



# Astronomy and astrophysics at UJ

## People:

**Staff:** Chris Engelbrecht  
Soeb Razzaque  
Hartmut Winkler  
Azwinndini Muronga  
Simon Connell

**Postdoc:** Nurur Rahman

**PhD students:** Chris Middleton  
Pierre van Heerden  
+ new enrolments in 2013

**MSc students:** Refilwe Kgoadi



# Astronomy and astrophysics at UJ

**Research Groups:**



# Chris Engelbrecht

- **Member**, Kepler Asteroseismic Science Consortium (KASC)
- **Member**, Kepler Working Group on Eclipsing Binaries (EBWG)



## Research Activity

- Optical photometry and spectroscopy of pulsating stars
- Theoretical treatments of convective energy transfer [**+Fabio Frescura & students (WITS)**]
- Theoretical studies of pulsations in rotating stars and tidally-distorted stars [ " ]
- Asteroseismology of pulsating B and A stars and of stars in eclipsing binary systems [ " ]
- Methods of time series analysis [ " ]
- Physics of neutron star interiors [ " ]

## Students

- PhD: Chris Middleton, Pierre van Heerden
- MSc: Refilwe Kgoadi



# Chris Engelbrecht

## Collaborations

- WITS (Fabio Frescura and 3 students)
- TRAPUM (Fabio, Neil Young (postdoc based at WITS))
- Various European asteroseismologists
- Members of the Kepler Eclipsing Binary Working Group
- Luis Balona (SAAO – retired), Peter Martinez (SAAO).  
NWU (Mafikeng) (Thebe Medupe and students)

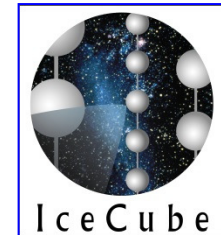
## Future plans and thoughts on strengthening AAN

- Soweto Science Centre (Manager: Chris Middleton): small telescope for public awareness and student outreach + software packages + portable planetarium:  
- this could serve schools in the Gauteng area to great effect (as a magnet to draw good students into AA)
- Expanding MeerKAT/SKA-related work through UJ niche research centre
- Expanding work in the UJ Astro-particle physics group
- Contributing to the establishment and functioning of NASSP North



# Soebur Razzaque

- **Member**, Large Area Telescope (LAT) Collab. of NASA's Fermi Gamma Ray Space Telescope
- **Associate Member**, IceCube Neutrino Observatory (at the South Pole) Collaboration



## Research Activity

- Modeling multiwavelength data from Gamma Ray Bursts (GRBs)
- Modeling high-energy neutrino emission from astrophysical sources
- Modeling propagation of ultrahigh-energy cosmic rays and very high-energy gamma rays
- Fundamental properties of gamma rays, cosmic rays and neutrinos
- Search for new physics: Axion-type Dark Matter candidates, Sterile neutrinos

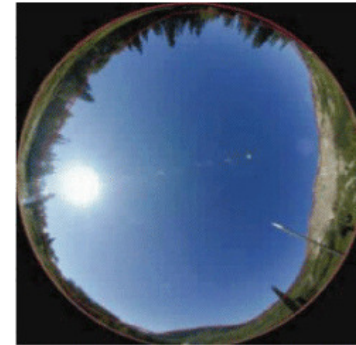
## Future/continuing focus areas

- ❑ Multiwavelength and multimessenger astronomy of transient sources:
  - GRBs, Blazars, Supernovae, Novae, Neutron Star flares, unidentified sources
- ❑ Modeling radio to gamma-ray background

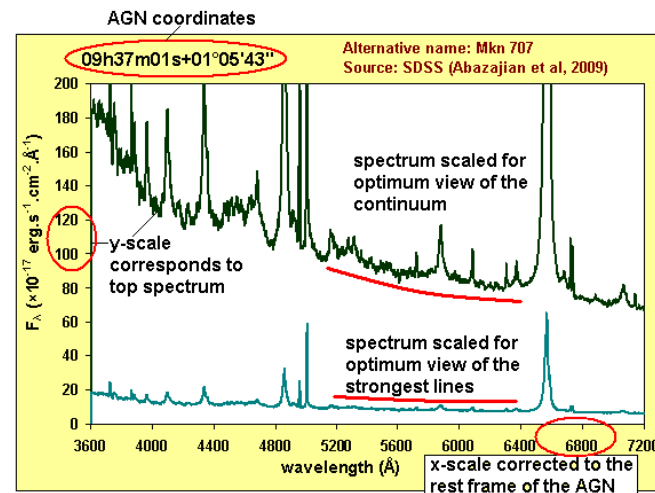
# Hartmut Winkler

## Research Activity

- Using optical photometry to measure night sky brightness in various colours, for implementation in solar energy research
  
- AGN's – Zorroaster catalogue just published:
  - all  $z < 0.1$  Seyferts 1 to 1.8
  - 2844 entries, spectral detail
  - ~1000 spectral images
  - google "zorroaster agn"
  - 2<sup>nd</sup> Ed.: 1000 more entries; new: line ratios; Oct 2013

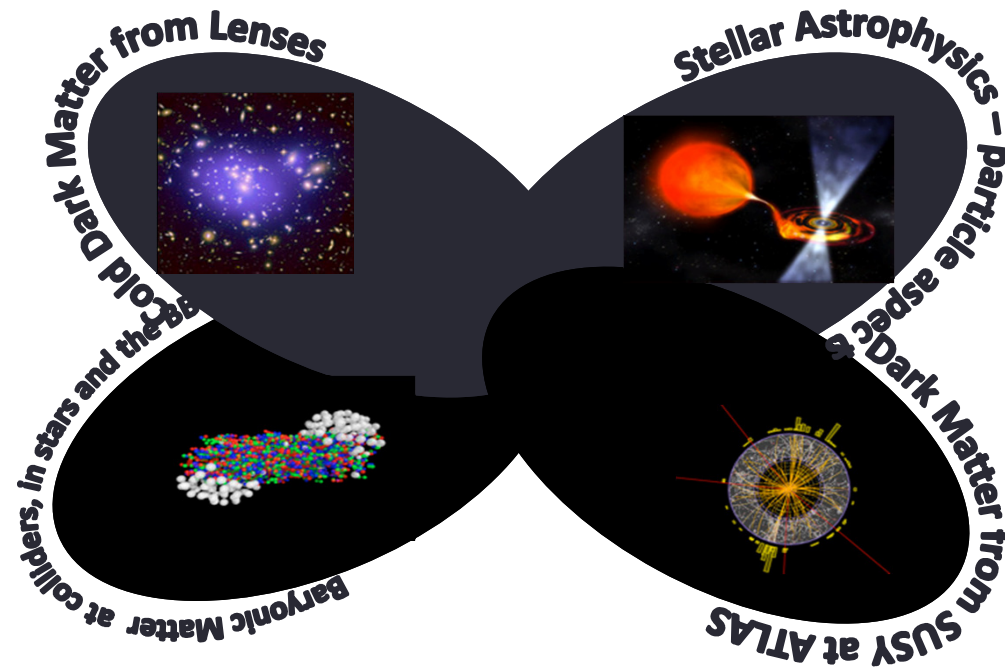


## One postgraduate student



## Research Activity

- Astroparticle physics:
- Exploring projects where astro-particle physics experiments address the same Dark Matter observables as the (LHC) ATLAS SUSY searches





# Azwinndini Muronga

## Research Activity

- Physics of compact stars
  - nuclear matter, neutron star matter and quark matter.
  - equation of state of nuclear matter and neutron Star matter
  - high-energy astro-particle physics
  - primordial magnetic fields
- Matter observables as the (LHC) ATLAS SUSY searches

## Future plans and thoughts on strengthening AAN

- Director of Soweto Science Centre

## One postgraduate student