

# Astronomy and Space Photonics Cluster Utrecht

Version 3 May 2011

## Vision

Co-locate world-leading groups in the Netherlands to optimize the development, construction and use of the next generation of world-leading photonic instruments for space research, astrophysics, planetary and Earth-oriented missions.

## Mission

- To carry out fundamental research and development in the area of photonic instrumentation for astronomy, planetary and Earth-oriented missions
- To scientifically drive, guide, design, build and use the next generation of instruments, and
- To train the users of these instruments and the next generation of instrument developers.

We achieve this common goal by sharing people, infrastructure and other resources.

## Partners

- SRON Netherlands Institute for Space Research (SRON)
- Sterrekundig Instituut Utrecht (SIU) of Utrecht University (UU)
- Nederlandse Onderzoekschool voor Astronomie (NOVA) and its optical/infrared instrumentation group

## Why now?

- The complexity of ground-based and space based instrumentation is increasingly similar and requires a common approach
- Willingness of NOVA to move its optical/infrared group to Utrecht
- Intention of SRON to remain in Utrecht

## Why Utrecht?

- Preferred location for all three partners
- Location of the two major partners with the largest infrastructure and staff
- Central location in the Netherlands

## SRON Contributions

- Design, construction, scientific use of space-based instruments
- Enabling space technology
- Science expertise
- Project expertise

## UU Contributions

- Fundamental instrumentation research and development
- Science expertise
- Education at BSc, MSc, and PhD levels

## NOVA Optical/Infrared Group Contributions

- Design and construction of ground-based instruments

## Goal

The existing collaboration between the NWO institute SRON Netherlands Institute for Space Research (SRON) and Utrecht University (UU), augmented with SRON's plan for new housing on the campus of UU and the intention of the Nederlandse Onderzoekschool voor Astronomie (NOVA) to move its optical/infrared instrumentation group from Dwingeloo to Utrecht, now provides the Netherlands with the unique opportunity to form a world-leading, multidisciplinary cluster for astrophysics, Earth and planetary science and instrumentation for ground-based and space-based applications. Both SRON and NOVA provide the national home base for the participation in international programs to provide auxiliary instruments for world leading missions governed by – but not limited to – the European Space Agency (ESA) and European Southern Observatory (ESO). This cluster will cover education, conceptual design, engineering, production, test and verification of groundbreaking instruments over 8 decades of photon energy, internationally a truly unique expertise cluster that is optimally positioned to take on the next generation of scientific challenges in the areas of astronomy and space science.

The ambitions of the three partners SRON, the SIU and NOVA are best served by co-locating these three institutes in a single, multi-functional building where MSc and PhD students are trained, enabling technology for space and ground-based instrumentation is developed, instruments are constructed, and scientific data from instruments on the ground and in space are analysed and interpreted. For SRON and NOVA such an integrated approach guarantees embedding in a strong scientific, academic environment with interactions between staff and students at all levels. For SIU it offers access to world-class technology and instrumentation development, putting astronomers at the forefront of international research. With a relatively small investment in FTE of academic staff, Utrecht University gains access to expensive infrastructure both on campus and in space. The use of combined infrastructure (class rooms, meeting rooms, other facilities) allows for an efficient exploitation and maximizes the use of resources. The specific infrastructure needs of SRON, in particular the clean room, are also attractive to other research groups on campus.

Space research, astrophysics, planetary science and the study of the Earth's atmosphere and climate offer an exciting, multidisciplinary curriculum for beta students at all levels (BSc, MSc and PhD) and strengthen the competitive position of Utrecht with respect to other beta faculties. Topics such as the earth climate, planets and exo-planets are particularly appealing to the broader (non-science) student community and to the general public at large, offering a great potential for outreach. Indeed, astrophysics is currently making tremendous progress and is in its "golden age". In spring 2010 the national university astronomy program structured in NOVA (Netherlands Research School for Astronomy) is reviewed by an international review committee set up by NWO to review the six top-research school and qualified as "exemplary".

This document concentrates on the vision for the future of astrophysics and space science in Utrecht and describes the requirements of SRON, NOVA and SIU to achieve this vision. Many aspects also apply to furthering the collaboration between SRON and other research groups of UU, in particular the Institute for Marine and Atmospheric research Utrecht (IMAU).

## Partner Ambitions and Requirements

SRON and the NOVA Op-IR instrumentation group will both strongly benefit from the academic environment offered through strong interactions with local staff and students at SIU while fulfilling their mission to operate as national facilities. In addition the co-location of SRON and the NOVA group offers synergy in knowledge and expertise in instrument design and building, and economics in sharing laboratory infrastructure.

## SRON

The NWO institute SRON Netherlands Institute for Space Research (SRON) is world-leading in the development and exploitation of innovative space instruments. Research at SRON focuses on the composition of the Earth atmosphere, planetary atmospheres, on the hot, extreme universe and on the cool, obscured universe. The Utrecht laboratory of SRON currently has ~150 FTE, and total annual SRON budget including the Groningen laboratory of ~20 M€. In 2009 the close ties between SRON and SIU as well as IMAU resulted in the establishment of a collaboration

agreement between UU and SRON, funded by the UU CvB with matching funds from SRON and joint, externally funded projects.

NWO and SRON are planning the construction of a new building for the Utrecht laboratory because renovation of the current building is not realistic. In its choice for a new location, SRON considers strong scientific collaborations with research groups at the hosting university, and the exchange of staff and students (at bachelor, master and PhD level) as an essential boundary condition. Criteria for the choice of the location of the new SRON building, focussed on astrophysics, are:

- Co-located with a strong university astronomical institute that has at least two programmatic research lines that are linked to the programmatic research lines of SRON
- Exchange of scientific staff and students, and joint appointments of staff
- Commitments from the hosting university for a period of at least 10 years
- Shared use of facilities and infrastructure
- 500 k€ per year contribution from UU for collaborations with SRON

### SIU

SIU's research is focused on the astrophysics of stars, stellar systems and their environments. Major efforts are made in observations and instrumentation to study stars (including the Sun) and their planetary systems, on stellar evolution and on the environment of stars and their ejecta, most of them in close collaboration with SRON. SIU's ambition is to be a world-leading institute in stellar astrophysics and the leading institute for optical astronomical instrumentation research and development in the Netherlands and to provide a competitive curriculum in astrophysics and space science at the MSc and PhD levels, in collaboration with NOVA and SRON.

SIU is increasing its MSc student numbers, which are already rising, through international advertisement, improved BSc course offerings, and making use of the strategic collaboration between UU and TUE by attracting students from TUE to the MSc program Astrophysics and Space Research, in particular the technology aspects involved in space instrumentation. To achieve these ambitions, the following boundary conditions should be met:

- Long term stability of permanent staffing of SIU at the ~10 FTE level with two strong, independent research lines
- An attractive MSc and PhD program making full use of the interactions with SRON, IMAU, Debye institute and the institute of theoretical physics, and with contributions of SRON staff in teaching

### NOVA

The Nederlandse Onderzoekschool voor Astronomie (NOVA) is one of six top research schools in the Netherlands. It consists of the astronomical institutes of the universities of Amsterdam (UvA), Groningen (RUG), Leiden (UL), Nijmegen (RU) and Utrecht (UU). Its legal representation rotates among these universities. At the moment UU is the "penvoerder" until 31 August 2012. NOVA executes an interlinked program of astrophysical research and instrumentation. Over the 2009-2013 period the budget of the instrumentation program amounts to ~30 M€ of which 60% is earned through external grants and contracts. This program is focussed on the development of instrumentation for astronomical ground-based telescopes, in particular for the Very Large Telescope and the new flagship of European astronomy, the European Extremely Large Telescope (E-ELT). The NOVA strategy is that its instrumentation program is driven by the develop, design and construction of 1-2 instruments for the E-ELT in collaboration with international partners. First light for the E-ELT is expected around 2020, and the first instruments will become available between 2020 and 2023.

The NOVA instrumentation group (currently ~10 FTE) serves astronomers at the UvA, RuG, RU, UL and UU. The current situation is that the instrumentation group works under responsibility and funding of NOVA, hosted at ASTRON in Dwingeloo, and staff employed by NWO. NOVA's strategic choice is to move its instrumentation group to a university campus to create stronger interactions between astronomers and instrument builders and achieve/continue strong strategic collaborations with SRON and/or ASTRON. Criteria for the choice of the location of the NOVA instrumentation group are:

- Co-located with a strong university astronomical institute that has at least two programmatic research lines including strong interest in use and development of Op-IR instrumentation and related education
- Co-located with ASTRON and/or SRON
- Long-term stability of the organization (up to at least end 2023)
- Well-founded laboratory; cost reduction through sharing of resources
- Need for employment of 10-12 fte new staff for 5 to 10 yr projects including some internationally respected experts
- NOVA is in charge of and responsible for the program

Utrecht, Prof.dr. Rens Waters (SRON scientific director), Dr. Roel Gathier (SRON managing director)

Leiden, Dr. Wilfried Boland (NOVA managing director)

Utrecht, Prof.dr. Christoph Keller (director SIU Utrecht University)