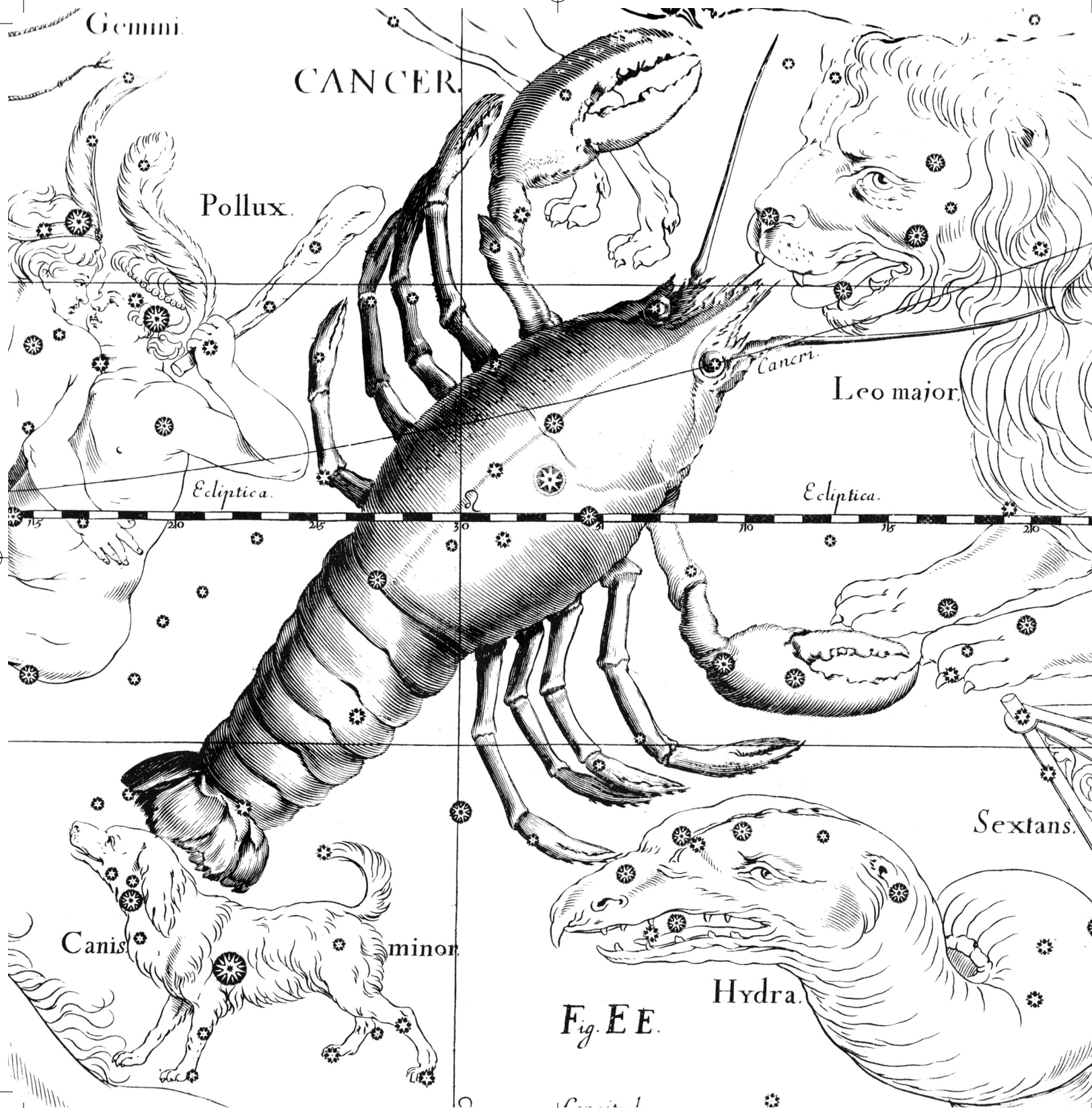


# SPACE in SCIENCE

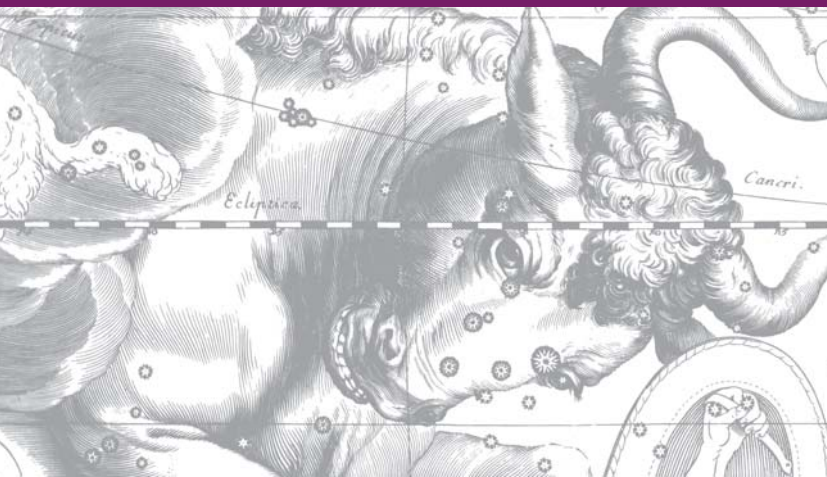
Polish Research  
and Higher Education Sector



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## History of Polish discoveries in space

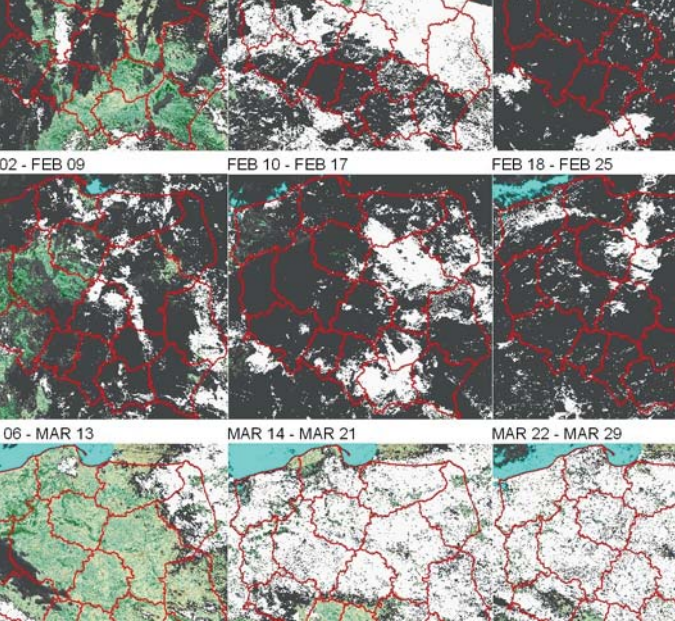


Speaking of the development of space technologies it should be remembered that they have been, and still are, developed as a result of scientific research. It is development of the basic sciences: astronomy, physics, mechanics, electronics and nanotechnology, that allows to build increasingly sophisticated devices and instruments; it is thanks to the basis sciences that today we have satellites, spacecrafts and the International Space Station. Therefore, equally important to the space industry building is to support science at the European and national levels.

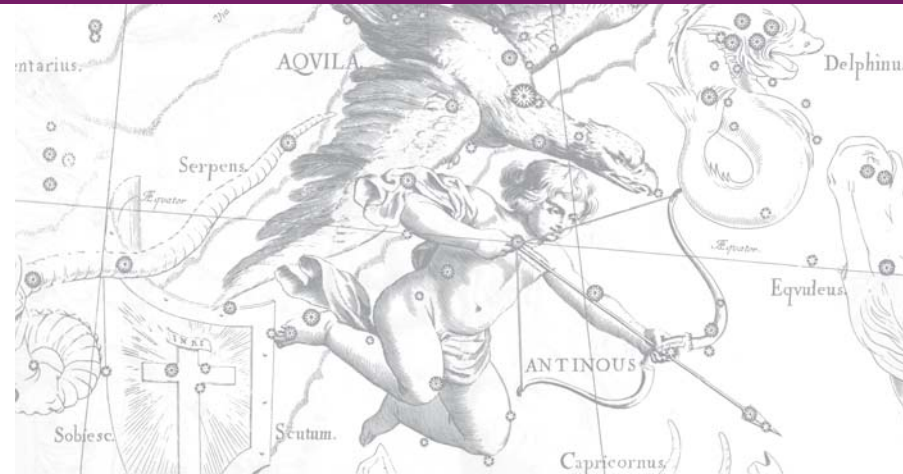
Poland, a country that has recently become the 20th member of the European Space Agency, is also taking part in the development of the space activity. The Polish tradition of interest in the space dates back to the fifteenth century. The Polish astronomer Nicolaus Copernicus made the first scientific revolution in this field. The Polish astronomer Johannes Hevelius constructed one of

the first modern astronomical instruments. Polish astronomers, including Aleksander Wolszczan and Andrzej Udalski, make discoveries in the Universe today. In the field of space technology development we also have achievements to be proud of. Our flagship scientific unit, the Space Research Centre of the Polish Academy of Sciences, builds high-quality research instruments that have been used in the missions such as Rosetta, Cassini-Huygens and Mars Express, and at the Herschel Space Observatory. The first two scientific satellites were built as part of the Polish-Canadian-Austrian programme BRITE. They have been launched in 2013 and 2014. Mission Control Center is located at the Copernicus Astronomical Center in Warsaw. Young Poles are also active in the space sector. In 2012, the PW-Sat satellite built by students of the Warsaw University of Technology was launched into the Earth's orbit. Robots built by students from





## History of Polish discoveries in space



the technical universities from Białystok or Łódź won the prestigious international contest Rover Challenge organized by The Mars Society. These achievements are treated not only as a confirmation of the quality of Polish science and technology, but also as our contribution to the implementation of the European Space Policy. Poland is trying to make good use of its opportunities in the space sector, brought about by the membership in the European Union and the European Space Agency, both in the field of science and of industry. Currently, more than 200 Polish enterprises and research centres participate in the EU and ESA programmes. Contemporary Polish astronomers have made a number of discoveries, and the space sector is one of the fastest growing sectors of the Polish economy. This is evidenced by the results achieved within the 7th Framework Programme in which Poland, with the participation of its 49 research teams, is in the 12th place among all Eu-

ropean countries, and the rate of success of Polish participants in this field has been almost two times higher than the average for the overall 7th Framework Programme. In particular, remote Earth observation techniques have a long tradition. Satellite observation and its applications are probably the most developed segment of the country's space sector, as evidenced by the number of submitted and positively evaluated proposals in this area. Particularly well developed is also the Polish commercial market of satellite navigation which is the source of many innovative solutions, products and services.

Polish scientific institutions and Polish companies are open to cooperation with European partners and thanks to their experience, knowledge and pursuit to make the best use of the country's science and technology potential can significantly contribute to the growth of European innovation.

# Earth observation



## Cracow University of Technology

[www.pk.edu.pl](http://www.pk.edu.pl)

Cracow University of Technology (CUT) has over 70-year-old tradition of educating engineers, modernity and openness to change as well as hard work on the improvement of the Polish scientific and technical thought. Currently, the university educates 14.5 thousand full-time and part-time students of BSc and MSc, PhD and postgraduate studies. Our educational offer comprises 31 programmes of BSc and MSc studies in Polish at 7 faculties and 7 programmes of study in English at 5 faculties. The university employs nearly 1 200 researchers and tutors that are outstanding professionals who participate in intercollegiate and international research teams. Their knowledge and expertise allow our university to maintain the high position in Polish and in the international scientific community. CUT Faculty of Physics, Mathematics and Computer Science is involved in Baltic Sat Apps program and in research in field of processing techniques of satellite data gathered from Copernicus. In the framework of bilateral agreements and the Erasmus + programme, Cracow University of Technology conducts research cooperation and student exchange with several hundred universities in 47 countries around the world. About 78 thousand students graduated from CUT - a huge crowd of well-prepared engineering professionals. We focus on ensuring high quality of education giving students the most durable and most valuable asset - knowledge.

## Forest Research Institute in Sekocin Stary

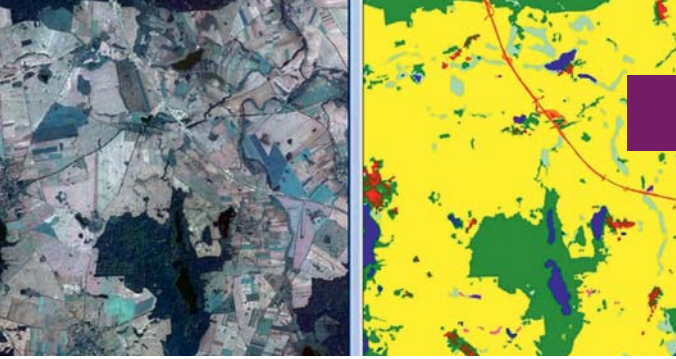
[www.ibles.pl](http://www.ibles.pl)

The Forest Research Institute (FRI) was established in 1930. The FRI conducts research in the wide range of fields directly and indirectly related to the forestry. The FRI carries out research for the State Forests National Forest Holding and other institutions including the Ministry of the Environment, Ministry of Science and Higher Education, the National Fund for Environment Protection and Water Management as well as the European Union under its Framework Programmes and financial instrument LIFE+. FRI cooperates within the frameworks of IUFRO and FAO, through contacts with partner institutions across Europe and received the status of PRO-FOREST Centre of Excellence in the area of protection of forest ecosystems. FRI participated in projects TATRY (FP4), and EFFE and SCEMA FOR (FP5). The institute have been involved in COST actions and in 10 projects as part of the EU's 6th Framework Programme: COMFOR, EFORWOOD, EVOLTREE, FIRE PARADOX, FORTHTREATS, TREE-BREEDDEX, 7th Framework Programme: BACCARA, FLEXWOOD, ISEFOR, FORFIRE, LIFE+: FutMon and INTERREG IVC: EFFMIS, EUFOFINET. At present, IBL participates in more than 150 international and national actions and research programs financed by the EU (e.g. FP7, COST, European Funds), Polish State Forests and governmental organizations.

## Institute of Agrophysics of the Polish Academy of Sciences in Lublin

[www.ipan.lublin.pl](http://www.ipan.lublin.pl)

Institute of Agrophysics (IA PAS) has the mission to provide scientific research in agrophysics. It keeps the orientation of physics since its fundation. Due to historical reasons this orientation was split and focused on multiple application areas ordered to different domains serving agricultural and food industry purposes. Since two decades it is changing the orientation in a new order determined by scientific aspects related not exclusively to agriculture, but to a broad spectrum of Earth Sciences, like environmental problems on regional scales in Poland with a particular focus on the Eastern part of the country recognized in EU as the Euroregion Bug. Currently IA PAS is a formal organizational authority entity for multidisciplinary expertizing the agricultural and the environmental management in the region, and on the national scale. IA PAS is the national leader in soil physics in Poland.



**Institute of Geodesy and Cartography  
in Warsaw**  
[www.igik.edu.pl](http://www.igik.edu.pl)

The Institute (IGiK) is a research and development institution. Our mission is to carry out the innovative research and applied science in the field of geodesy, cartography, remote sensing and GIS. The Center of Remote Sensing of IGiK is one of the leading institutions specialized in applying both optical and radar data for various applications. It consists of 24 researchers of comprehensive skills in remote sensing, GIS, environment, statistic, programming and modelling. The Center focus R&D on applications of EO for land cover/use classification and changes, agriculture (forecasting of yield, drought detection, crop recognition and condition assessment, soil moisture, ASAP System and Service for farmers delivering automatic processing chain of EO based products to users), analyses of wetland and grasslands areas (biomass, hydrological cycle, carbon and energy balance modelling), bioenergy crops, forestry (mapping and biomass estimation) hazards: floods, fires, windstorms and ground deformation. Most of R&D activities of the Center are connected to Climate Change issue, among them is study the cloudiness diurnal cycle over multi years. The Centre of Geodesy and Geodynamics of IGiK conducts the research on reference systems and their realizations, establishment and maintenance of geodetic, gravimetric and magnetic control networks, gravimetry, modelling gravity field of the Earth, determining geoid, monitoring deformations and geodynamic processes, modern surveying techniques, GNSS, metrology in gravimetry and geodesy.

**Institute of Meteorology and Water  
Management – National Research Institute**  
[www.imgw.pl](http://www.imgw.pl)

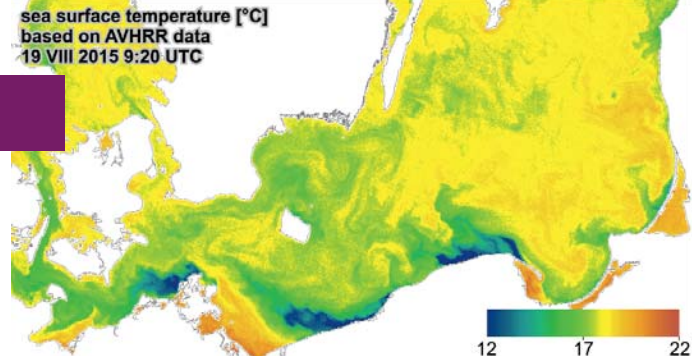
The Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB) is a research-development unit created on the 30th of December 1972. It is responsible for meteorological and hydrological protection of the country. Statutory tasks of the Institute include scientific and development activities as well as state services in the following domains: meteorology, hydrology, oceanology, water management and engineering, water resources quality, wastewater management and sewage utilization. IMGW-PIB conducts also research and implementation works aiming to utilize satellite data in hydro-meteorological protection of Poland as well as in scientific research of atmosphere, hydrosphere, biosphere and marine environment. As the one and only owns operational satellite ground receiving station, located in Krakow, to receive and process geostationary and polar orbiting satellite data from meteorological and environmental satellites. The HQ of Institute is located in Warsaw.

**Institute of Oceanology  
of the Polish Academy of Sciences in Gdansk**  
[www.iopan.gda.pl](http://www.iopan.gda.pl)

The Institute of Oceanology of the Polish Academy of Science (IO PAN) was founded in 1983. Today it is the leading oceanographic institution in Poland, having also well-established position in the European and Worldwide marine research.

The Institute's mission is to generate knowledge required to support the understanding, the sustainable use and protection of the marine environment. This is carried out by means of innovative, high-level scientific and technological research that enhances our understanding of the environment, and provides expertise and technology for stakeholders, i.e. Polish and international users of marine-oriented knowledge and technology, governmental agencies, policymakers, educators and students, and Polish society at large. The Institute of Oceanology conducts scientific research mainly in the Baltic Sea and European Arctic Seas.

The Institute is also active in the research and applications related to various aspects of satellite remote sensing of the ocean properties and the air-sea interface. This has led to extensive experience in processing and use of satellite data in the research and monitoring of the marine environment.



## Polish Geological Institute-National Research Institute

[www.pgi.gov.pl](http://www.pgi.gov.pl)

Polish Geological Institute-National Research Institute (PGI-NRI) is a state research institution with over 600 high-qualified employees in field of geology, hydrogeology and environmental studies, who work on national and international projects. PGI-NRI's headquarter is located in Warsaw, Poland, and the company has seven local branches located in Kraków, Wrocław, Sosnowiec, Gdańsk, Kielce, Szczecin and Lublin. PGI-NRI undertakes scientific research and development in fields of earth sciences.

As leading geological institution in the country, PGI-NRI provides scientifically based advice and support to local and national administration as well as undertakes initiatives focused on promoting and informing society about geological science and issues related to natural resources and their protection.

The Institute is involved in comprehensive studies of geological structure of the country for practical use in national economy and environmental protection. In addition to scientific activities in all fields of modern geology the Institute was entrusted with the tasks of the Polish Geological Survey. Moreover, it is responsible for the country's security in supply of mineral resources, the ground-water management, for monitoring of the geological environment and warning against natural hazards and risks.

## University of Agriculture in Krakow

[www.geo.ur.krakow.pl](http://www.geo.ur.krakow.pl)

The structure of the University comprises 7 faculties: Agriculture and Economics, Forestry, Environmental Engineering and Land Surveying, Biotechnology and Horticulture, Production and Power Engineering, Technology and The Faculty of Animal Sciences as well. The main mission of the University is the education of experts who would find employment in the widely understood food and forest economies and specialists in environmental protection using the modern technologies like Geomatics. The University aims to prepare professionals able to meet the challenges of contemporary sustainable development based on ecological rules of management and utilisation of the Earth resources. Two main research areas may be distinguished as part of the University activities, i.e. research projects realised as EU where the objectives are determined the author of a project or by contracting agency.

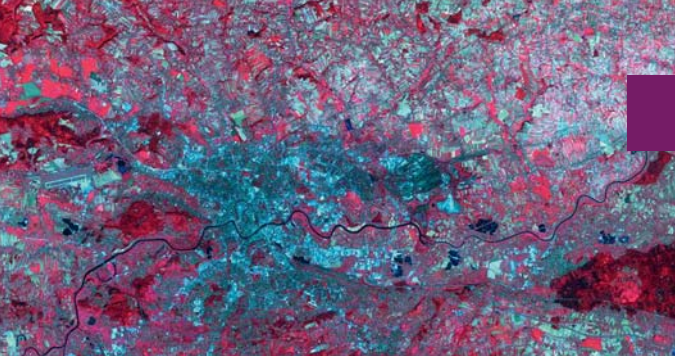
The research activities at the University of Agriculture in Krakow concerns the widely applications of Geomatics Technologies like: VHR satellite and airborne optical (multi- and hyperspectral) or radar remote sensed imageries, the 3D Photogrammetry, spatial databases and LiDAR point clouds - in the modern: forestry, agriculture, environment protection and landscape monitoring - at local, regional and global scales.

## University of Gdańsk

[www.ug.edu.pl](http://www.ug.edu.pl)

The University of Gdańsk (UG) is the largest educational institution in the Pomerania region. It has 11 faculties with over 30,000 students, doctoral students and post-graduates, who are taught by 1,700 academic staff. In such fields of study as Biology, Biotechnology, Chemistry, Oceanography, Quantum Physics, Pedagogy, Psychology, Law and Economic Sciences, the University of Gdańsk is one of the best institutions in Poland. The University of Gdańsk provides education in 75 fields of study, comprising 223 specializations, full-time and part-time studies, at the level of first or second cycle studies, or within comprehensive (long cycle) five-year master's programmes. The students pursue their studies in state-of-the-art facilities on the University's Baltic Campus, which is one of the largest university complexes in northern Poland. The members of the academic staff of the University conduct scientific and scholarly research on a world-class level, not only creatively expanding the frontiers of knowledge, but also serving the whole of the Pomerania region with their knowledge and experience, thus aiding its dynamic modern development. UG cooperates with universities, tertiary colleges and scientific and research institutions in almost every country around the world. Participation in the European and international programmes allows for the expansion of the University and has an impact on its research and teaching base. UG implements its motto of in mari via tua, and serves the development of the Pomerania region, whose wealth is the very sea itself.





### University of Warsaw

[www.uw.edu.pl](http://www.uw.edu.pl)

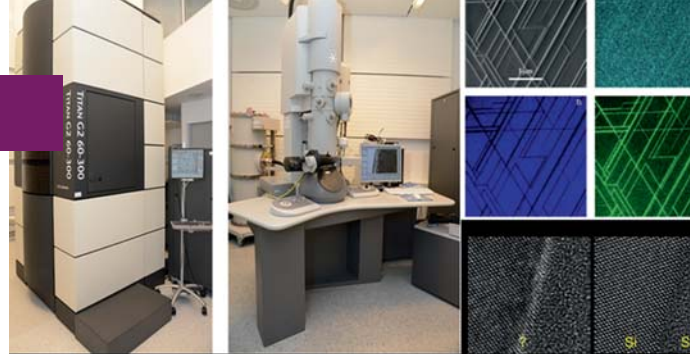
University of Warsaw (UW), established in 1816, is Poland's largest and finest university. From its beginning the University of Warsaw has played a major role in the intellectual, political and cultural life of Poland, and has been recognized throughout the world as a leading academic centre in this part of Europe. In 2010 and 2011 UW has been declared number 1 in the ranking published by the national daily Rzeczpospolita and the education monthly Perspektywy. Dynamic political, social, and economic changes accompanying Poland's democratisation have brought the University new opportunities and challenges. In the beginning of 21st century, University of Warsaw is moving forward with a plan to modernise its structure, organisation and curricula in an effort to prepare its faculties, students and graduates to function freely in the international community. Today UW employs over 6,200 people, including 3,240 academic teacher and educates almost 53,700 undergraduate and graduate students. Each year over 20,000 young people enroll as students at the University of Warsaw. Their interest in studying at UW results above all from the University's prestige, something UW has earned through the high educational level it offers and the research work.

### Wrocław University of Environmental and Life Sciences

[www.upwr.edu.pl](http://www.upwr.edu.pl)

The University (WUELS) is a leading third generation university; combining research, education and business roles. Home to the "Green Valley" initiative; paving a way to 4.0 food industry and agriculture extensively using satellite techniques.

Research related to space science at WUELS is concentrated at the Institute of Geodesy and Geoinformatics GNSS&METEO Working Group and relates to the activities within Global Geodetic Observing System. These activities cover in particular: (1) integrated water vapor recovery from real-time and near real-time Global Navigation Satellite Systems (GNSS) observations, (2) integration of GNSS products and numerical weather models, (3) recovery of the total electron content (TEC) in the ionosphere and mitigation of the impact of TEC variations on GNSS positioning, (4) analysis of atmospheric occultation of GNSS signals between LEO and GNSS satellites, (5) real-time precise point positioning using multi-GNSS signals, (6) evaluation of orbit quality and precise orbit determination of multi-GNSS satellites using Satellite Laser Ranging, (7) monitoring of Earth surface deformations using spaceborne InSAR data. IGG is at the forefront of challenges related to data processing of the newly-deployed systems, such as Galileo, GLONASS, QZSS, and BeiDou with the quality assessment of multi-GNSS orbits and clocks and their impact on positioning, navigation, estimated Earth rotation parameters, and GNSS-derived global, regional, and national geodetic reference frames.



## AGH University of Science and Technology in Krakow

[www.tem.agh.edu.pl](http://www.tem.agh.edu.pl)

The International Center of Electron Microscopy for Material Science was created on 1st June 2010 but its roots go back to 1960. The Center is non-faculty unit of the AGH-UST, acting in co-operation with foreign partners. The leading unit of Center is the Faculty of Metals Engineering and Industrial Computer Science. The IC-EM is focused on the application of new methods of electron microscopy, spectroscopy and tomography: (1) Quantitative characterization of macro/micro/nano structure of materials with the aid of light and electron microscopy, (2) Electron tomography: imaging of the micro/nano structure of materials in three-dimensional space; metrology, (3) Investigation of the electric and magnetic fields with the aid of electron holography, (4) Investigation of materials surfaces with the aid of atomic force microscopy, (5) Investigation of physical and mechanical properties of materials.

Expertise in characterization of materials for energy systems and aeronautics, graded and multilayered materials, biomaterials, other advanced materials. The Centre is fully equipped with modern electron microscopes, among others: Titan3 G2 60-300 (FEI). The Center team collaborates with 40 research institutions from 18 countries. The co-operation is related mainly to bilateral co-operations as well to the projects executed under the 6th and 7th Framework Programmes of the European Union and also belong to several international societies associations and scientific networks.

## Air Force Institute of Technology in Warsaw

[www.itwl.pl](http://www.itwl.pl)

Since 1958 is a scientific and research organisation supervised by the Minister of National Defence. Its mission is scientific support and research into problems of military aviation.

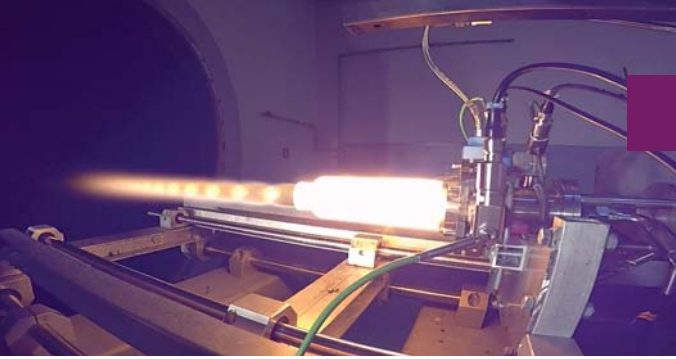
Owing to the studies in the field of reliability and broadly understood flight safety, the Institute has significantly contributed to the development of Polish aviation. The Institute's output comprises hundreds of elaborations - effects of research and experimental works, design efforts, and technical/servicing activities - applied in the Armed Forces of the Republic of Poland. AFIT's Scientific Council is authorized to confer the post-doctoral degree in the field of "Machine Building and Operation". We have various research laboratories accredited by the Polish Centre for Accreditation and Polish Ministry of National Defence, Quality Management System certificates, licenses for trading and developing armament and technology predicted for military and police services. Our pillars are highly qualified scientists and modern, unique research, control and measuring equipment.

Main research areas: Aeronautical Systems, Logistics Systems, Safety and Reliability, Unmanned Aerial Vehicles, Training Systems, Air Armament, Airfield and Road Infrastructure, POLs, Biocomponents in POL's Engineering Products, C4ISR, Aircraft Engines and Digital Avionics.

## Foundry Research Institute in Krakow

[www.iod.krakow.pl](http://www.iod.krakow.pl)

Foundry Research Institute, founded in 1946, is a leading research institution in Poland in the scope of foundry technology. The core competence of the Institute is to develop the metal casting technologies related to different cast materials, like: grey, alloyed, ductile, ADI, vermicular graphite cast irons, cast steel, Al, Mg, Zn, Sn, Cu, Ni, Fe, Co, Ti, other ferrous and non-ferrous metals and alloys. The world-wide known areas of studies conducted in FRI are composite metal-ceramic, functionally graded materials, as well as high-porosity metals and alloys. The outstanding competence of FRI is the ability to study the properties and behaviour of metal, metal ceramic composites, and ceramics in liquid state. Under possession of FRI there is a centre of high temperature studies, which owns a home-made, unique experimental facilities, that allows for studying the material properties in high temperature, up to 2300°C. It has developed the methods of testing the material structure, surface and microstructural properties in liquid state (e.g. by sessile drop method). FRI offers the scope of research in advanced materials that may be delivered as a proof of concept for space applications. The outstanding materials for such purpose are: high-porosity metals (gasars), functionally graded materials, metal-ceramic composites, methods of joining dissimilar materials, methods of development of flight waste into fine grain powders, advanced non-destructive testing (computed tomography) of components of ground stations.



## Gdansk University of Technology

[www.pg.gda.pl](http://www.pg.gda.pl)

Gdansk University of Technology (GUT) was founded in 1904. It is the largest technical university in Northern Poland, and one of the most prestigious and widely recognized internationally. At present, nearly 22,000 students are enrolled at 9 faculties, 7 of which possess the highest rank A category. The university employs 2,800 staff including over 1,300 academics. According to the Ministry of Science and Higher Education most secondary-school graduates willing to undertake technical studies in Poland chose GUT.

University possesses modern R&D infrastructure, including among others HRPT/MetOp satellite ground station, Peta flop class cluster for big data processing and Full size cubic Cave Automatic Virtual Environment laboratory.

In the last year GUT obtained prestigious HR Excellence in Research logo given by European Commission, and as one of the 12 best Polish universities was qualified to The Times Higher Education World University Rankings.

The university continually strives to ensure that at least 20% of graduates establish their own high tech start-up companies, mostly in Information and Communications Technology (ICT) and chemistry. In the academic year 2016/2017 the new intercollegiate field of study Space and Satellite Technology was established at GUT jointly with Maritime University and the Naval Academy in Gdynia.

## Industrial Research Institute for Automation and Measurements in Warsaw

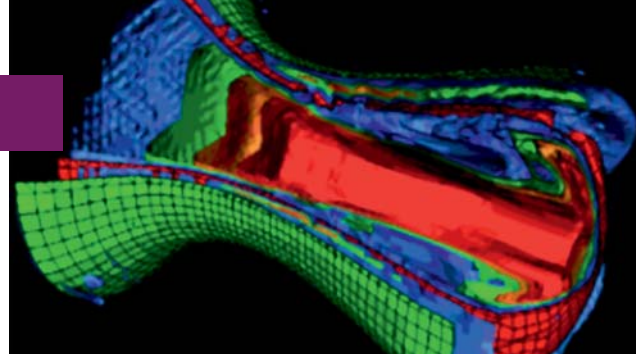
[www.piap.pl](http://www.piap.pl)

The activity of PIAP is solving technical problems in various sectors connected with security of citizens, infrastructures and national security in the area of the automation, robotization and test equipment. Scope of PIAP competence includes development, implementation and start up at user's site and post-sales maintenance of intelligent systems and mobile robots for special applications. PIAP's mobile robots for surveillance and EOD are extensively used by Eastern European police, border guards and military forces. PIAP offers the following services to its clients: implementation of scientific and R&D projects required for development of new methods and equipment in the fields of: robotics, satellite navigation and telemetry, testing components and systems. PIAP specialists are experienced in realization of the unique technical solutions for IT systems for hazards monitoring and telemetry systems covering also smart sensors' network and different methods of data transmission, also for critical infrastructure and researches are active in fields of robots autonomy, decision support and human machine interface design. PIAP realized several projects concerning issues, relevant to proposal topic, like: teleoperation of mobile robots equipped with manipulators, intuitive and adaptable Human-Machine Interfaces, device control consoles, robot internal task management, additional on-robot data acquirement and transfer, monitoring of security breaks in critical infrastructure. PIAP is widely cooperating with industrial and scientific organizations and research groups from EU and Candidate Countries.

## Institute of Aviation in Warsaw

[www.ilot.edu.pl](http://www.ilot.edu.pl)

The Institute (IA) was established in 1926. Today it is largest Polish R&D centre dedicated to aerospace engineering. Being focused on international partnerships within European programs, IA cooperates with the ESA, the EDA and the EC. In recent years this included work within: FP (5-7), PECS, ESA Polish Industry Incentive Scheme, ESA Clean Space, ESA GSTP, ESA GSP, ESA TRP and Horizon 2020. National projects are developed using funds from the National Centre for Research and Development. The dedicated Center of Space Technologies (CST) focuses on R&D in space propulsion and space transportation. IoA develops technologies for environmentally-friendly rocket propulsion systems. A crucial achievement within the field is the development and commercialization of the method for obtaining High-Test Peroxide (up to 99.99%). A few propulsion platforms with various thrust levels (1-5000 N) have been developed. Current activities include work on systems with thrusts up to 50000 N. The work of the Centre includes development of sounding rocket systems and launch vehicle subsystems. Institute of Aviation has capabilities in delivering microgravity experimentation platforms and services. Since 2007 numerous small launch vehicle studies have been completed. Several international activities concerning spacecraft deorbitation are ongoing. Example partners of IoA include General Electric, Pratt & Whitney, Lockheed Martin, Thales Alenia Space, Airbus Space and Defence, Rolls Royce and Polish Armaments Group.



## Institute of Electronic Materials Technology in Warsaw

[www.itme.edu.pl](http://www.itme.edu.pl)

Founded in the early seventies of the twentieth century, the Institute of Electronic Materials Technology (ITME) with about 300 employees is a research, development and consultative institution offering a unique combination of scientific and technological capabilities. The Institute of Electronic Materials Technology is recognized for its comprehensive and interdisciplinary research in the field of materials engineering, electronics, photonics, optoelectronics, environmental engineering, chemical technology and nanotechnology.

Our research in the field of materials engineering is carried out on advanced and innovative new generation materials, including two-dimensional materials such as graphene. Technologies for producing new materials are being developed and properties of the materials are being tested, as well as their applications in power industry, electronics, photonics, aerospace, automotive and other sectors. The ITME achievements place it among the best research and development institutions that successfully carry out innovative research in many fields related to new technology. Scientists cooperate with a great number of national and foreign universities, institutes, research and development centres and major electronic industries all over the globe. The Institute provides its research and technological services to industries and other scientific institutions.

## Institute of Fundamental Technological Research of Polish Academy of Sciences in Warsaw

[www.ippt.pan.pl](http://www.ippt.pan.pl)

The Institute of Fundamental Technological Research (IPPT PAN) was established in 1954 and the main task of the Institute is to conduct high quality research in the areas which are the focus of the world's science and technology. The most important fields of the Institute's expertise include theoretical and applied mechanics, theory of coupled mechanical and physical fields, theoretical and experimental mechanics of materials and structures, computational methods in mechanics, acoustoelectronics, and ultrasonic medical diagnostics. Extensive research is also conducted in several branches of fundamental science and technology, such as: physics and thermodynamics of continua; plasma physics; stochastic dynamics; fluid mechanics; laser beam interaction with metal surfaces, nanophotonics, applied mathematics, applied informatics, and bio-informatics. The Institute has an extensive experience in international co-operation particularly in the area of international Research and Technology Development projects (RTD). Great importance is attributed to various forms of co-operation with industry. Together with the results of scientific research, the Institute has developed a wide range of modern technologies. Today IPPT PAN employs over 140 scientists and researchers, including 48 professors and provides first-rate PhD education in contemporary technology, mechanics, acoustics, computing, and its advances related to biomedical applications, enhanced by internationalization, links with industry, and the encouragement of a discovery spirit.

## Institute of Industrial Organic Chemistry in Warsaw

[www.ipo.waw.pl](http://www.ipo.waw.pl)

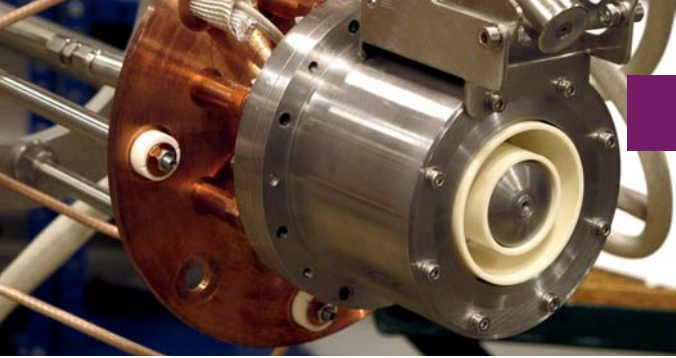
Institute of Industrial Organic Chemistry (IPO) carries out research concerning national defence, state services, chemical and manufacturing process safety as well as work for the agriculture including: production technology for plant protection agents, elaboration of effective and safe application of plant protection agents in ariculture and pomiculture. IPO elaborates and implements preparations for insect control in animal farming and sanitary hygiene, auxiliary products for pharmacy, household chemistry, paper and tanning industry.

IPO implements and abides regulations concerning ban on research, production, storage, and use of chemical weapons as well as its destruction. Laboratory of Dangerous Properties of Materials functioning possess the implemented Quality Management System confirmed by the Polish Center for Testing in a wide range at fields: chemical safety, technical explosives, powders, rocket propellants, electrostatic hazards. The Laboratory is among 12 laboratories in the world which have been recognized by the UN as leading global entities and references for international applied methods.

In 2016 the first ESA project was received (GSTP project „Hydrogen Peroxide Storability/CopmpalibilityVerification” is done within a Polish consortium with Jakusz).

The Institute offers development of compositions and technologies of high-energy materials, production of products for special needs, tests of explosives and hazardous materials and evaluation and classification of dangerous goods in transport.





## Institute of Plasma Physics and Laser Microfusion in Warsaw [www.ipplm.pl](http://www.ipplm.pl)

The Institute (IPPLM) was founded on 1st January 1976. The IPPLM's activity includes research on the thermonuclear fusion in devices with the magnetically confined plasma (in tokamaks and stellarators) and fusion induced by the pulsed lasers; the study and applications of Plasma Focus devices and plasma thrusters are also carried out. These studies include experimental research, theoretical analysis, and numerical simulations of plasmas. IPPLM represents Poland in the EUROfusion consortium, which was created in Europe for the development of fusion energy within EURATOM Community. IPPLM coordinates fusion projects performed by Polish institutions in the frame of the national CeNTE Consortium. Satellite Plasma Thruster Laboratory (PlaNS) in the IPPLM develops R&D activity in the field of experimental and theoretical plasma physics relevant to electric propulsion, the design of a small Hall effect thruster (HET), and a pulsed plasma thruster (PPT) devoted mainly for micro-satellites. The PlaNS laboratory also carries out technological design and laboratory tests of plasma sources (Hall accelerators in particular). The major part of this work was realized within EC FP7 projects, as well as the ESA project. In the framework of the ESA PECS program, the KLIMT-HET project gained funding for implementation. Within the project, the design and tests of a 300–500 W small KLIMT model have been successfully accomplished. The tests were performed in the ESA's Propulsion Lab. in the Netherlands, as well as in the PlaNS Laboratory.

## Lodz University of Technology [www.p.lodz.pl](http://www.p.lodz.pl)

Lodz University of Technology (TUL) offers 36 fields of studies to over 20 thousand students, including one hundred twenty specializations at nine faculties. The profile of education at TUL combines knowledge of basic sciences, technical sciences, specialist subjects with the issues in the area of organization and management, economics, banking, marketing, and in arts. Students get acquainted with the latest technologies and computer applications. Over 1500 academics work at TUL. They are among the leaders in Polish and international universities in research on numerous areas of science and technology. A large number of the research concerns applications of new technologies and materials as well as working out of new technologies. The best represented areas of science are biotechnology, electronics and telecommunication, computer science, materials engineering, technologies and nanotechnologies applied in technique, medicine, environmental protection, and improvement of food safety and quality. Biomedical engineering and research in new technologies in textile engineering are also dynamically developing areas of science at the university. Lodz University of Technology coordinates the activities of The Baltic Sea University which include 180 universities from 14 countries of the Baltic Sea region. The creation of the Laser Diagnostic and Therapy Centre - a future medicine institution is regarded to be a remarkable achievement of TUL. The main objective to create this unit was to do research on influence of laser rays on human organism as well as to develop new methods of healing with the use of laser technology.

## Military University of Technology in Warsaw [www.wat.edu.pl](http://www.wat.edu.pl)

Military University of Technology (MUT) is one of the leading research, science and technology polytechnic school in Poland. MUT is unique center in Poland, offers both for military and civilian students high quality undergraduate and postgraduate studies leading to the Bachelor's, Master's and PhD's degree as well as specialist short time courses. MUT as research entity carrying out a comprehensive basic and applied research, implementation and modernisation within the scope of new technologies, chemistry, physics, photonics, optics, bioengineering, advanced energetic technologies for the national and military applications. Numerous inventions, innovations and prestigious national and international patents and awards prove a very high level of MUT's research. Nowadays the space technology and carrying out space research is one of new MUT's interest to support innovation activities of the national authorities concerning space sector development and reaching a high research level in the field of aerospace engineering. The main research scope of MUT based over six academic faculties: Faculty of Cybernetics, Faculty of Electronics, Faculty of Advanced Technologies and Chemistry, Faculty of Civil Engineering and Geodesy, Faculty of Mechatronics and Aerospace, Faculty of Mechanical Engineering. Nowadays MUT aims at increasing its participation in European programs for research and development such as Structural Funds 2014-2020, Horizon 2020, European Defence Agency, NATO and space research of ESA programmes.



## Poznań University of Technology

[www.put.poznan.pl](http://www.put.poznan.pl)

Poznan University of Technology (PUT) offers education in ten faculties, providing a total of 26 majors. PUT facilitates the implementation of its vision as the country's top university of technology, aspiring to be a partner of European schools of higher education in terms of providing the quality of education and research level. PUT has been admitted to the Conference of European Schools for Advanced Engineering Education and Research; is also a member of Societe Europeenne pour la Formation des Ingenieurs, European University Association, International Association of Universities, and more.

In 2016 the Aeronautics and Aerospace course was established by the Faculty of Machines and Transport and educates students in 4 specializations: Piloting of Aircraft, Aircraft and Flap Engines, Air Transport, and Aviation Safety and Management. In addition, postgraduate studies in Space Engineering, Mechatronics, and Diagnostics of Aircraft Engines are here offered. These fields of education correlate with research activities of the Faculty.

The main areas of research concern phenomena related to the aerodynamic heating and the activity is generally focused on two main problems: the evaluation of the existing reusable thermal protection system and on the new solutions of the reusable thermal shields systems. Research analyses mainly concern passive thermal protection systems for orbiters, as well as metal shields of space aircrafts.

## Silesian University of Technology

[www.polsl.pl](http://www.polsl.pl)

Civil Aviation Personnel Education Centre of Central and Eastern Europe Silesian University of Technology was established in 2008. Representatives from aviation sector seats in the Programme Council. Members of Programme Council are: Civil Aviation Authority, Polish Air Navigation Services Agency, Council of Regional Airports, Polish Aviation Club, Silesian University of Technology. The Centre organised "Poland Air Team" which conducts intensive scientific works - research concerning the implementation of techniques and satellite technologies in aviation. Its participating in global activities, such as implementation of Performance Based Navigation. GNSS in air navigation. Together with Polish Air Navigation Services Agency fulfill European plans: EGNOS Introduction in European Eastern Region - APV Mielec and Helicopters Deploy GNSS in Europe (HEDGE) Projects, Helicopters Deploy GNSS in Europe (HEDGE) Next Project, Support on Pre-Operational Actions in GNSS (SHERPA) Project. Preparation of EGNOS implementation plans are in line of part of national PBN strategies and PinS procedure for rotorcrafts. Centre participated in many workshops and prepared with PANSA national documents: SHERPA-PANSA-NMA-D11 EP EGNOS POLAND MAKET ANALYSIS, SHERPA-PANSA-NSR-D21EP Polish National Scenario, SHERPA-PANSA-ENIP-D22EP EGNOS National Implementation Plan, SHERPA-PANSA-ENIP-D22EP EGNOS National Implementation Plan.

## Space Research Centre of the Polish Academy of Sciences in Warsaw

[www.cbk.waw.pl](http://www.cbk.waw.pl)

Space Research Centre (CBK) is a governmental, non-profit, research organisation that was established in 1976. The fields of CBK's scientific interest of are: space and solar physics, solar system dynamics and planetology, remote sensing, satellite geodesy and geodynamics. To support these areas of interest, a wide range of technically advanced instruments have been developed. CBK scientists serve as elected officers of several scientific international organisations. The CBK has developed and manufactured space-qualified hardware for over 60 space missions. The space instruments made in the institute studied or are going to examine the Earth's orbit and deep space within the following satellite projects and missions: Apex, Coronas-I, Interball-2, Cassini/Huygens, Priroda/Mir, Coronas-F, Integral, Rosetta, Mars Express, Venus Express, Demeter, Herschel, Solar Orbiter, ASIM, Taranis, Bepi Colombo, JUICE, Chang-E and ATHENA. CBK is the only institution in Poland whose activity is fully devoted to space research and its applications in space weather, geosciences, technology, and security. CBK has over 50 cooperating partners both in Poland and abroad and it is visited each year by over 100 foreign researchers. The guest room facilities, seminar rooms and other elements of infrastructure are a visitor friendly environment. The institute has a strong market-orientation, the relations with industry, especially SMEs are well established and a substantial part of funding comes from contracts.



**Szewalski Institute of Fluid-Flow Machinery  
of the Polish Academy of Sciences in Gdańsk**  
[www.imp.gda.pl/en](http://www.imp.gda.pl/en)

The Institute of Fluid-Flow Machinery PAS (IMP-PAN) is the biggest among scientific units of the Polish Academy of Sciences in Northern Poland and the second largest in the country. IMP-PAN hires over 200 employees, where 96 hold a science degree (including 30 nominated professors). The Institute possesses all possible authorisations and academic rights in the area of mechanics, machine construction and exploitation as well as energetics. Energy conversion in flows constitutes the fundamental research field in IMP-PAN, however lately its scientific policy was shifted towards a new specialization i.e. RES-based small-scale distributed heat and power engineering (highly efficient co-generation systems, boilers, gasifiers, PV and energy storage). The investigations are being carried out in the field of: fluid mechanics, multiphase flows, thermodynamics, plasma physics, laser technique, nanotechnologies, smart materials, machine mechanics, tribology and diagnostics. Apart from the fundamental research, the Institute offers its services in the area of practical engineering applications such as: turbines, pumps and hydrokinetic couplings, ventilators, marine propellers, solar collectors; their design, calculation and technical expertise; development of unique equipment and apparatus. In the field closely related to 'space science' the Institute is involved in studies of plasma-dynamics (e.g. ion thrusters), aerothermodynamics, including flow control and passive control of shock waves, as well as structure health monitoring.

**Warsaw University of Technology**

[www.pw.edu.pl](http://www.pw.edu.pl)

The Warsaw University of Technology (WUT), the oldest and the highest-ranking technical University in Poland has become the most important scientific centre of engineering in Poland and gained international prestige. Research is conducted in pure and applied sciences by all of its organizational units: institutes, faculties and research centres.

WUT has long lasted activity in research and education in the field of space technology and exploration, going back to late sixties of the previous century when teaching and research in small rocket propulsion systems and combustion processes in microgravity started. In 1996 a new in Polish academia interfaculty course in space technology was established and the first Polish Students' Space Association created at WUT. Since then students have been participating in the majority of the ESA educational programmes developing and building Mars rovers, sounding rockets, cansat launchers, stratospheric balloons, small satellite thrusters and satellites in a cubesat standard (PW\_Sat1 – the first Polish satellite launched in 2012, PW\_Sat2 – will be put on the orbit in 2018). For over 20 years the WUT research groups have been taking part in many space related projects comprising new materials, control, navigation and mission analysis, satellite communication systems, radar systems and signal processing, rocket and satellite propulsion systems, on-board computer modules, large scale integrated photonic components, high resolution satellite images processing and utilization in geodetics engineering and other industrial applications.

**Wroclaw University of Science and Technology**

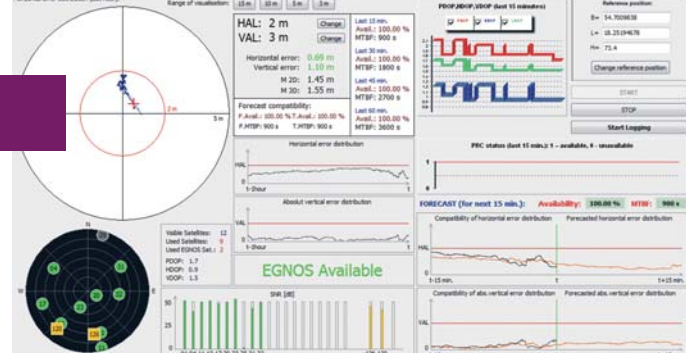
[www.space-comm.pwr.wroc.pl](http://www.space-comm.pwr.wroc.pl)

Wroclaw University of Sciences and Technology (WUST) has been established in 1945. Presently, at 16 WUST Faculties is enrolled more than 34 000 students and more than 2000 academic staff is employed.

Research interests in aerospace engineering is focused on electrical engineering, robotics and structures. Highlights of space programs are onboard communication systems and antennas. Other major contributions are in re-entry space transportation. Various antennas, the broadband communication system and microwave circuits for use onboard small satellites had been developed and have been delivered by WUST to space missions that are space flown or their spacecraft integration are underway for missions planned in 2018. Among them, WUST developed a pair of antennas on the Columbus module/International Space Station for broadcasting digital TV and other signals. These antennas operate in open space flawlessly since 2008.

WUST has developed the broadband communication system and a part of the onboard computer for European Student Earth Orbiter (ESEO) and for SSETI-Express (2005). The antenna contracted by CNES has been developed for its broadband satellites. WUST has implemented an extensive range of activities aiming at transferring technologies originated at space program to maritime 4G/5G communication, avionics for small planes and reduction of toxic emission by power plants. There are ongoing technology developments of polarimetric aerospace SAR radar.

# SSA and Navigation



## Adam Mickiewicz University in Poznan

[www.amu.edu.pl](http://www.amu.edu.pl)

Adam Mickiewicz University (AMU) in Poznań is the major academic institution in Poznań and one of the top Polish universities. Its reputation is founded on tradition, the outstanding achievements of the faculty and the attractive curriculum offered to students.

In addition to its facilities in Poznań, it has campuses in Gniezno, Kalisz, Piła and Ślubice/Frankfurt-Oder. The University currently employs nearly 3,000 teaching staff, including 264 tenured professors, 439 associate professors and 1617 adjunct professors with the Ph.D. title and senior lecturers. The University was founded in 1919 and currently its student population is nearly 49 000 students (over 1000 are international students).

Students may choose between 180 possible professional specialisations. In recent years the educational offer has become increasingly diverse. New educational projects include: integrated studies in humanities, natural sciences, social sciences, and program carried out in cooperation with other institutions both in Poland and abroad. AMU comprises 15 faculties.

## Maritime University in Szczecin

[www.am.szczecin.pl](http://www.am.szczecin.pl)

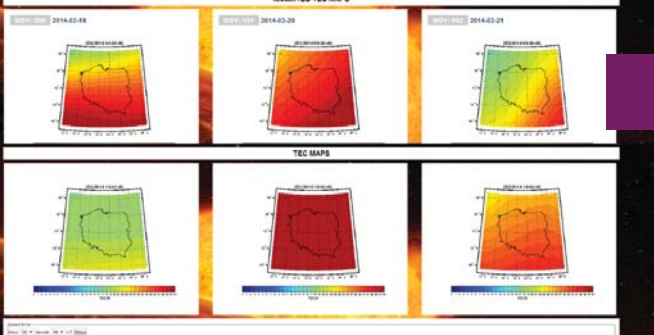
The Maritime University of Szczecin (MUS) is a continuator of State Marine School founded in Szczecin in 1947. Currently, there are 3 faculties at MUS, 2 of which have full academic rights to grant postdoctoral degrees in 2 disciplines. In the Faculty of Navigation, Faculty of Marine Engineering, and the Faculty of Economics and Transport Engineering, offering totally 30 specializations, study almost 4 000 students a year. The mission of MUS is to educate highly qualified maritime staff i.e. navigators, surveyors, mechanics etc. answering the needs of contemporary transport, fishing and offshore fleet and staff prepared to implement supporting computer software, specialized in marine traffic engineering and transport-forwarding-logistics. MUS has over 100 well-equipped laboratories, a modern research-training vessel the m/s Nawigator XXI and more than 20 technically most advanced simulators. The Faculty of Navigation prepares students to work in the following fields: navigation, transport, geoinformatics, marine informatics, offshore survey, ocean engineering and ship technology. Research on application of global satellite navigation systems in wide maritime and inland marine domain, navigation systems, and satellite navigation systems in particular, are part of Faculty's employees research interests. Amongst others, the Institute of Marine Traffic Engineering concluded the project EMPONA for ESA and the Institute of Marine Geoinformatics is the leader of the Polish White Paper of Spatial Hydro Information.

## National Institute of Telecommunications

[www.itl.waw.pl](http://www.itl.waw.pl)

The National Institute of Telecommunications (NIT) is a modern research & development institution operating in the area of telecommunications and information technology. It conducts works in the scope of development of the state telecommunications network, normalization and standardization of telecommunication systems and devices. NIT now employs about 250 persons among them the team of scientists and experts with high competences in the field of telecommunications and information technology, in its three centres: in Warsaw, Wrocław and Gdańsk. It has a stable economic position and manages to operate effectively in new market conditions and in a quickly changing environment. An extremely quick pace of changes in those areas and a related emergence of the information civilization understood as a combination of the information society and the knowledge-based economy, constitute challenges the Institute is able to meet. Undoubtedly it is possible due to a long-term tradition of the NIT and resulting experiences, highly qualified scientific and engineering staff and tangible resources. General mission of the National Institute of Telecommunications is: to serve purposes of the development of information society and knowledge-based economy, to provide a scientific, research and technical support to any institutions of the state, to perform works used in practice by entities operating in the market.





## SSA and Navigation

### Polish Naval Academy in Gdynia

[www.amw.gdynia.pl](http://www.amw.gdynia.pl)

Establishing Naval Officers School was connected with regaining independence in 1918. In 1922, The Naval Officers School in Toruń was founded. In the pre-war period the school trained more than 250 Navy officers. During the WWII as early as November 1939 the Naval Officer School was re-activated in the British naval base of Davenport, later at Okehampton. The School served the Polish Navy until December 1946, when it was closed down. After the WWII the main objective was to recreate, in fact build from the start, the Naval Officers School in new location – on Oksywie – part of Gdynia. It started to operate as early as 18 January 1946 and has continued its mission up to the present. The school, with the passage of time, has reached higher and higher levels of excellence. Today it is a state-owned university opens to all educational needs of the whole coastal region, for military as well as civilian youths. Institute of Navigation and Naval Hydro-graphy of the Polish Naval Academy was founded in January 1973. It is a part of Faculty of Navigation and Naval Weapons which has been authorized of awarding the doctoral degree since 80's. The main fields of interest of Institute are: the navigational infrastructure of Polish maritime territories, procedures of estimation of maneuverability of ships and vessels, new procedures of seabed's shape estimation and description of bottom structure, methods of determination of the base-line of the Polish territorial sea and exploitation's aspects of radionavigation systems, especially satellite systems.

### University of Warmia and Mazury in Olsztyn

[www.uwm.edu.pl](http://www.uwm.edu.pl)

The University of Warmia and Mazury in Olsztyn (UWM) was founded on 1 September 1999. Currently, there are 17 faculties at UWM, 11 of which have full academic rights, namely the right to grant postdoctoral degrees (in 13 disciplines). Furthermore, the doctoral degree can be granted at 16 faculties, within 24 disciplines.

The Faculty of Geodesy and Land Management prepares students to work in the following fields: digital photogrammetry and Internet photogrammetry, close range photogrammetry, engineering geodesy, satellite geodesy, higher geodesy, geomatics and spatial information systems, land management, numerical cartography, cadastral survey and common appraisal, mathematics and mathematical statistics, spatial and archeological reconstruction, positioning and navigation systems, remote sensing and photointerpretation, theory of deterministic chaos in dynamic analyses, theory of environment and real estate evaluation. Research on application of global satellite navigation systems, improving methods of acquiring, gathering and processing geodetic and satellite data and their use in special information systems as well as optimizing methods of space management are only a few examples of scientific fields of interest of the faculty employees.



**Centre for Advanced Studies in Astrobiology (CASA) in Szczecin**  
[www.astrobiologia.pl](http://www.astrobiologia.pl)

CASA\* is a virtual scientific institution in Poland active since 2003. Its main goals are to perform and coordinate interdisciplinary research in astrobiology, develop advanced technologies, train the next generation of researchers and increase the public awareness for science. CASA\* is organized as a consortium of five Founding Institutions: the Space Research Centre, the Nicolaus Copernicus Astronomical Centre, the Institute of Paleobiology of the Polish Academy of Sciences in Warsaw, the Nicolaus Copernicus University in Toruń and the University of Szczecin. The headquarters of CASA\* are at the Faculty of Mathematics and Physics of the University of Szczecin. CASA\* brings together research teams whose experience covers the topics of astronomy, astrophysics, biopolymer physics, statistical physics, cosmic physics, medical genetics, space medicine, microbiology, biogeology, biosedimentology and geomicrobiology. One of the largest CASA\* programs "Through Cosmic Dust to DNA" is designed along five scientific topics, namely the origin, structure and evolution of planetary systems; mutagenic effects of cosmic radiation; effects of ionizing radiation on organic and inorganic molecules; search for life under extreme conditions and carbonate and siliceous minerals and sediments as carriers of traces of extant and past microbial life. CASA\* is participating in EANA (European Astrobiology Network Association), several COST actions and in a number of international projects.

**Institute of Geological Sciences Polish Academy of Sciences in Warsaw**  
[www.twarda.pan.pl](http://www.twarda.pan.pl)

Institute of Geological Sciences PAS (IGS PAS) was established in 1956. The first half of century of institute activity was focused on investigations of Earth. Since 2008, extraterrestrial topics emerged in IGS PAS. Geological studies of Mars, meteorites, and impact craters have become major scientific paths of the IGS PAS Research Centre in Wrocław. The main subject of planetary investigations are analyses of surficial processes on Mars including (1) reconstructions of past glacial, fluvial, lacustrine, mass-wasting, volcanic, and tectonic events on the basis of comparative studies and geomorphological mapping in the equatorial trough system Valles Marineris, (2) searching for water and related sulfate minerals in the Martian polar regions, and (3) investigation of slope relief changes due to Deep-Seated Gravitational Slope Deformation (DSGSD) and its correlations with terrestrial examples. Another Martian topic is trying to answer whether the subsurface of Mars was a habitable environment using studies of fracture networks and secondary mineralization of altered Martian meteorites. The studies of impact craters includes structure investigation by 3D scanning and modeling, as well as crater dating by charcoal emplaced within proximal ejecta blanket.

**Institute of Nuclear Physics of the Polish Academy of Sciences in Krakow**  
[www.ifj.edu.pl](http://www.ifj.edu.pl)

The Institute of Nuclear Physics (IFJ PAN) performs research of high international visibility and is a research institution with a large scientific and technical potential. Wide scope of interest includes theoretical and experimental research in the fields of particle physics and astrophysics, nuclear and strong interaction physics, condensed matter physics as well as interdisciplinary research in a range of related fields.

Key activities of the Institute involve participation in large-scale experiments carried out through global research collaborations. Major observational astronomy and astroparticle projects are H.E.S.S., HAWC and CTA detecting very-high energy gamma photons, AUGER and CREDO measuring ultra-high-energy cosmic rays, T2K studying neutrino oscillations, and SUNLAB searching for dark matter particles. Through these projects IFJ participates in worldwide networks for multi-messenger studies of astronomical objects.

Theoretical studies in high-energy and plasma astrophysics, that treat particle acceleration and transport processes, are carried out using super-computer simulations.

Another activity of IFJ are measurements of cosmic radiation doses in space, with the aim on determination of radiation risk to astronauts. They are carried out mainly within European Space Agency projects (e.g., MATROSHKA – exposure of a human phantom at the International Space Station), using miniature thermoluminescent detectors developed at the IFJ.

### Main School of Fire Service in Warsaw

[www.sgsp.edu.pl](http://www.sgsp.edu.pl)

The Main School of Fire Service (SGSP) is a state services technical university supervised by the Minister of Interior and Administration. SGSP is the only one scientific and educational entity in Poland which is appointed to train fire officers (Eng./Bach./Msc. Eng.). The mission of the university is to train specialists in civilization and natural threats analyses, life, health and property protection and other valuables, but also to educate students in the feeling of patriotism and sacrifice in duty with respect to duty discipline. At the same time SGSP is an operational unit of the State Fire Service. SGSP is a two-faculty university, which educates in safety engineering in two specialties: Fire Safety Engineering and Civil Safety Engineering. Among our students there are fire-fighters of the State Fire Service, officers of other emergency services and fire services supervised by the Minister of Interior and Administration as well as "civilian" students not depended on the Ministry. Civil Safety Engineering Faculty educates specialists in civil protection/safety engineering encompassing civil planning, organisational preparedness against threats and prevention and liquidation of disasters' consequences. SGSP contributes in research projects which are realized in frames of bilateral and multi-lateral international cooperation. Since 2004 SGSP is a member of the European Fire Service Colleges' Association – EFSCA which was chaired by the University in 2009/2010.

### Military Institute of Aviation Medicine in Warsaw

[www.wiml.waw.pl](http://www.wiml.waw.pl)

The Military Institute of Aviation Medicine was established shortly after Poland regained its independence. The scientific activity undertaken by the Institute dates back to January, 1928 when the Aviation Medical Centre was set up in Warsaw on order of the later first Marshal of Poland Józef Piłsudski. It was the first health care centre serving the needs of aviation. In 1931, built the first low pressure chamber and thus began equipping the Institute in other devices and aviation simulators. The Institute is proud to be continuing and developing this tradition.

Currently the scientific activity at the Institute focuses on the issues of aviation pathophysiology and psychology, connected with the diagnostics and treatment of diseases limiting the ability to perform air service. Moreover the unique character and range of work carried out at the Institute is focused around Scientific and Didactic Centre, Aeromedical Training Division, Clinical Centre, Medical Assessment and Occupational Medicine Centre, Night Vision Training System.

### National Centre for Nuclear Research in Swierk

[www.ncbj.gov.pl](http://www.ncbj.gov.pl)

NCBJ is the largest research Institute in Poland with over 1000 employees. It operates Maria, the sole in Poland research nuclear reactor. It conducts both fundamental and applied research in various fields of physics (elementary particle physics, nuclear physics, hot plasma physics, astrophysics etc.), nuclear power, application of ionizing radiation in medicine, industry etc.

Fundamental research includes experimental and theoretical efforts to discover the most fundamental laws of nature. We have participated in large international research consortia organized to delve deep into the smallest elements the matter is composed of, as well as have built proprietary robots capable to observe deep skies. To that end we have developed indispensable research infrastructure, in particular Świerk Computing Centre.

Space technologies are developed / space-related research is conducted in NCBJ Astrophysics Division, as well as in NCBJ Department of Nuclear Techniques & Equipment. In particular, NCBJ has contributed to construction of the POLAR Detector launched on September 15, 2016 on board Tiangong-2 Chinese space station to measure photon polarization in Gamma Ray Bursts. NCBJ has been involved in the EUSO experiments for ISS and stratospheric balloons aimed to detect extreme energy cosmic ray particles. Researchers from NCBJ have participated in analysis of scientific data acquired by satellites launched within framework of a number of international space missions (AKARI, WISE, others).

## Space Research Centre of the Polish Academy of Sciences

[www.cbk.waw.pl](http://www.cbk.waw.pl)

CBK is the only institute in Poland whose activity is fully dedicated to research into Space, solar and planetary physics using space technology and satellite techniques. Five main CBK's research areas are: physics of the Sun (a division in Wrocław, Poland), study of planets and small solar system bodies, interplanetary space physics and astrophysics, plasma physics and • planetary geodesy and geodynamics with Astrogeodynamic Observatory in Borowiec.

Moreover, CBK's activities cover:

- Regional Warning Centre Warsaw, which is the branch of International Space Environment Service (ISES), responsible for measurements and predictions of solar activity and related Earth phenomena.
- CBK is present on the Polish Polar Station Hornsund on Spitsbergen to monitor polar ionospheric conditions using ionosond, riometer and GPS receivers for scintillation monitoring.
- RIMS station of EGNOS system in Warsaw provides permanent GNSS observations for the EGNOS corrections.
- Crisis Information Centre in Warsaw uses satellite imagery to improve performance in the area of emergency and crisis management.
- Astrogeodynamic Observatory in Borowiec provides permanent GPS observations and international laser ranging service designed to track space debris.
- AO Borowiec determines and distributes a very precise time scale with accuracy provided by Cesium Fountain atomic clock.

• Also, AO Borowiec operates within the international network of LOFAR telescopes dedicated to diagnosing the ionosphere.

• The Geodynamic Laboratory in Książ provides permanent observations of tidal and non tidal signals of gravity and tectonic deformations  
CBK offers Ph.D. studies in Space Physics, Geodynamics and space technologies and technics.







## Adam Mickiewicz University in Poznań

[www.astro.amu.edu.pl](http://www.astro.amu.edu.pl)

The history of the Astronomical Observatory of Adam Mickiewicz University in Poznań begins in 1919 shortly after Poland regained its independence after the First World War. The Observatory is a part of the Physics Faculty, with 35 staff including 20 researchers. From the very beginning scientific activities of the Faculty covered the fields of astrometry and celestial mechanics. Recently scientific research has been extended also to astrophysics. Education at the Observatory includes undergraduate and postgraduate studies in astronomy as well as introductory lectures for students of geography and physics. Main research areas include: dynamics of artificial satellites, dynamics of Small Bodies in the Planetary System, dynamics of comets in the Oort Cloud, physical studies of asteroids, radial velocities of stars, stellar astrophysics.

## Jagiellonian University in Krakow

[www.oa.uj.edu.pl](http://www.oa.uj.edu.pl)

The Astronomical Observatory is an Institute within the Department of Physics, Astronomy and Applied Computer Science of the Jagiellonian University in Krakow. It is named after Nicolaus Copernicus and is based at Fort Skala, some 10 km (6 miles) west of the centre of the city. Travel is through either of the settlements of Bielany or Zakamycze. The University was founded in 1364, the Observatory - in 1792. Since that moment the scientific program of the Observatory has covered observations of the positions of the Sun, the Moon and Jupiter satellites, stellar occultations, celestial mechanics of the Solar System and binary stars, meteorological observations, research of eclipsing binaries, the rotation and figure of the Moon. A detailed history of the Observatory is available. Currently, there are about 40 scientists, actively carrying out research in the following fields: cometary physics, photometry and modelling of various stars, the observation of radio emission from the Sun, extragalactic radio sources, active Galactic nuclei, the interstellar and intergalactic medium, galactic physics, magnetic fields in the Universe and the large-scale structure of the Universe. Research is often in cooperation with a number of other institutions both in Poland and abroad, using a wide range of instruments and satellite observations.

## Nicolaus Copernicus Astronomical Centre of the Polish Academy of Sciences in Warsaw

[www.camk.edu.pl](http://www.camk.edu.pl)

The Nicolaus Copernicus Astronomical Centre (CAMK) was founded in 1978, based on the Astronomy Unit of the Academy, set up in 1956. The construction and equipment of CAMK were made possible thanks to help from the American astronomical community. CAMK was one of the pioneers of numerical computing methods, networks and Internet in Poland, and was equipped with one of the first microcomputers. Many highly regarded Polish astronomers who now work around the world originally came from the Centre. Currently all the major areas of astrophysics are studied at CAMK. Research is carried out in stellar evolution, the theory of accretion, high energy astrophysics, the dynamics of stellar systems, cosmology, relativity theory, the astrophysics of neutron stars, numerical simulations and other fields. Astronomers from CAMK are involved in a number of major international observational projects such as: H.E.S.S. and CTA (observations of ultra-high energy photons (TeV) via detection of Cherenkov radiation), Herschel (satellite observations in IR domain), SALT (Southern African Large Telescope), INTEGRAL, Fermi (satellite observations of gamma rays) and in LIGO-VIRGO project for detection of gravitational waves. Two projects are financed in part by European Research Council: SOLARIS, search for extrasolar planetary systems, (Starting Independent Researcher Grant) and Araucaria (measuring the cosmic distance scale with 1% accuracy). The ground station for the control of the first Polish scientific satellite BRITE is also located at the CAMK.



## Nicolaus Copernicus University in Torun

[www.umk.pl](http://www.umk.pl)

The Torun Centre for Astronomy is a part of the Faculty of Physics, Astronomy and Informatics of the Nicolaus Copernicus University. It was created by a union of the Torun Radio Astronomy Observatory and the Institute of Astronomy on January 1st 1997. The TCA is an optical and radio observatory located in Piwnice about 15 km north of Toruń, Poland. It houses two single-dish antenna telescopes, 32 metres and 15 metres in diameter, as well as the largest Polish optical telescope – 90 cm Schmidt-Cassegrain camera. The facility is operated by the Nicolaus Copernicus University. Also, photometry using 60 cm Cassegrain telescope is made and radio measurements of the Sun at a frequency of 127 MHz have been recorded on a daily basis since 1958 using a 23 m interferometer. Since 1981 the observatory has been a part of a worldwide network of radio telescopes participating in VLBI (Very Long Baseline Interferometry). The 32 m telescope is a 620-ton construction. It is used in VLBI experiments, as well as spectroscopic, flux, polarisation measurements and pulsar observations. The 15 m telescope is used for training students of the Nicolaus Copernicus University. The observatory's role as a VLBI station is unique in central/eastern Europe. The research concentrates on observations and theoretical interpretation of physical processes in compact active regions of radio galaxies and quasars, observational cosmology, the timing of pulsars, the search for new planetary systems and Solar System studies.

## Pedagogical University in Krakow

[www.up.krakow.pl](http://www.up.krakow.pl)

The idea of building a modern astronomical observatory in a mountainous region, and therefore in good climatic conditions came in the first half of 1983. It was accepted by the management of the Krakow Pedagogical University. It was decided that the best place to build the observatory would be the peak of Suhora in the Gorce mountain range, 1,000 m above sea level. This location was several kilometres away from the nearest villages, and was surrounded by a large forest, now a national park. Supporting the idea of building the observatory at the Suhora site was the presence of a chair-lift at nearby Tobołów (934 m above sea level), which solved many transportation problems. Since 1991, Mt. Suhora observatory has been part of a world-wide network of astronomical observatories called The Whole Earth Telescope, which carry out simultaneous observations of the variable stars (at specific set times), whenever possible throughout a 24 hour period. The observatories are situated at various geographical longitudes around the globe such that, if in one location night is ending, a different site further to the west can continue the observations. Two week observation sessions, coordinated by the headquarters, take place a few times each year. The research is primarily focussed on white dwarfs, high density and compact stars which are in the final stages of their evolution. Pulsations in these stars cause brightness changes of between 0.005 to 0.2 mag.

## University of Warsaw

[www.astrouw.edu.pl](http://www.astrouw.edu.pl)

The Astronomical Observatory of the University of Warsaw was founded in 1825 and during its almost two century long history has continued scientific research and educational work. The Institute is located in the historical building in the beautiful old Lazienki Garden. The Observatory is a relatively small Institute, its research staff counts 17 astronomers including eleven astronomers with a Full Professor title, two members of the Polish Academy of Arts and Sciences and two members of the Polish Academy of Sciences. Typically about 10 PhD students complete the scientific research staff. The high scientific position of the Observatory's astronomers is highly recognized by the scientific community in Poland and worldwide. Astronomers from the Observatory are very often awarded the most prestigious scientific awards in Poland. The Observatory is the headquarters of two widely recognized worldwide large scale longterm sky surveys: OGLE and ASAS - leaders in the new field of modern astrophysics. Astronomers from the Observatory are also actively involved in many well-known astrophysical collaborations like Araucaria, H.E.S.S., CTA, LIGO/VIRGO and satellite missions like Planck and Gaia. The Observatory operates two observation stations. The northern station is located in Ostrowik near Warsaw and it is used mainly for educational and training purposes. The southern station is located at the Las Campanas Observatory, Chile (LCO) - one of the best astronomical sites in the world.



## University of Wrocław

[www.astro.uni.wroc.pl](http://www.astro.uni.wroc.pl)

The Astronomical Institute is located in the Eastern part of Wrocław, in a quarter called Sepolno. There is a dome at the top of the highest, three storied building. The dome contains a 20-cm Clark-Repsold refractor. There are two departments in the Institute: the Department of Astrophysics and Classical Astronomy and the Department of Solar Physics and Space Science.

Tasks of the Institute include:

1. It is the home institution for teaching astronomy within the undergraduate studies at the Wrocław University.
2. Bialkow Observatory, which is a part of the Institute, works as one of five professional observatories in Poland. There are actually two professional instruments in the observatory: a 60-cm reflector and a 53-cm coronagraph. Observing staff take part in the international programs and observational campaign's observing both the Sun and stars.
3. It popularizes astronomy at primary and secondary school level. Since its foundation, the Astronomical Institute was a part of the Faculty of Mathematics, Physics, and Chemistry. As the institute developed and the number of the students increased considerably, a need for reorganization appeared. In 1995 the Faculty of Chemistry was created. A year later, the remaining part of the old faculty split into two separate faculties: Mathematics and Informatics, and Physics and Astronomy.

## University of Zielona Góra

[www.uz.zgora.pl](http://www.uz.zgora.pl)

The Institute of Astronomy University of Zielona Góra was established in 2000 at the Faculty of Mathematics, Physics and Technology of School of education. Currently the Institute is entitled conduct an Astronomy course with specialization in Computational Astrophysics. In autumn 2005 the observation tower called Braniborska Tower was completely restored and transformed into a modern astronomical observatory. The tower was built originally between 1841 - 1860. The original purpose of the tower was to provide opportunity to observe the night sky above and surrounding landscape for the citizens of the Lower Silesia (now Lubuskie County). Nowadays, a telescope is placed at the top of this building. So this old building, according to its tradition, is host to a new observatory. Under a 3-meter dome, we installed a 14-inch Meade LX200GPS telescope equipped with a CCD ST-8XE camera and UBVRI, LRGB filters. The main topics we deal with are: the theory and modelling of radio and X-ray emission from pulsars; neutron stars, strange stars and black holes; plasma astrophysics; relativity theory; modelling gravitational waves; celestial mechanics and planetary exploration; extragalactic astronomy and cosmology; modelling of interstellar extinction and mathematical physics. In addition, employees of the institute together with students are involved in several projects related to observations in radio, optical and high Energy (X-rays, gamma) wavelengths.



## European Space Foundation

[www.spacefdn.com](http://www.spacefdn.com)

European Space Foundation was founded in 2014 as a non-government institution that supports research and educational projects focused on space and robotics. It also deals with cooperation and knowledge transfer between companies and institutions. Its main mission is to promote science, technology, engineering and mathematics. Among many European Space Foundation initiatives can be mentioned:

- Organizing the European Rover Challenge – the biggest space and robotics event in Europe, that gathers every year hundreds of young Mars rover constructors from all over the world and tens of thousands of visitors.
- Initiating the long-term Baltic Challenge project focused on support the development of efficient robotics and space technologies for the purpose of exploration and exploitation of the aquatic and hard to access environment of the seas and inland water on the Earth and on the other planets and their moons.
- Initiating the project of building of the first Polish Mars habitat (crowd-funded and located primary in Southern Poland) where international simulations for the analogue astronauts are taking place.
- Publication of reports in the field of cosmology and robotics in Poland (eg research on the potential of student robotics teams or the image of Polish space sector entities).

## Mars Society Polska

[www.marssociety.pl](http://www.marssociety.pl)

Mars Society Polska was founded in 1999. It is a non-profit organization bringing together professionals and enthusiasts of the space industry. The main reason to establish Mars Society Poland was to lead to the first manned mission to Mars. Mars Society Poland belongs to a broader community of similar organizations in ten-odd other countries on several continents. Mars Society Poland works for the development of science, education and popularization of knowledge in the field of space research and exploration. Mars Society Polska also support the space sector in Poland.

The following are ventures implemented by Mars Society Polska:

- educational competitions - Red Rover Goes to Mars,
- scientific and technical projects of the manned Mars vehicle - Mars Pressurized Rover,
- Columbia Negotiations Project simulation game design,
- Polish teams in University Rover Challenge,
- participation in the Mars Desert Research Station mission simulation,
- supporting Martian base projects,
- ASTROBOT – an astronaut competition for junior high school students,
- assistance in creating algorithms of 3D RODM Mars models,
- Mars Festival and popular science lectures on space exploration,
- cyclical organization of the competition of Mars rovers - European Rover Challenge as part of training space sector staff.

## Polish Astronomical Society

[www.pta.edu.pl](http://www.pta.edu.pl)

The Polish Astronomical Society (PTA), established in 1923, is the major organization of professional astronomers in Poland, bringing together about 300 members. The objectives of the Society are promoting the advancement of the Science of Astronomy and its teaching and encouraging popular interest in Astronomy. This is achieved by means of: holding conventions, symposia, scientific meetings recognizing outstanding achievements by awarding medals and prizes publishing periodicals (e.g., *Urania - Postępy Astronomii* [*Urania - Advances in Astronomy*], which is one of the oldest in the world among popular astronomy magazines) evaluating the state and needs of the Polish astronomy collaborating with affined organizations in Poland and abroad. The primary activities of PTA are its biennial conventions, during which scientific accomplishments of Polish astronomers are presented. The current state of affairs in Polish astronomy is analysed, which enables the coordination of scientific and organizational activities nationwide. Between 1923 and 2013, thirty six PTA conventions have taken place.





### Polish Society of the Admirers of Astronomy

[www.ptma.pl](http://www.ptma.pl)

The origins of Polish Society of the Admirers of Astronomy, under the auspices of the Polish Academy of Sciences, is one of the oldest companies in Poland. Proper beginning of the creation of the Society was the appearance in 1919 Brorsena-periodic comet Metcalf ((23P / 1919 Q1) (1919 III) (1919b). The aim of the Society is to practice and increased public awareness about the Universe by:

- creating the union of people working in the field of astronomy and related sciences, and interest in these areas of knowledge,
  - familiarizing members of the Society of the latest progress of astronomy and related sciences and to stimulate your own research,
  - popularization of astronomy among the most extensive areas of society, particularly young people.
- The company achieves its objectives by:
- the establishment and operation of astronomical observatories and planetariums,
  - publishing including magazines, books, yearbooks, maps, atlases, newsletters, and other teaching aids and scientific,
  - the organization of technical and scientific laboratory to facilitate members of independent research and observation,
  - research,
  - Public decoration shows the sky,
  - the creation of special libraries,
  - Wheels Astronomical School organization,
  - lectures and organizing scientific conferences,
  - maintaining contacts with similar institutions in the country and abroad.

### Polish Rocketry Association

[www.rakiety.org.pl](http://www.rakiety.org.pl)

The Polish Rocketry Association was founded in February 2010 to gather all amateurs of experimental rockets builders and to coordinate their activities. We associate people of different professions such as: mechanics, electronics, chemists, designers, IT designers, students and many others. In October 2010 Prof. Jacek Walczewski, co-founder of METEOR 2K research rocket (altitude ca. 100 km in 1970) joined PRA as an honorary member. As part of our activities we take part in popular science events in Poland, perform shows, make model trainings; we do our best to get people interested in rocketry. We organize rocket meetings in Poland to launch experimental rockets and model rockets. This kind of our activity is possible thanks to cooperation with the Polish Army, which opens military areas for safe flights. We cooperate also with universities, research institutes and foreign organizations presenting similar goals and activities. Our achievements, as for now include building a supersonic rocket, which reached a height of 4.5 km, made a movie from board, collected flight data and landed safely. Our next plan is to achieve a flight altitude of 10 km by using a hydride rocket motor, which is under construction now. Our dream is to develop a Polish amateur research rocket which is able to reach an altitude of 100 km. We would like to expand the knowledge and change the attitude of Poles in respect to the civil use of rocket techniques and history of Polish research rockets.

### UNEP/GRID-Warsaw Centre

[www.gridw.pl](http://www.gridw.pl)

UNEP/GRID-Warsaw Centre, a branch of the National Foundation for Environmental Protection (a non-governmental organization), is a specialized, UN-affiliated agency collecting, processing, and disseminating environmental information for Poland and other countries. Specific areas of expertise and activity entail analyses of spatial data on environmental and socio-economic phenomena and processes; geodatabase development and maintenance (incl. data harmonization according to the INSPIRE implementing rules); development and market application of GIS solutions and geoportals as well as practical implementation of result of scientific discovery related to novel geoinformation tools and methods. Centre is involved in capacity building, providing specialized trainings, educational materials and publications targeted primarily at public administration bodies and related to the use of remote sensing tools, GIS tools and applications (with focus on open source solutions), spatial data (provided accordingly to the INSPIRE Directive, open data, Copernicus products, etc.) for environmental management, spatial planning, crisis management, etc. UNEP/GRID-Warsaw Centre is associated with the NEREUS as DORIS\_Net Regional Contact Office (RCO) in the Mazovia Region – centre focused on promoting use of satellite data and technologies as a trigger for development of the region. Centre is also a member of Copernicus Academy, bridging the gap between skills and the use of satellite data by implementation of education and networking activities.

## Supporting Institutions



**University of Warsaw - Department of International Aviation and Space Law**  
[www.wpia.uw.edu.pl](http://www.wpia.uw.edu.pl)

The Department of International Aviation and Space Law is a division of the Institute of International Law operating at the Faculty of Law and Administration of the University of Warsaw. The Department has been established in 1990, thanks to the efforts of prof. dr hab. Zdzisław Galicki, who was subsequently managing its work for over 20 years. Currently, the research conducted at the Department is directed by dr hab. Katarzyna Myszona-Kostrzewa, a long-standing member of the Committee on Space and Satellite Research of the Polish Academy of Sciences. The Department of International Aviation and Space Law is, so far, the only research unit dealing with international space law in Poland.

As part of the work carried out by Department, research related to the development of international space law is conducted, with special regard being given to the legal aspects of the use of new technologies, including satellite technology. Master's theses on space law are written under the auspices of the academic staff of the Department. The Department is also responsible for education of students in the field of international space law.

**Committee of Space and Satellite Research of the Polish Academy of Sciences**  
[www.kbkis.pan.pl](http://www.kbkis.pan.pl)

Committee of Space and Satellite Research of the Polish Academy of Sciences (CSSR) tenure performs the following tasks: Integrating and stimulating research in Poland and the use of space and scientific cooperation with foreign and international organizations in this field and have representation in Poland. Supporting action taken on Poland's accession in membership into the European Space Agency, and the creation of a Polish Space Agency. Promotion of space research in radio, television and other media. The structure of the Committee is formed by Bureau and Sections Committee. Currently, the Committee consist of five sections:

- Section of Astronautics and Space Technology,
- Section of Astrobiology and Space Medicine,
- Space Physics Section,
- Section of Satellite Geodesy,
- Section of Remote Sensing.

CSSR is the representative of Poland in COSPAR.



## Silesian Planetarium in Chorzow

[www.planetarium.edu.pl](http://www.planetarium.edu.pl)

The biggest and the oldest planetarium in Poland was founded in 1955 to commemorate a great astronomer - Nicolaus Copernicus. It is provided with Zeiss projection apparatus, placed under the 23 metres dome - the screen of the artificial sky. Almost 400 spectators can watch the programme at one time. The planetarium sky is an exact picture of the real firmament under which different lectures take place. The telescope with a 30 cm lens situated in the Astronomical Observatory enables astronomers who work in the Planetarium to follow planetoids and comets. On fine days, visitors can observe the Sun, and after the sunset – admire the most interesting night objects, magnified up to 750 times. Time is measured by the big sun-dial which is situated in the planetarium yard. The meteorological and seismologic stations are on regular duty. Due to their standard equipment it is possible to run attractive lessons for students. The exhibition placed in the ring surrounding the dome is worth seeing when you visit the Planetarium. In the video room, decorated with portraits of Polish astronomers, visitors can meet an astronomer and discuss current astronomical events. An astronomical contest is organized for students showing great interest in astronomy and physics. A group of amateurs can take part in the meetings organized by various clubs and also by the Silesian Department of the Polish Amateurs Astronomical Society. They can use all the attractions of Planetarium, including the library with over 10 thousand books and magazines.

## Observatory and Planetarium in Frombork

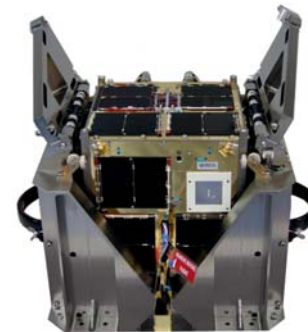
[www.frombork.art.pl](http://www.frombork.art.pl)

The planetarium is situated in the belfry, also called the Radziejowski's Tower. It is equipped with Carl Zeiss machinery and projects on the dome (8 m in diameter) the images of the sky seen from any place on Earth, any time of day or year. It depicts on artificial sky the course of the Sun, planets, comets, artificial satellites, and images of over 6000 stars. Astronomical observatory – around 1.5 km southwest from Frombork, on a hill positioned 47 m over sea level (known as the Crane Mountain). It has at its disposal pavilions with instruments for observing the sky – telescopes etc.; observatory platform, and a research building, small library and dark room. The observatory serves mostly educational purposes. In the summer it hosts the astronomy fans group organised by the educational program called Holidays in the planetarium.

## Planetarium in Grudziadz

[www.planetarium.grudziadz.pl](http://www.planetarium.grudziadz.pl)

The Nicolaus Copernicus Planetarium and Astronomical Observatory in Grudziadz has been running for over 40 years. Since 1972, over 35 years of activities relating to popularize astronomy, Grudziadz Planetarium and Observatory, was visited by over 250,000 people. Grudziadz Planetarium and Observatory is also the organizer of the National Youth Seminar for Astronomy (OMSA). In 2009, for the twenty-fifth time the final of the competition took place. The main operations of the planetarium are projections for schools teaching about different types of nature, astronomy, geography and physics, also for preschoolers. The planetarium is visited each year by approx. 8,000 people.



## Observatory and Planetarium in Olsztyn

[www.planetarium.olsztyn.pl](http://www.planetarium.olsztyn.pl)

In the centre of Olsztyn, the capital of Warmia and Mazury, visitors will find a characteristic building on top of which a dome shimmers with silver flashes. The Olsztyn Planetarium has been one of the major tourist attractions of the city for almost 40 years. Maintaining a balance between entertainment and education, it offers popular shows whose main value is visual attractiveness as well as educational courses under the artificial sky presenting astronomical knowledge which is part of school curricula. On the 539th anniversary of Nicolaus Copernicus' birthday, the Olsztyn Planetarium inaugurated a new digital projection system. Two video projectors are equipped with optics sufficient to cover the whole dome of the projection hall with a 16-million-pixel picture. The picture which surrounds the viewer is controlled live with software which facilitates presenting the starry sky and celestial phenomena as they happen at any moment and in any place on Earth or in space. We can also watch objects in the close and distant Universe while wandering among planets, stars, and galaxies. The projection system works also as a projector for films made in the full-dome technology which are shown by the planetarium. Entering the planetarium hall, it is worth looking at an identical copy of Sputnik 1, the first artificial satellite of Earth. Both the upstairs as well as downstairs hall house permanent exhibitions where visitors can see images of space objects, miniatures of astronomical instruments from the times of Copernicus', and temporary exhibitions frequently arranged.

## W. Dziewulski Planetarium in Torun

[www.planetarium.torun.pl](http://www.planetarium.torun.pl)

The Planetarium is located in the area of the Old Town. The building is an example of industrial architecture and originates from the second half of the 19th century. It was previously used as a gas container for the citizens of Torun. Actually, there were three gas containers but two of them were pulled down in 1927. The remaining one was renovated in the 80's and since 1994 is a home to the Planetarium. The Planetarium's dome is 15m wide. Today, the Planetarium is one of the most popular tourist attractions in Torun. This success was possible, mainly, thanks to fulfilling the expectations of the guests visiting Torun. When they visit the hometown of Copernicus, they look for connections with the Universe and they find them in the Planetarium. Since the Planetarium was opened, the number of visitors has been systematically growing and amounts to over 150 000 each year. Other factors, such as good cooperation with the educational system (it should be added here that about 70% of the visitors are school groups) and the high quality of the presentations contribute to the success. The Planetarium in Torun presents popular astronomical shows that embrace almost the entire scope of the astronomical knowledge. There are also two interactive exhibitions the Geodium and the Orbitarium. The Planetarium has been organized and it is still managed by the Foundation of Friends of the Planetarium and the Museum of Nicolaus Copernicus.

## Copernicus Science Centre, Planetarium in Warsaw

[www.kopernik.org.pl](http://www.kopernik.org.pl)

The Heavens of Copernicus is one of the most comprehensive and modern multimedia planetaria in the world. Since June 2011, it has been located on the Vistula River bank together with the Copernicus Science Centre. Thanks to the applied state-of-the-art multimedia technologies one may feel immersed in the observed, normally unavailable worlds. Make yourself comfortable and let yourself be enchanted with the amazing images of the starry sky. Watch breath-taking movies (also in 3D), visit different parts of the Earth and other planets, reach the borders of the Galaxy, and take part in special live shows. The Heavens of Copernicus planetarium invites you to watch multimedia presentations of well-known scientists and listen to live classical and jazz music concerts. Our repertoire accounts for all tastes, and we keep preparing new surprises for you. You can also attend the night sky observations in the Discovery Park and visit the exhibition Look: there's the Earth! to find out more about our planet. We are very proud of our production studio, which has produced two amazing full-dome pictures: 'Dream To Fly' (nine awards on international film festivals including the Director's Award in Jena) and 'Hello Earth' (two awards on international film festivals). The Copernicus Science Centre along with the planetarium are the Polish partners of ESERO, the educational project of ESA. In this project we share innovative classroom materials, organize meetings and workshops for teachers so they can include Space-related topics in their daily teaching and improve knowledge of STEM disciplines among students.



	advanced materials and nanotechnology	aerospace or space engineering	applied automation	astronomy	automatic control and robotics	aviation and cosmonautics	electronics and telecommunication	industrial computer science	materials engineering	mechanical engineering	mechatronics	navigation	oceanography and ocean engineering	systems engineering	technical physics	tele and applied informatics
Bialystok University of Technology					X		X			X						
University of Bielsko-Biala					X					X						
Higher School of Environmental Protection in Bydgoszcz						X										
Kazimierz Wielki University in Bydgoszcz									X		X					
University of Economy in Bydgoszcz											X					
University of Technology and Life Sciences in Bydgoszcz							X		X	X					X	X
State School of Higher Education in Chelm										X						
State Higher School of Vocational Education in Ciechanow										X						
Czestochowa University of Technology							X		X	X	X				X	
Polish Air Force Academy in Deblin						X										
State School of Higher Professional Education in Elblag										X						
Gdansk University of Technology	X	X			X		X			X	X	X	X		X	X
Medical University of Gdansk										X						
University of Gdansk													X			
Gdynia Maritime University		X					X			X		X				
Polish Naval Academy in Gdynia					X					X	X	X	X			
Silesian University of Technology in Gliwice	X		X		X		X	X	X	X	X				X	
State Higher Vocational School in Glogow					X											
State Higher Vocational School in Gniezno							X									
State Higher Vocational School in Gorzow Wielkopolski										X						
Higher School of Grudziadz										X						
Bronislaw Markiewicz State Higher School of Technology and Economics in Jaroslaw							X									
Karkonosze State Higher School in Jelenia Gora							X									
President Stanislaw Wojciechowski Higher Vocational State School in Kalisz										X						
Engineering College of Mechatronics in Katowice											X					
University of Silesia in Katowice									X		X				X	

# Fields of Education

	advanced materials and nanotechnology	aerospace or space engineering	applied automation	astronomy	automatic control and robotics	aviation and cosmonautics	electronics and telecommunication	industrial computer science	materials engineering	mechanical engineering	mechatronics	navigation	oceanography and ocean engineering	systems engineering	technical physics	tele and applied informatics
Boleslaw Markowski Higher School of Commerce in Kielce							X									
Jan Kochanowski University of Humanities and Sciences in Kielce															X	
Kielce University of Technology					X		X			X						
University of Computer Engineering and Telecommunications in Kielce							X									
State School of Higher Professional Education in Konin										X						
Koszalin University of Technology							X		X	X	X					
AGH University of Science and Technology in Krakow					X		X		X	X	X				X	X
Jagiellonian University in Krakow	X			X					X							
Tadeusz Kosciuszko Cracow University of Technology	X				X				X	X					X	
State Higher Vocational School in Krosno										X						
Jan Amos Komieniski State School of Higher Vocational Education in Leszno										X						
Higher School of Economics and Innovation in Lublin										X						
Lublin University of Technology									X	X	X				X	
State College of Computer Science and Business Administration in Lomza					X											
Lodz University of Technology	X	X			X		X		X	X	X				X	
State Higher Vocational School in Nowy Sacz											X					
Higher School of Computer Science and Management in Olsztyn											X					
University of Warmia and Mazury in Olsztyn										X	X				X	
Opole University of Technology					X		X			X	X					
Higher School of Technology in Ostrow Wielkopolski										X						
Stanislaw Staszic State School of Higher Vocational Education in Pila										X						
Stefan Batory Higher School of Business in Piotrkow Trybunalski											X					
Lower Silesian College of Entrepreneurship and Technology in Polkowice											X					
Adam Mickiewicz University in Poznan				X												
College of Communications and Management in Poznan					X											
College of Education and Therapy in Poznan									X							

	advanced materials and nanotechnology	aerospace or space engineering	applied automation	astronomy	automatic control and robotics	aviation and cosmonautics	electronics and telecommunication	industrial computer science	materials engineering	mechanical engineering	mechatronics	navigation	oceanography and ocean engineering	systems engineering	technical physics	tele and applied informatics
Poznan University of Technology					X		X		X	X	X				X	
East State Higher School in Przemyśl											X					
State Higher Vocational School in Raciborz					X											
Higher School of Business in Radom										X						
Kasimir Pulaski Technical University of Radom							X			X						
Rzeszow University of Technology						X	X		X	X	X				X	
University of Information Technology and Management in Rzeszow							X									
University of Rzeszow									X						X	
Jan Grodek Higher Vocational State School in Sanok										X						
Maritime University in Szczecin										X	X	X				
University of Szczecin													X			
West Pomeranian University of Technology in Szczecin	X				X		X		X	X	X		X		X	
Higher Vocational School in Tarnow							X		X							
Nicolaus Copernicus University in Torun	X			X	X										X	
Alfred Meissner Graduated School of Dental Engineering and the Humanities in Ustron									X							
Consortium of Collegium Varsoviense and Warsaw Higher School of Economics					X											
Military University of Technology in Warsaw		X				X	X		X	X	X					
University of Warsaw				X												
Warsaw University of Technology		X			X	X	X		X	X	X				X	
University of Lower Silesia in Wrocław												X				
University of Wrocław				X											X	
Wrocław University of Technology					X		X		X	X	X			X	X	X
State Higher School of Vocational Education in Zamosc										X						
University of Zielona Gora				X	X		X			X						

## Also Registered on EMITS

Academic Computer Centre CYFRONET AGH in Krakow  
[www.cyfronet.pl](http://www.cyfronet.pl)

Building Research Institute in Warsaw  
[www.itb.pl](http://www.itb.pl)

Center of Theoretical Physics of the Polish Academy of Sciences in Warsaw  
[www.cft.edu.pl](http://www.cft.edu.pl)

Central Mining Institute in Katowice  
[www.gig.eu/en](http://www.gig.eu/en)

Centre of Polymer and Carbon Materials of the Polish Academy of Sciences in Zabrze  
[www.cmpw-pan.edu.pl](http://www.cmpw-pan.edu.pl)

CHEMIN Dorota Piłakowska-Pietras In Wroclaw  
[www.chemin.pl](http://www.chemin.pl)

Electrotechnical Institute in Warsaw  
[www.iel.pl](http://www.iel.pl)

European Regional Centre for Ecohydrology of the Polish Academy of Sciences in Lodz  
[www.erce-unesco.lodz.pl](http://www.erce-unesco.lodz.pl)

Gdynia Maritime University  
[www.am.gdynia.pl](http://www.am.gdynia.pl)

Industrial Institute of Agricultural Engineering in Poznan  
[www.pimr.poznan.pl](http://www.pimr.poznan.pl)

Institute for Renewable Energy in Warsaw  
[www.ieo.pl](http://www.ieo.pl)

Institute of Ceramics and Building Materials in Warsaw  
[www.icimb.pl](http://www.icimb.pl)

Institut of Electronic Technology in Warsaw  
[www.ite.waw.pl](http://www.ite.waw.pl)

Institute of Geography and Spatial Organization of the Polish Academy of Sciences in Warsaw  
[www.igip.twarda.pan.pl](http://www.igip.twarda.pan.pl)

Institute of Metallurgy and Material Science of the Polish Academy of Sciences in Krakow  
[www.imim.pl](http://www.imim.pl)





Institute of Non-Ferrous Metals in Gliwice  
[www.imn.gliwice.pl](http://www.imn.gliwice.pl), [www.imn.skawina.pl](http://www.imn.skawina.pl)

Institute of Physics of the Polish Academy of Sciences in Warsaw  
[www.ifpan.edu.pl](http://www.ifpan.edu.pl)

Institute of Security Technologies MORATEX in Łódź  
[www.moratex.eu](http://www.moratex.eu)

Institute of Spatial Management and Housing in Warsaw  
[www.igpim.pl](http://www.igpim.pl)

Maksymilian Pluta Institute of Applied Optics in Warsaw  
[www.inos.pl](http://www.inos.pl)

National Marine Fisheries Research in Gdynia  
[www.nmfri.gdynia.pl](http://www.nmfri.gdynia.pl)

Police Academy in Szczytno  
[www.wspol.edu.pl](http://www.wspol.edu.pl)

Poznan University of Economics and Business  
[www.ue.poznan.pl](http://www.ue.poznan.pl)

Poznan University of Life Sciences  
[www.up.poznan.pl](http://www.up.poznan.pl)

Tele & Radio Research Institute in Warsaw  
[www.itr.org.pl](http://www.itr.org.pl)

Warsaw University of Life Sciences  
[www.sggw.pl](http://www.sggw.pl)

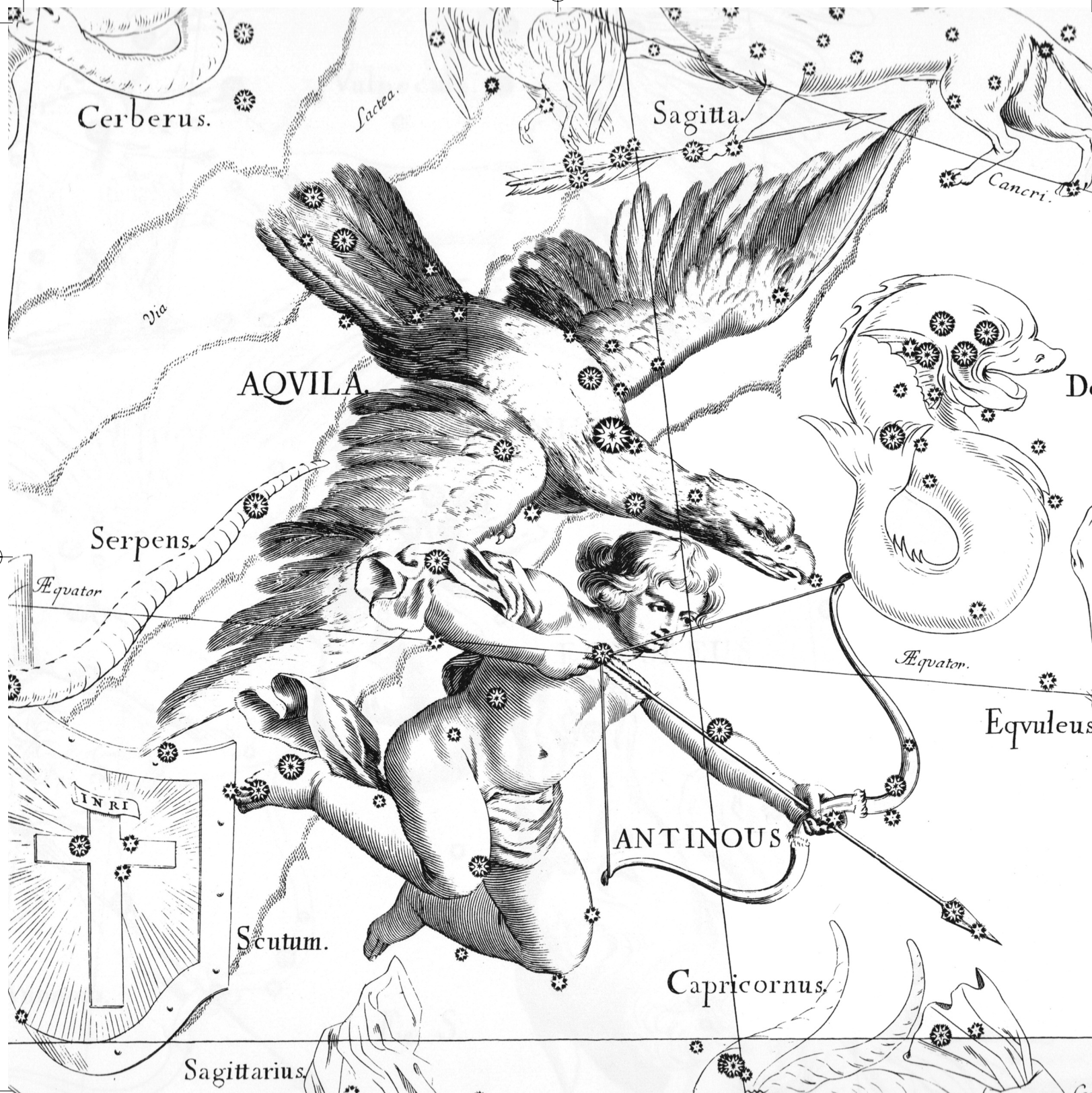
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Wspolna 1/3 str.  
00-529 Warsaw, Poland  
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