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YUNIBESITHI YA PRETORIA  
Faculty of Natural and Agricultural Sciences

Department of Zoology and Entomology

Contact: Prof. Sue Nicolson 012 420 3233 E-mail: [swnicolson@zoology.up.ac.za](mailto:swnicolson@zoology.up.ac.za) Website: [www.up.ac.za](http://www.up.ac.za)





## Communicating Science with Pixton Comics

The UP with Science group visited 'Dialogue in the Dark' at Sci Bono; an experience that provided a better understanding about the real life situation of blind people.



### Recycle your Plastics

by Melicia

Thursday April 5, 2012  
Pixton strip  
22 views | 0 comments



### Assignment:

Create a Pixton comic about a 'Green Living' related topic. The main message of your comic should encourage the readers to change their life styles.

### Recycle and Re-use

by tino-cs

Thursday April 5, 2012  
Pixton strip  
13 views | 0 comments



"Except for the science, I learnt to interact with diverse groups and learnt people skills that I would not have gotten anywhere else."

Liezl





# Group M - Murray & Roberts

## (2010 intake)

Fatima Aboo  
 Kgothatso Baloyi  
 Kyle Benkenstein  
 Brenton Bester  
 Muhammad Carrim  
 Jean-Dré Crouse  
 Kyereba de Heer Menlah  
 David de Lancey  
 Annemarie de Wet  
 Mari du Plessis  
 Liezl Ferreira  
 Marnus Ferreira  
 Janice Geel  
 Monique Gerber  
 Kathleen Godfrey  
 Nadia Gordon  
 Caroline Hannweg  
 Jacqueline Henning  
 Chloe Howell  
 Baatle Kgosiemang  
 Benjamin Kheitsane

Randy Khoele  
 Gregory Laycock  
 Charity Mabona  
 Gregory Makama  
 Lailan Malan  
 Pheny Mapotse  
 Given Matjeke  
 Terrence Methula  
 Elias Mndebele



Nkgameleng Mkhonoana  
 Boipelo Molebale  
 Kutlwano Mswetsa  
 Amina Muhammed Akoo  
 Odirile Ntshudisane  
 Ruani Oberholzer  
 Christina Panayotakis  
 Kgaogelo Photcane  
 Jakobina Qambela  
 Brendan Quinn  
 Mapule Rantlha  
 Danielle Scheepers  
 Richan Schwellnus  
 Lesego Seabi  
 Goratileona Sekudu  
 Koketso Shuping  
 Marko Svicevic  
 Lona Taba  
 Elizabeth van der Westhuizen  
 Gina Wilkins





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- meet scientists at work;
- go on excursions;
- do research and
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The course runs over 3 years and thereafter you may qualify for a full tuition scholarship. UP with SCIENCE is a voluntary programme for secondary school learners presented by the University of Pretoria, at its Hatfield Campus.



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Brochures and application forms are available from your science teacher.

Closing date for applications: 15 April 2011. Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)

Enquiries: Ms. Helga Nordhoff. Tel: 012 420 2838 / 3787. E-mail: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

# 2011

### Departments visited

Agricultural Economics  
Biochemistry  
Chemistry  
Electron microscope  
Food Science  
Genetics  
Geology Museum  
GIS  
Mathematics  
Microbiology  
Physics  
Tswaing Crater  
(Geology & Plant Science)  
UP Farm  
(Animal Science,  
Plant pathology &  
Plant production)  
Zoology

Experience  
real Science  
Brochure Programme  
2011

### Food Science



## "Mathematically correct Breakfast"

Cut a bagel so that you have two interlocking halves







# IYC 2011

International Year of  
CHEMISTRY

## 2011 International Year of Chemistry



**Marie Skłodowska Curie**  
Polish-born French physicist and chemist.  
(7 November 1867 – 4 July 1934)

Marie Curie was a pioneer in the field of radioactivity and she discovered two elements: polonium and radium.

She was the first female professor at the University of Paris and the first woman to be awarded a Nobel Prize. In 1903 she, her husband Pierre Curie, and Henri Becquerel jointly received the Nobel prize in Physics. A hundred years ago, in 1911, Marie was awarded the Nobel Prize in Chemistry.

Cesium (Cs), synthetic element 86, was named after Marie and Pierre Curie.

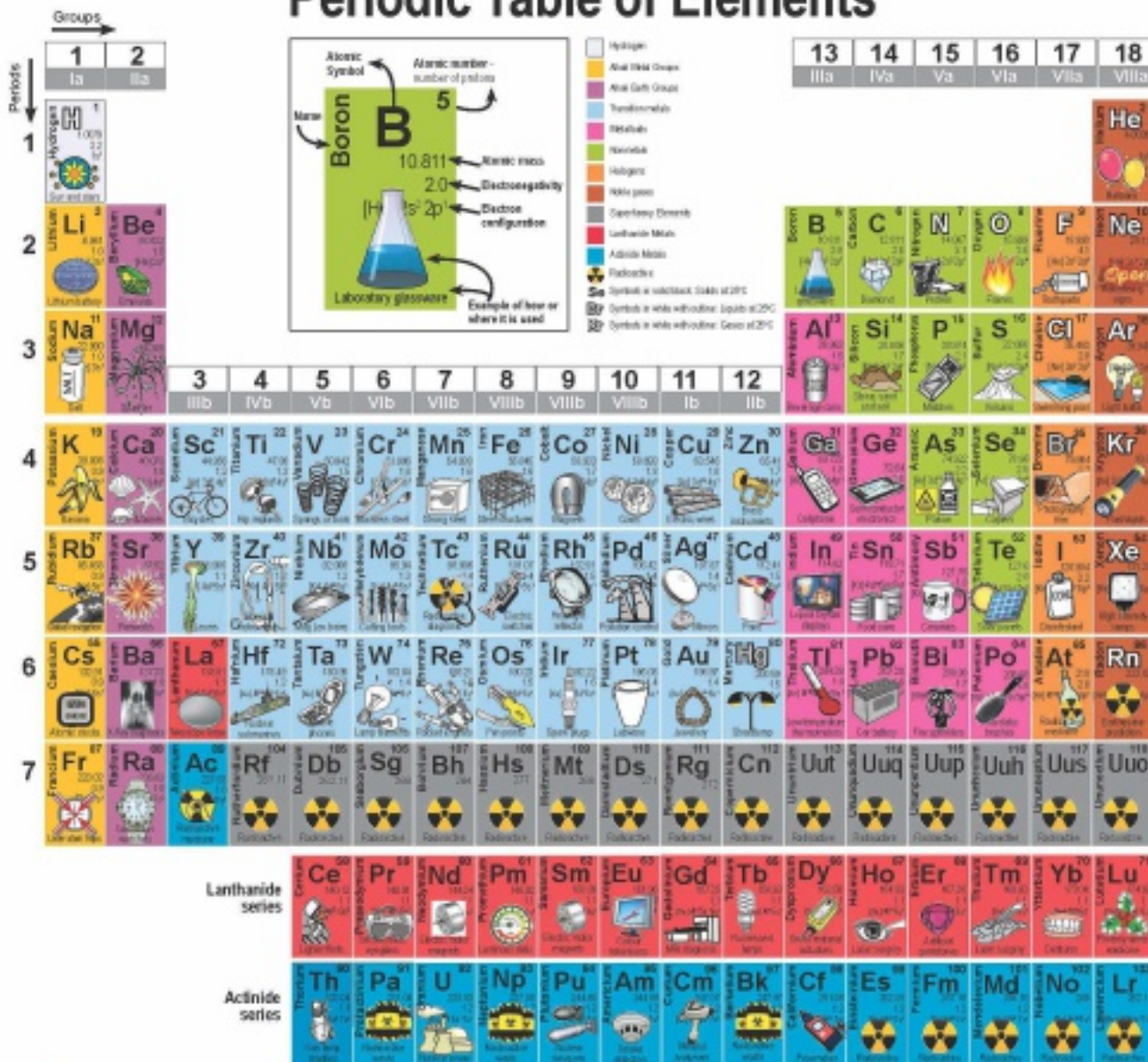


**Dmitri Ivanovich Mendeleev**  
Russian chemist.  
(8 February 1834 – 2 February 1907)

Mendeleev was one of the first to notice that elements showed regular repeating properties if they were listed according to their atomic mass. His 'periodic table of elements' is regarded as the backbone of modern chemistry.

Mendeleev (1869), element 101, was named after him in 1955.

## Periodic Table of Elements



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YUNIBESITHI YA PRETORIA  
Faculty of Natural and Agricultural Sciences

Department of Chemistry

Contact: Prof Egmont Rohwer 012 420 2512. E-mail: egmont.rohwer@up.ac.za. Website: www.up.ac.za





Elemental card game

## Group N Research Projects



- Biochemistry: Biochemistry and the business of Tuberculosis
- Genetics: Microbe Mythbusters: Fungi vs Bacteria
- Geology: Who's your daddy?
- Mathematics: Solving best-path problems with simple calculus
- Plant Pathology: Practical Plant Pathology
- Physics: Simulating and measuring projectile motion
- Plant Science: Antibiotics from natural origin
- Zoology: Invertebrate biodiversity on campus



**Bookma<sup>R</sup>k**  
Your campus, your bookstore

## Challenges & Rewards



*"I have understood my strengths, weaknesses and where my interest in science lies."*

Thandeka





## Group N (2011 intake)

Thandeka Babedi  
 Jessica Bender  
 Karen Bezuidenhout  
 Bennie Botha  
 Hanco Britz  
 Zukisani Charleman  
 Jason Cloete  
 Johan Coertze  
 Elmien Coetser  
 Zaleekhah Dawood  
 George de Kock  
 Alexander de Koning  
 Duncan Dean  
 Morongwa Dikotope  
 Marnus Els  
 Luveshnie Gounden  
 Nonhlanhla Hlope

Ashley Jones  
 Petrus Joubert  
 Miché Kannemeyer  
 Marisca Lindford  
 Lucia Makinta  
 Raymond Malema  
 Mathabo Masemola  
 Boikanyo Matsha  
 Lungile Mbazima  
 Success Mbonde  
 Emily-Rose Miller  
 Ofentse Mogoatlhe  
 Neo Moima  
 Dineo Mokone  
 Kgomotso Motshoane  
 Tebogo Mphelo

Nompumelelo Mthimunya  
 Khani Mukansi  
 Damon Munday  
 Zamokuhle Nkosi  
 Hildsley Noome  
 Annette Opperman  
 Shannon Parker  
 Tshifiwa Ramaleba  
 Quintin Retief  
 Johannes Sekgabi  
 Alphie Shikwambana  
 Sanele Sibeko  
 Nqobile Sibiya  
 Capathia Skhosana  
 Zanne Terry  
 Tshhegofatso Thipe  
 Harshan Vallabh



# Experience real Science

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- go on excursions;
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UP with SCIENCE is a Science Education Programme for secondary school learners presented by the University of Pretoria, in the North-West Province.



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Closing date for applications: 20 April 2012. Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)  
Enquiries: Ms. Hege Nordhoff. Tel: 012 420 2638 / 3707. Email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

# 2012

## Departments visited

Agricultural Economics  
Biochemistry  
Chemistry  
Food Science  
Genetics  
GIS  
Mathematics  
Microbiology  
Physics  
Plant Pathology  
Soil Science  
Tswaing Crater  
(Geology & Plant Science)  
UP Farm  
(Animal Science,  
Plant pathology &  
Plant production)  
Zoology (and visit to the Zoo)

Experience  
real Science

Enrichment  
Programme  
2012



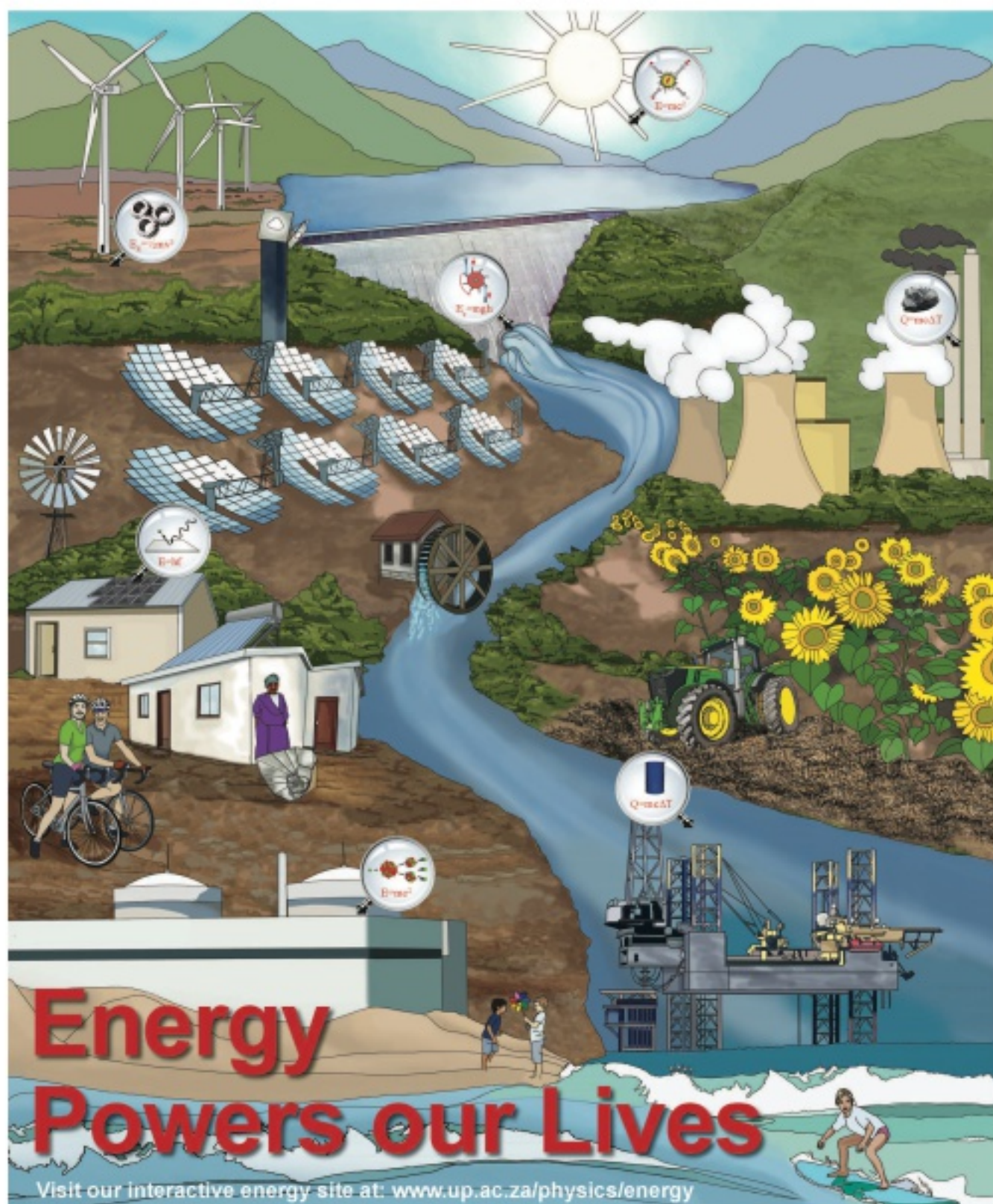
## Biochemistry

Prof Verschoor  
at his best

"The Professor touched a sensitive point when he brought up the connection between God and the Big Bang theory; this was very interesting, because this topic started a lively debate which continued long after the end of the lecture.."

Megan





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YUNIBESITHI YA PRETORIA  
Faculty of Natural and Agricultural Sciences



Department of Physics, 1912 - 2012, Centenary Celebration.  
Contact: Prof Chris Theron. Tel: 012 420 2455 Website: [www.up.ac.za/physics](http://www.up.ac.za/physics)



## Group O Research Projects



- Biochemistry: Being positive about attracting germs:  
Development of a germ biosensor
- Chemistry: Water Quality and Environmental Health
- Genetics: Mighty bacteria in a civilized world
- Geology: Mapping rocks
- Mathematics: The Monty Hall puzzle and related mathematics
- Plant Pathology: Evaluating virulence of selected plant pathogens and induction of plant resistance by plant growth promoting rhizobacteria
- Physics: Physics in a Flash
- Plant Science: Doing it nature's way:  
sterilization of the beast *Lantana camara*
- Zoology: Campus from the Ground UP:  
Small Things that Run the World



## Visit to the CSIR Nanotechnology Wind tunnel Laser Centre



*"The wind tunnel that involved aeronautics was the most interesting part of the excursion for me. The wind tunnel which was massive was very intriguing and I thought the prototypes were quite cool. I also learnt how fast moving air will exert high pressure on an aircraft once it is airborne."*

Matthew





## Group O (2012 intake)

Nkateko Baloyi  
 Stephanie Bender  
 Dirk Bodenstein  
 Ammarah Cassim  
 Na'eem Davis  
 Shane de Beer  
 Joanel de Clerck  
 Olivia de Kock  
 Megan Fowlds  
 Francois Groenewald  
 Eric Heyl  
 Itumeleng Kola  
 Kaamilah Joosub  
 Kirsten Knoll  
 Andrij Kocur  
 Moakedi Kola  
 Juan-Pierre Kotzé

Shalona Krishna  
 Vraschik Lalla  
 Charlene Lau  
 Marinda le Roux  
 Gerhard Maré  
 Nkabaneng Marule  
 Tshepiso Masango  
 Matthew Mashava  
 Mathew Mashiga  
 Keneilwe Mathe  
 Karabo Mathebula  
 Pheladi Mokoena  
 Kealeboga Mothusi  
 Lucender Motsoene  
 Ayanda Mthimunye  
 Sachin Narsai  
 Katlego Ncube

Kagiso Ngale  
 Promise Ntuli  
 Rubendri Pillay  
 David Pym  
 Michél Robbertse  
 Celeste Ryan  
 Renate Schoeman  
 Simon Scholtz  
 Izahn Schönken  
 Obakeng Sepeng  
 Dhivyaa Swaminathan  
 Morné van Biljon  
 Heinrich van Deventer  
 Danielle van Wyk  
 Nesrae Williams  
 Lethabo Zwane  
 Lindo Zwane



2013

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- go on excursions;
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The course runs over 3 years and thereafter you may qualify for a full tuition scholarship.

HP with SCIENCE is a Science Foundation Programme for excellence school leavers sponsored by the University of Padova and the Italian Government.



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Faculty of Natural and Agricultural Sciences

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Brochures and application forms are available from your science teacher.

Closing date for applications: 13 April 2013. Website: [www.sportforpeace.org.za](http://www.sportforpeace.org.za)

Erasmus, M., Hoke Nordhoff. Tel: 012 433 2036 / 3007. Email: [erasmus@erasmus.nl](mailto:erasmus@erasmus.nl)



## Physics

### Liquid Nitrogen and Instant Ice Cream!

*"It was a long yet interesting day at Physics. A lot of things have been clarified for me about physics; what you can study at university and what you can do for your country and the world."*

Kgaogelo



# YOUR FUTURE CAREER IN PLANT PATHOLOGY

In Plant Pathology, students are trained as specialists in plant health. To keep plants healthy, they study organisms that cause diseases, how plants are affected by pathogens, and how plant diseases can be controlled. With this knowledge, they are able to help growers to produce healthy, safe and nutritious plants for retailers, food manufacturers and exporters.

## CAREER OPPORTUNITIES

### Becoming a Scientist:

Do experiments in the lab or field using basic or molecular methods.

### Researcher:

Perform experiments and provides technical support to research teams.

### Procurement agent, risk assessor:

Work for big retailers or government dealing with risk assessment and quality management.

### Auditor/Inspector or regulator:

Inspects import or export food or plants for international quality and safety standards.

### Lecturer:

Teaches courses at university or technical level.

### Senior executive level (CEO, marketing manager, quality manager, etc. at a biotechnology firm, agrochemical or fertilizer company, retailer or exporting company.

### Consultant:

Advises large estates, farmers, retailers, exporters or agricultural businesses.

## PLANT PATHOLOGY CAREER

### Doctoral Degree

### Masters Degree

### BSc (Hort) Plant Pathology

## UNIVERSITY

### Matric

### Grade 10

Subjects included in your undergraduate degree:

- Introduction to crop protection
- Principles of plant pathology
- General plant pathology
- Plant disease control
- Host-pathogen interactions
- Plant pathology research project
- Advanced plant disease control
- Current concepts in plant pathology

- 50-50% Afrikaans/English
- 50-50% Additional HSC Language
- Physical Science
- Mathematics
- 60-60% for one of the two subjects, 50-50% for the other subject
- 50-50% Two other HSC subjects

Physical Science  
Mathematics  
2 Other subjects  
preferably one of the subjects should be Biology



Where can I obtain more information?

Phone Prof. Lee Koster at 012 420 4997 or send an email to lee.koster@up.ac.za for further information

## Group P Research Projects



- Biochemistry:** Crowd-sourcing the collective consciousness to cure cancer
- Chemistry:** Water Quality and Environmental Health
- CTHB:** What's in a tree?
- Geology:** Geology rocks
- Mathematics:** The quickest path from A to B
- Plant Pathology:** The Vegetable Garden and Plant Pathology
- Physics:** The Radio Universe
- Plant Science:** What did your steak have for lunch?

## Zoology Scorpions, Snakes, Spiders and other Scary Creatures







**Consumer Science**  
In the kitchen!



**Geography**  
First lessons in  
surveying!







## Group P (2013 intake)

Jessica-Amori Ackron  
 James Adam  
 Ashraf Aly  
 Kaylen April  
 Nawaaz Babamia  
 Rian Badenhorst  
 Thokozile Bapela  
 Ashiya Darki  
 Felicia Dhlewayo  
 Tasmia Gani  
 Le-lani Janse van Rensburg  
 Leané Joubert  
 Ayesha Khan  
 Morné Kloppers  
 Alicia Koekemoer  
 Ruan Kruger  
 Walt Laurence

Thabang Lesufi  
 Lexi Ligeti  
 Nokukhanya Magagula  
 Joëlle Mandile  
 Sharon Mashishi  
 Onthatile Masombuka  
 Johannes Matsimbi  
 Kgaogelo Mohlala  
 Kgomotso Mosupyoe  
 Brent Nel  
 Otsile Ngale  
 Khanyisile Ngcobo  
 Katie Ngobeni  
 Serelle Odendaal  
 Jessica Olivier  
 Jován Otten

Gopika Ramkilawon  
 Boitshoko Rammuki  
 Kaylan Reddy  
 Marion Reynolds  
 Taylor Schürmann  
 Thabang Seabi  
 Mmathabang Sekoala  
 Pretty Serumula  
 Charles Sithole  
 Wayde Thomas  
 Jeanette Tshehla  
 Renske van Rooyen  
 Zelda van Staden  
 Marlise van Tonder  
 Fernando Ventura  
 Nadia Verster  
 Carien Visser



# experience real science

Are you in Grade 10 and interested in science?

If you are in Grade 10 and want to experience real science, you might be the ideal candidate for the UP with Science programme. The programme is a science enrichment programme for students attending senior public schools, which is supported by the University of Pretoria. It is open to all Grade 10 students who have a high potential and a keen interest in science. It is a unique and exciting programme. During the programme, you are exposed to an inquiry-based approach to science. It is a year-long programme, after which you may qualify for a UP with Science bursary, which is a valuable opportunity for you.

**UP with Science learners will:**

- In Grade 10 taking Science and Mathematics.
- Participate in experiential learning to learn new things.

**UP with Science learners will:**

- be interested in how our world works and how science can help us understand it.
- be able to think critically and solve problems.
- be able to work in a team and communicate effectively.
- be able to think creatively and come up with new ideas.

Visit the website [www.upwithscience.co.za](http://www.upwithscience.co.za) for more information on the UP with Science programme.



# the sky is not the limit

## How UP with Science helped Dr Hlozek

Facilitated by the burning questions about the universe, Dr Hlozek, graduated towards science at school, in the hope of one day being able to answer these questions. It seemed destined for him. Through various programmes, scholarships and a natural aptitude, the universe slowly opened up to him.

Dr Hlozek is currently conducting postdoctoral research in cosmology at Princeton University, where she is analysing light from the Big Bang. She completed her PhD in 2010, and is also the Gordon-Cowan Fellow in the Princeton Society of Fellows in the Humanities. She was recently named a TEDx Fellow for 2013. This is a fellowship that focuses on both her science and the communication of science to the public.

She studied off her books back when in Grade 10 through the UP with Science programme, after which she completed a BSc (Mathematics) degree in the Faculty of Natural and Agricultural Sciences at UP in 2008. She completed her honours in Applied Mathematics at the University of Cape Town in 2009, and was part of the National Aeronautics and Space Science Programme (NASP) at the University of Cape Town. Her studies were funded by the Department of Science and Technology (DST) and the National Development Programme.

Between 2008 and 2010, as a fellow scholar, Dr Hlozek read for her T Honours in Mathematics at Oxford University.

"I am passionate about using my communication skills to bring the needs of young people to the fore of science. I believe in the power of science to change the world."

Credit: Mail and Dr Hlozek

# How to write a scientific report

By Prof J.E. van der Waals

## UP with Science

### Characteristics of a good scientific report

A good scientific report is clear, concise, logical, and well-structured. It should be written in a formal style and should be free of errors.

### Scientific writing

When you are writing a scientific report, you should follow the following guidelines:

- 1. **Plan**: Before you start writing, plan your report. Decide on the topic, the scope, and the structure.
- 2. **Write**: Write your report in a clear and concise style. Use simple language and avoid jargon.
- 3. **Revise**: Revise your report carefully. Check for errors and make sure your report is well-structured and easy to read.

### Structure of a scientific report

The structure of a scientific report is as follows:

1. **Introduction**: This section introduces the topic and states the purpose of the report.
2. **Methodology**: This section describes the methods used in the study.
3. **Results**: This section presents the findings of the study.
4. **Discussion**: This section discusses the results and their implications.
5. **Conclusion**: This section summarizes the findings and provides a final statement.

### References

References are listed at the end of the report. They should be written in a standard format and should include the author's name, the year of publication, and the title of the work.

## Articles in the JuniorTukkie Magazine

43 JuniorTukkie November 2016

## Natuur- en Landbouwetenskappe

# Liezl Ferreira

## sit haar uitstekende prestaties van die vorige jare voort

Vanjaar is Liezl weer met die Visekskuller en Rektor se medaile vir haar uitstekende voorname akademiese prestasie as die beste student in die Fakulteit, met 'n gemiddelde van meer as 92,18 % gedurende haar drie jaar voorname studies.

Sy het ook die Discovery Holdings-prys en die Outurance-prys verower.

Verlede jaar was sy die nommer een-student op die Oskaan se Meritstelsel, met 'n gemiddelde van 93% en het ook die meeste van die toekennings (meer as 10) geleënsdig ontvang.

Liezl Ferreira

Liezl (Group M)

JuniorTukkie and UP with Science have collaborated for many years, but since 2013 the Grade 11 UP with Science learners have participated in the Empowerment Week and from 2015 UP with Science received financial support from JuniorTukkie.





# Expo

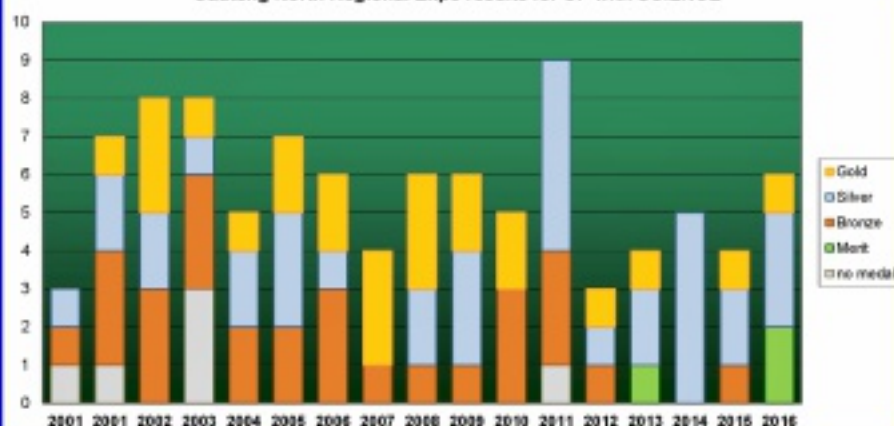


Walter with Sadika & Zuleikha (2003)

UP with Science learners are encouraged to enter the Northern Gauteng Science Expo and their projects generally do very well. The graph below shows the medals their projects have received in the last sixteen years.

Often projects are selected for the National Expo and occasionally they get the opportunity to represent South Africa at an International Science Fair.

Gauteng North Regional Expo results for UP with SCIENCE



Nqobile & Harshan



Izahn & Naeem

## UP with Science projects at the National Science Expo

- 2000 Eating habits of African teenagers and adults in Pretoria  
(Represented South Africa at the International Expo in France)
- 2001 Heavy metal absorption by plants  
(Jacqueline Meyer & Rethabile Mohapi)
- Taxonomy and distribution of medically and agriculturally important rodents  
(Manuel Goncalves, Lerato Mabena & Kenosi Rapoo)
- Walk through time  
(Jacob Modiba & Gloria Shabangu)
- The effect of temperature and the resistivity of semi-conductors and conductors (metals)  
(Moses Mokwena, Bongile Nethanando & Cynthia Tjati)
- 2008 Newton, Kepler and simulating orbits  
(Johannes Moutatse & Muhammad Adil Nurmahomed)
- 2010 Taming the Lantana Monster!  
(Sipho Congolo & Eugene Duvange)
- 2012 Simulating and measuring projectile motion  
(Nqobile Sibuya & Harshan Vallabh)
- 2013 The Monty Hall Problem and Related Mathematics  
(Na'eem Davis & Izahn Schönken)
- 2016 Bacterial community structures in South African dams  
(Jacqueline Janse van Rensburg & Zamazimba Madi)



# 2014

Ebra

Ebrahim



# INSECTS AND MICROBES

## a tree's friends or foes?

Some insects have brightly coloured larvae, sometimes called caterpillars. Caterpillars are eating machines! The Poplar Emperor Moth eats the leaves of Camels Foot and the Common Coral Tree, as well as oaks, poplars, eucalypts, Black Wattle and pine trees. Without leaves the tree can't carry out photosynthesis and convert atmospheric carbon dioxide to sugar and oxygen which it needs to live.

Pollinators carry pollen from the male part of the flower (the anthers) to the female part of the flower (the stigma) to fertilise the plants. Without being fertilised the plants can't make seeds which grow into new plants. Without bees there would be no trees!

It can be difficult for plant roots to get food from the soil, but it's a lot easier for fungi. These mycorrhizal fungi, like *Arbuscula*, are found growing on the roots and help the plant get what it needs to live out of the soil. When you see mushrooms, that's the fungus growing on the outside of the tree, the rest is growing on the roots.

The larvae of native wood boring insects live inside the trunk of the tree where the xylem and phloem that transport water and nutrients that feed the tree are found. The larvae eat the wood and make burrows called galleries. These galleries prevent movement of water to the tree leaves. A famous wood boring insect in South Africa is the woodboring *Sirex noctilio*, which kills trees in pine plantations.

Some fungi are parasites of trees, like the fungus *Armillaria* which lives on the roots of trees and causes them to rot. Some species of this fungus are thousands of years old and so big that they are measured in square kilometres (the biggest is 8.8km<sup>2</sup>), but you can't see them because they live on the roots under the ground. The mushrooms you see are the fungus growing above ground.

Nitrogen is an essential element for life. People get nitrogen from eating proteins, but plants can only get it from the air, which is not easy! To do this they need the help of special nitrogen fixing bacteria like some species of *Rhizobium*. These bacteria live in special nodules on the roots and give the plants nitrogen in exchange for food and a place to live.



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA



Tree Protection  
Co-operative  
Programme



DST-NRF Centre  
of Excellence  
in Tree Health  
Biotechnology



### Contact details:

Ms Heidi Fysh (CTHB Administrator). Tel: +27 (0)12 420 3855. Email: heidi.roos@fabi.up.ac.za or FABI web-page <http://fabinet.up.ac.za>



## Plant Science

### Making tone gel cream with *Greyia flanaganii*



Plant science. As soon as we were informed that we were going to be making a cream I was certain that no face shone brighter than mine because it had been my childhood dream to be able to create my very own product. It was great fun mashing leaves, measuring the chemicals so that they were spot on and continually stirring as the cream magnificently thickened."

Um mi





## Group Q (2014 intake)

Ebrahim Ahmed  
 Amogelang Baloyi  
 Stefan Beukes  
 Meyer Botha  
 Alex Bruhns  
 Koketso Chabalala  
 Thato Diale  
 Evadné Engela  
 Mario Ervedosa  
 Renaté Grobler  
 Roenita Grové  
 Carla Hollamby  
 Jireh Janse van Rensburg  
 Tiego Kau  
 Fatima Khan  
 Jared Khayyam  
 Juline Magwaza

Khanyisile Mahlangu  
 Thabisile Mahlangu  
 Reabetswe Maifadi  
 Sibongile Mandlati  
 Lourenço Marques  
 Tebogo Mogase  
 Resego Molele  
 Botlhale Moobi  
 Neo Motloutsi  
 Reratile Motsaathebe  
 Ripsiy Mvulane  
 Adri Nel  
 Gcina Nkomzwayo  
 Naledi Nkwanyana  
 Monja Nortje  
 Clarice Odendaal

Christo Opperman  
 Alainah Parker  
 Ifrah Rage  
 Lize Reinecke  
 Tamara Ricci  
 Deane Roos  
 Hajira Sikander  
 Wendy Simelane  
 Vrishti Singh  
 Ryno Smith  
 Lesego Sono  
 Nadia Strydom  
 Marissa Swart  
 Tsholofelo Tshenkeng  
 Alexander van Heerden  
 Bjorn Venter  
 Wihan Wampach



# 2015

**UP with Science,** presented by the University of Pretoria, is a programme that will show you what science is really about.

**Grade  
10s...  
this  
is for you!**

- Experience real science
- Learn and experience new things relating to science
- Get to know more about your environment and social issues
- Do research
- Work in teams
- Design and present science shows
- Meet scientists at work
- Go on excursions

2015 INTERNATIONAL YEAR OF LIGHT  
AND LIGHT-BASED TECHNOLOGIES

1. The first step is to identify the problem.



increase your knowledge  
of science and  
science-related  
**careers.**

0000

After successfully completing the UP with SCIENCE programme you'll receive a tuition bursary for study programmes in the Faculty of Natural and Agricultural Sciences.

The nation's oldest  
is also called the  
applied sciences, and  
... a 14-year-old

**2 learners**  
Work your school for  
the programme.

**Helpful tip**

60% to 80% of the total cost of a new building is the cost of the building's systems. The cost of the building's systems is the cost of the building's systems. The cost of the building's systems is the cost of the building's systems.

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*E. coli*, *S. aureus*

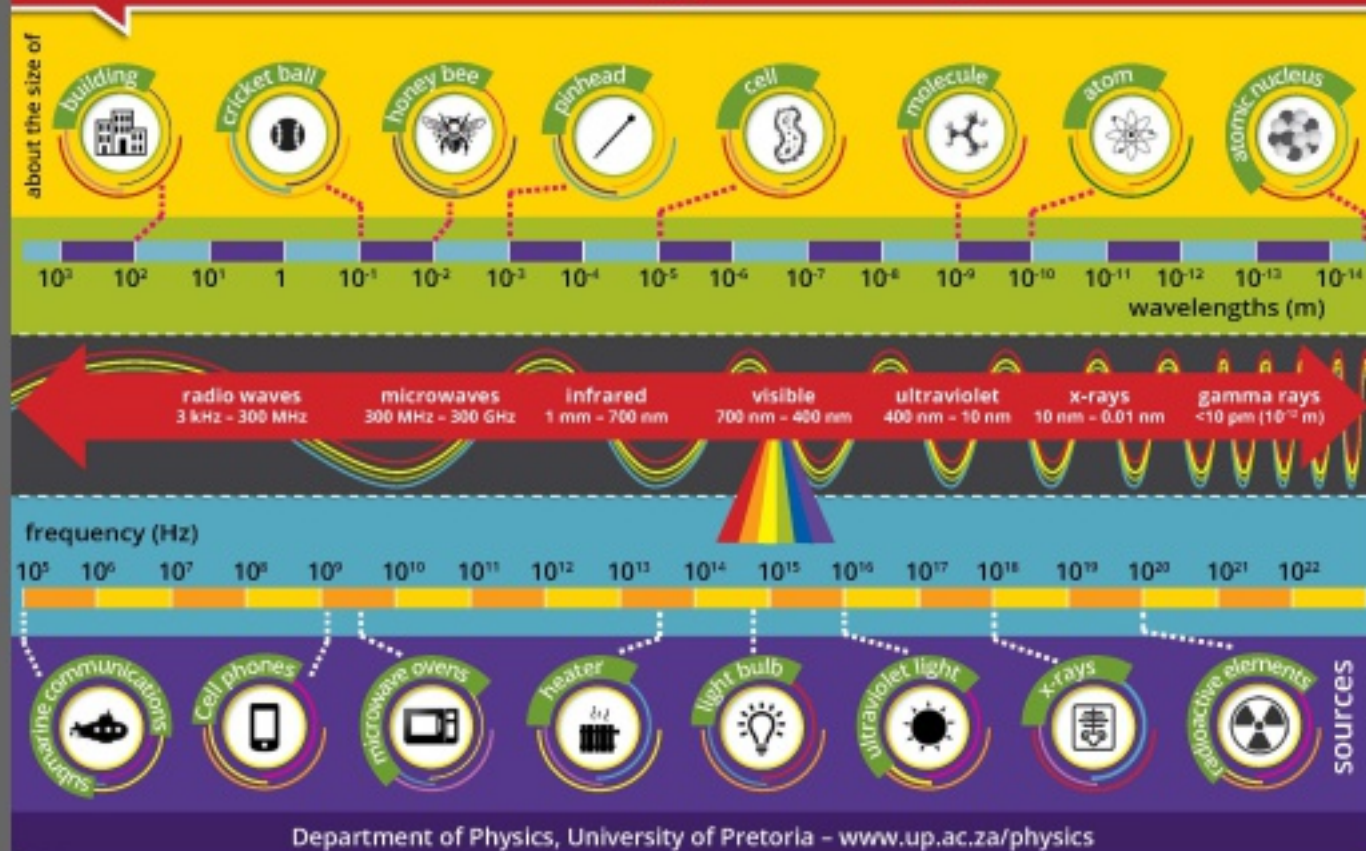
the fabrics through mic

"Our subsequent visit was to Retail Management. The erudition about science of clothes was fascinating; the cell structures of different fabrics and how to determine the physical properties. We were even given the opportunity to view the cell structures of some fabrics through microscopes."

Karabo



# The Electromagnetic Spectrum



Department of Physics, University of Pretoria - [www.up.ac.za/physics](http://www.up.ac.za/physics)

**Meet an UP with Science alumnus**

For Jacobus, this was his first experience of the UP with Science Initiative at Tloaneeng, a turning point in his life.

As a Grade 10 learner at the 10th Avenue High School in Tloaneeng, and a child from a nearby farm, it was not at all likely that he would ever study at a university or even one day occupy a senior position in the mining industry – until the University of Pretoria's unique science enrichment programme gave him that opportunity.

"The programme changed my future," recalls Jacobus. "It was the first time I was in a classroom where the teachers were not just lecturers, but mentors. They encouraged me to think critically and to explore the world of science to the best of my abilities."

**UP with Science**, presented by the University of Pretoria, is a programme that will show you what science is really about.

**Grade 10s... this is for you!**

- 1. Experience and learn about the world of science
- 2. Develop your scientific skills and knowledge
- 3. Gain insight into the career opportunities available in the field of science
- 4. Meet and interact with scientists and researchers
- 5. Gain insight into the career opportunities available in the field of science
- 6. Develop your scientific skills and knowledge
- 7. Gain insight into the career opportunities available in the field of science

2015



Spiders



Disecting a seal



At Geography







Tie dying at  
**Chemistry**

Toffee apples at  
**Consumer Science**





## Group R Research Projects



### Agricultural Economics:

The South African Futures Exchange (SAFEX) Simulation Game

Biochemistry: Egging it on with cholesterol

Geography, Geoinformatics, Meteorology:  
Simulating Flooding Risk in Magnolia Dal, City of Tshwane 2016

CTHB: The life and times of *Syzygium cordatum*. From a small wound to a dead tree

Genetics: Using genetics to investigate cyanotoxins in the Vaal Dam

Mathematics: Perplexing problems

Physics: Capturing energy from the sun

Plant Science: Why bother with grassland rehabilitation?

Statistics: Can you Gangnam style with statistics?



Luvhani Budeli



Jacqueline Janse van Rensburg and Zamazimba Madi at the Gauteng North Expo. They participated in the National Expo and were selected to represent South Africa at the Intel ISEF in Los Angeles in 2017.

## Group R (2015 intake)

Shula Arendse  
Savannah Bennet  
Jonathan Birch  
Carmel Botha  
Luvhani Budeli  
Magdalena Cilliers  
Francois Conradie  
Johannes Conradie  
Courtney Cooper  
Abdullah Darki  
Samira Fanami  
Zixolile Gara  
Shanay Gungudoo  
Mikeila Jacobs  
Jacqueline Janse van Rensburg  
Saalimah Joosub

Karabo Khwinana  
Ruben Kriel  
John Kutu  
Warren Machio  
Zamazimba Madi  
Makgwale Makena  
Masilo Makola  
Malebo Maphutha  
Mpho Mautla  
Carla Meyer  
Lehlohonolo Mhlongo  
Tshiamiso Moagi  
Goitse Modisane  
Katlego Monyela  
Ummi Moosa  
Keneilwe Ndhlovu  
Vaughn Nel

Pearl Ntshana  
Marni Oberholzer  
Jason Pillay  
Jordan Pym  
Seyuri Rajaruthnam  
Molebogeng Rampa  
Kholofelo Ramphekwa  
Lwazi Rantjie  
Amogelang Sedibe  
Angelina Shai  
Prevail Sithole  
Zené Smit  
Pieter Snyman  
Anja Turner  
Mekayla van Huyssteen  
Albert Wilken



# UP WITH SCIENCE

## Grade 10s...

- Experience real science.
- Learn and experience new things relating to science.
- Get to know more about your environment and social issues.
- Do research.
- Work in teams.
- Design and present science shows.
- Meet scientists at work.
- Go on excursions.

**UP with Science,** presented by the University of Pretoria, is a programme that will show you what science is really about.

The course runs over three years and thereafter you may qualify for a tuition scholarship.

UP with Science is a science enrichment programme for secondary school learners, which is presented by the University of Pretoria on the Hatfield Campus.

Breakdown and application forms are available from your Science teacher.

Closing date for applications: 15 April 2016.

Website: [www.upwithscience.up.ac.za](http://www.upwithscience.up.ac.za)  
 Department: E-Science Institute  
 Tel: 012 329 4323/4324/4325  
 Email: [upwithscience@up.ac.za](mailto:upwithscience@up.ac.za)

2016 10th Annual UP with Science Competition



UNIVERSITEIT VAN PRETORIA  
 AN DER VRIEDYK VAN PRETORIA  
 YUNIBESITHI YA PRETORIA

UP WITH SCIENCE



[www.up.ac.za](http://www.up.ac.za)

## "Evil giants"

(pathogens, viruses and insects)

## Mycotoxins

Derives from the fungus - mycelium or mycelium, meaning "fungus" and "toxin" meaning "poison". A toxic substance produced by a fungus, especially moulds.

## Bacterial plant pathogens

## Fungal plant pathogens

## Insects

The effect of fungal pathogens on legumes can be devastating. Ultimately the seed is diseased beyond repair and unable to germinate and grow. ☹

## Uses of legumes

### Medicinal

Different legumes have various medicinal qualities. The legume family is a healthy plant.

### Cancer besh

Cancer Besh (Pisum sativum) is a traditional remedy for various ailments, such as, diabetes, hypertension, etc.

### Liquorice

Liquorice (Glycyrrhiza glabra) is used for coughs, colds, etc.

### Animal fodder

### Best survival food

UP with Science 2016  
 1st Prize: R1000  
 2nd Prize: R500  
 3rd Prize: R250  
 4th Prize: R100  
 5th Prize: R50  
 6th Prize: R25  
 7th Prize: R10  
 8th Prize: R5  
 9th Prize: R2  
 10th Prize: R1

## Life cycle of the bean



## Anatomy

### Leaf

Have you ever wondered what it looks like on the inside?

### Stem

### Root

## The nitrogen cycle

(Understanding the cycle)



Department of Plant Science  
[www.up.ac.za/plantscience](http://www.up.ac.za/plantscience)



# Group S

## Departments visited

Agricultural Economics  
 Biochemistry  
 Centre for Tree Health  
 and Biotechnology (CTHB)  
 Chemistry  
 Consumer Science  
 Food Science  
 Genetics  
 Mathematics  
 Physics  
 Plant Science  
 Tswaing Crater  
 (Geology & Plant Science)  
 UP Farm  
 (Animal Science,  
 Plant pathology &  
 Plant production)  
 Veterinary Science  
 Zoology



"I really appreciate what I have learnt in the programme for the past few months. It really helped me to know what I'm interested in."

Catherine



### How to apply

In Grade 10 in 2015/16 Your Science and Mathematics marks are above 60%? Get your science teacher to nominate you!

### Important stuff

- 1 Complete your UP with Science application form and hand in a completed copy of your Grade 10 year-end results.
- 2 Also submit your science teacher's nomination recommendation (to be filled with assistance).
- 3 Write a message (100-150 words) and tell us why you are interested in the programme.

### Meet an UP with Science alumnus

For Grade 10 in 2015/16, the UP with Science programme played an important part in both her personal and academic development.

As a young Grade 10 girl from Midrand, Catherine never imagined that science would inspire her love and passion for the wonderful world of science and mathematics.

"I began to learn about science in action, performed chemical experiments, went on outings and even made a career choice. This programme motivated me to study science at Tshwane University of Technology, where I am now a student and major in degree in Natural Sciences."

As a full-time student and researcher at UP, Catherine has enjoyed the programme's values and mission – to be part of students' personal and academic development, to be able to make a difference for both individuals and society, and to be a role model for others.

"I am grateful to the UP with Science programme for the experience and guidance during my journey to becoming a student at Tshwane University of Technology."

**UP with Science** is a programme that aims to provide students with a broad exposure to science and mathematics, and to develop their interest in these subjects. The programme is open to all students who are interested in science and mathematics.

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## Physics

Building a  
spectroscope  
and observing  
light spectra



*"UP with Science is an experience of a life time  
and I will never forget my time here."*

Caythlin

*"Thank you for all you have done. You have  
really confirmed my desire to study science."*

Nompumelelo





**At Onderstepoort**

## Group S (2016 intake)

Tyrice Arries  
 Taleah Ayob  
 Johannes Boon  
 Alta Bruwer  
 Chetana Chatergoon  
 Cornelius Daniels  
 Anize de Vos  
 Abigail Erasmus  
 Johan Ferreira  
 William Florence  
 Kaamila Gani  
 Craig Green  
 Neels Haasbroek  
 Natasha Hlongwane  
 Fatima Ismail

Caythlin Jacobus  
 Katlego Kolotsi  
 Rehaubetsoe Lebone  
 Itlotleng Leso  
 Daniël Lotheringen  
 Mooketsi Mabula  
 Busisiwe Mahlangu  
 Katleo Makhanya  
 Lethabo Maredi  
 Mlamli Modikoane  
 Tashriq Moerat  
 Devash Moonsamy  
 Tiisetso Morake  
 Kenalemang Motiang  
 Cathrine Mpobane

Nompumelelo Msiza  
 Shenaiya Naidoo  
 Oratile Nkwashu  
 Phakamile Nyakale  
 Zeenat Patel  
 Saroné Pretorius  
 Kabeer Shamsodeen  
 Sibusiso Sigasa  
 Karabo Skhosana  
 Stéphan van Biljon  
 Yané van der Westhuizen  
 Chantelle van Wyk  
 Sumé van Zyl  
 Tyrick Welcome  
 Tshegofatso Zaza



# Science Shows

From 2002 the UP with Science learners presented science shows at primary schools, often schools that one of the learners attended. Originally the shows were presented in the second semester by the grade 11 learners, but from 2010 this outreach activity was moved to the first semester for the grade 12 learners.



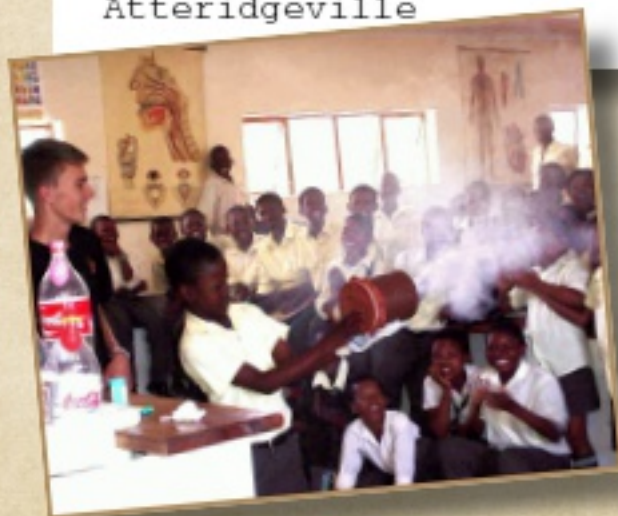
2005

- Laerskool Akasia
- Laerskool Bakenkop
- Laerskool Paratus
- Laerskool Suiderberg



2009

- Laerskool Akasia, Arcadia
- Laerskool Paratus, Thaba Tshwane
- Mogale Primary School, Mamelodi
- Walton Jameson Primary School, Atteridgeville



2007

- 2 Primary schools in Mamelodi
- Primary school in Teresapark
- Walton Jameson Primary School, Atteridgeville

2011

- Bajabulile, Primary School, Mamelodi
- Burgher Right Primary School, Pretoria West
- Doornpoort Primary School
- Marematlou Primary School, Atteridgeville

2004

- Lefofa Primary School, Hammanskraal
- Kgetseatsie Middle School, Hammanskraal
- Laerskool Unieffees, Pyramiding
- Laerskool Louis Leipold, Lyttleton Manor

2003

- Laerskool Magalieskruin, Magalieskruin
- Laerskool Pretoria Oos
- Walton Jameson Primary School, Atteridgeville
- Waterkloof Primary School

2008

- Laerskool Generaal Smit, Daspoort
- Kutung Primary School, Soshanguve
- Refithlile Primary School, Shoshanguve
- Sunnyside Primary School, Shoshanguve



**2002**

- Motswatemeng Technical School, Makapanstad, Moretele District
- Prestige College



le Primary  
anguve  
mary School

**2016**

- PS Fourie Primary School, Eersterust
- Laerskool Magalieskruin
- Nantes Primary School, Eersterust

**2012**

- Laerskool Westerlig, Danville
- Laudium Primary School
- P.S Fourie Primary School, Eersterust
- Walter Sisulu Primary School, Olievenhoutbos, Centurion

**2013**

- Generaal Beyers Primary School, Danville
- Kekana Primary School, Hammanskraal
- Lyttelton Primary School, Eersterust
- Norridge Primary School, Eersterust



**2014**

- Brindhaven Primary School
- Laerskool Kwaggasrand
- Laerskool Nantes
- Pienaarsrivier Primary School



**2015**

- Cullinan Combined School
- Laerskool Akasia
- Laerskool Haakdoorn
- Phuthaditshaba Primary School
- Pretoria Chinese School
- Rekopantse Primary School

**2006**

- Dr. I.M. Monary Primary School, Mamelodi
- J.J de Jong Primary School
- Vukani Mawethu Secondary School
- Walton Jameson Primary School, Atteridgeville







Anton Ströh



John Rogan



Max Braun



Johan Engelbrecht



Robin Crewe



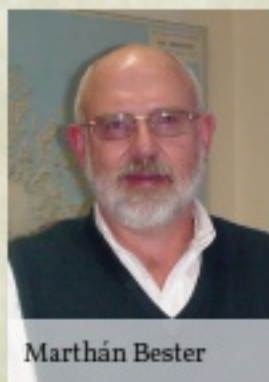
Johan van Staden



Geoffrey Matsepe



Walter Mayer



Marthán Bester



Roan Fraser



Johan Jv Rensburg

Mia Ackermann  
Terry Aveling  
Juanita Avontuur  
Robert Bagnall  
Werner Barnard  
Irene Barnes  
Carl Baumeister  
Nigel Bennett  
Marthán Bester  
Paulete Bloomer  
Jan Boeyens  
André Botha  
Max Braun  
Anele Brits  
Pieter Burger  
Barbara Castleman  
Chris Chimimba  
Eugene Cloete  
Roelf Coertze  
Jan Coetzee  
Martin Coetzee  
Carlo Combrink  
Teresa Coutinho  
Elsie de Meyer  
Hannes de Meyer  
Pierre de Villiers  
Sybrand de Waal  
Danita de Waal  
Petunia Degashu  
Miranda Deutschländer  
Mmantsae Diale  
Jules DjokoKamden  
Barbara Dombrowsky  
Wilma du Plooy  
Cornél du Toit  
Michael Ellis  
Freddy Els

Francois Engelbrecht  
Monica Galliford  
Anabella Gaspar  
Taffy Gomwe  
Veloshinie Govender  
Joha Grobbelaar  
Leylani Grobler  
Wiebke Grote  
Alan Hall  
Tracy Hall  
Piet Hammes  
Gerda Harmzen  
Bianca Hinze  
Rudi Horak  
VVH Icharam  
Johan Janse van Rensburg  
Barend Jansen van Vuuren  
Alta Jooste  
Fourie Joubert  
Angelique Joubert  
Lizandé Kellerman  
Godfrey Kgatle  
Lise Korsten  
Quenton Kritzingen  
Nic Labuschagne  
Peter le Roux  
Tamzyn Level  
Amelita Lombard  
Maggi Loubser  
Wolfgang Maier  
Seite Makgai  
Thulani Makhalanyane  
Stanley Manzini  
Christine Maritz  
Jacques Marneweck  
Vusani Mathada



# People passionate about promoting science

Some people who assisted with UP with Science are listed below; there were many more! Thank you all for your support for these 19 years.



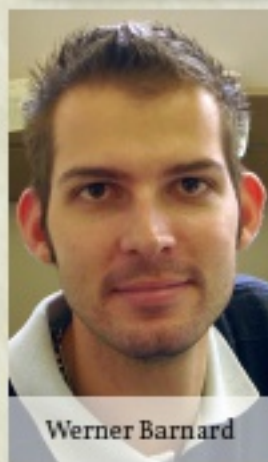
Marietjie Potgieter

Philani Mavimbela  
Roland Merkle  
Engela Meyer  
Amanda Minnaar  
Mase Mokhele  
Calvin Mophuting  
Rethabile Motloun  
Lutendo Mugwedi  
Kershney Naidoo  
Thomas Nembudani  
Helga Nordhoff  
Almarie Nordier  
Ikechukwu Okeke  
Nicky Olivier  
Ulonka Olivier  
Rudi Penzhorn  
Shadrack Phophi  
Zelda Pieterse  
Theresa Pretorius  
Linda Prinsloo  
Victoria Rautenbach  
Belinda Reyers  
Martin Rigby  
Grant Roberts  
Mark Robertson  
John Rogan  
Egmont Rohwer  
Jolanda Roux  
Quentin Santana  
Deon Scheepers  
Thomas Schmidt  
Irene Schoeman  
Franci Siebert  
Gilbert Siko  
Melissa Simpson  
Melissa Simpson

Puffy Soundy  
Kitty Stamhuis  
Emma Steenkamp  
Chantal Strumpher  
Dirk Swanevelder  
Craig Symes  
Nicolette Taylor  
Victor Tibane  
Puleng Tsie  
Natalie Uys  
Este van Marle-Koster  
Peet van Rooyen  
Louwrens van Schalkwyk  
Johan van Staden  
Natalie van Zuydam  
Gusti van Zyl  
Nic van der Berg  
Chris van der Merwe  
Melissa van der Merwe  
Barend van der Merwe  
Monica van der Merwe  
Esther van der Spuy  
Jacquie van der Waals  
Johan van der Waals  
Eduard Venter  
Elise Venter  
Sabine Verryn  
Jan Verschoor  
Annemarie Viljoen  
Edward Webb  
Markus Wilken  
Brenda Wingfield  
Mike Wingfield  
Amy Wooding  
How-Chiun Wu  
Deryck Yelverton  
Elizma Yelverton



Jan Verschoor



Werner Barnard



Petrus Lombard



Egmont Rohwer



Rudi Horak

Photo: Facebook



Chantal Scholtz



Jacquie van der Waals









## Talks & Workshops

Marion West (HartRAO)  
Astronomy

Zuleikha Ahmed  
Study methods workshop

Santjie du Toit (UP)  
Antarctica

Angelique Kritzinger (UP)  
Mystery Circles in Namibia

Johnny Rizos (CSIR)  
The uses of satellites and the importance they  
have in our daily lives

Refentse Shinner (SAB)  
Responsible Alcohol Consumption

Thomas du Plooy (CSIR)  
Laser Technology

Dr Jeanne de Waal (SU)  
Nematodes as biological control

Lucky Sikhwivhilu (CSIR)  
Nanotechnology

Thokozile Malaza  
HIP2B2

Prof Nithaya Chetty (UP)  
Astronomy in South Africa

Duduzile Ntuli  
Food labels and diabetes research

Sci-Bono  
Dialogue in the Dark

Matthys Dippenaar (UP)  
Pretoria's Fountains - Arteries of Life

Dr Renée Hlozek (was in Group B )  
Astronomy

Dr Tali Hoffman  
MammalMap

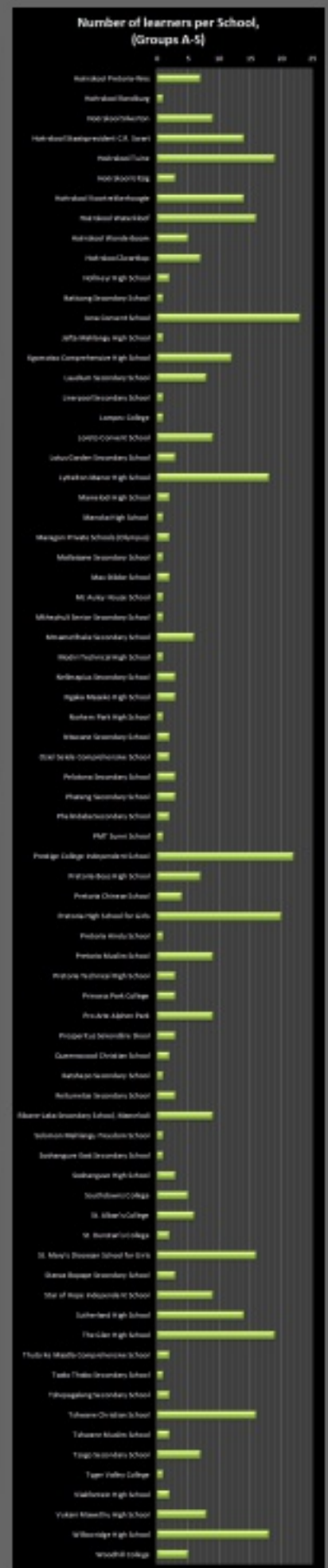
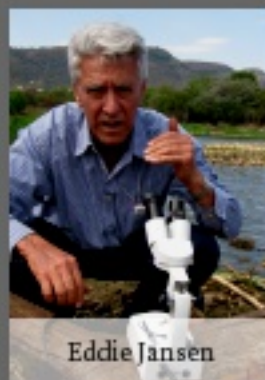
Dr Henry Throop (UP)  
NASA: New Horizons spacecraft flying to Pluto

Prof Cowan (UP)  
Living, working (and playing) in Antarctica

Patricia Gouws (Unisa)  
Robotics workshop

Jacques Pienaar (was in Group G)  
Dark Matter

Stefan Nordhoff  
Money skills for students





## MOTIVATING SCIENTISTS FOR AFRICA

Helen A. Harcourt, Sci-Educ, University of Pretoria, RSA

"UP with Science" is a science enrichment programme for senior secondary school learners presented by the University of Pretoria. Its aim is to increase young people's knowledge of science and to motivate them to follow a science-related career. Approximately 50 learners who have a high potential and a keen interest in science are selected annually from learners in secondary schools in the greater Pretoria/Tshwane area. The participants are chosen so that the group reflects the racial, gender and economic diversity of South African population.

### Background

The "UP with Science" programme was started in 1988 and since 2005 it is based at Sci-Educ, the Science Centre on the main campus of the University of Pretoria. After 18 years it is considered to be one of the most successful outreach programmes of the university. The physical environment of the Science Centre is stimulating and during the three-year programme learners are exposed to various scientific issues that are raised during focus months and through travelling exhibits.

### Structure of the programme

The three-year course consists of monthly Saturday meetings and a week-long holiday programme each year.

#### Year One: Grade 10

The main focus in the first year is an stimulating introduction to departments in the Faculty of Natural & Agricultural Sciences. Learners take part in the science enrichment activities and experiences that include:

- hands-on laboratory work;
- presentations by lecturers/ scientists from various departments in the Faculty of Natural and Agricultural Sciences;
- talks and lectures by well-known scientists.

#### Year Two: Grade 11

In the second year the focus is on exposure to guided research. Learners spend time working with researchers from the University in science laboratories on mini-research projects exploring "real science" problems. Some research projects lead to excellent Science Expo projects. They also get an opportunity to design and present science shows at primary schools.

#### Year Three: 2009 - Grade 12

In the third year the focus is on strengthening basic science knowledge and communication. In addition to the above activities, learners

- do their research projects;
- use the internet to do science research and
- receive career guidance.

#### Year Four to Six: Science University

Learners who complete the "UP with Science" programme and who fulfil the admission requirements and attend in the Faculty of Natural and Agricultural Sciences at the University of Pretoria receive a full tuition scholarship.

**"UP with Science" learners should be:**

- interested in their surroundings,
- inquisitive & experimental,
- curious about the environment,
- keen to learn new things,
- able to work in a team,
- open to social issues.

**Departments**

- Botany & Zoology
- Biochemistry
- Biotechnology
- Chemistry
- Genetics
- Geology
- Microbiology
- Physics
- Plant Pathology
- Plant Production
- Soils & Regional Planning
- Zoology

**For example you can:**

- investigate the effect of temperature on the rate of an enzyme-catalysed reaction.
- determine the effect of pH on the rate of an enzyme-catalysed reaction.
- investigate the effect of substrate concentration on the rate of an enzyme-catalysed reaction.
- determine the effect of temperature on the rate of an enzyme-catalysed reaction.
- determine the effect of pH on the rate of an enzyme-catalysed reaction.
- determine the effect of substrate concentration on the rate of an enzyme-catalysed reaction.

**UP with Science**

## 5th Science Centre World Congress, Toronto



## YOUNG RESEARCHERS

### A World of Science

The "UP with Science" programme is not curriculum based and during the 18 meetings in the first year the learners visit many different departments in the Faculty of Natural and Agricultural Sciences. Scientists take place under the guidance of knowledgeable scientists. Some places he visit are:

- Botany/Biochemistry/Bioinformatics/Chemistry
- Undergraduate Laboratory Campus
- Undergraduate Laboratory Campus
- Undergraduate Laboratory Campus
- Undergraduate Laboratory Campus

The most memorable activities from the first year seem to be the visit to the Tanning Estate as well as the day in the Protein Department. The learners built a radio and made that, for cream with liquid shingles.

### Science Research

The most memorable activity in the first semester of the Grade 11 year is the most memorable activity of the "UP with Science" programme.

- do small, real research projects which often lead to a larger project;
- are exposed to hands-on science in real laboratories;
- get to know young, motivated and passionate scientists;
- learn to solve science-related problems;
- learn to work in a multi-cultural team.

### Gaining Regional Science Exps

- The Expo takes place in August.
- Maximum of 2 learners per project may enter.
- Good Grade 11 award. UP with Science always brings home medals.
- Projects often go through to the National Expo.
- In 2000 one group went to the International Expo in France.

### Communicating Science

During the second half of the grade 11 year and the first half of the grade 12 year they explore some Science Communication methods. These include:

- taking part in the Gaining Regional Science Exps;
- presenting science shows to primary school learners;
- researching a science topic on the internet;
- writing a scientific report;
- presenting their research topic at their peers.

**Components of a Research Project**

- Formulate a question or hypothesis
- Find out what is known
- Design a procedure
- Do the experiment
- Analyse the results
- Draw a conclusion

**Popular Science Topics**

- "UP with Science" Award
- "UP with Science" Award
- "UP with Science" Award
- "UP with Science" Award
- "UP with Science" Award

**UP with Science**

## THE FIRST 10 YEARS

### Education in South Africa

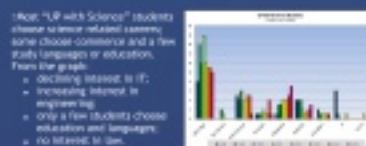
The South African government understands that education is an important factor for the development of the country and the education budget has been the second largest budgetary item for the last few years. Compulsory schooling for all children aged 7 to 12 was introduced in 1996. Although there has been a significant decrease in the number of people with no schooling in the last 10 years, only 18% of the population completed 12 years of schooling and 9% obtain a higher education.

South Africa desperately needs more scientists & engineers, but relatively few learners pass higher grade mathematics (≥ 75%) and higher grade science (≥ 55%). Less than 25% of the 25 000 matriculants pass maths at the level required for related university courses.

### "UP with Science" Statistics

In the course of the 3 year programme only a few learners drop out. Main reasons are:

- parents move to a different city;
- the learner decides not to study in a scientific field;
- other commitments, e.g. sport, music, etc. take up too much time.



### "UP with Science" Students



**Summary:**

- low drop-out figures;
- high number of post-graduate students.

**Dissemination:**

- UP with Science
- UP with Science
- UP with Science
- UP with Science
- UP with Science



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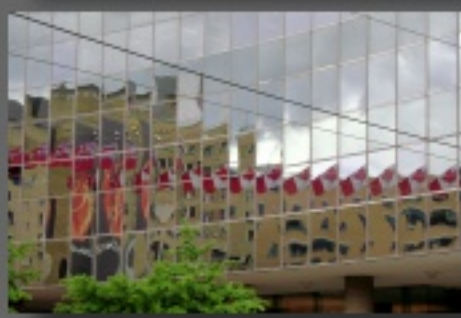
**UP with Science**

**Year 10**

**Year 11**

**Year 12**

**UP with Science**





## Papers and Presentations at Conferences

- VM Baloyi, HI Nordhoff, MHW Braun, E Gaigher, WE Meyer. 2013. **Correlation between the social background of a selected group of grade 10 learners and their views on the nature of science.** Presented at the SAIP Conference 2013.
- H.I. Nordhoff. 2011. **HELP! What are Scientists trying to tell me and should I care?** Presented for the panel discussion at the 6th Science Centre World Congress in Cape Town.
- H.I. Nordhoff. 2010. **Improving the Image of Science: Science Communication for Grade 12's.** Presented at the 13th SAASTEC Conference 2010.
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- H.I. Nordhoff. 2006. **Africa – A Puzzle!** Poster presentation about the design of an Africa Puzzle for Sci-Enza. Presented at the 9th SAASTEC Conference 2006, *Science Centres: Interacting with the World!*
- H.I. Nordhoff. 2005. **From Newton to Einstein – Developing a card game as an outreach activity.** Presented at the 8th SAASTEC Conference 2005, *Education and Change through Science and Technology Centres.*
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