



TARTU OBSERVATORY DEVELOPMENT PLAN 2014 - 2020

MISSION

VISION

RESEARCH AND DEVELOPMENT STRATEGY

RESEARCH AND DEVELOPMENT OBJECTIVES

DEVELOPMENT INDICATORS BY 2020

PRIORITY AREAS

BACKGROUND INFO

RESEARCH TOPICS AND FINANCING

1. INTERNATIONALLY RECOGNIZED EXCELLENCE IN RESEARCH
2. WELL-ROUNDED STAFF
3. BUSINESS COLLABORATION FOR THE DEVELOPMENT OF TECHNOLOGICAL CAPABILITIES
4. INSPIRING, MOTIVATING AND EDUCATING SPACE CENTRE FOR THE PUBLIC

FINANCING

DEVELOPMENT PLAN REVIEW PROCEDURES

APPENDIX 1 INTEREST GROUPS RELATED TO TARTU OBSERVATORY'S ACTIVITIES

APPENDIX 2 INTERNAL AND EXTERNAL ENVIRONMENT ANALYSIS (SWOT 2013)

Mission

The mission of Tartu Observatory as Estonia's space research centre is to implement cutting-edge scientific research in the interests of Estonia's development.

Vision

Tartu Observatory is a recognized partner in the international sectors of scientific research and technological development. Its established research competence is applied to the promotion of science education, supporting entrepreneurship, and expanding the scientific understanding of the world, thus helping to find solutions for the challenges facing society.

Research and Development Strategy

The R&D Strategy specifies the actions needed to achieve the vision set out in the Development Plan, taking into account Tartu Observatory's internal strengths and weaknesses, as well as the opportunities and threats of the external environment. Development Indicators show the level of achievement desired by 2020.



Research and Development Objectives

1. Tartu Observatory is one of the leading research and development institutions in Europe in the fields of astronomy, remote sensing, and space technology.
2. Tartu Observatory is an active and visible partner in international cooperation.
3. Tartu Observatory is a national competence and innovation centre in the fields of astronomy, remote sensing and space technology.
4. The research work of Tartu Observatory supports the development of a knowledge-based economy in the interests of the Estonian society.

Development Indicators by 2020

1. Number of publications in peer-reviewed international scientific journals: at least one article published by each research employee per year.
2. Number of employees: at least 50 researchers with doctoral degrees employed at Tartu Observatory. Viable international research groups supervise approximately 50 students of Estonian universities at any one time, including around 20 PhD students.
3. Collaboration with businesses: consistent partnerships developed with at least 10 companies - functioning services, in-service training, and student internship exchange.
4. Tartu Observatory is an attractive venue for conducting research and development, with both domestic international employees who are satisfied and happy. Hosts at least 6,000 students, teachers and enthusiasts a year on-site, with a working virtual visitor centre.

Priority Areas

To ensure sustainable development in the years 2014 – 2020, Tartu Observatory must pay special attention to the following key strategic areas:

1. Internationally recognized excellence in research.
2. Well-rounded staff.
3. Business collaboration for the development of technological capabilities.
4. Inspiring, motivating and educating space centre for the public.



Background Info

Tartu Observatory is a state Research and Development agency managed by the Ministry of Education and Research. The institute operates under the Research and Development Organization Act, other laws and international treaties.

The main occupation of Tartu Observatory is research and development. Tartu Observatory conducts basic and applied research in the fields of astronomy, remote sensing, and space science and technology; participates in university teaching in these fields and related disciplines; provides consultations and professional expertise in space-related areas, advising public authorities, businesses and schools on science and technology development. Tartu Observatory continues the long tradition of Estonian science, and educates the public about astronomy, space science and technology developments, and the role of Estonian scientists in global scientific work.

Tartu Observatory is a successor of the Tartu University Observatory founded in 1808 and Tartu Meteorological Observatory built in 1865. Tartu Observatory is a successor of Institute of Astrophysics and Atmospheric Physics that was established by decree No. 374 of the Council of Ministers of the Estonian SSR on August 22 in 1973. Tartu Observatory is located in Tartu County, Nõo Rural Municipality, Tõravere.

Research Topics and Financing

The total budget of Tartu Observatory in 2013 was approximately 3.5 million EUR, of which 40% came from the state budget, and 60% from other projects. The number of employees was 104 (corresponds to 77 full-time positions), including 61 scientists and 17 engineers and technicians who work on the research.

The main building of Tartu Observatory was renovated in 2011-2013. In addition to modernized facilities for the researchers, new clean rooms were constructed for space technology work, along with optics laboratories and a spacious visitor centre.

Research is divided into four departments: stellar physics, cosmology, remote sensing, and space technology. Teaching and postgraduate courses are conducted in cooperation with the University of Tartu and the Estonian University of Life Sciences. In 2013, Tartu Observatory executed three target-financed research themes, four Estonian Science Foundation grants, four postdoc and mobility grants, nine international collaborative projects, 11 different research equipment and infrastructure development support projects, two initiatives in the research internationalization program; participated in five R&D projects in the field of environmental protection and technology, 2 scientific education support projects, one centre of scientific excellence in cosmology, plus a number of smaller Estonian and international agreements.

32 articles originating at Tartu Observatory were published in categories 1.1 of ETIS, along with over 14 articles in international peer-reviewed journals or conference proceedings, and two monographs by the researchers of Tartu Observatory.

The Development Plan for the period of 2014-2020 is based on analysis and discussions with Tartu Observatory staff about the results and achievements of the previous period, 2008-2013. The following outlines the strategic development vision for the area, the main objectives and key action items to achieve them.



1. Internationally Recognized Excellence in Research

Vision

Tartu Observatory is a well-known and recognized partner in the international research landscape. At least 50 post-doctorate researchers are based here. All areas of research feature active, viable, international research teams producing high-quality scientific results. The consistent development of all research areas is ensured by international collaborations, diverse sources of funding, and the training of future generations of researchers.

By 2020, Tartu Observatory will feature lively international cooperation and scientist exchange with various research institutes and businesses. Our researchers publish high-quality, impactful articles in leading specialist journals.

Tartu Observatory scientists are in demand, and participate in the most important specialist and collaboration networks and scientific events in their fields. Each year, international scientific events (conferences, seminars, summer schools) take place in Estonia, led by Tartu Observatory's scientists.

Main Objectives

- The scientists of Tartu Observatory have high-quality, impactful publications in leading journals of their fields.
- Tartu Observatory is a visible and active partner in the international research landscape.
- Tartu Observatory's faculty is international; workgroups include both experienced researchers and graduate students of various levels, as well as technical staff.

Activities

- Tartu Observatory provides the prerequisites for researchers and research teams to participate in international research and development programs through provision of co-financing resources and support services.
- Each research team makes maximum use of the EU's R&D framework program Horizon 2020, other international and domestic cooperation opportunities (OPTICON, AstroNet, RadioNET, COST, etc.), submitting regular project proposals to achieve the goals set forth in the development plan.
- With its scientific competence, Tartu Observatory supports state institutions as they participate in space science and related technology development: the European Union's environmental and security monitoring program Copernicus, and preparations for accession to the European Space Agency (ESA), in collaboration with the European Southern Observatory (ESO), the Nordic Optical Telescope (NOT), studies and experiments in the astro particle physics field with the APPEC consortium, and other professional networks.



- With our R&D work in the field, we participate in the implementation of such Estonian Research Infrastructure roadmap objects as the Estonian Environment Agency and accession to the European Space Agency. In support of their research and development activities, specialist centres of competence and excellence are established (Dark Matter Centre of Excellence, Remote Sensing Competence Centre, Nanosatellite Technology Centre, Astronomic Observation Centre, etc.).
- Every research direction provides active partners for teaching and graduate student mentoring at Estonia's major universities and research institutions. We participate in the shared use of modern research infrastructure by opening up our laboratories and research equipment options to other research institutions (University of Tartu, Tallinn University, Estonian University of Life Sciences, Institute of Chemical Physics and Biophysics).
- Scientists and their cooperation partners are actively involved in the joint publication of articles in order to achieve greater influence. Participation in the editorial bodies of scientific journals and performance of peer reviews.
- Tartu Observatory has an International Council that supports R&D work, meets once a year, and gives advice to the Observatory on directions for scientific research.
- Active international scientist exchange is ongoing; we host foreign scientists, and our scientists regularly visit various scientific institutions and businesses for self-development.
- Foreign researchers working at Tartu Observatory have access to the information and employment-related documents (including contracts, certificates, etc.) they require, in English. Each Observatory employee, student, and foreign researcher feels comfortable here, and quickly finds the necessary support in resolving work-related and everyday life issues.
- Tartu Observatory organizes a major international scientific event (conference, seminar or summer school) in Estonia every year.

2. Well-Rounded Staff

Vision

Tartu Observatory has created an internationally competitive and attractive R&D work environment for researchers, and offers various opportunities to researchers and students from other scientific institutions for internships at Tõravere. Tartu Observatory's scientists advise and support state agencies in their areas of competence, and represent Estonia's interests in expert forums.



Tartu Observatory helps universities to develop astronomy, remote sensing and space technology-related fields of study. Scientists teach classes in their research areas, provide guidance to students of all academic levels, and involve students in the work of research teams. By 2020, opportunities have been created for specialist internships in all of the Observatory's areas of research, at home and abroad.

We provide assistance with creating modern teaching materials, paying great attention to the use of e-learning opportunities, and in particular contribute to the professional in-service training of teachers of physics and life sciences.

The administrative burden of project financing, and problems caused by international and cultural differences, are mitigated through multifaceted support services.

Main Objectives

- Tartu Observatory is an internationally renowned and attractive science centre for conducting cutting-edge research and development.
- The competence of Tartu Observatory staff in the fields of space science and technology is utilized in the execution of national objectives.
- Tartu Observatory scientists help out with university classes, and supervise research papers at all academic education levels.
- Tartu Observatory supports the development of the scientific language and terminology and the training of a sufficient number of specialists required for the continuation of the national science community.

Activities

- Each research group looks for capable young people and encourages them to start careers in science, involves talented young people in the work of research groups, and gives candidates specific suggestions for starting or continuing a career. Tartu Observatory pays scholarships to successful students who have the potential for space-related research and development work.
- Tartu Observatory collaborates with Centres of Excellence and research institutions to create joint computation clusters. Based on the contents of the research work, contributions to the development of information technology use are made via the improvement of computation competence: large data set management, data search, analysis and visualization algorithms.
- Tartu Observatory's governance structure facilitates the development of research groups. Workers receive professional training and the opportunities to develop supporting skills (languages, leadership, teamwork, teaching, mentoring).
- Tartu Observatory promotes the training of young scientists abroad along with participation in cooperation networks, and offers employment opportunities and courses for foreign graduate students and postdoctoral fellows.
- Tartu Observatory in collaboration with the University of Tartu, Tallinn University, and the Estonian University of Life Sciences takes care of the teaching and internships of students in scientific and engineering/technological fields related to space exploration, and directs enterprising young people towards the implementation of innovative applications in the business sector.



- Tartu Observatory provides its scientific competence to support state agencies that participate in space science and related technology development through the sectoral programs of professional research competence and excellence centres (Dark Matter Centre of Excellence, Remote Sensing Competence Centre, Nanosatellite Technology Centre, Learning Centre for Astronomical Observations, etc.).
- Tartu Observatory employees apply their knowledge and skills for educational purposes, participating in space-related awareness programs, business-oriented activities, and training of teachers and students.

3. Business Collaboration for the Development of Technological Capabilities

Vision

Tartu Observatory is motivated for applied research and effective cooperation with businesses. By 2020, Tartu Observatory will have developed a number of useful applications and new technological solutions for Estonian and European small and medium-sized businesses.

Infrastructure services are open to businesses; the quality of services offered by the laboratory complex and visitor centre is ensured by a well-functioning quality management system. Research planning includes constant attention to the feasibility of applications for the results, and collaboration with businesses is welcomed.

Well-known and recognized experts are working at Tartu Observatory, acting as consultants in the Observatory competence areas (technology transfer and development, environmental monitoring problems, space science, life science education) to both businesses and state agencies.

Main Objectives

- Tartu Observatory is a reliable partner for businesses; our services are of high quality.
- The results of research conducted by Tartu Observatory's scientists find applications in the Estonian economy.
- Tartu Observatory's working environment supports the creation of new knowledge and adoption of innovative solutions both in the Observatory's research directions and in business, as well as the public and non-profit sectors.
- Estonia's public is familiar with the results of Tartu Observatory's research and development, and global developments in these areas. Tartu Observatory's applied science is regularly presented at international events and in publications.

Activities

- We invite business partners to bring their sectoral expertise and competence to R&D centres of excellence (Dark Matter Centre of Excellence, Remote Sensing Competence Centre, Nanosatellite Technology Centre, Learning Centre for Astronomical Observations, etc.).



- We prioritize projects and studies that meet the "Knowledge-based Estonia 2014-2020" strategy for smart specialization on growth areas:
 1. **Information and Communication Technology:** algorithms for the processing of large data sets, visualization methods and technologies, output that prioritizes end-user needs, nanotechnology applications.
 2. **Health Technologies and Services:** air, soil and water quality monitoring methodologies.
 3. **More efficient use of resources:** natural resource monitoring, effective use of technology, noncontact measurements.
- We support the creation and outfitting of sectoral and cross-sectoral joint laboratories and centres. The quality of services offered to businesses is ensured by a well-functioning quality management system that provides the basis for the formation of customer loyalty.
- Tartu Observatory in collaboration with the University of Tartu, Tallinn University, and the Estonian University of Life Sciences takes care of the teaching and internships of students in scientific and engineering/technological fields related to space exploration, and directs enterprising young people towards the implementation of innovative applications in the business sector.
- Scientists are valued guests at public events, experts in multiple public discussions and assessments, popular lecturers at specialist training events. Scientific conferences and workshops are organized, and novel opportunities in space science and technology are presented.

4. Inspiring, Motivating and Educating Space Centre for the Public

Vision

Tartu Observatory considers the needs of Estonia's social and economic development in its activities.

By 2020, Tartu Observatory shall be a modern research centre with an attractive working environment and state-of-the-art equipment, with motivating working conditions for cultivating world-class scientific excellence, developing collaborations with knowledge-based businesses and promoting science.

Tartu Observatory continues its long tradition of being a cultural centre in the broadest sense, an interesting destination for internationally renowned top scientists, students, school children, teachers, and specialists. Tartu Observatory regularly hosts various scientific conferences, seminars and events for promoting science, as well as in-service training events.

The public continues to pay attention to the space domain. The scientists of Tartu Observatory are valued guests at public events, experts in various public discussions and assessments, popular lecturers at specialist training events.



Main Objectives

- Tartu Observatory is the driver of the Estonian R&D and innovation strategy "Knowledge-based Estonia 2014-2020" and other strategies, and the keeper of the continuing legacy of scientific excellence.
- Tartu Observatory has a Visitor Centre with a modern concept, dedicated to the promotion of life sciences and supporting science education, a highly capable internationally renowned training centre for young scientists.
- Tartu Observatory employees are satisfied with their working conditions and working environment, and actively participate in its improvement.

Activities

- Tartu Observatory supports the implementation of the "Knowledge-based Estonia 2014-2020" strategy by maintaining world-class scientific excellence, smart prioritization, and active participation in international networks. Its experts advise the Estonian Space Affairs Council, the Horizon 2020 space programme committee, the Estonian Environmental Observatory, and others.
- Tartu Observatory's Visitor Centre is a strong partner for Estonian educational and research institutions, tourism enterprises and public sector agencies. The main building, Stellarium demo rooms and grounds are developed according to an updated plan that considers the peculiarities of all interest groups.
- Tartu Observatory's scientists are involved in the preparation of textbooks and teaching materials, and publish articles in popular publications. Science awareness activities are considered as an important factor in researcher competitions.
- Laboratories are shared with other research and development institutions and business partners. Consultations and joint meetings are held to respond to European Space Agency tenders.
- The Visitor Centre conducts refresher training for science teachers and professionals in various fields, active learning for school children, special courses for young scientists, and visits for enthusiasts.
- International cooperation and openness to society are supported by modern ICT solutions. Participation in global distributed computing systems. An ICT system is in place that meets the needs of the Tartu Observatory.



Financing

The financing of this Development Plan is provided by a combination of Estonian budgetary means and projects of the EU's R&D program Horizon 2020, as well as other EU funds. Participation in the development of state programs is prioritized in order to conduct applied studies.

Additional financing for enhancing domestic research and development activities and conducting various activities is solicited from public project competitions, together with partners from R&D agencies, universities and businesses.

Development Plan Review Procedures

The development plan will be reviewed by the Research Council of Tartu Observatory once a year. The results are summarized for the members of the international advisory board for purposes of receiving assessments and advice.

The summary results of the implementation of the development plan are presented annually by the director to the employees at the end of February, and it is published on the Observatory's Intranet along with the opinion of the international advisory board.

This development plan has been approved by the Research Council of Tartu Observatory on 17 March 2014.

Appendixes of the Development Plan:

Appendix 1 Interest Groups Related to Tartu Observatory's Activities

Appendix 2 Internal and External Environment Analysis (SWOT 2013)



Appendix 1 Interest Groups Related to Tartu Observatory's Activities

As a State Research and Development Agency, Tartu Observatory's activities are based on the interests of the Estonian state and economy, and are aimed at achieving and maintaining an internationally recognized level of excellence in research, ensuring the appearance of the next generation of space scientists, increasing high-tech capabilities in Estonia, developing knowledge-intensive services needed by society, and the formation of enterprising people.

Based on the objectives mentioned above, the organizations interested in Tartu Observatory's activities within the framework of international cooperation can be split into three major groups: (1) the general public, government ministries and state agencies, (2) research institution networks, (3) corporations and educational institutions.

Community and Public

- Interested in astronomy, space exploration, nature and environment related physical phenomena.
- Tartu Observatory promotes continued interest in science in the broadest sense, the development of engineering mind-sets and understanding of global changes among Estonian youth by launching the visitor centre, maintaining professional competence and active learning programs, publishing calendars, hosting excursions, publishing science news, conducting traveling exhibitions, conferences, public lectures and observation nights.

European Union

- Interested in developing and implementing EU policies in various areas.
- Tartu Observatory will contribute to the implementation of the policies of the European Union (Space Policy, Copernicus - the Global Monitoring for European Security) and will help shape Estonian policy in the corresponding areas through scientific experts.

Ministries, State Agencies

- Interested and required to represent Estonia in specialized working groups in Europe and the world, as well as to use expert assessments to develop scientifically justified positions and policies.
- Tartu Observatory provides competence in the form of experts in various fields, both at the state and international levels, and can assist in the development of positions and policies.

International Cooperation Networks

- Interested in collaborating to solve common scientific problems together, exchanging professional information both in narrow and broad fields of research, and creating a single scientific community.



- Tartu Observatory is an important partner in many professional organizations and research networks (ESA, ESO, IAF, COSPAR, JRC, AERONET, EARSeL, Nordic Optical Telescope, OPTICON etc.).
- Tartu Observatory provides assistance through scientific experts in assessing EU framework programmes and other international projects.

Agencies Involved in Environmental Problems (Ministry of Environment, PRIA, EMHI, etc.)

- Interested and required to conduct monitoring of changes to Estonia's environment, perform analyses, assess environmental resources, check the distribution of EU agricultural subsidies, and solve other problems.
- Tartu Observatory provides research, development and consultancy services on various issues in forestry, agriculture, radiometry, climatology and other fields.

Scientific Journals

- Interested in finding peer reviewers and editorial staff, and publishing high-level scientific articles.
- Tartu Observatory possesses specialist competence in peer-reviewing and editing various scientific journal articles.

Media

- Interested in news coverage related to astronomy, natural phenomena, the environment, and the development of space technology.
- Tartu Observatory offers competent professional information about space exploration, astronomy, cosmology, atmospheric physics, remote sensing and space technology, and works with the media to promote science through public issues of interest.

Universities, Research Institutions, Scientists

- Interested in initiating and implementing joint projects in the European Union, contributing to the development of international excellence across the globe, and exchanging specialist information.
- Interested in conducting world-class educational activities at the bachelor's, master's and doctoral levels, as well as scientific collaboration between research groups.
- Interested in creating opportunities for their students to train at the international level, find supervisors and reviewers for research papers.
- Tartu Observatory is a strong partner in joint projects as both initiator and executor, is interested in international exchange of young scientists and educating Estonian students abroad, while having the competence to supervise foreign students and edit research papers.



- Tartu Observatory is a strong partner for data exchange, possesses competence in comparing and using measurement data, developing software and technologies, and is interested in collaborating with research teams from various scientific institutions, which creates synergies in solving problems at the interface of different fields.
- Tartu Observatory has a strong competence and interest in the supervision of theses, teaching at all university levels, and scientific collaboration with other R&D institutions. The output of this is multifaceted specialists and scientists for Estonian institutions and businesses.

Businesses

- Interested and required to implement innovative developments, adopt new instrumentation and deploy the appropriate software, recruit specialists with modern training.
- Require professional expertise, expert opinions and analyses for successful operation, motivation and experimental environments for deployment of innovative ideas, and offer the equipment or services that the Observatory wishes to buy.
- Employ specialists who need additional training in high-tech fields.
- Tartu Observatory is the competence centre for remote sensing hardware and software development, as well as a research centre that motivates businesses to make improvements in radiation measurement and radiometry, provides environmental consultations and valued assistance in the preparation of guides, encyclopedias and calendars.
- Tartu Observatory takes care of the next generation of scientists and provides world-class education to a competent workforce of graduate and postgraduate students for businesses and institutions, and also provides in-service training for specialists.
- Tartu Observatory is interested in working with small and medium-sized companies, able to perform world-class assessments and analysis, and is a strong partner in its research fields.

Educational Institutions, Schools

- Interested in astronomy, learning, teaching and stargazing, remote sensing and space technology, as well as in-service training of teachers.
- Tartu Observatory offers schools the opportunity to visit the observatory in groups, look at the stars, participate in active learning programs about remote sensing and space technology, and provide in-service training of science teachers in collaboration with universities and community organizations.



Appendix 2 Internal and External Environment Analysis (SWOT 2013)

Internal Environmental Analysis

Strengths

Tartu Observatory's main strengths and preconditions for organizational development due to the internal environment are:

- Historical traditions have created the conditions for comprehending the cutting edge of science. Strongly growing new directions create synergies between scientific fields and in technological collaboration with both research institutions and businesses.
- Inspiring grand goals, a lot of material suitable for publication, extensive and high-quality documented data sets, as well as modern, state-of-the-art laboratories provide the opportunity to conduct top-class scientific research.
- Good working relationships with foreign partners. An international network of relationships has been established, and there is lively international collaboration and exchange of scientists in certain fields.
- Known in science, culture and politics. Tartu Observatory's scientists are valued experts in the field of space. Results of their work are well-promoted, and we are open to the media. People want to come back here.
- Inspiring leadership and competent staff. Scientists working at Tartu Observatory are renowned experts in space science. Professional staff, good engineers and software experts provide the institution as a whole with flexibility, which is characterized by the formation of dynamic research groups and general enthusiasm.
- Close collaboration with the University of Tartu and the Estonian University of Life Sciences. Our scientists provide guidance to a number of enthusiastic PhD students, and a new generation of young scientists is coming up.
- The renewed infrastructure and a good, friendly working environment have a positive emotional impact on those coming from outside. The peaceful atmosphere and a good natural environment are conducive to creative research.
- The funding base has become more diversified. The institution is prepared to work with a number of different sources. We are able to apply and carry out a wide variety of projects.

Weaknesses

Factors that may hinder development, stemming from Tartu Observatory's internal environment:

- The quality and volume of research have not proven to be sufficient, and reduce the competitiveness of the institution for Estonian scientific financing, where bibliometric indicators are more important than the substantive impact of the publications.



- There is some fragmentation of research topics, a lack of a sufficient number of up-and-coming researchers, and a shortage of international contacts, leading to so-called "individual" scientists, who struggle with a project-based financing scheme.
- The small number of international partners and projects for certain research groups limits their opportunities for participation in large networks. The contents and form of the research projects do not encourage the performance of internationally accepted fundamental research.
- Comfort and satisfaction with what has been achieved, and the lack of readiness for changes in science, generates tension at the human level, because rules change too fast, and there is a feeling of personal responsibility.
- Project-based financing and activities in which the scientist has to manage both people and money in addition to the external network of scientific problem solving activities require skills that are significantly different from the previous work experience of many researchers.
- Researchers' age structure is uneven. Lack of a systematic approach to student involvement and lack of professional instructors hinders research directions for sustainable development.
- Working arrangements have increased the institution's administrative burden in new conditions (centralization of accounting and human resources activities, project-based approach and state procurements).

External Environment Analysis

Opportunities

Taking into account the developments in the societies of Estonia and the European Union in general and the nature of Tartu Observatory, the opportunities for institutional development stemming from the external environment are:

- The demand for developing new services and technologies at both the national and international levels, the nanosatellite revolution, the lack of competition in space technology management in the Baltic States.
- Capability to meet the needs of businesses and the needs of testing at Tartu Observatory laboratories, which creates opportunities for new services, networking, and student involvement in business enterprises.
- New research funding rules in the European Union offer us the opportunity to participate in both EU and Estonian programmes and projects in the new round of applications.
- At the international level, our profile will increase with accession to the European Space Agency and the expansion of strategic cooperation into new countries such as China, India, Russia, as well as the involvement of foreigners, student and scientist exchange, internships at research institutions and companies.



- Positive public and media interest in the topic of space will help keep us in the picture, and the Visitor Centre will contribute to the implementation of world-class space science in the interests of Estonia's development.
- Active involvement in the development of Estonian research funding and research career models (tenure and emeritus phase) helps to shape an internationally attractive environment.

Threats

Potential threats stemming from the external environment can be highlighted, with weighting, in the form of issues in the following areas:

- Conflict between the mainstream and being unique.
- Fundamental science is strictly project based, which is badly administered.
- Satellite mission failure, rejected articles.
- Changes in Estonian society - the demographic situation in Estonia is reducing the number of young and active researchers.
- Uncertainty over funding. The failure of the larger and more long-term projects and applications, key persons leave and go into industry or abroad.
- The administrative burden increases due to regulatory requirements, which leads to bureaucratic work. Longer-scale planning is necessary to carry out the various activities, which eliminates the flexibility to respond to changes. The public procurement process is long and does not always get the best results.