

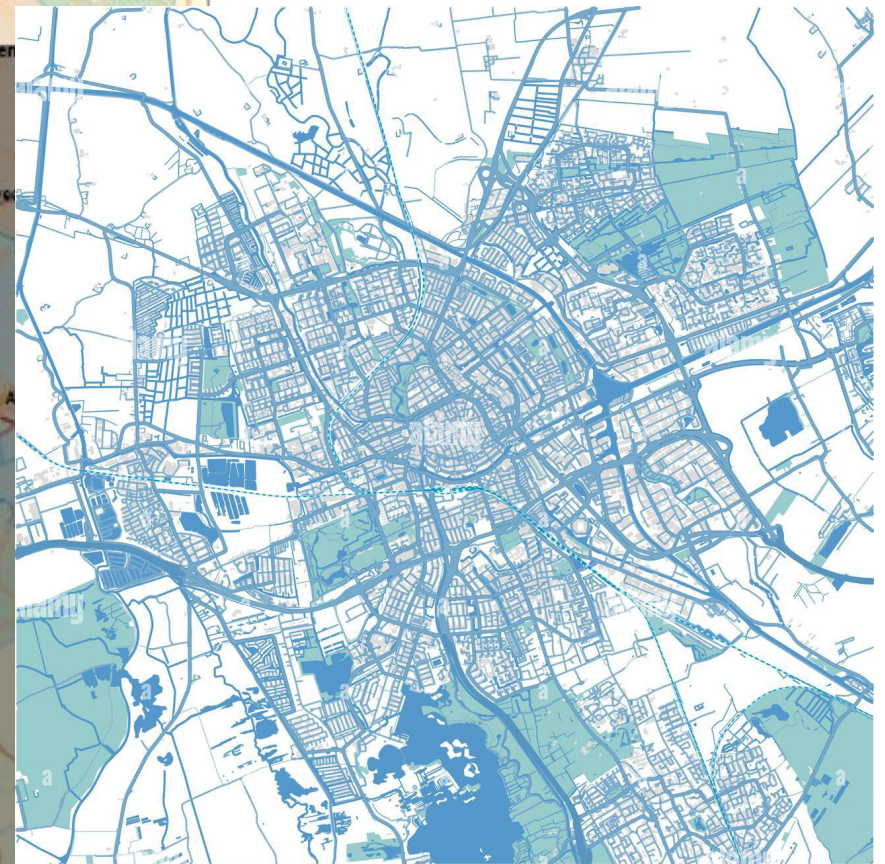
Kapteyn Astronomical Institute



“The Kapteyn Astronomical Institute has a mission to conduct world-leading research in astronomy, develop cutting-edge instrumentation, and train the next generation of outstanding researchers” (SEP 2016, 2023)

This remains our mission, besides (i) strengthening in astronomical data science, (ii) interdisciplinary research, and (iii) furthering societal relevance.

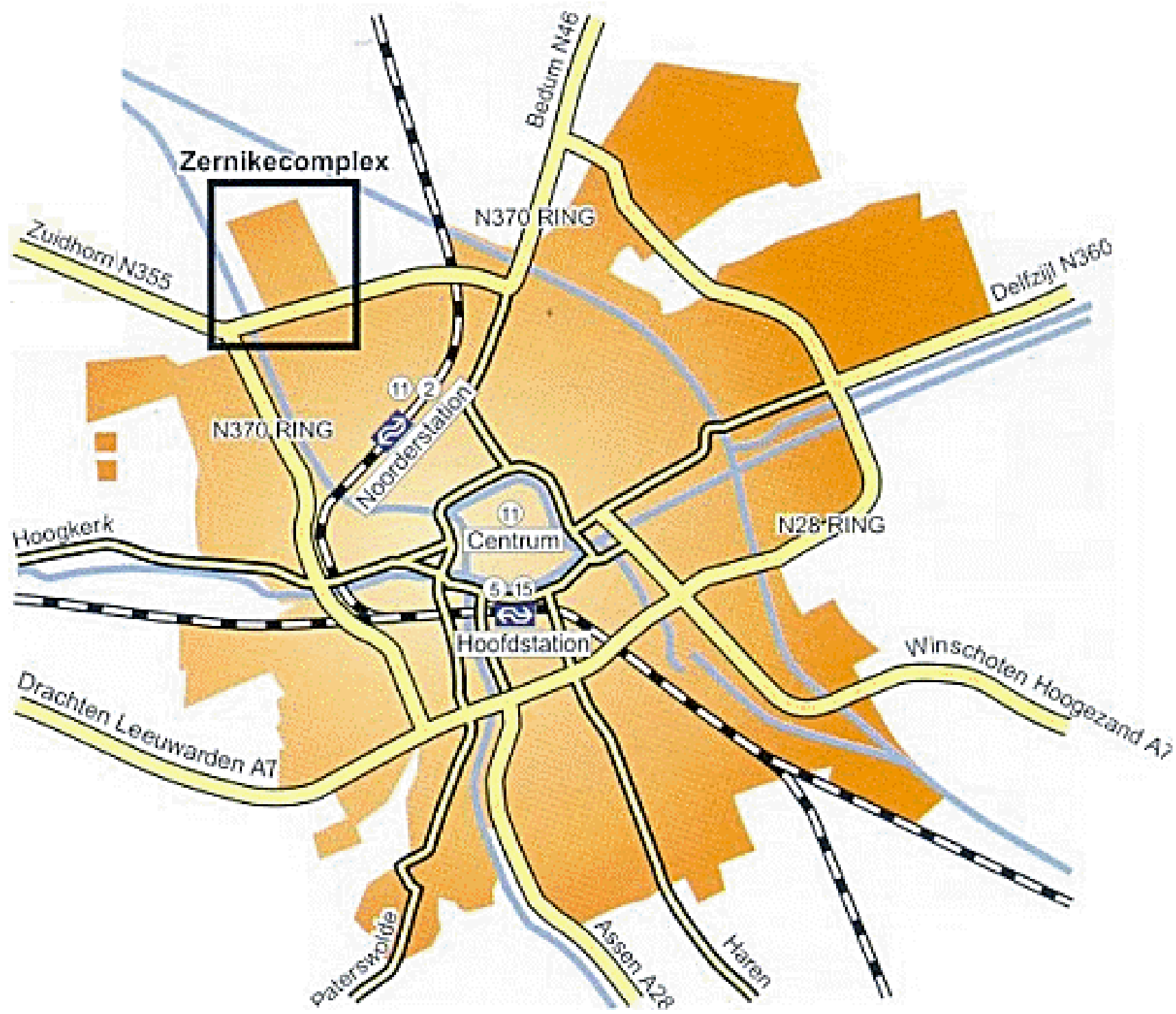




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Feringa Building



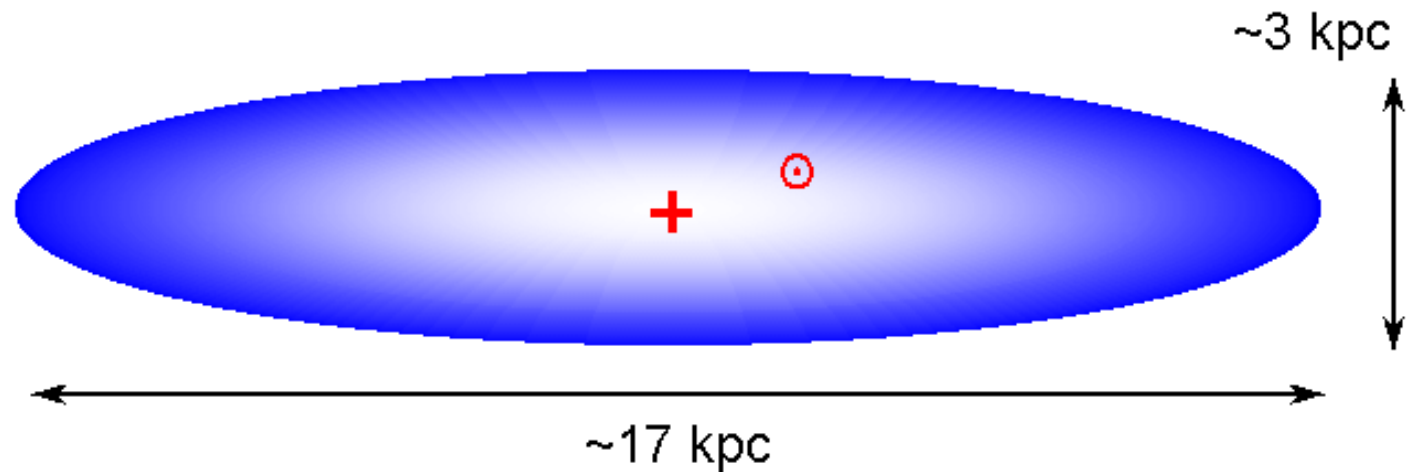
Jacobus Kapteyn

Jacobus Kapteyn (1851-1922)

- used photographic star counts
- estimated distances statistically based on parallaxes & proper motions of nearby stars.
- neglected interstellar absorption of starlight (assumes that stars were faint only because they are far away, not because interstellar absorption blocks some of the light).



Kapteyn Model (1922)



Kapteyn Universe

- Milky Way is a flattened disk, ~15 kpc across & ~3 kpc thick
- the Sun is located slightly off-center.

MSc research project

Research Expertise Kapteyn Institute (SRON, ASTRON)

- *Structure and Dynamics of galaxies*
- *Formation and Evolution of galaxies*
- *the Milky Way Galaxy*
- *Interstellar matter, planet and star formation*
- *Cosmology and large-scale structure*
- *Relativistic astrophysics*
- *Instrumentation*

Few Selected Science Highlights

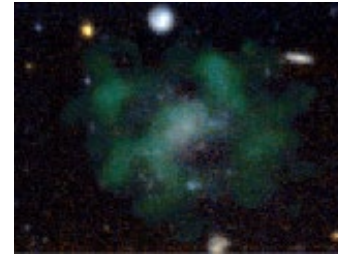
Galactic Archaeology



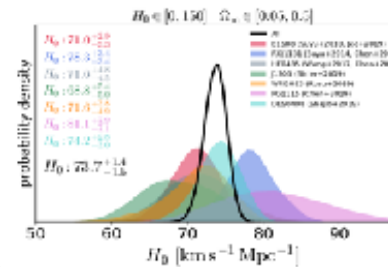
- Discovery of a major merger in our MW with Gaia (*Nature*)
- Discovery of the lowest metallicity stars in the MW halo with CFHT (*Nature*)



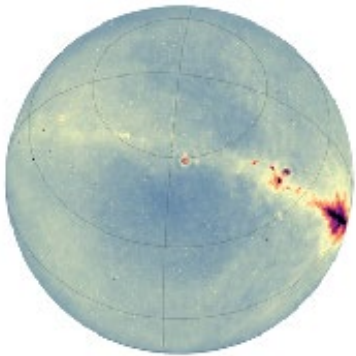
Galaxy Formation & Cosmology



- Lack of Dark Matter in Ultra Diffuse Galaxies with WSRT/VLA
- Tensions in H_0/S_8 with TDCOSMO/KiDS (1000+ citations in few years)



Epoch of Reionization & Cosmic Dawn



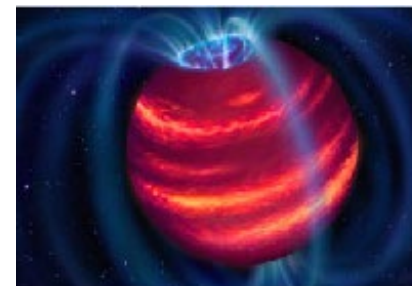
- Deepest high- z limits EoR/CD 21-cm signal with LOFAR
- Ly- α emitters from $z \sim 3-8$ with VLT-MUSE



Exoplanets/Proto-planetary Discs



- Discovery Chromium Hydride molecules in hot Jupiter atmospheres with HST STIS
- Discovery first exoplanet via circular polarisation with LOFAR (*Nature*)



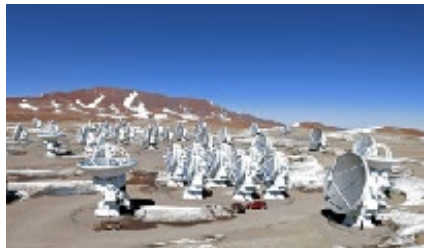
Working with and Building Key Facilities

Kapteyn involved in many and leadership (✓) in selected facilities

ING WHT/INT



ALMA



APERTIF ✓



LOFAR2.0 ✓



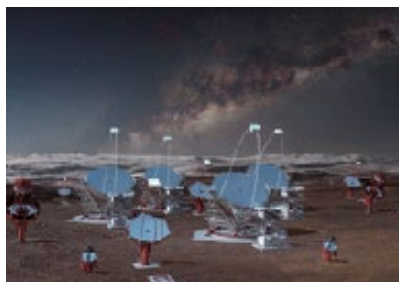
VLT



WEAVE WHT ✓ 4MOST VISTA ✓



CTA



ELT Micado/Metis ✓



SKA mid & low



GAIA ✓



JWST
NIRSPEC/MIRI



Euclid ✓



Athena ✓



Ariel



Netherlands School for Astronomy (NOVA)

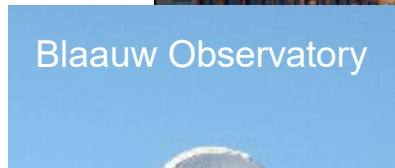
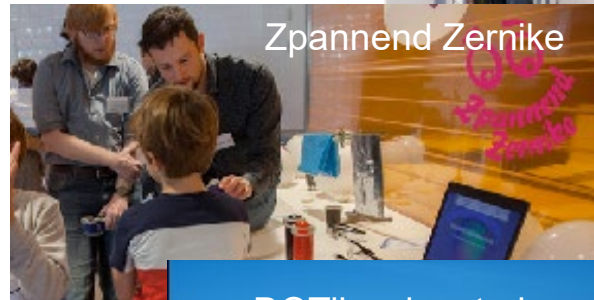
NOVA is the (super) glue between the four University Institutes

- Kapteyn **research focus** on Networks NW1 (**galaxies**) & NW2 (**ISM/Stars/Planets**)
- Kapteyn is involved/leads **instrumentation programs** at both instrumentation labs:
 - O/IR & Sub-mm - **MICADO/WAEVE/ALMA (bands)**
- NOVA supports a strong **PhD/PD programs** and support network: exploits instruments
- Strong (inter)national outreach/PR, complementing local/regional programs

Society: Outreach/Impact

Continuing successful programs, but also created new one. More on that later

Presentation:
Peletier



Presentation:
Verdoes Kleijn

Spin-off Companies/Collaborations

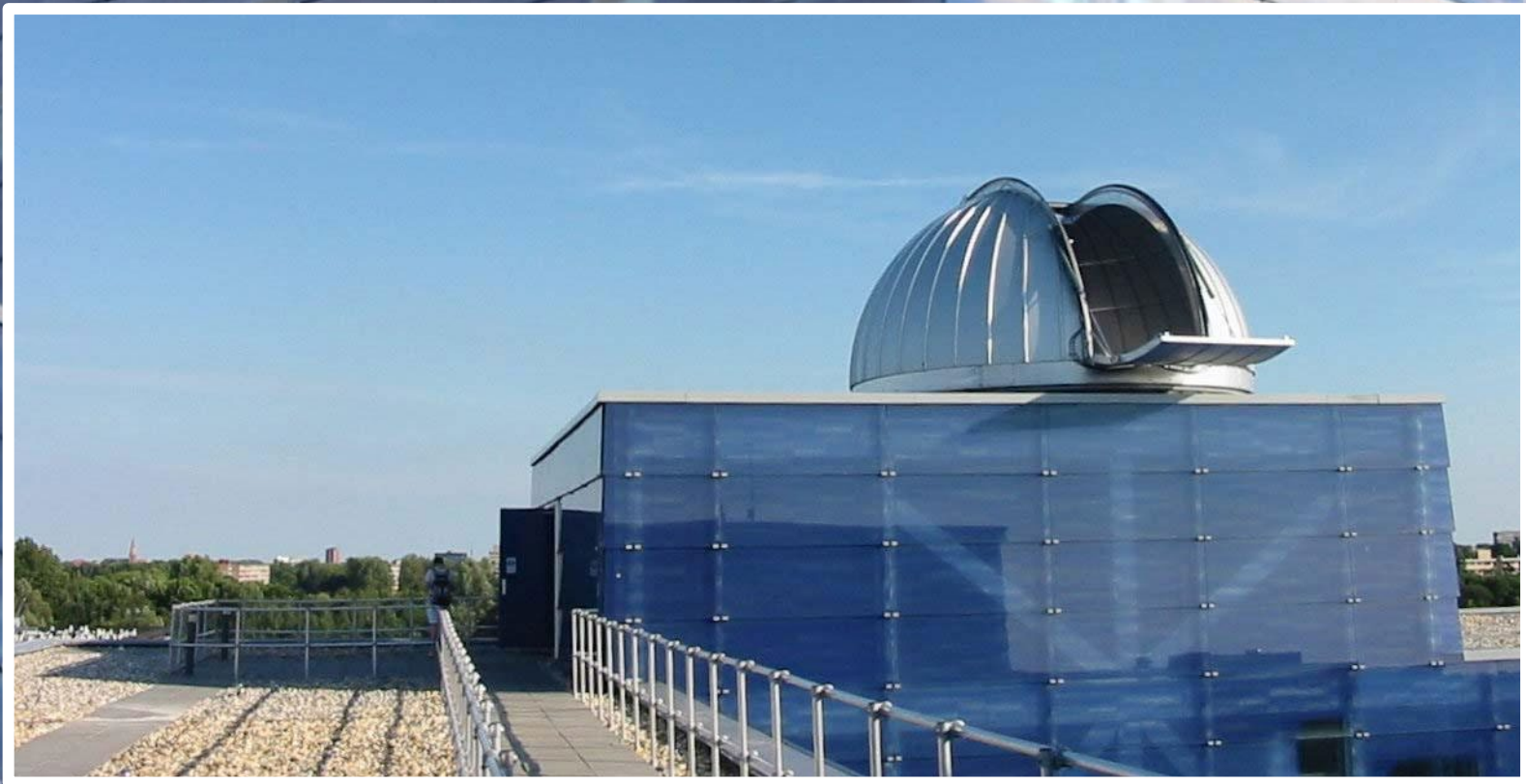
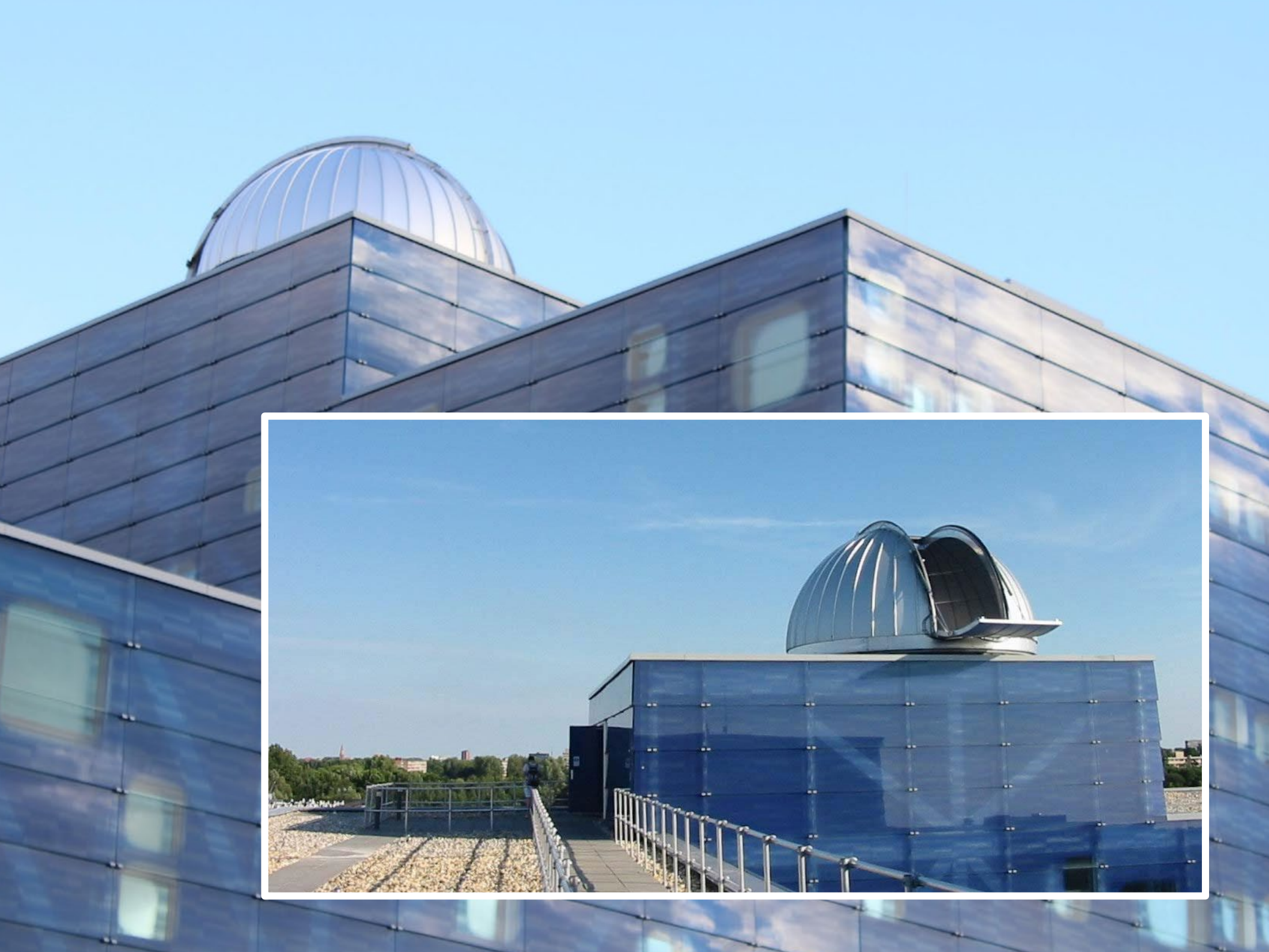


Training Early-Career
Researchers

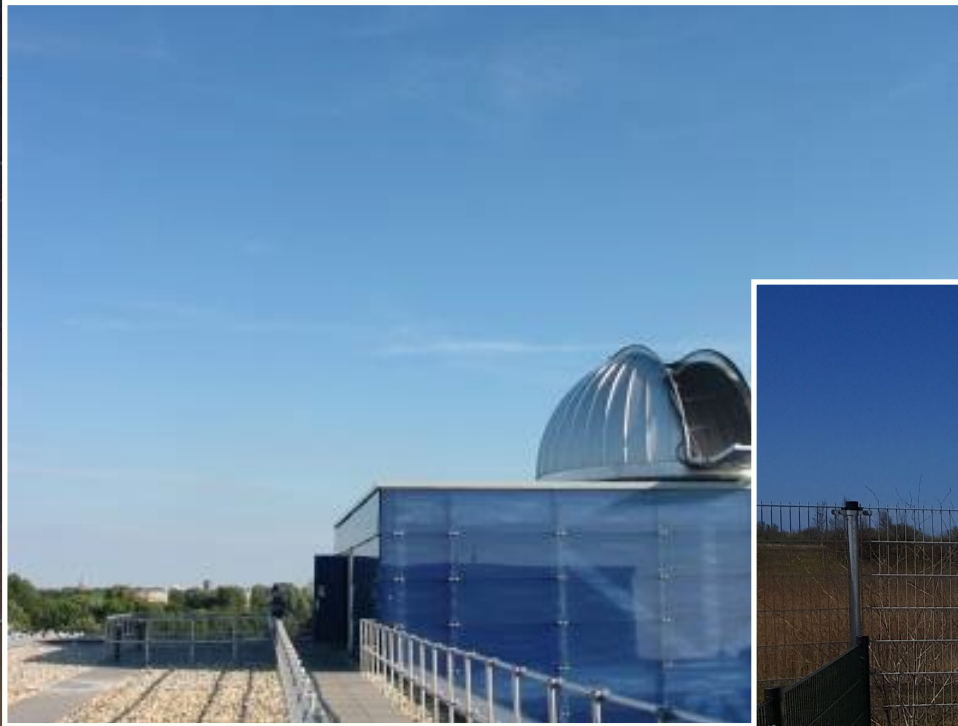


Euclid/Astronomical Science Center





BSc practicals: Observational Astronomy



Blaauw Observatory



Lauwersmeer Robotic Telescope

Astronomy Core

- **Stars, Nucleosynthesis & Chemical Evolution**
- **Formation and Evolution of Galaxies**
- **Dynamics of Galaxies**
- **Active Galactic Nuclei**
- **Cosmic Structure Formation**
- **Star and Planet Formation**
- **Exoplanets**
- **Astrochemistry**
- **High Energy Astrophysics**
- **Astronomical Data Science**