FAKULTEIT INGENIEURSWESE
FACULTY OF ENGINEERING

Postgraduate studies: Should I pursue a Masters in Mechanical or Mechatronic Engineering?

Thorsten Becker

Department of Mechanical and Mechatronic Engineering
Stellenbosch University

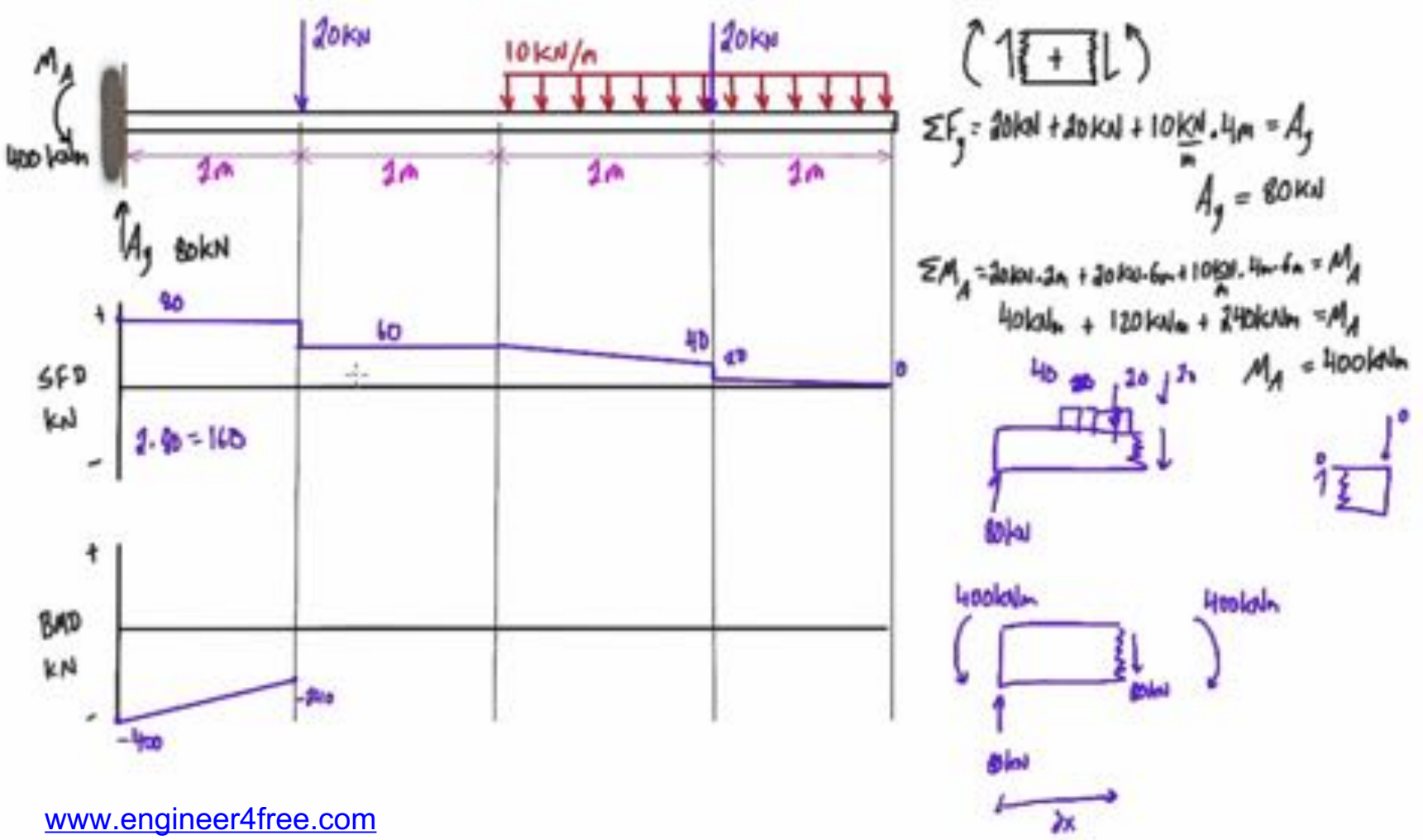
1918·2018

Overview.

- Why would you want to do a postgraduate degree?
- What type of research does our department do?
- What is a postgraduate study and how does it work at Stellenbosch University?
- How do I go about getting information on a Master topic?
- Funding.
- Supervisor(s).
- Information submitted by various research groups.
- Final remarks.

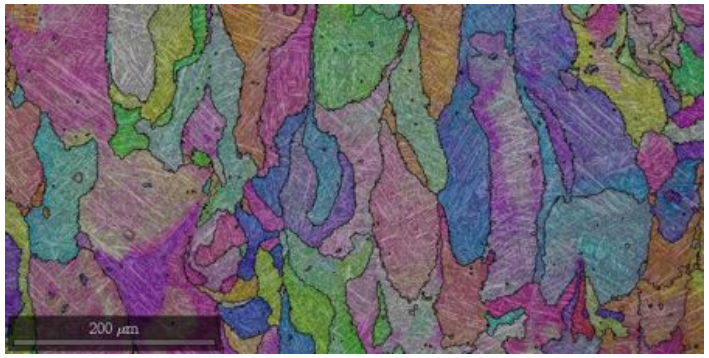
Why a postgraduate degree?

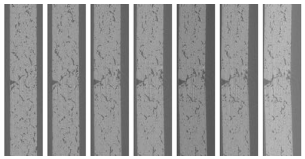
Why a postgraduate degree?

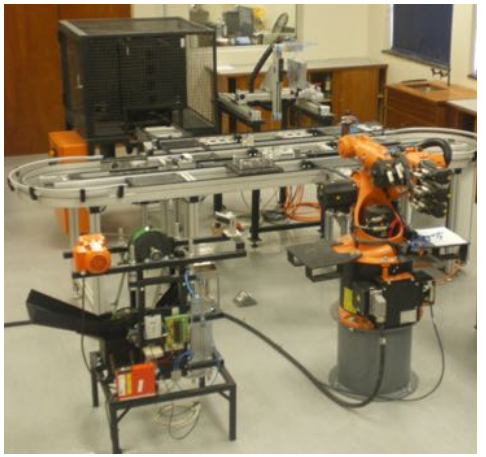


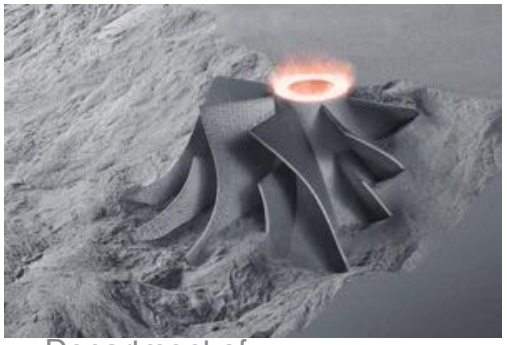
www.engineer4free.com

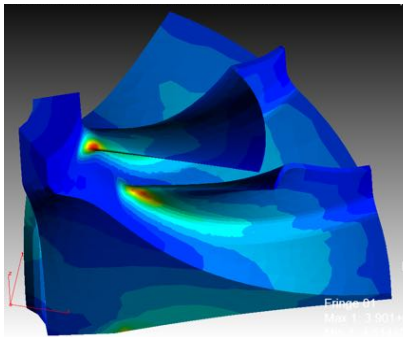
We do groundbreaking research.











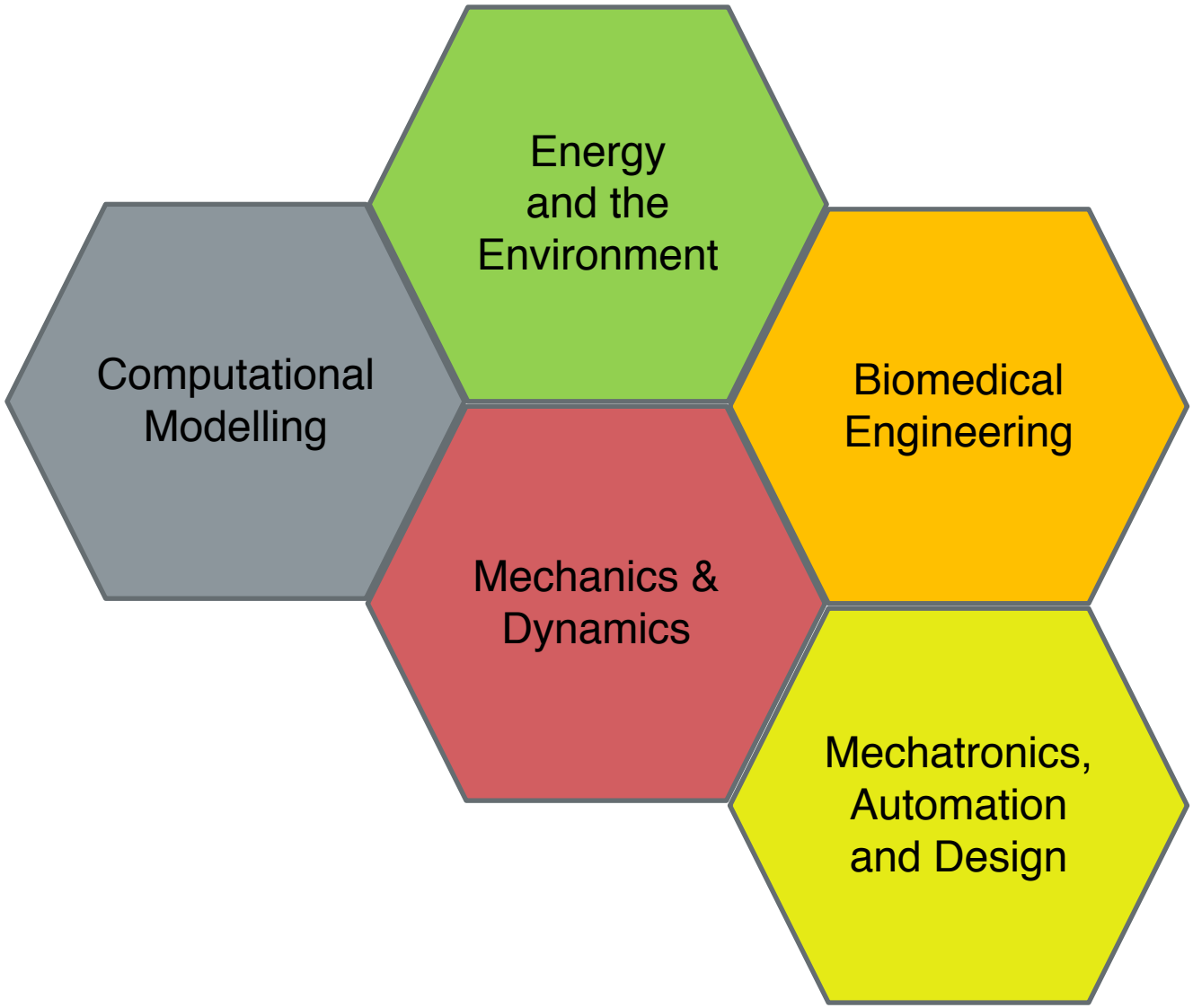
Citations per faculty.

Refine: South Africa

# RANK	UNIVERSITY	OVERALL SCORE	ACADEMIC REPUTATION	CITATIONS PER FACULTY	EMPLOYER REPUTATION	FA
2018	Uni Search					
207	Stellenbosch University	33.1	34.4	52.9	33.5	
333	Rhodes University	-	-	38.2	-	
356	University of Cape Town	48.9	60.2	35.9	55.1	
372	University of Witwatersrand	33	34.7	33.7	43.6	

www.topuniversities.com

Departmental research themes.



Research groups.

Biomedical Engineering

Biomedical engineering (BERG) involves applying the concepts, knowledge and approaches of virtually all engineering disciplines to solve or improve healthcare related problems. Biomedical engineers use their expertise in biology medicine ...

Read more >

Renewable Energy

The **Centre for Renewable and Sustainable Energy Studies** (CRSES) acts as a central point of entry into Stellenbosch University for the general field of renewable energy. Some contract research projects are completed within CRSES ...

Read more >

Solar Thermal Energy

The **Solar Thermal Energy Research Group (STERG)** was the first university research group in the country to focus on solar thermal energy research. A main objective of the group is to train students to deliver research outputs in CSP.

Read more >

Thermodynamics and Fluidmechanics

Current project title: Minimized water consumption in CSP plants (MinWaterCSP) Project duration: 36 months, started 01/01/2016 Consortium: 12 partners from 6 countries Demo sites: South Africa, Morocco and Spain Academic Institution partners: Fraunhofer ISE, Stellenbosch University, University of Rome, IRESEN

Sound and Vibration

The **Sound and Vibration Research Group (SVRG)** is situated in the Department of Mechanical and Mechatronic Engineering at the University of Stellenbosch. The SVRG has established expertise, equipment and laboratory facilities ...

Read more >

Mechatronics, Automation and Design

The **Mechatronics, Automation and Design (MAD)** Research Group focusses on product design and manufacturing systems that combine controllers, sensors, actuators and/or mechanisms, such as reconfigurable manufacturing systems and

Read more >

Materials Engineering

The **Materials Engineering group** is working with many of the leading national and international institutions in the area of materials engineering. The level of contact varies from fully funded research projects, through to partial funding of projects ...

Read more >

Materials, Optimisation and Design (MOD)

The Materials, Optimisation and Design research group work on a diverse group of projects related to structural analysis and optimisation. The primary goal of which is producing or facilitating advanced engineering design

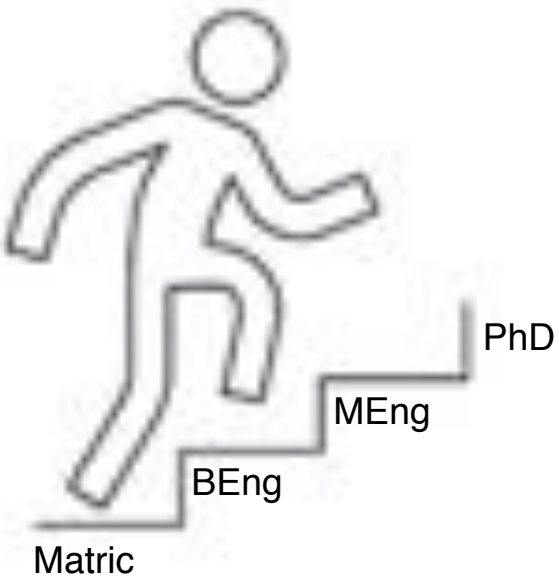
What is a postgraduate study?

Masters in Mechanical or Mechatronic Engineering.

- Research Masters (typically a 2 year program, full time):
  - 1 semester of course work at an advanced level.
  - 2-3 semesters of research.
  - Submission of a research thesis.
  - Submit a research article for publication.
- Structured masters (CRSES, typically a 1 year program):
  - 2 semesters of course work at an advanced level.
  - Project.

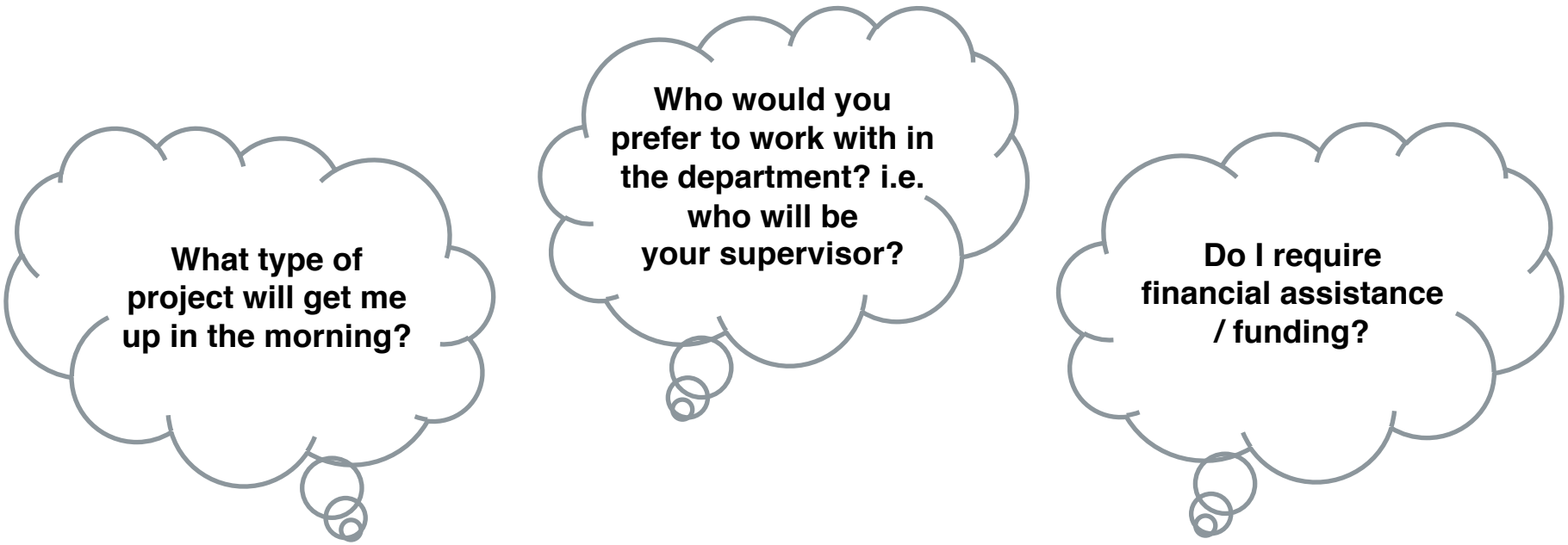
PhD in Mechanical or Mechatronic Engineering.

- 3 year program (full time).
- 36 months of research.
- Novel and groundbreaking.
- Submission of a research thesis.
- Publication numerous research articles and conference talks



How do I go about deciding on a MEng?

Ask yourself three questions.



Funding.


Listen. Let me tell you how it works.
Art and Research have a lot in common...
ART
RESEARCH
Searches for truth:
Values originality and creativity:
Makes the world a better place:
REALLY HARD TO GET FUNDING FOR:

Funding.

Some research projects are funded. Some are not.

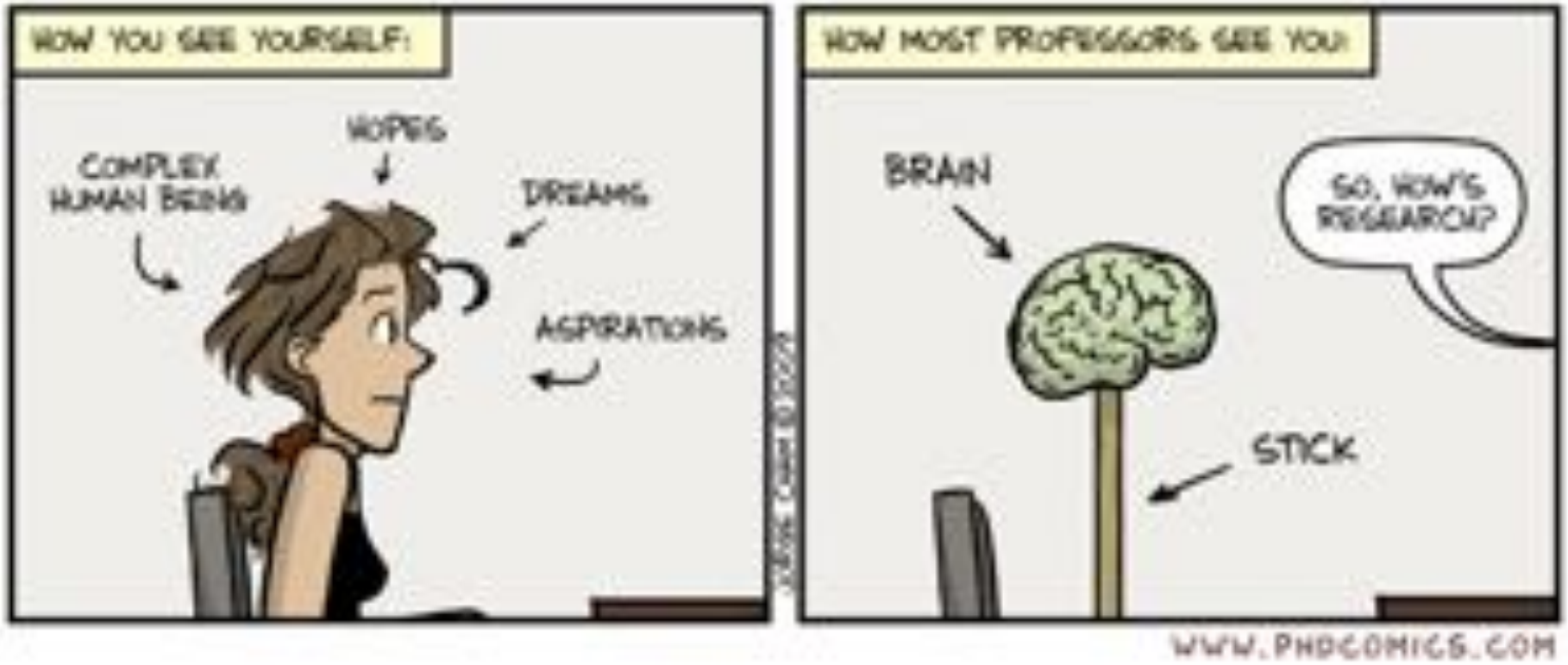
Sometimes you can be lucky and become part of a well funded research program, sometimes you need to organize your own funding through scholarships and bursaries.

Industry

National Research Foundation

Trusts

Supervisor(s).



Supervisor(s).

You require a supervisor from our department. You can have co-supervisors from any other department or university.

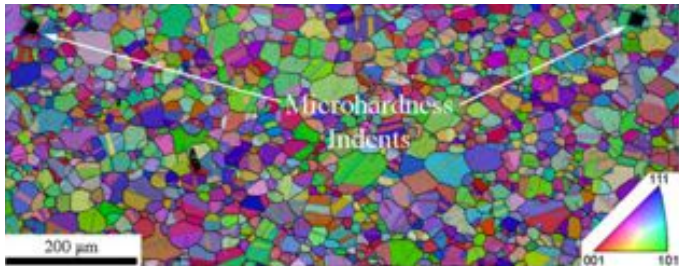
- Someone that is an expert in your intended field of study.
- Someone who understands you and whom you understand.
- Someone who will encourage and assist you to develop standards of achievement that will result in a thesis of merit.
- Someone that does *not* do the work for you.
- Someone that *you* can arrange to meet regularly (i.e. has time for you).
- Someone that gives you feedback and critique.
- Someone that can help mediate in certain situations.

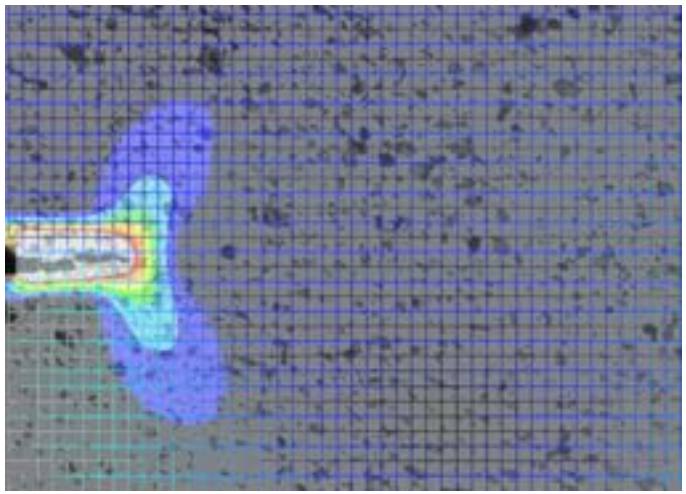
Project.

https://www.sun.ac.za/english/faculty/eng/mechanical-mechatronic/Pages/postgraduate-research-topics.aspx

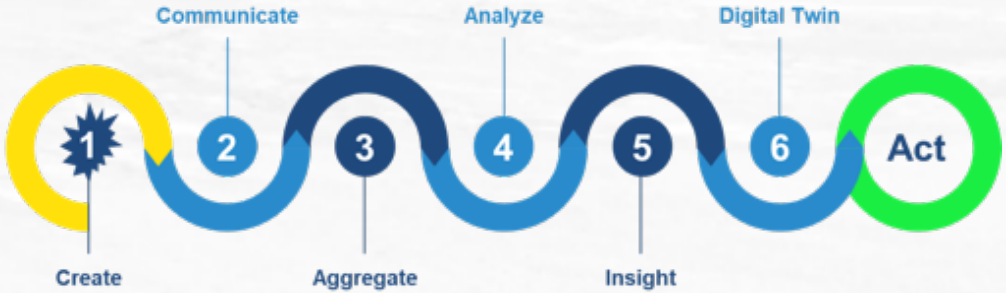
Materials Engineering group

- Qualification of 3D printed titanium parts for Medical Implants and Aerospace components.
- Degradation of material properties using computer vision.
- Resource efficient process chains for titanium products: near net-shape preforms using powder metallurgy
- Collaboration with local university (UCT, CUT, CSIR) and international Universities (Oxford, Leuven).
- Contact:
  Assoc. Prof Thorsten Becker tbecker@sun.ac.za
  Assoc. Prof Debby Blaine dblaine@sun.ac.za
  www.sun.ac.za/mateng





DIGSAA - Digital twin solutions for the SA Agulhas II



sound & vibration RESEARCH GROUP

UNIVERSITEIT STELLENBOSCH UNIVERSITY

NTNU
Norwegian University of Science and Technology

TUHH
Hamburg University of Technology

Aalto University
School of Engineering

Topics – DIGSAA

Contact: Annie Bekker

Supervisors:

Annie Bekker, Chris Meyer, Jacques Muiyser

Topics:

- Wave slamming
- Rigid body motion
- Scale modelling

Techniques:

Measurement, Signal processing, Modelling, Advanced data analytics, Multi-variate models, augmented reality

Bursaries:

Masters R 70k + top up, PhD R100k + top up

Prof Anton Basson (ahb@sun.ac.za)

Dr Karel Kruger (kkruger@sun.ac.za)

Mechatronics Automation Design

www.sun.ac.za/mad

Industry 4.0 in the South African context

→ Development of frameworks for "digital twins" of systems

Manufacturing

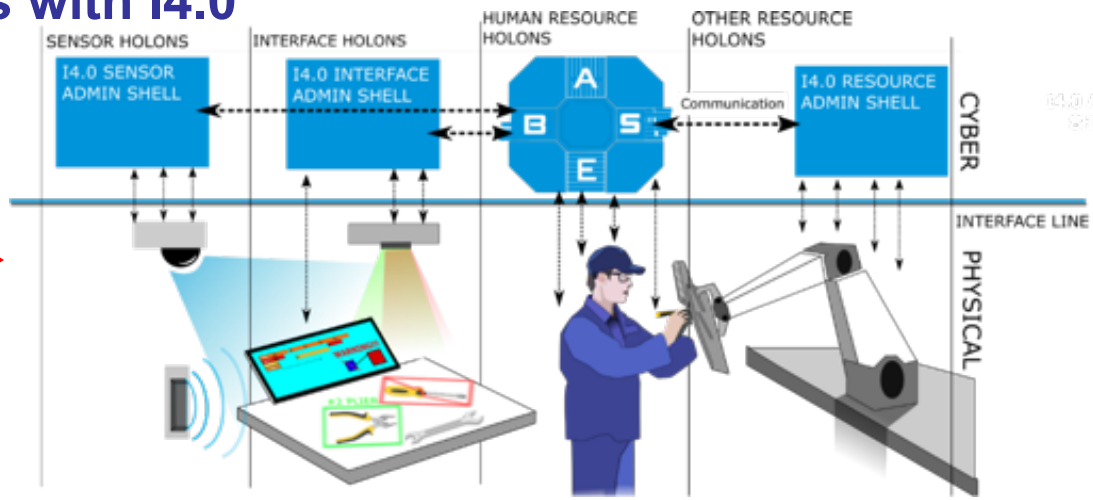
Maritime

Agriculture

Renewable energy

→ Development of frameworks for "digital twins" to integrate humans with I4.0

1 Masters bursary available!!



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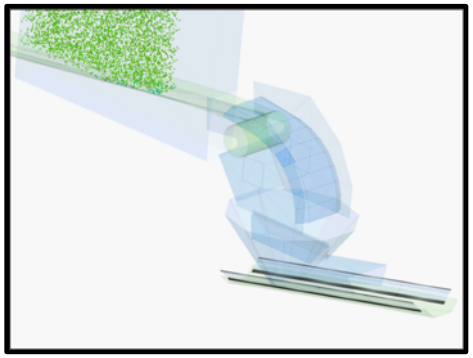
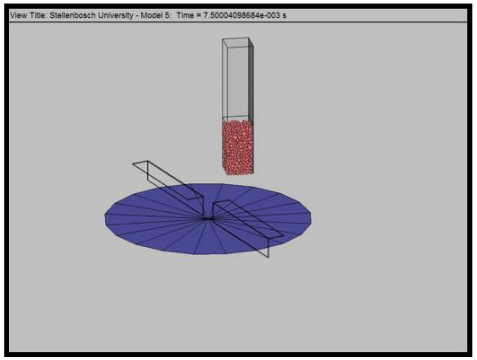
Bulk Materials Handling using the Discrete Element Method (DEM)

Prof Corné Coetzee (ccoetzee@sun.ac.za)

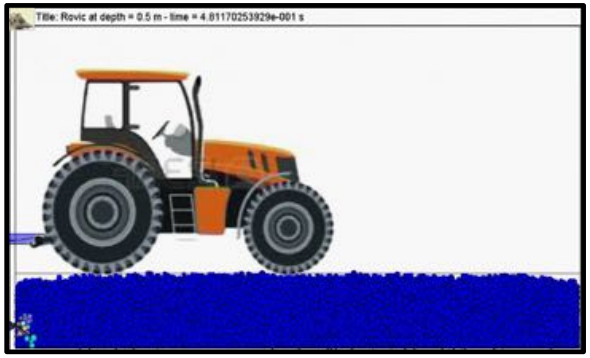
- The modelling of granular materials with the focus on bulk materials handling
- Applications in the mining and agricultural sectors: design of new and improving of existing systems and equipment
- Collaboration with local companies and international universities
- Possible funding for Master students



Discrete Element Modelling of Conveyor and Transfer Chute



Discrete Element Modelling of Fertiliser Spreader

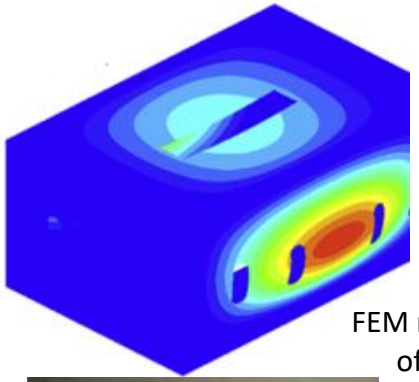


Discrete Element Modelling of Soil Tillage

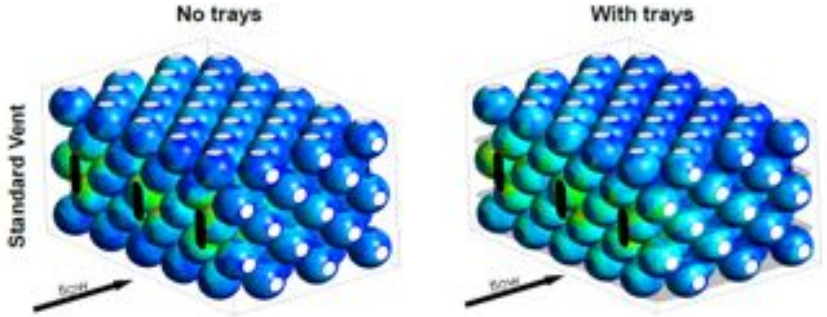
Agricultural Engineering
Postharvest Technologies

Prof Corné Coetzee (ccoetzee@sun.ac.za)

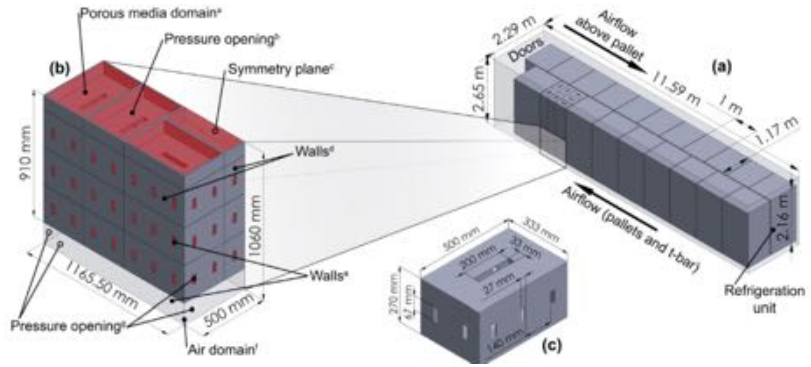
- The optimisation of packaging for fruit and vegetables: existing and new
- Finite element modelling (FEM) to investigate and improve the structural integrity
- Computation fluid dynamics (CFD) to analyse and improve the cooling processes
- Close collaboration with the department of horticultural sciences at Stellenbosch and local manufacturers of packaging materials
- Possible funding for Master and PhD students



FEM modelling of a box



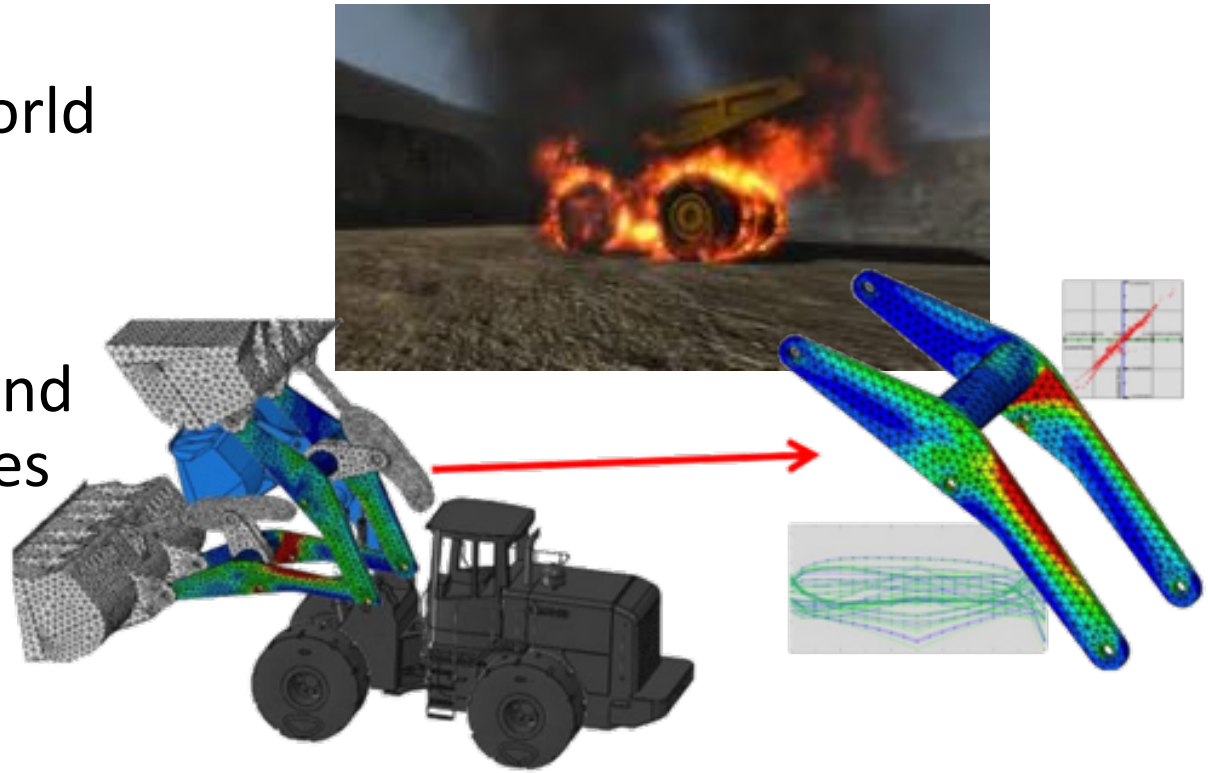
CFD modelling



Gerhard Venter

- Part of MOD research group
- Linear and non-linear FE analysis
- Numerical design optimization and related technologies
- Application to a wide range of real world problems
- Mostly funded from industry
- Currently: material characterization and load recovery using inverse FE analyses
- Contact: Prof Gerhard Venter

gventer@sun.ac.za

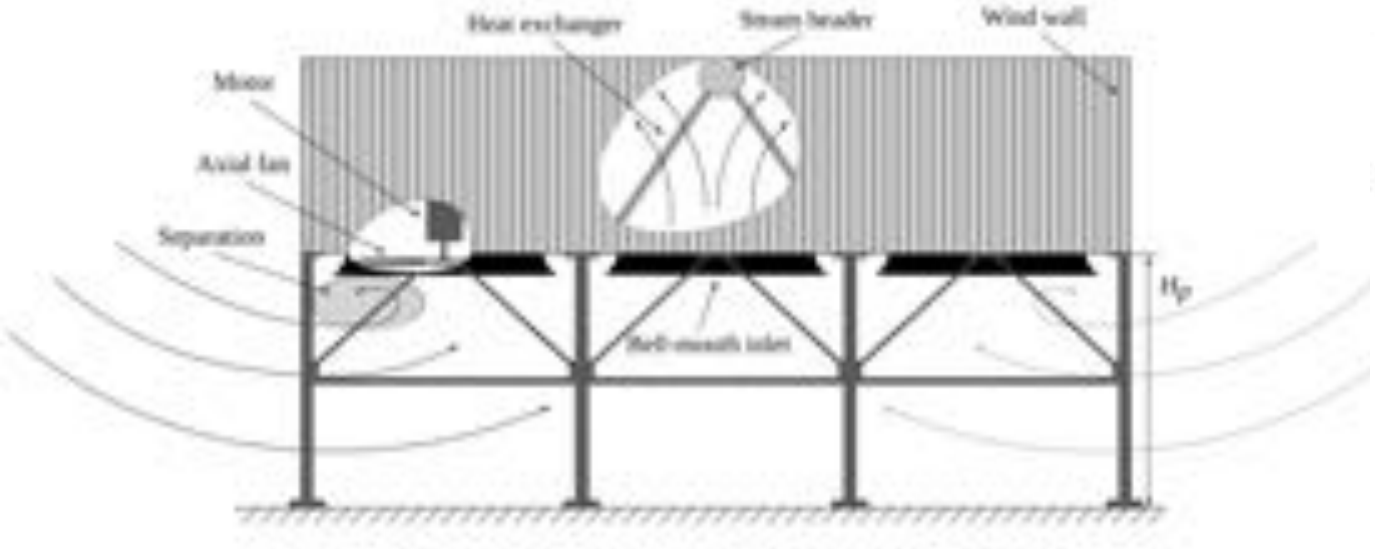


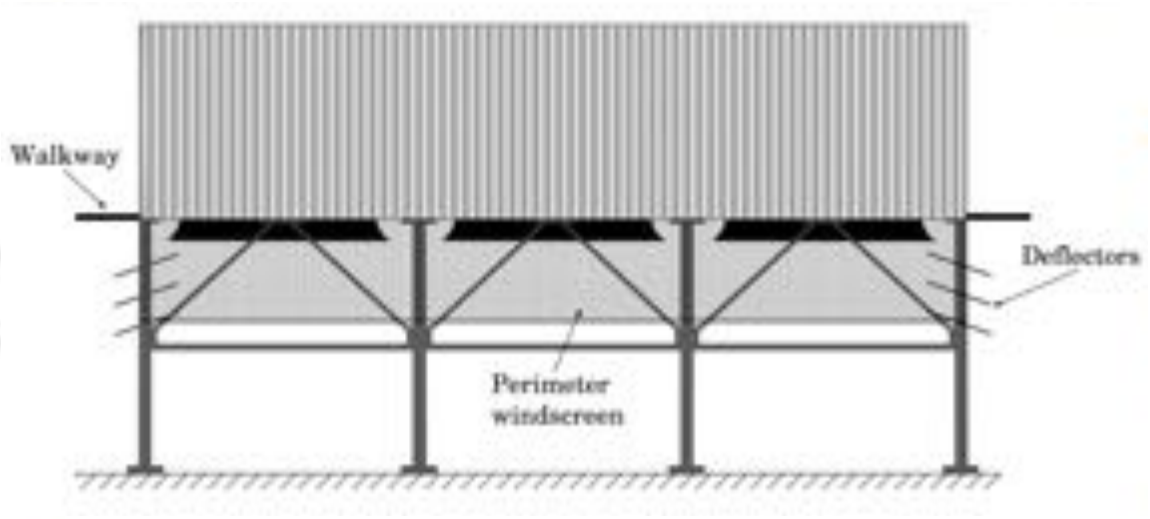
Wind mitigation for air-cooled condenser fan systems

Dr Jacques Muiyser
jmuiyser@sun.ac.za

Multiple experimental and numerical research topics related to the performance and vibration of air-cooled condenser fan systems operating under windy conditions:

- Optimisation of wind mitigating mechanisms
- Investigation of novel wind mitigation concepts
- Numerical modelling of fans and mechanical/structural components

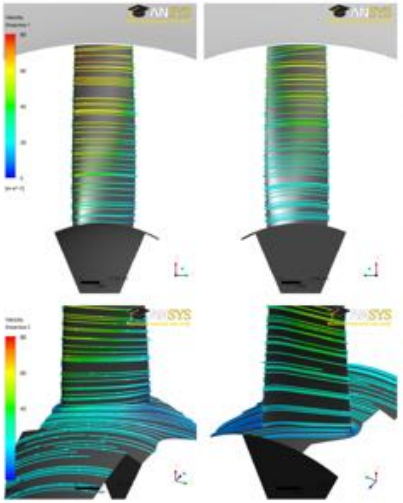


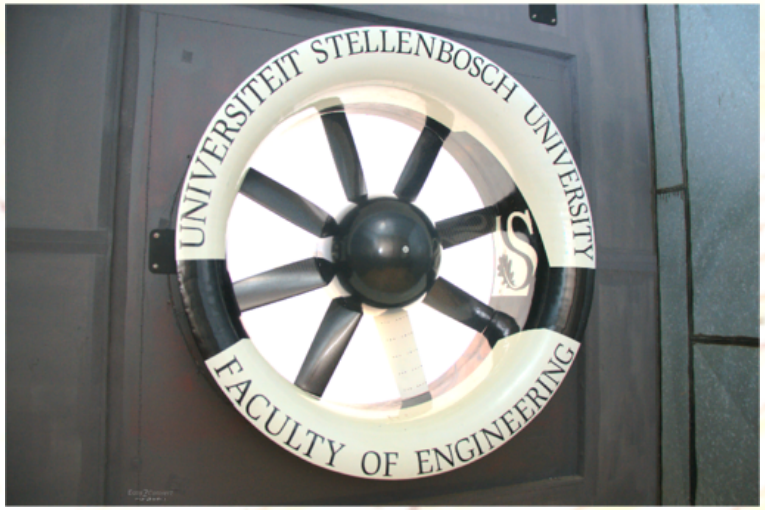


Figures created by Simon Marincowitz

Termovloei Afdeling – Thermo-Fluids Division

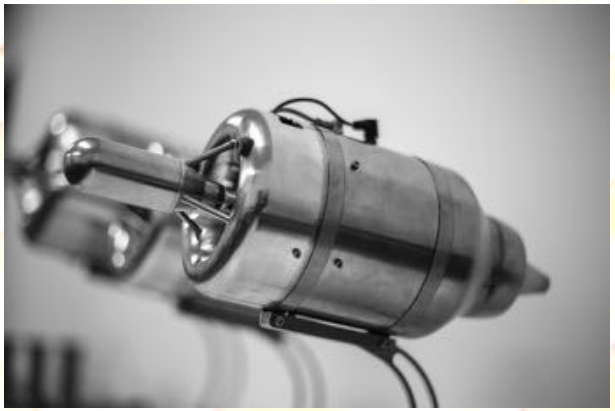
Johan van der Spuy: Large diameter axial flow fans, micro gas turbines

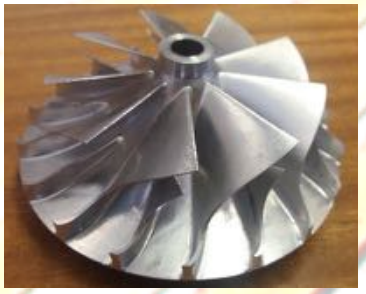




Thesis: Francois Louw

- sjvdspuy@sun.ac.za
- Simulating and testing large diameter axial flow fans for application in air-cooled condensers.
- The development of micro gas turbines for propulsive and renewable power generation purposes.





Website: Cape Aerospace (CAT)

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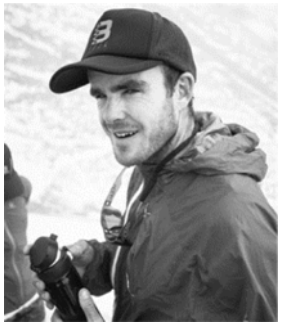
Mike Owen – Thermofluids division

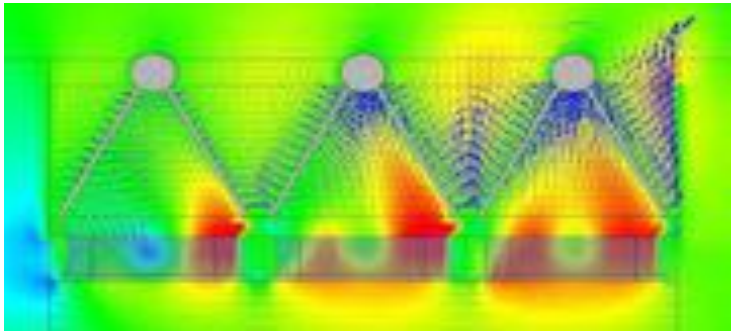


RESEARCH AREAS

- **Heat transfer & fluid dynamics**
- **Industrial heat exchangers**
  - Dry, wet & hybrid cooling
- **Renewable & sustainable energy**
  - Reducing energy related water consumption
  - Solar energy applications
- **Energy efficient buildings**
  - Thermal performance of buildings

POST-GRAD OPPORTUNITIES

- **ACC fan performance**
  - Numerical and experimental work
  - Wind screens, inlet configurations, ???
- **Hybrid condensers**
  - Primarily experimental work
  - Performance characterization
- **Other**
  - Anything rad, come and talk to me! Bring coffee.



mikeowen@sun.ac.za, M516

Solar Thermal Energy Research Group

Using the sun to supply renewable energy

We research:

- Thermodynamic cycles
- Automation of heliostat fields
- Storing heat in rocks
- Using drones to service the plants
- Implement Internet-of-Things and Industry 4.0 ideas in the plants

Helio100 at Mariendal, Stellenbosch

Technical tour
Khi Solar One, Upington

STERG
SOLAR THERMAL ENERGY RESEARCH GROUP

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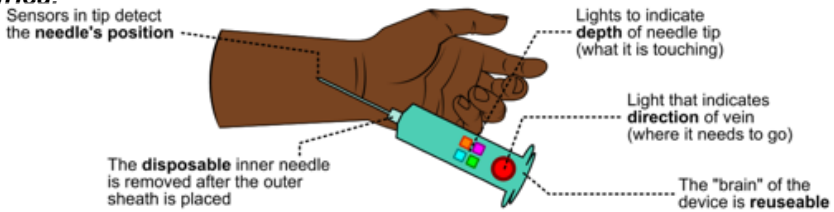
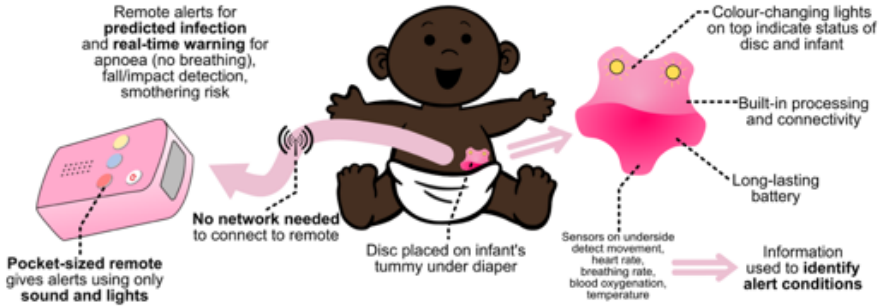
OVERVIEW

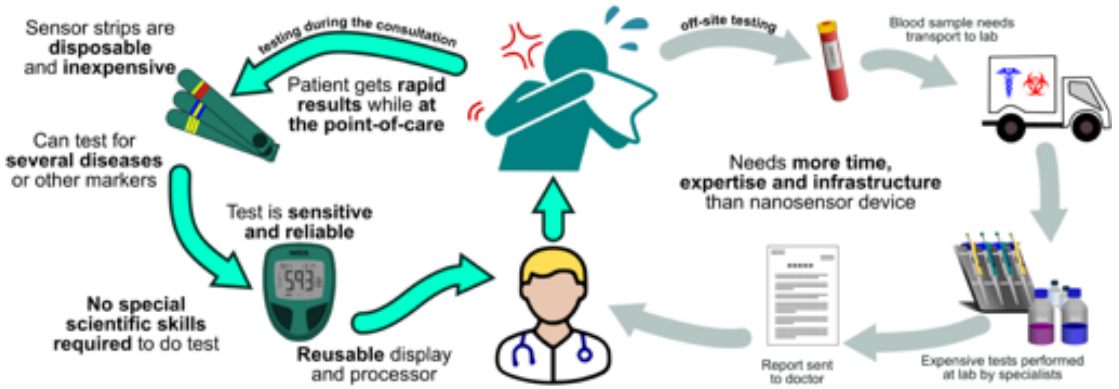
- ***Based Based on the United Nations Millennium Development Goals, our vision is focused on affordable quality healthcare making life better for the 1 Billion in Africa.***
  - Unique solutions



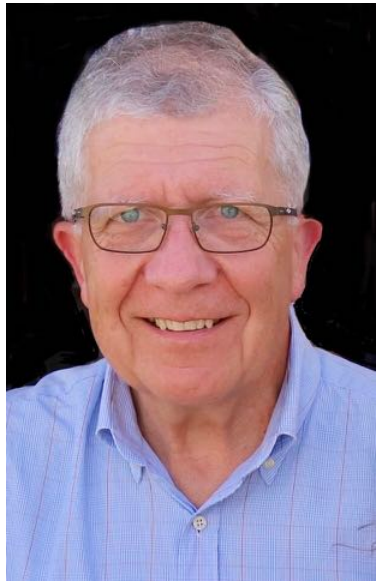
  - Diagnostic support



  - Point of care nano-sensors



CONTACT



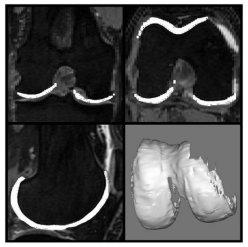
Professor Pieter Fourie

prfourie@sun.ac.za

ORTHOPAEDIC ENGINEERING

OVERVIEW

- Develop solutions for the treatment of musculoskeletal disorders:
  - Implant design
  - Medical image processing
  - Surgical planning and navigation
  - Computational anatomy
- Focus on the South African population and healthcare
- Collaborate with industry and surgeons
- Possible funding for Master's students



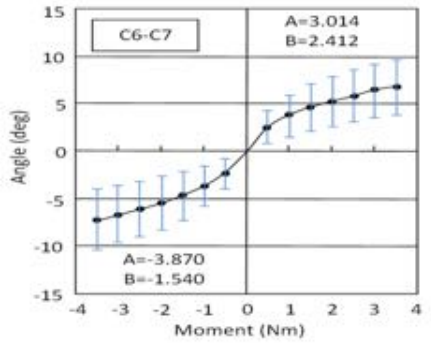
CONTACT

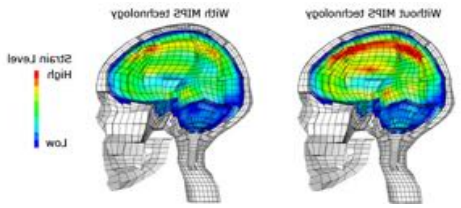
Dr J van der Merwe
Office M3035
jovdmerwe@sun.ac.za

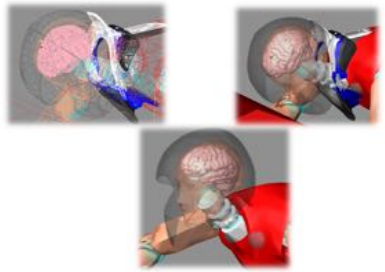
INJURY BIOMECHANICS

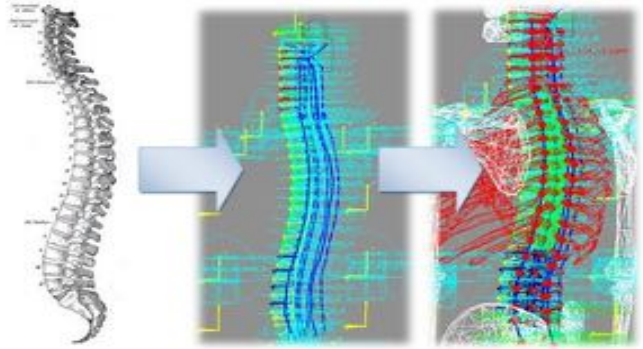
OVERVIEW

- Investigate human reaction to impact:
  - Study of injury causation / prevention
  - Human body modeling through FEA or Musculoskeletal Multibody Models
  - Relating clinical injuries to injury mechanisms (engineering “language”)
  - Matching injury mechanisms to corresponding injury tolerance limits
  - Measurement/calculation of body-specific forces/moments to be compared to tolerance limits
  - Injury prevention through innovative product design
  - Evaluation of real-world product efficacy via physical or virtual “Crash Test Dummy” analysis
- Collaborate with industry, neurosurgeons, orthopedic surgeons etc.
- Possible funding for Master’s students









CONTACT

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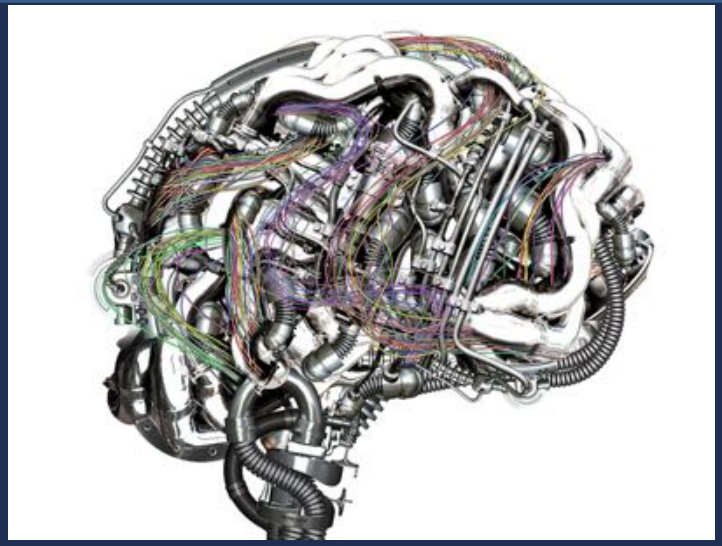
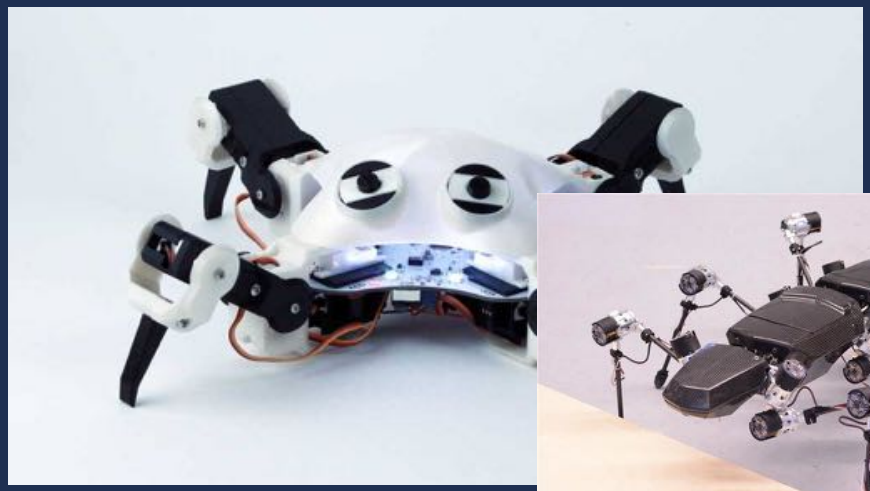
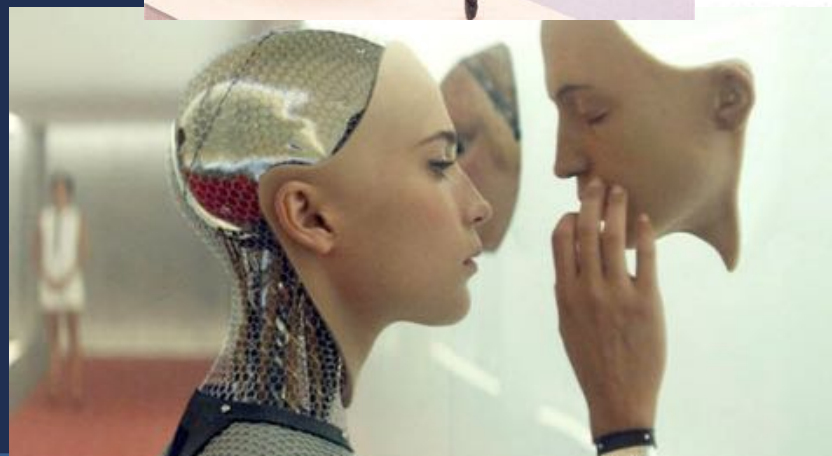
Office M140
corneld@sun.ac.za

Artificial Intelligence, Machine Learning & Machine Consciousness

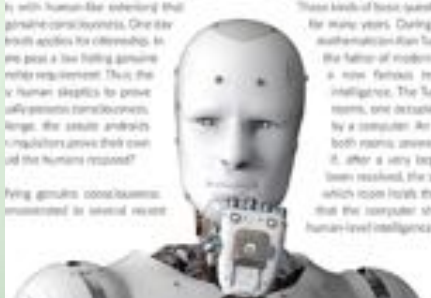






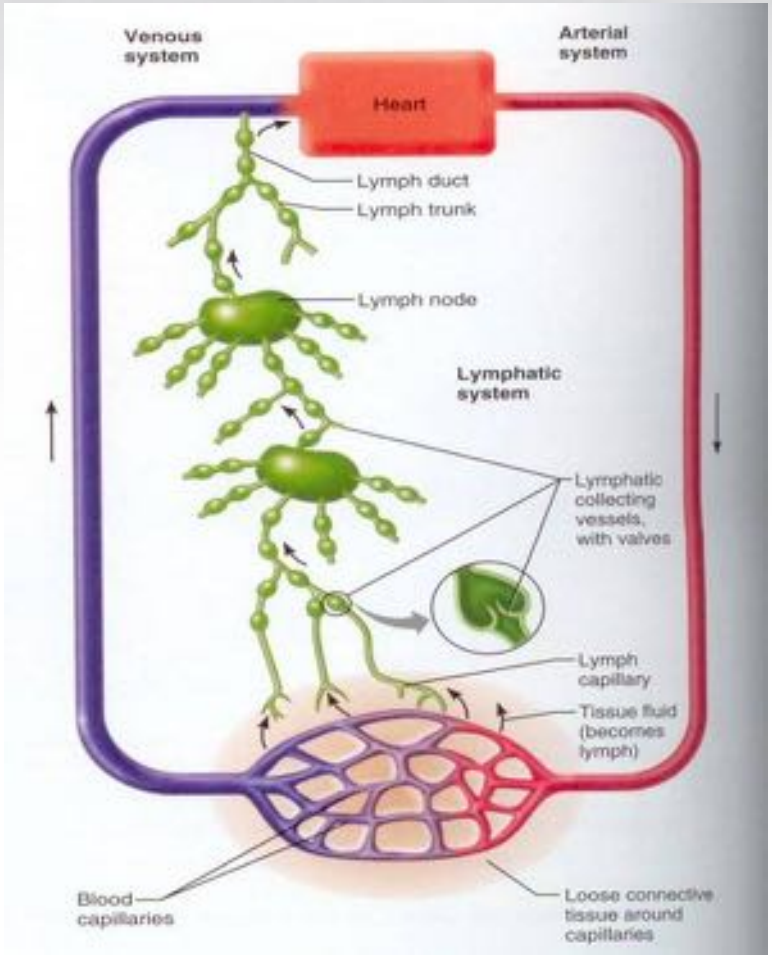
Will Robots Ever Achieve Genuine Consciousness? How Will We Know?

Paul Nunez



Microcirculation Flow Patterns in the Lymphatic System

- Investigations into
  - Initial lymphatics
  - Lymph propulsion
  - Pressure gradient
- **Liora Ginsberg**
- **ginsberg@sun.ac.za**

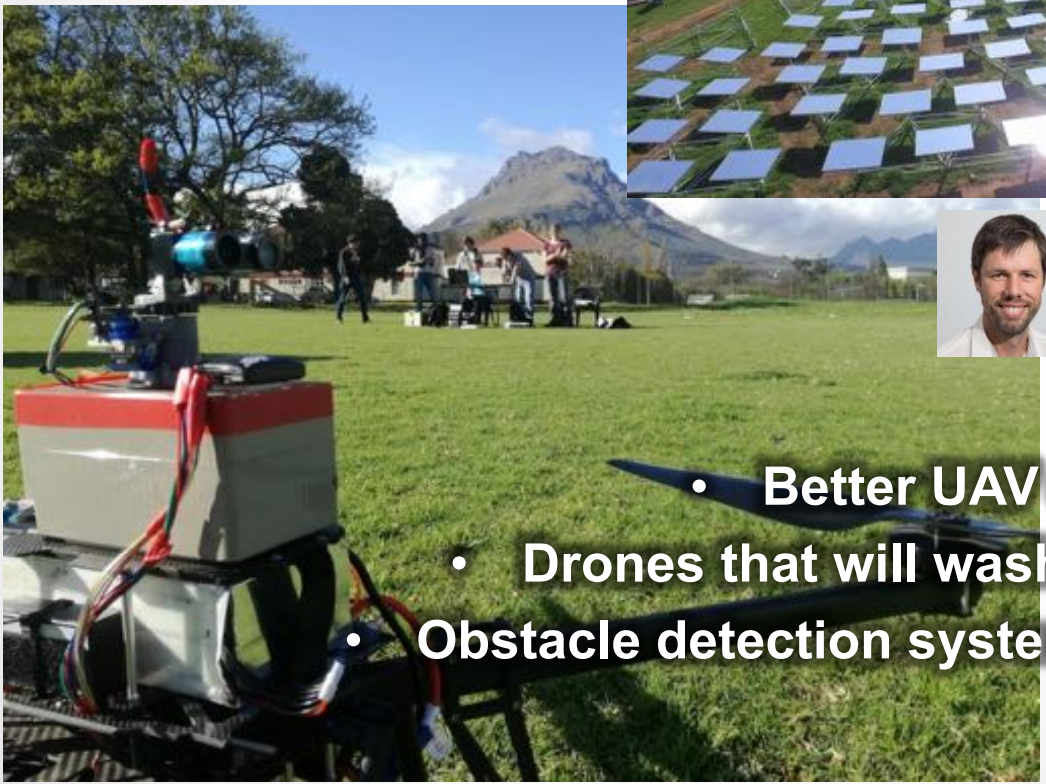


Thermofluids Division: Research on Octane Blending Behaviour

- Octane blending behaviour research done in collaboration with **Sasol Energy**
- Current project: Synergistic and antagonistic (+ve and –ve non-linear) octane blending behaviours of common hydrocarbon molecular classes and octane boosting additives
- Uniquely modified octane engine in Department used for testing fuel blends. Engine is one-of-a-kind in South Africa
- Funding for the next project on octane blending behaviour and modelling is available and includes a student bursary
- Students who are interested in this project or this field of research can contact **Mr Richard Haines** (rhaines@sun.ac.za) for more information

STERG
SOLAR THERMAL ENERGY RESEARCH GROUP

Flying robots



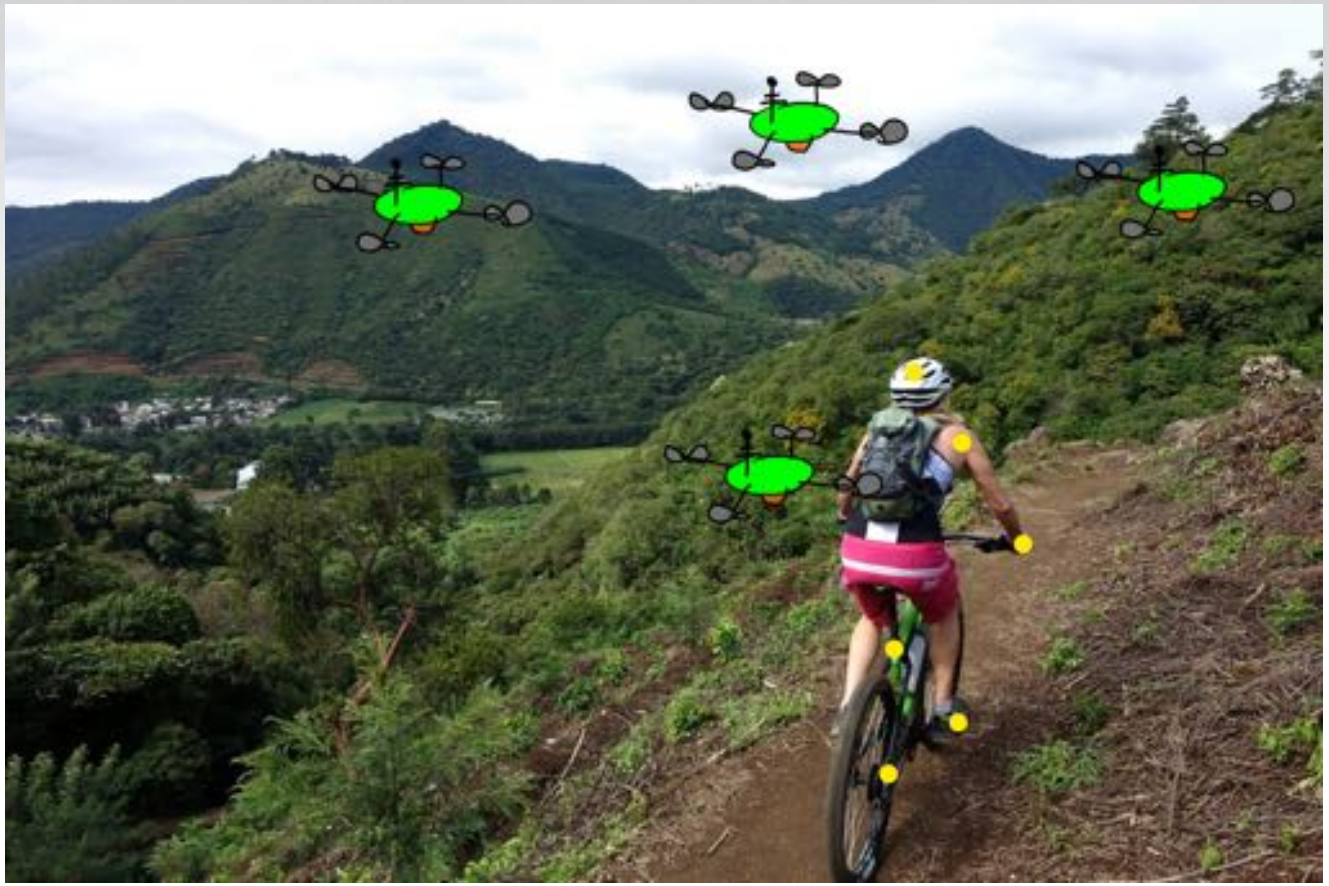
Willie Smit

We need:

- **Better UAV controllers**
- **Drones that will wash heliostats**
- **Obstacle detection system for UAVs**

Measurements with cameras

- Capture the motion of a mountain biker with drones
- *Prof. Schreve, Dr Smit*



Final remarks.