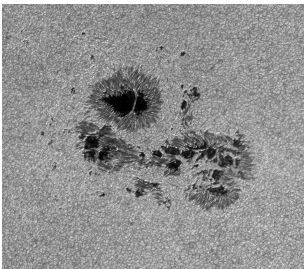
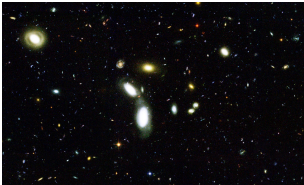


# MASTER ASTROPHYSICS



Universiteit Utrecht  
Sterrekundig Instituut



- *content*
  - evolution of stars and stellar populations
  - high-energy astrophysics and space research
  - solar physics
- *requirements*
  - 1st year: 8 Advanced Astrophysics Courses
  - 2nd year: MSc thesis research, seminars
  - options: other courses, Astrovaria, international
- *Utrecht*
  - astrophysics in depth
  - excellent physics
  - strong links to space research

# MSc Astrophysics Requirements



Universiteit Utrecht  
Sterrekundig Instituut

- *first year = courses*
  - 8 courses @ 7.5 ects
  - 1-2 replacements by Astrovaria permitted
  - 1-2 replacements by NOVA or other courses permitted
  - 1-2 replacements by bachelor courses permitted if needed
- *second year = research*
  - research @ 60 ects
  - SIUSS literature-study presentation at start
  - lunch talk presentation at completion
  - poster presentation at Nederlandse Astronomenconferentie
- *both years = seminar participation*
  - SIU Student Seminars
  - SIU lunch talks
  - Utrecht Astrophysics Colloquia

# MSc Astrophysics Courses



Universiteit Utrecht  
Sterrekundig Instituut

- *Advanced Astrophysics Courses @ 7.5 ects*
  - Observational astrophysics
  - Radiative transfer in stellar atmospheres
  - Magnetohydrodynamics of astrophysical plasmas
  - Solar physics
  - Stellar evolution
  - Stellar nucleosynthesis
  - Stellar winds and mass loss
  - High-energy astrophysics
  - Galaxies
  - Active galactic nuclei
  - General relativity and astronomy
- *Alternatives*
  - Astrovaria = 7.5 ects astronomical activity (observing, popularization)
  - Interacademiaal College = national astronomy course (6 ects)
  - NOVA courses elsewhere, physics courses (Utrecht or elsewhere)

# MSc Astrophysics

## Thesis Research



Universiteit Utrecht  
Sterrekundig Instituut

- *one full year (60 ects)*
  - find willing supervisor
  - define subject with supervisor
  - conclude formal contract
- *SIU*
  - evolution of stars and stellar populations
  - high-energy astrophysics and space research
  - solar physics
- *elsewhere*
  - SRON Utrecht: X-ray astronomy
  - FOM Rijnhuizen: plasma physics and magnetohydrodynamics
  - other NOVA institutes: Amsterdam, Leiden, Groningen, Nijmegen

# MSc Astrophysics Seminars



Universiteit Utrecht  
Sterrekundig Instituut

- *SIU Student Seminars*
  - half-hour presentations by Masters and PhD students
  - training opportunity
  - friendly moderator
  
- *SIU lunch talks*
  - half-hour presentations by students, staff, visitors
  - recent research
  - preceded by round-the-table news exchange
  
- *Utrecht Astrophysics Colloquia*
  - one-hour presentations by visiting scientists
  - alternating between SIU and SRON
  - followed by drinks and dinner with speaker

# MSc Astrophysics Options



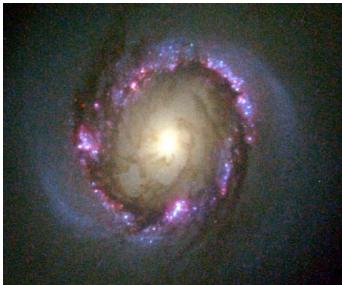
Universiteit Utrecht  
Sterrekundig Instituut

- *other courses*
  - bachelor astronomy courses if needed
  - NOVA astronomy courses at Amsterdam, Leiden, Nijmegen, Groningen
  - physics courses at Utrecht or elsewhere
- *Astrovaria*
  - observation (DOT La Palma)
  - popularization (Zenit article)
  - education (contribution to practica, lecture notes)
- *international*
  - observation (DOT La Palma)
  - part of thesis research elsewhere (Erasmus)
  - Astrovaria elsewhere (Erasmus)

# Evolution of Stars and Stellar Populations



Universiteit Utrecht  
Sterrekundig Instituut

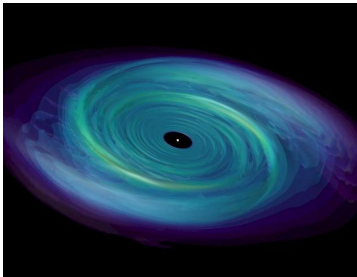


- *stellar evolution and stellar environments*
  - structure and evolution of single and binary stars
  - nucleosynthesis
  - structure and formation of stellar winds and nebulae
- *stellar end stages*
  - formation of white dwarfs, neutron stars, black holes
  - supernovae
  - gamma-ray bursts
- *stellar evolution versus galaxy evolution*
  - starburst galaxies
  - formation of stars in interacting galaxies
  - cluster evaporation in different galaxies

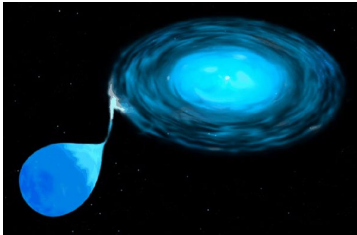
# High-Energy Astrophysics and Space Research



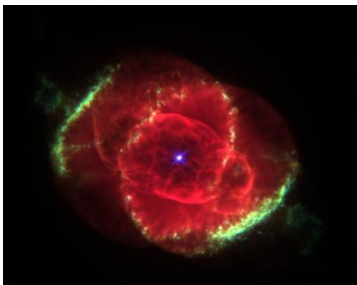
Universiteit Utrecht  
Sterrekundig Instituut



- *neutron stars*
  - neutron star properties
  - pulsar magnetospheres
  - pulsar radiation mechanisms



- *X-ray binaries*
  - properties and formation
  - close encounters
  - binary cluster evolution



- *relativistic shocks*
  - dynamics
  - particle properties
  - active galactic nuclei



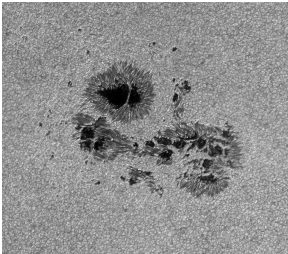
# Solar Physics



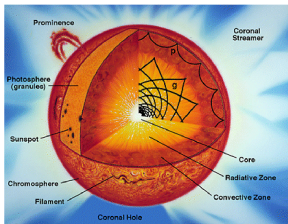
Universiteit Utrecht  
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- *instrumentation: Dutch Open Telescope*
  - our own solar telescope on La Palma
  - superb high-resolution tomographic imager
  - technical physics projects

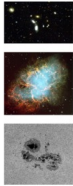


- *observation: DOT exploiting*
  - structure and dynamics of solar magnetism
  - frequent international campaigns
  - frequent student participation



- *interpretation: solar atmosphere physics*
  - magnetic fields photosphere–chromosphere–corona
  - structure and dynamics of magnetic elements
  - structure and dynamics of active regions

## MASTER ASTROPHYSICS



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  - evolution of stars and stellar populations
  - high-energy astrophysics and space research
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## Evolution of Stars and Stellar Populations



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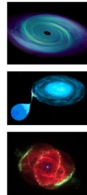
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## High-Energy Astrophysics and Space Research



- **neutron stars**
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## MSc Astrophysics Courses



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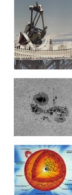
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## Solar Physics



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  - our own solar telescope on La Palma
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