“THE SRON ASTROPHYSICS PROGRAM IS DEDICATED TO UNRAVELING THE HISTORY OF THE UNIVERSE...”

TO BOLDLY GO WHERE NO ONE HAS GONE BEFORE...

Groundbreaking space research and technology
OUR MISSION...

SRON’s mission is to bring about breakthroughs in international space research. The institute develops pioneering technology and advanced space instruments, and uses them to pursue fundamental astrophysical research, Earth science and exoplanetary research. As national expertise institute SRON advises the Dutch government and coordinates – from a science standpoint – national contributions to international space missions.

SRON’s scientific program focuses on the evolution and history of the universe, on climate change and air quality on earth, and on the atmospheres of planets near other stars than our sun.

SRON therefore has four program lines: Astrophysics, Exoplanets, Earth and Technology. These four program lines are supported by two expertise groups: Instrument Science and Engineering.

SRON’s goals are to maintain its leading position in international space missions and to find answers to the big scientific and societal questions of our time.

SRON...

- was founded in 1983 as Stichting RuimteOnderzoek Nederland (Space Research Organization Netherlands).
- is part of the Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO).
- was given the name SRON Netherlands Institute for Space Research in 2005.
- has an annual budget of approximately 20 million euros.
- is the national center of expertise for space research in the Netherlands.
- has two laboratories: in Utrecht and Groningen.
- designs and develops world-class innovative space instruments for astrophysical, exoplanetary and earth-oriented research and analyzes the data provided by these instruments for advanced research.
- aspires to act as PI-institute for the development of state-of-the-art satellite instruments for space research missions of ESA, NASA and other space agencies.
- gives counsel to the Dutch government and coordinates – from a science standpoint – national contributions to international space missions.
- SRON stimulates the implementation of space science in our society.
But there are more questions that await answers. How are stars and planets born? Which molecules play a key role in the birth process? To discover this we must study the star cradles in the cool universe, the cool clouds of gas and dust in space. No optical or X-ray telescope can pierce through these clouds. But with special, deeply cooled instruments on space telescopes we can pick up the infrared and submillimeter radiation from behind these veils. For example, with this approach we have found water in the gas torus released from Saturn's moon Enceladus, in gas streaming off comets, in planetary atmospheres, external galaxies, and around evolving stars. We now have a far better understanding of the cosmic cycle of gas that leads to the birth of stars and planets, and the role played by water and other molecules. The next generation of infrared telescopes will peer even deeper into the cool universe, back in time, when the first stars were born.

The SRON astrophysics program is dedicated to unraveling the history of the universe. For this we study cool as well as hot and turbulent areas of the universe.

Cosmic objects and phenomena in the hot universe release enormous amounts of energy and therefore radiate X-rays and gamma rays. The radiation from these objects – such as black holes and the hot tenuous gas within clusters of galaxies and in the filaments between them – contain information about the origin and evolution of galaxies and clusters of galaxies and the universe itself. With the next generation of X-ray telescopes we will be able to shed light on two of the most pressing questions in astrophysics: 1) How did ordinary matter assemble into the large-scale structures we see today? 2) How do black holes grow and shape the universe?

“We now have a far better understanding of the cosmic cycle of gas that leads to the birth of stars and planets...”
We now know that in the universe tens of billions planets orbit other stars than our sun. And a good number of those exoplanets might resemble earth. In 2005 the first ‘super earths’ were discovered, rocky planets outside our solar system with approximately five times the earth’s mass. Now more than 2000 exoplanets have been discovered. Astronomers expect to find a twin sister of the earth within decades.

The big question is of course if life can exist on one or more of those exoplanets. To find that out we need to be able to chart the characteristics of the planet’s atmosphere and surface and that might well be possible in the coming years. We can detect the exoplanet through the starlight that its atmosphere reflects and through the radiation that the planet emits itself. This also provides us with a lot of information about the composition of its atmosphere and its habitability.

“The big question is of course if life can exist on other planets...”
The earth’s atmosphere is a reaction vessel full of poorly understood processes. Everything seems to point to the fact that the climate is changing. Yet which gases in the atmosphere are contributing to the greenhouse effect and to what extent are they doing this? Where do they come from? And where are they going to? What is the role of the oceans? We try to answer these scientific questions and address public concerns such as air pollution.

Consequently research into the earth’s atmosphere is vitally important for society. As watchful eyes over the earth, our ultrasensitive detectors and smart electronics onboard earth observation satellites provide detailed images of the emission and spread of greenhouse and air-polluting gases. And with new satellites – as opposed to ground-based observations – we can now obtain an overall picture of the earth’s atmosphere within a day.

SRON also develops ultrasensitive instruments to chart air pollution from space. With these instruments we expect, for instance, to be able to measure with unprecedented accuracy the properties of aerosols: microscopically small, moving particles such as volcanic ash, sea salt and dust, and clouds in the earth’s atmosphere.

“With new instruments we can measure the properties of for instance aerosols very accurately...”
SRON’s X-ray, submillimeter and infrared detectors have been developed to are meant to fly onboard the revolutionary space telescopes of ESA, NASA, and JAXA, and other space agencies; some submillimeter/infrared cameras and on-chip instruments are have been developed to be mounted on ground telescopes. We must therefore This means that we must continue to work hard on the development of new generations of detectors and the necessary read-out and control electronics.

The new generation of (on-chip) spectrometers requires the development of new advanced electronics, superconducting nanotechnology, smart control software, extreme cooling technology, and novel materials. We have the necessary know how, experience, and facilities to do this.

“Thinking the unconventional is important.”

Moreover, all of the components must be able to survive the launch and then function faultlessly for a period of five to fifteen years. SRON technology is therefore a catalyst for innovative technology that is finding a growing number of applications in society. For instance, our terahertz technology has now been launched on the market for inspection purposes.
SRON is the national point of contact for scientific research in space. We aspire to act as PI-institute for the development of state-of-the-art satellite instruments for space research missions of ESA, NASA and other space agencies. Therefore we seek to intensify the collaboration with national and international partners, universities and industry.

SRON stimulates knowledge transfer to industry and society. The planned relocation of SRON Utrecht to Science Park Amsterdam – where an international hub of natural sciences and technology is evolving – fits within this ambition. The same applies to the more intensive collaboration of SRON Groningen with knowledge partners in the north of the Netherlands.
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As national expertise institute SRON gives counsel to the Dutch government and coordinates – from a science standpoint – national contributions to international space missions. SRON stimulates the implementation of space science in our society.

SRON is part of the Netherlands Organisation for Scientific Research (NWO).

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“HERE YOU CAN SPEND YEARS WORKING TO YOUR HEART’S CONTENT ON A SINGLE INSTRUMENT UNTIL IT’S PERFECT...”