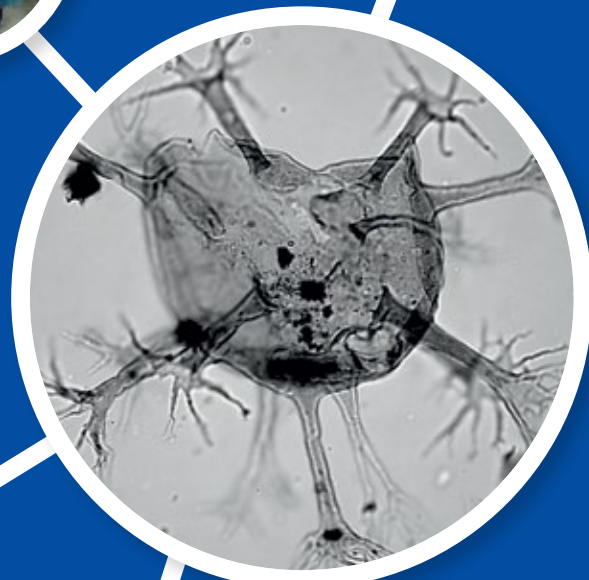


JAGIELLONIAN UNIVERSITY
IN KRAKÓW

RESEARCH HIGHLIGHTS



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

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IN KRAKÓW

RESEARCH HIGHLIGHTS



KRAKÓW 2015



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

This publication is based on data prepared by faculties, interfaculty and interdepartmental units.

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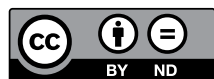
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JAGIELLONIAN UNIVERSITY
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A FEW WORDS OF INTRODUCTION: WHAT WE ARE PROUD OF

6



Dear Readers,

It is with great pleasure that we introduce our new publication presenting an overview of the research activities of Jagiellonian University, located in Kraków, Poland. I would like to sincerely thank the members of the team who made the effort to develop the concept, collect the material, and prepare it for publication. I hope that our work will be met with approval as well as understanding for the necessary simplifications. I am convinced that the guiding principle for this publication, "The Jagiellonian University is the leading scientific research centre in Poland," will defend itself.

Two pillars

The mission of the University is based on two pillars: conducting scientific research that expands our knowledge of the world and humanity as well as educating a new generation of sensible and wise people. The ability to create a harmonious whole from these elements, at the highest possible level, demonstrates the quality and excellence of the University. It should be remembered that the traditional university is neither an invention factory nor a training centre. Scientific research should not be conducted on demand or to deliver particular technical solutions, but is instead intended to broaden the horizons across multiple fields of knowledge. Such progress in research, referred to as **basic research**, is the foundation of future technologies and inventions, which could not exist without it. All of the ideas implemented in the form of new technologies or products had previously been purely theoretical. Narrow, specialist skills are not the crucial elements of the education offered by the University. Instead, the focus lies in developing competencies to conduct critical analyses of problems, mastering the basic methodologies of seeking solutions, stimulating creativity, and promoting courage in reasoning and decision-making.

Science emanates from unrestricted (fortunately!) **human curiosity**. This fundamental characteristic has been transformed into sophisticated methodological tools that not only help us to find answers to questions regarding the surrounding reality, but also help us to evaluate the level of reliability of these answers. Information is gradually gathered, sorted and generalised, allowing theories to be created that describe the mechanisms of the world's functioning at various levels of its complexity. Theories are then used to improve human life, to make life easier and more attractive. This is not just in the consumption of material goods, but also in the sense of feeling and finding one's own place in an ever-changing world. All of this – theory and practice; formulating and verifying hypotheses; fundamental issues and their specific applications – stems from simple curiosity. Thanks to this, it continues to last.





Destination: future

The curiosity of scholars and scientists at the Jagiellonian University, combined with their skills and experience, is reflected in the highest quality of scientific research conducted at our faculties. Every year, about 9,000 scientific publications affiliated with the Jagiellonian University appear in various periodicals. More than one-third of them are published in the most important journals of their respective fields. Six out of the fifteen Faculties were rated with an exclusive A+ category. Four Faculties were granted the status of Leading National Research Centre (KNOW). These facts can be appreciated only when one understands that out of nearly 1,000 Polish research institutions only 45 are ranked in the A+ category, and only 10 boast of the KNOW status.

Our modern research facilities frequently evoke admiration and jealousy among our guests. I am very proud that the Jagiellonian University, with a history dating back 650 years, is one of the leading research centres in Poland, and its achievements are recognised by numerous international bodies.

We continue the work of our renowned graduates and professors in order to meet the new challenges of modern times. We have stated this in our Jubilee motto:

"Inspired by the past, we shape the future."

This publication comprises the **scientific showpieces** of fifteen faculties and six inter- and extra-faculty units of the Jagiellonian University that encompass (almost) the entire spectrum of sciences, from the humanities to engineering. We briefly present branches of scientific research conducted in each unit, the most important achievements, selected leading personalities in every field of knowledge, and the important partners participating in research activities. Page colours not simply ornamental – they represent the gown colours of specific Faculties, whereas extra-Faculty units take on the blue colour of the University.

These colourful showpieces are supplemented with research snapshots, which can be found in *Science Projector* (www.projektor.uj.edu.pl/science-projector).

I sincerely hope that our presentation will convince you of the Jagiellonian University's significant contribution to modern science. I am confident that the future will bring even more successful endeavours. Judge for yourselves whether my pride in these accomplishments is justified.

Prof. Stanisław Kistryn

Vice-Rector for Research
and Structural Funds



650 YEARS OF SCIENCE IN KRAKÓW



The oldest university in Poland

The Jagiellonian University, the oldest university in Poland and the second oldest university in this part of Europe, was founded by King Casimir the Great in 1364. The king's death almost put an end to the University, but in 1400 it was re-established by King Władysław Jagiełło, from whom its current name originates. This was made possible thanks to his wife, Queen Jadwiga of Anjou, who bequeathed a significant number of valuable assets to the Jagiellonian University. At that time, the University consisted of four Faculties: Liberal Arts, Medicine, Law, and Theology.

The Middle Ages and the Renaissance

The oldest university college was first called the King's College, and then the Major College (Collegium Maius).

Two more colleges were established in the 15th century:

the College of Law (Collegium Iuridicum) and the College of Philosophy, also called the Minor College (Collegium Minus). The

University's fame soon spread throughout Europe. The new students were not only from Poland, but were also from Rus, Lithuania, Hungary and Germany. Some were from more remote lands: Switzerland, England, Spain and the Netherlands. Law, mathematics and astronomy enjoyed a high reputation. Most notably, Nicolaus Copernicus, the father of the heliocentric theory, was then a student at the University. However, in the middle of the 16th century the University entered a period of crisis caused by the Reformation and the creation of new institutions of higher education in Europe. Since the end of the 16th century, the University has commonly been referred to as the Academy of Kraków (Academia Cracoviensis).



The reforms of the Enlightenment

The creation of the Commission of National Education in 1773 marked the start of a new epoch. The main purpose of the first national authority for education was a general overhaul of the education system in Poland. The Commission's envoy, Hugo Kołłątaj, took the initiative to radically reform the University. The four faculties were closed and two new colleges were established in their place: the Collegium Morale (Theology, Law and Literature) and the Collegium Physicum (Mathematics, Physics and Medicine). Polish replaced Latin as the language used for lectures (with the exception of theology). Well-known scholars were brought to the University, including Jan Śniadecki, a mathematician and astronomer, which led to the development of natural sciences. During that period, construction began on an astronomical observatory, a botanical garden, a university clinic, and the Collegium Physicum. The reformed University was called the Principal School of the Polish Kingdom (Schola Princeps Regni Poloniae).

1364

King Casimir the Great establishes the University in Kraków

1491/1492

Nicolaus Copernicus undertakes studies in Kraków

15th Century – the Golden Age

Scientific activity of Paweł Włodkowic (Law), Marcin of Olkusz, and Wojciech of Brudzewo (Mathematics and Astronomy)

1517

Tractatus de duabus Sarmatiis by Maciej of Miechów, the first description since antiquity of the lands between the Vistula River, the Don River, and the Caspian Sea



The period of the Partitions of Poland

Despite thorough reforms conducted in Poland, which among other things resulted in the world's second constitution in 1791, the collapse of the country was not halted. In 1795, the third and final partition of Poland took place, and Kraków fell under Austrian occupation. The University was called the Principal School of Kraków. It was later linked with Lviv University and German became the official teaching language. In 1817, the University adopted its current name: the Jagiellonian University. Crucial changes in the history of the University occurred in the second half of the 19th century, after Austria granted Polish Galicia autonomy. Polish was again used as the language of instruction. The year 1887 saw the construction of a new building for the main college (Collegium Novum).

Modern times

In 1918, after the end of World War I, Poland regained its independence and the development of the Jagiellonian University truly accelerated. More than 4,000 young people began studying here in the post-war period. The growth of the University was brutally interrupted by the outbreak of World War II. On 6 November 1939, the Germans arrested 183 members of university staff and transported most of them to the Sachsenhausen concentration camp; the educational site itself was closed. In response, secret schooling involving about 800 students began in 1942. Karol Wojtyła, later Pope John Paul II, was one of these students. Following the war's end in 1945, more than 5,000 students enrolled for the first academic year. The structure of the university underwent numerous changes in the new communist reality. The Faculty of Theology, Faculty of Agriculture and the Faculty of Medicine were transformed into separate academic entities, distinct from the Jagiellonian University. The years 1968 and 1981 were marked by the waves of student protests against the regime.

The university today

The fall of Communism began the next stage of the University's dynamic development. In the late 1990s, a project entitled "Construction of the Campus of the 600th Anniversary of the Jagiellonian University Revival" was launched. Over the last 25 years, new faculties were opened including the Faculty of Biochemistry, Biophysics and Biotechnology, and the Faculty of International and Political Studies. Today, the Jagiellonian University comprises fifteen faculties, with three medical faculties constituting Collegium Medicum. Approximately 50,000 students and doctoral students attend our University. Among our foreign students are the citizens of the European Union, Eastern European countries (Ukraine and Belarus), as well as from Asian and African countries. Today, the Jagiellonian University employs more than 540 professors, 730 habilitated doctors, and 2,600 members of other educational staff. Their mission is to maintain the University's centuries-old traditions of making new scientific discoveries and educating future generations.

Written by Assoc. Prof. Krzysztof Stopka

**Jagiellonian
University –
15 faculties, almost
50,000 students
and 4,000 scholars,
650 years of
tradition**

1777-1780

Hugo Kołłątaj implements reforms of the University in the spirit of the Enlightenment

1874

Tadeusz Browicz, a professor at Jagiellonian University, discovers the bacteria that causes Typhoid fever

1883

Karol Olszewski and Zygmunt Wróblewski – professors at the Jagiellonian University – liquefy oxygen and nitrogen (air components)

1895

Napoleon Cybulski and Władysław Szymonowicz isolate adrenaline and discover the hormonal impact of the adrenal medulla

1817

Jagiellonian University becomes the official name of the institution

INTERFACULTY AND INTERDEPARTMENTAL UNITS



Jagiellonian Library

The Jagiellonian Library (as it has been known since the 19th century) is the oldest university-wide unit – it is almost as old as the University itself. The Library's tremendous expansion in the 16th century was followed by a period of stagnation. It was overcome by the actions of the Commission of National Education which, as part of the reform of the University of Kraków, granted a permanent fund for the Library. Since then, the "Jagiellonka" became a public university library.

Another period of dynamic expansion occurred after World War II, particularly in 1969, when the Library began to archive Polish publications. The last decade of the 20th century and the beginning of the 21st century was a period of great transformation. In addition to the construction of the second building, numerous changes were introduced to the organisation of work. The most important change was the computerisation of the library which started in 1993. It encompassed collecting data, developing collections, preparing information about the collections and making them available.

Jagiellonian Centre for Experimental Therapeutics

In July 2008 Prof. Karol Musioł, the Rector of the Jagiellonian University at the time, appointed the Interdisciplinary Project Team to implement the project of the Jagiellonian Centre for Experimental Therapeutics (JCET). The JCET consortium comprised the Jagiellonian University, the Łódź University of Technology, and the Institute of Nuclear Physics of the Polish Academy of Sciences in Kraków. These units developed a common research infrastructure: a scientific centre with the most modern and specialised research equipment. Creating JCET laboratories and conducting scientific activities was possible with the support of the European Union. Research activity began in 2011. JCET laboratories are located in Life Science Park (Kraków).



Copernicus Center for Interdisciplinary Studies

On 1 October 2008, the Copernicus Center for Interdisciplinary Studies was established on the basis of decisions made by the Rector of the Jagiellonian University and the Rector of the Pontifical University of John Paul II. The initiator of this project was Rev. Prof. Michał Heller. The ideas that led to setting up the Center, which had been maturing for a long time in the Kraków community, materialised for the first time in the form of a research team called Ośrodek Badań Interdyscyplinarnych (the Center for Interdisciplinary Studies – CIS). Its main research task was "Philosophy in Science," i.e. exploring philosophical issues that are in one form or another interconnected with other sciences. Members of the CIS have also been interested in the relationship between theology and science.

The idea to establish the Center was born as a result of an expansion of the range of issues under consideration, which exceeded the organisational capabilities of CIS. It was necessary to introduce more organised research teams and to institutionalise their activities.

1897

The University opens all divisions to female students

1925

Tadeusz Banachiewicz introduces 'cracovians' (Polish: krakowiany), used for geodesic and celestial calculations and later used to outline Pluto's orbit

1938/1939

Karol Wojtyła, later Pope John Paul II, begins studying Polish Philology at the University

1974-1975

Geologists at the Jagiellonian University discover two unknown minerals: iron-germanium sulfosalts and lead-germanium sulfosalts



Malopolska Centre of Biotechnology

The Malopolska Centre of Biotechnology consists of six units that focus on different yet complementary areas of research, and five laboratories of independent research groups. The Centre was founded through a joint initiative of the Jagiellonian University and the Agricultural University of Kraków. The MCB officially opened on 13 May 2014 on the Campus of the 600th Anniversary of the Jagiellonian University Revival. The ceremony was accompanied by the scientific conference "Challenges of Biotechnology in 21st Century," during which a lecture was given by Prof. Robert Huber, a Nobel laureate and recipient of an honorary doctorate from the Jagiellonian University.

SOLARIS National Synchrotron Radiation Centre

The SOLARIS Synchrotron, located on the Jagiellonian University Third Campus in Kraków, will be the most modern device of its kind, generating electromagnetic radiation whose unique qualities will allow researchers to look deep inside the matter and analyse it thoroughly. Research may begin as early as in 2016. Initial efforts to build the synchrotron were made in 1998. In 2010, an agreement on the co-financing and implementation of the project was signed. The signatory parties were the Ministry of Science and Higher Education, and the Jagiellonian University. The Synchrotron Radiation Centre – an inter-faculty unit of the Jagiellonian University – was appointed the project coordinator. The SOLARIS Centre will be open to all research groups, not only those from Poland. It will be the first interdisciplinary research infrastructure in this part of Europe.

- Knowledge
- Therapy • Philosophy
- Biotechnology • Synchrotron
- Innovations • Books
- Medicine • Science
- Laboratories • Light
- Patents



CITTRU

In 2013, CITTRU (Centre for Innovation, Technology Transfer and University Development) celebrated its tenth anniversary. The initial mission of CITTRU was to protect and commercialise University technologies. Over time, though, the mission was broadened to include the acquisition of EU funds and the multidimensional promotion of science. In 2007, thanks to CITTRU, standardised commercialisation regulations were introduced at the University which extended its technological offer and led to the the filing of new patent applications and new patents. On 1 November 2013, in accordance with a decision made by the Rector of the Jagiellonian University, the existing scope of tasks of CITTRU was extended and divided between CITTRU and the Office for Structural Funds.

Written by Piotr Żabicki, PhD

1996

An archaeological mission that included Jan Chochorowski, a professor at Jagiellonian University, discovers a complete tomb of a Scythian prince

2010

Discoveries in biotechnology on energy transmission in cells

The Beginning of the 21st Century

Breakthroughs in cardiovascular and transplant surgeries at the Medical College

2013

The success of archeologists from the Jagiellonian University concerning Maya settlement in Guatemala is placed in *Time* magazine's list of top 100 contemporary scientific discoveries

2014

The 650th Jubilee of the Jagiellonian University – a time capsule is buried that includes a message for future generations of scholars and students



Major studies and research projects

- **Europeanisation of Law.** This research is represented by the research project „Made in Europe – European Legal Standards for Quality for Services on the Global Competitive Market.“ Prof. Fryderyk Zoll is the Project Manager, and the collaborating institution is the University of Osnabrück. The research seeks to discover the degree to which differences between Member States’ judicial systems concerning service provision create barriers for the development of a joint European market.

- **Naturalization of Law.** Interdisciplinary research led by Prof. Jerzy Stelmach that aims to discover whether the achievements of contemporary empirical science (psychology, neurobiology) are significant. If yes, then what effect does this have on the legal theory and specific legal institutions?

- **Barriers towards EU citizenship.** The “All Rights Reserved? Barriers towards EUropean CITIZENship” (bEUcitizen) research project is conducted by a consortium of twenty-six European universities. It focuses on difficulties EU citizens encounter in exercising their rights, the reasons behind such difficulties, and the measures that should be taken to strengthen the concept of European citizenship.

- **Restorative Justice and Mediation.** These studies are implemented within the framework of “The 3E Model for a Restorative Justice Strategy in Europe” research project, which is coordinated by University of Thessaloniki. The research aims to establish developmental strategy for mediation and other restorative program regulations. Analyses of such regulations in eleven European countries is a measure towards achieving this objective.

- **Comparative Legal Studies.** As a part of this theme, the interdisciplinary research project “The Creation and Reception of European Law in German and Polish Business Law” was carried out at the Faculty under the direction of Prof. Jerzy Pisiński. Research was conducted within the framework of the European Doctoral College, in collaboration with the University of Heidelberg and the University of Mainz. The twofold objectives of the project were comparative studies of domestic and European law as well as assessment of the Polish law’s compliance with the EU law.

Collaboration

Faculty scholars are members of international expert groups in organisations such as the European Labour Law Network, the International Committee of the Red Cross, and the international forum for environmental protection of the Avosetta Group, and the Acquis Group.

Regular scientific cooperation takes place between the University of Augsburg (Kraukauer-Augsburger Rechtsstudien), Harvard University (“Harvard Negotiation Project”), the University of Wrocław (“The Kraków-Wrocław Scientific Meeting of Administrators”), and the University of Greifswald (projects include “Mare Balticum – Strafvollzug und die Beachtung der Menschenrechte,” “Comparative Analysis of Women’s Prisons: Current Situation, Demand Analysis, and Best Practice,” and “Long-term Imprisonment and Human Rights, Juvenile Justice Systems in Europe”).



Scholars

Prof. Jerzy Stelmach – Head of the Department of Philosophy of Law and Legal Ethics, recipient of honours degrees from Heidelberg University and University of Augsburg, also a philosopher. He completed his doctoral habilitation under the direction of Prof. Kaufmann during a Humboldt scholarship in Germany. He was the dean of the Faculty, founded interdisciplinary scientific research teams, and coordinated pioneering projects, including a study group within a project financed by the John Templeton Foundation. Author of several monographs published in Poland and abroad, editor of collective works (e.g. the series *Krakauer-Augsburger Rechtsstudien; Studies in Philosophy of Law*). Co-founder of the Foreign Law Schools and the European Doctoral College.

Prof. Andrzej Świątkowski – Head of the Department of Labour Law and Social Policy, also a sociologist. He was awarded the title of the Jean Monnet Chair in European Labour Law and Social Security, as granted by the European institutions. Member of the International Society for Labour and Social Security Law; Vice-President of the European Committee of Social Rights; European Commission expert in the field of labour law. Author of numerous publications (thirty books). Editor of publishing series and periodicals (e.g. *Jagiellonian University Yearbook of Labour Law and Social Policy; East West Review of Social Policy*).

Prof. Fryderyk Zoll – professor of the Jagiellonian University and the University of Osnabrück, recipient of an honorary degree from the Ternopil National Economic University. Member of the Civil Law Codification Commission and the Academy of the Comparative Law. Co-founder of the School of Polish and European Law in Ukraine, the Ukrainian Law School in Kraków, and the first Student Legal Aid Clinic in Poland. Author of numerous publications on the law of obligations, comparative law, European privacy laws, bankruptcy law, and loan collateral.

Achievements

One of the Faculty's successes is the research programme conducted within the framework of the European Doctoral College in 2002-2010, in collaboration between doctoral students of the Jagiellonian University, the University of Heidelberg, and the University of Mainz. It has resulted in more than fifty doctoral theses, some of which were published as a part of the *Rechtstransformation in der Europäischen Union* series.

Another important scientific achievement of the Faculty is the development of the *Słownik Historii Doktryn Politycznych* (The Dictionary of Political Thinking History) published from 1997 to 2012; comprises five volumes including 750 entries. This work is edited by lawyers from the Jagiellonian University: Prof. Michał Jaskólski and Prof. Krysztyna Chojnicka.

An important contribution of scholars from the Faculty of Law and Administration is the editing of Kraków criminal records from 1554 to 1625 and of the Dobczyce criminal records from 1699 to 1737. This provides a tool for exploring the development of criminal law, the judicial system, and the legal culture. This research project is implemented by employees from the Department of Polish Legal History, the Department of Canon and Religious Law, and the Source Materials Workshop.



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Specialisation

- Civil Law
- Administrative Law
- Labour Law • Criminal Law
- Theory and Philosophy of Law
- History of Polish Law
- Constitutional Law
- Penitentiary Policies
- Sociology of Law
- Alternative Dispute Resolution

FACULTY OF LAW AND ADMINISTRATION

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Major studies and research projects

The Development of Individualised Medicine. Research in this field is conducted within the scientific consortium of the Faculty and the Institute of Pharmacology of the Polish Academy of Sciences, which received the status of the Leading National Research Centre (KNOW). The main objective of the research work is to create treatment tailored for individual patients, taking into account genetic and environmental factors as well as the patient's lifestyle. The main research interests of the scientists who participate in this project are civilisation diseases: tumours, cardiovascular diseases, and nervous system diseases. They are often difficult to treat and, in spite of medical and technological progress, therapeutic interventions often end in failure or only partial recovery of the patient.

New Lines of Research in Various Medical Fields. The Development of Individualised Medicine. New strategies of medical development are outlined as a part of the Faculty's top priority initiative, "Omicron," involving five units of the Faculty of Medicine: the Metabolic Disease Department, the Pharmacology Department, the Department of Transplantation, the Internal Medicine and Rural Health Department, and the 3rd Department of Surgery. The project allows for laboratories to be equipped with modern high quality armamentarium. It is innovative at a national level and at the same time can compete with centres around the globe, which strengthens the global prestige of the Medical Faculty and, therefore, of the Jagiellonian University. It provides new possibilities for collaboration due to the status of the scientific excellence centre.

Establishing a modern breast cancer diagnostic centre promotes new research in oncology, based on digital and conventional mammography, ultrasound examinations, and biopsy systems. Organisational guidelines for the registration of the centre in the European Breast Cancer Units system have already been developed.

Collaboration

The Faculty of Medicine participates in a joint initiative of KNOW (Leading National Research Centre) with the Institute of Pharmacology of the Polish Academy Of Sciences in Kraków and co-creates a scientific consortium with the Faculty of Chemistry at Jagiellonian University which offers Mol-Med doctoral studies.

Studies on differential diagnostics of diabetes types, evaluation of the quality of ageing populations as well as health determinants and life quality of the elderly are conducted in partnership with scientific centres from the United States, Great Britain, Germany, Sweden, Belgium and Spain. This collaboration also involves research on new endocrine peptides and radiopharmaceuticals, as well as on the genetic background of hypertension and organ damage due to this disease.





Scholars

From 2009 to 2014, four active scholars from the Faculty of Medicine were awarded "Jagiellonian Laurel" prize for outstanding scientific achievement: Prof. Ryszard Korbut, Prof. Marek Sanak, Prof. Tomasz Brzozowski and Prof. Maciej T. Małecki.

Prof. Ryszard Korbut – Chair of the Department of Pharmacology. His reputation as a scientist is recognised both domestically and internationally; he has authored more than 300 original publications and is a co-editor of pharmacology course books. His research includes the pharmacology of cardiovascular drugs, antithrombotic and antiplatelet drugs. He is a codiscoverer of prostacyclin and thromboxane synthase inhibitors.

Prof. Marek Sanak – Chair of the Department of Molecular Biology and Clinical Genetics of the 2nd Department of Internal Diseases. He has developed new non-invasive methods of measuring the levels of several substances, and is a renowned expert on internal diseases and clinical diagnosis. He is principal investigator of the program run in cooperation with Swiss scientists on genetics in asthma and the immunological background of viral diseases. In 1999 Prof. Sanak has received an award by Ministry of Health Care for the highly distinguished achievements in molecular biology. He has been nominated by students of Jagiellonian University Medical School for Foreigners as beneficiary of recognition as one of the best teachers among medical educators.

Prof. Tomasz Brzozowski – Chair of the Department of Physiology. Prof. Brzozowski specialises in research on the mucosal barrier of the alimentary tract in the context of the pathogenesis of gastric ulcers and the influence of various factors in the mechanisms of damage and protection of the mucous membranes of the stomach and intestines. He is the author of more than 300 original works, a co-author of course books on experimental and clinical physiology and gastroenterology, the editor-in-chief of the *Journal of Physiology and Pharmacology*, and an honorary Professor of the University of California, Irvine.

Prof. Maciej T. Małecki – Chair of the Metabolic Diseases Department and Clinic. His scientific interests revolve around problems associated with diabetes, particularly its monogenic forms, and metabolic diseases. He is a co-discoverer of one of the genes responsible for the MODY forms of diabetes. His papers have been published in the journal *Nature Genetics*, the *New England Journal of Medicine*, the journal *Diabetes Care*, and other recognised scientific periodicals. His works have been cited approximately 3,500 times.

Achievements

One of the greatest achievements of the Medical Faculty is the development of a minimally invasive procedure for transcutaneous access to the hearts of patients with cardiovascular diseases, as well as developing and implementing (as a part of the European EuroNet-PHL-C1 network) the first international programme for the treatment of the classic form of cancer, known as Hodgkin's lymphoma, in children and adolescents.

The Faculty conducts studies that have detected new angiotensin metabolites, including angiotensin-(1-7), which has physiologically and pharmacologically proven vessel-dilating effects. This discovery is a breakthrough in the understanding of many diseases, including the pathogenesis and treatment of hypertension and atherosclerosis.

During the Second European Economic Congress (2010), the Faculty of Medicine was awarded the Crystal Brussels Prize in the category of the best research centers in Poland.



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Specialisation

- **Medicine**
- **Cardiology** • **Metabolic Disorders** • **Physiology**
- **Pharmacology** • **Neurology**
- **Internal Diseases** • **Molecular Biology** • **Gastroenterology**
- **Paediatrics**

FACULTY OF MEDICINE

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Major studies and research projects

• **Neuropathic Pain and/or Epilepsy: Towards New Drugs.** Research is conducted in the Department of Bioorganic Chemistry in collaboration with the National Institutes of Health from the United States and with other departments of the Faculty. Research projects focus on design, synthesis, and multidisciplinary pre-clinical tests. The particles of new compounds that have been designed and pharmacologically tested are subject to patent in the European Union, the United States, Russia, China, Korea, India, Japan, Brazil and other countries. Commercialisation of the results is in progress.

• **In Vitro Cultures of Medicinal Plants and Fungi.** Research is conducted in the Chair of Pharmaceutical Botanic. It aims to demonstrate the use of *in vitro* cultures of plants and fungi as a source of crucial therapeutic compounds.

• **Modern Drug Forms: Biopharmaceutical Aspects.** Scientific research is conducted in the Chair of Pharmaceutical Technology and Biopharmaceutics. Scientists focus on paediatric drugs, multi-compartment drugs, and innovative solutions for the design of medical drugs using the rules of Quality by Design as well as the principles of Process Analysis Technology.

• **Sensitization and Toxicity of Drugs' and Cosmetics' Ingredients.** Analyses conducted at the Department of Experimental Dermatology and Cosmetology mainly focus on the phototoxicity of drugs and cosmetic products. The scope of the research includes *in vitro* experiments with cultured skin cells, starting with clinical observation, and ending with market and legal analyses of the cosmetic products available in Poland.

• **New Drug in the Treatment of Central Nervous System.** Departmental units, the ADAMED pharmaceutical company, Cracow University of Technology, and the Institute of Psychiatry and Neurology in Warsaw collaborated on a project called "Developing a Polish drug as therapy for central nervous system diseases: Schizophrenia, depression and anxiety – preclinical trials." Outcomes of the project include innovative compounds that demonstrate antipsychotic and anti-depressant activity, and have led to five international patent filings. Commercialisation of the results is in progress.

Collaboration

Research projects are carried out in collaboration with numerous international centres, such as the National Institutes of Health and the National Cancer Institute of the United States as well as pharmaceutical faculties and research institutes from France, Germany, Israel, the United Kingdom, Italy, Turkey, Finland, Portugal, and Canada. In relation to the conducted research, scientists at the Faculty work with Adamed, Apipol, Farmina, and other pharmaceutical companies in Poland.



Scholars

Prof. Barbara Filipek – her scientific interests include the discovery of new anti-inflammatory, analgesic, antiarrhythmic and hypotensive structures, and defining the mechanism of their action. She is the Chair of the Department of Pharmacodynamics at the Jagiellonian University Medical College, the Chair of the Postgraduate Education School, and a member of the Polish Pharmacological Society and the Polish Pharmaceutical Society. Her scientific achievements include 128 original articles, 50 monographs, and 26 patents. She collaborates extensively with the pharmaceutical industry, including the Apipol, Farmina and Adamed companies.

Prof. Renata Jachowicz – her research focuses on the development and assessment of high-quality, safe, modern forms of drugs. She is the Chair of the Department of Pharmaceutical Technology and Biopharmaceutics at Jagiellonian University Medical College. She is a member of the Executive Committee of the European Association of Faculties of Pharmacy and a WHO expert. She is also the Head of the Commission for Pharmaceutical Form and Biopharmacy in the Committee of Therapy and Drug Research of the Polish Academy of Sciences, as well as the Head of the Expert Group on Drug Formulation and Pharmacy Drugs of the Polish Pharmacopoeia Commission. She has authored 122 original and review articles

Prof. Katarzyna Kieć-Kononowicz – her research interests revolve around discovering new biologically active substances both through computer design and through chemical and biotechnological synthesis. She is the Chair of the Department of Technology and Biotechnology of Drugs at the Jagiellonian University Medical College and a Polish delegate to the European Federation for Medicinal Chemistry. She is a member of: the Commission for the Synthesis and Design of New Medical Drugs in the Committee on Therapy and Drug Research of the Polish Academy of Sciences; the European Histamine Research Society; the International Society of Heterocyclic Chemistry; the European Association of Pharma Biotech; the Paul Ehrlich MedChem Euro PhD Network; and other institutions. Her scientific achievements include 150 original and 15 review papers. She is the author of various chapters found in six course books and scripts.

Achievements

The ToxCmp computer system was developed at the Faculty. This system assesses the risk of drug cardiotoxicity as well as potential drug efficiency and safety. In 2013, a British company bought this technology.

International patent claims have also been obtained for a new method of solid-phase synthesis with the so-called piperolic linker. This significantly expands the possibility of developing new biologically active compounds. This achievement is the result of large-scale studies conducted within Polish-French collaboration.

Some of the original projects undertaken by the Faculty are exhibitions that popularise science. Such exhibitions include, for example, "Edible and Poisonous Fungi," "100 Years of Nivea Crème," and "The Pharmaceutical Tradition of Preparing Medicinal Wines."



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Specialisation

- Medicinal chemistry
- Pharmacoeconomics and Drug Policy
- Pharmacology and Pharmacotherapy
- Pharmaceutical Biotechnology
- Functional Food
- Multi-compartment Drug Dosage Forms
- Neural Networks
- Medical Material

FACULTY OF PHARMACY

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Major studies and research projects

The main research directions of the Faculty include: the biological bases of schizophrenia and depression; determinants of fertility; determinants of ageing; health education and health promotion; experimental gastroenterology; programmes for cardiovascular disease prevention; health psychology; e-health technologies and problems; and human resource management in nursing.

Current research projects:

- **Cardiovascular Disease Prevention: Efficiency Control.** The main purpose of this activity is to improve the standards of preventive cardiology measures. As a part of the Ministry of Health's POLKARD programme, an assessment of the cardiovascular disease prevention programme was conducted. Due to the use of standard research tools, the obtained data are used for international comparisons conducted in a research project run by the European Society of Cardiology (the EUROASPIRE project).

- **Economic and Psychosocial Factors and Health Status.** The international research project HAPIEE ("Health, Alcohol and Psychosocial Risk Factors in Eastern Europe") is based on long-term simultaneous observations in four Central and Eastern European countries. It researches the health of 36,000 people aged from 45 to 69 years (in Poland, more than 10,000 people).

- **Factors Affecting the Levels of Female Sex Hormones.** This research documented that levels of female sex hormones are influenced by nutritional status at all stages of life. Knowledge of factors determining hormone levels is vital for breast cancer prevention programmes. This project is conducted in collaboration with Harvard University and the University of Tromsø in Norway.

- **Changes in Dietary Habits.** An analysis of the efficiency and social approval of programmes that promote changes in eating habits (the EATWELL research project). The results of this study were used in providing recommendations for effective ways of changing these habits.

- **Organisation of the Employment of Nursing Personnel.** The research is aimed at formulating new assumptions of policies for the productive employment and management of hospital nursing personnel. It also aims to establish guidelines on the impact of employee job satisfaction and staff resources on the results of treatment and the quality of patient care. The RN4CAST research project is the first project of this type implemented in Poland. Due to international research procedures and the comparison of results obtained in twelve European countries and in the United States, the project confirmed that improving hospital employment conditions is a relatively inexpensive way of increasing the quality of care, patients safety and satisfaction, and the sustained employment of nursing personnel.

Collaboration

Scientists from the Faculty of Health Sciences participate in research projects conducted by scientific consortia (e.g. the 7PR UE Eatwell Consortium and "UE CHANCES – Consortium on Health and Ageing: Network of Cohorts in Europe and the United States"). They also collaborate with the following universities and research centres: the University of Texas; the Health Science Center San Antonio; the Department of Cellular and Structural Biology; the Artificial Limb Centre (CRA – Centre de Rééducation et d'Appareillage) of Institut Robert Merle d'Aubigne, Valenton (France); Harvard University; the University of Tromsø; Katholieke Universiteit Leuven (Belgium); the University of Kuopio (Finland); Technische Universität Berlin; and many others.

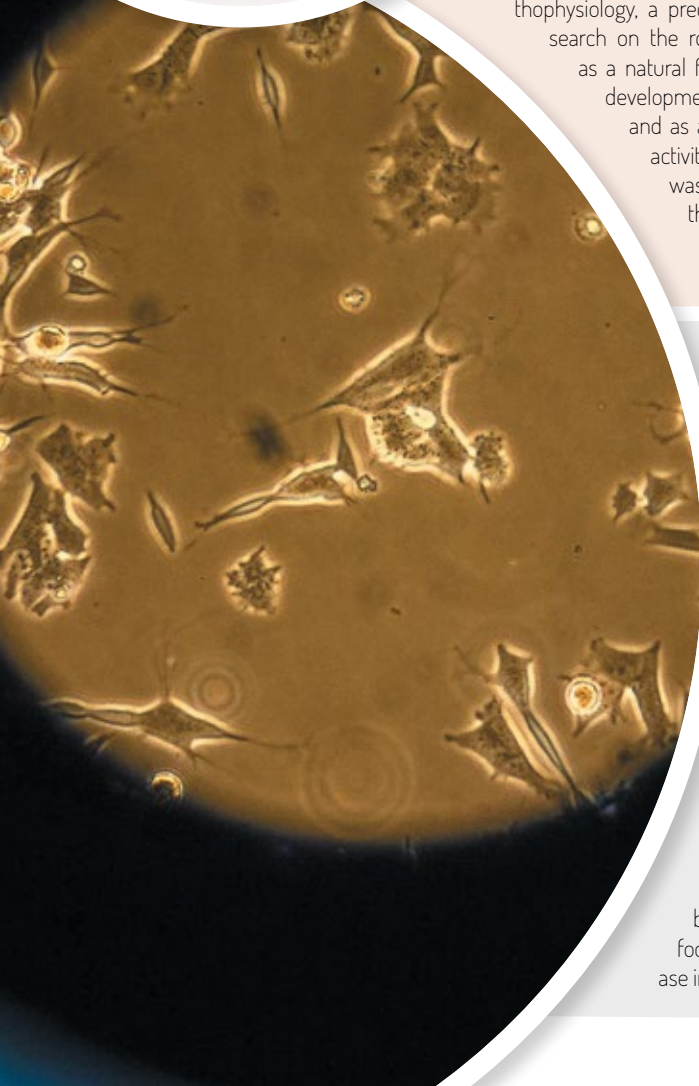


Prof. Andrzej Pilc – is a physician and psychopharmacologist who conducts research on the biological basis of mental disorders. He is a corresponding member of both the Polish Academy of Arts and Sciences and the Research Units Evaluation Committee. He is the author of more than 200 publications and has been cited more than 6,000 times.

Prof. Marian Szczepanik – a medical biologist conducting research on: provoking immunological tolerance; inhibiting Th1 contact hypersensitivity reactions; suppressing the inflammatory reaction in the experimental autoimmune encephalomyelitis; collagen-induced arthritis; ulcerative colitis in mice; and multiple sclerosis.

Prof. Andrzej Pająk – a physician, specialist in internal medicine and public health, member of the Committee on Public Health of the Polish Academy of Sciences, and a member of the Central Commission for Academic Degrees and Titles. He has many years of experience in research on epidemiology and non-infectious disease prevention, particularly of circulatory system diseases. He has participated in numerous international research programmes

Prof. Jolanta Jaworek – a leading expert on pancreas physiology and pathophysiology, a precursor of pioneer research on the role of melatonin both as a natural factor in preventing the development of acute pancreatitis and as a regulator of the exocrine activity of the gland. In 2005, she was awarded the Individual Award of the Minister of Health for her work on the role of melatonin and leptin in pancreas physiology.



- Health Sciences
- Medical Biology
- Epidemiology
- Disease Prevention
- Health Promotion

Specialisation

Achievements

The Faculty's scientific achievements include developing the "Charter of Rights of Elderly Participants of Clinical Tests" and establishing a model of therapeutic communication that has a wide variety of uses in medicine and health sciences.

The Faculty's scientists have also contributed to establishing essential scientific facts including: demonstrating that the average education level of the local community is a determinant of individual fertility; indicating the importance of riboflavin as an immunomodulator; investigating the role of circadian variability and physical strain in the regulation of food intake and adipokine and ghrelin release in humans.

FACULTY OF HEALTH SCIENCES

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Major studies and research projects

- **Psychology.** Psychological research encompasses, among others, the following fields: social cognition, the neurobiological bases of reading, and cognitive control. As part of the latter, a research project entitled "Beyond Automaticity: Behavioural, Cognitive, and Neural Mechanisms of Self-control" is being conducted by Prof. Edward Nęcka.
- **Sociology.** In sociological research, attention should be given to studies on the Europeanisation of the memory of the Holocaust in Eastern Europe. Other subjects explored by Faculty members include studies on the relationship between gender equality and quality of life, as well as a labour market monitoring project that is unique to Poland. The project is being run as part of a long-term study entitled "Human Capital Balance."
- **Philosophy.** Members of the Faculty of Philosophy of the Jagiellonian University conduct research on applied ethics and professional ethics, among other topics. Additionally, research into the theory of branching space-times and its application are developing rapidly. A project called "History of Ideas Research Network" is also conducted as part of philosophical research funded within the National Programme for the Development of Humanities.
- **Religious Studies.** Religious studies conducted at the Faculty of Philosophy involve research on the ancient Mexican cultures and their astronomical traditions, mystery theatre in pre-Columbian Mexico, and the history of and current affairs in cultures in the Holy Land, etc.

• **Cultural Studies.** The Centre for Comparative Studies of Civilisations investigates modern Hindu temples funded by the Birla family. There are also ongoing studies on the depiction of contemporary light art as well as studies on civil war as a cultural phenomenon as illustrated by the conflict in the Republic of Tajikistan.

• **Pedagogy.** The scope of research at the Institute of Pedagogy includes the following issues: andragogy, socio-cultural animation, pedagogical anthropology, general didactics, didactics in higher education, philosophy of education, pedagogical communication, pedagogy of culture, general pedagogy, and family pedagogy.

Collaboration

Scholars from the Faculty of Philosophy of the Jagiellonian University are involved in several dozen international projects, e.g. one concerning gender equality, which brings together researchers from Oslo and Kraków.

Research devoted to the cultures of ancient Mexico is conducted in collaboration with the Instituto Nacional de Antropología e Historia, while academics from the Institute of Psychology collaborate with the University of Maryland (studies on motivated social cognition), Pennsylvania State University (studies on bilingualism), and the Université Libre de Bruxelles (studies on consciousness).



Prof. Arnold Lebeuf – investigates cultural anthropology, particularly the importance of astronomy in culture. He conducted studies in Santa Cristina, Sardinia (the measure of moonlight in the Nuragic culture well from 1000 BC). It is worth noting that his research also explores pre-Columbian cultures, e.g. Aztec mystery theatre, archives of the Moctezuma family, as well as the calendar, cosmology and astronomy in Mesoamerica during the pre-Columbian period.

Prof. Włodzimierz Galewicz – conducts fundamental and pioneering studies in Polish philosophy on the most significant contemporary ethical issues concerning the broadly defined applied ethics and professional ethics, particularly bioethics and business ethics. As of autumn 2014 he was implementing a research grant devoted to the problem of justice in health care (MAESTRO Programme).

Prof. Edward Nęcka – explores topics related to general and cognitive psychology, including intelligence and creativity issues. He is the founder of the formal theory of intelligence. His most recent research focuses on cognitive control and self-control. In the sphere of the latter, Prof. Nęcka is conducting research through a grant (MAESTRO Programme).

Prof. Piotr Sztompka – primarily investigates issues related to social change and the concept of social systems. His research is also devoted to system transformation, the concept of social trauma, visual sociology, and sociology of everyday life. He has written more than twenty sociology books, published mostly in the United States and the United Kingdom. The most significant books include *System and Function* (1974), *Society in Action: The Theory of Social Becoming* (1990), *The Sociology of Social Change* (1993), and *Trust: a Sociological Theory* (1999).

Specialisation

- Neuroscience
- Cognitive Science
- Social Psychology
- Cognitive Psychology
- Social Research Methods
- Social Anthropology
- Sociology of Population Studies
- Cultural Studies
- Social Work
- Buddhism

Achievements

The synthesis of the history of Polish philosophy presented in work *Historia filozofii polskiej* (History of Polish Philosophy; 2010), written by Jan Skocznyński and Jan Woleński, two professors from the Faculty of Philosophy of the Jagiellonian University, constitutes an achievement of fundamental importance for the development of humanities.

The book describes Polish philosophical thought both in the broad context of European philosophy and in connection with other areas of life: science, religion, politics, literature, and arts. This work is the fruit of many years of research of both scholars, who are not only insightful historians of Polish philosophy, but also its evangelists in the international philosophical community as well as the discoverers of the forgotten figures, concepts and works of Polish philosophy.

Research conducted in the Institute of Psychology on changes in the brain observed after acquiring cultural skills, reading in particular, made it possible to identify the areas of the brain responsible for this process. People who use both the visual and Braille alphabets participated in this research.

FACULTY OF PHILOSOPHY

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Major studies and research projects

- **Sacred Art.** A survey of sacred art in eastern Poland has been the subject of research since 1992. This research has resulted in more than 20 volumes of monographs as part of a series of publications entitled *Materiały do dziejów sztuki sakralnej na dawnych ziemiach wschodnich. Kościoły i klasztory rzymskokatolickie dawnego województwa ruskiego* (Materials on the History of Sacred Art in the Eastern Territories of the Former Polish Commonwealth: Roman Catholic Churches and Monasteries of the Former Province of Ruthenia) edited by Prof. Jan Ostrowski. Another important project is the preparation of the corpus of 19th- and 20th-century stained glass windows in Roman Catholic churches in the metropolitan areas of Kraków and Przemyśl.

- **Archaeological Studies.** The discovery of a Maya royal tomb (Nakum, Guatemala) with a burial chapel and sacrificial deposits is one of the Faculty's greatest achievements. The deposit comprised a unique artefact: nine clay heads representing Mayan deities. The Guatemalan discoveries were placed on a list of the *Time* magazine's top 100 scientific discoveries of the modern world (NB as the only discovery by Polish scientists).

Moreover, archaeologists from the Faculty of History are conducting research into the Nile Delta, in Tell el-Farcha, where a team led by Prof. Krzysztof Ciałowicz discovered a building that served residential, temple, and sepulchral purposes. The older parts of the structure revealed the second-oldest brewery of this type in Egypt. Another venue that is being explored by the archaeologists from the Jagiellonian University is Nea Paphos in Cyprus. A team led by Prof. Ewdoksia Papuci-Władyka unearthed a Roman agora of Nea Paphos together with some relics of the Hellenic period. In 2011, the Paphos Monuments were included in the UNESCO World Heritage List.

- **Searching for Polonica in Foreign Libraries.** In 2011, the search led to a wonderful finding: Henryk Głębocki, PhD, discovered Juliusz Słowacki's lost manuscript, *Dziennik podróży na Wschód* (Journal From the Journey to the East). The manuscript was found in The National Library of Russia. The discovery includes 74 pages of notes from journeys to Egypt and the Holy Land, sketches and concepts of future works, the poet's detailed bills, and numerous beautiful drawings. Up until then, it had been believed that Słowacki's journal was burned during World War II. Among other library and archive discoveries, the discovery of a 10th-century manuscript in the National Archive in Kraków, made by Marcin Starzyński, PhD, is also worth mentioning. Additionally, studies on Polonica are currently in progress in the Vatican Secret Archives (Monumenta Poloniae Vaticana).

- **Studies in Antiquity.** A book about Hypatia of Alexandria, written by Prof. Maria Dzielska and translated into several languages, brings it to the forefront of numerous valuable monographs. Prof. Dzielska is the most frequently translated Polish historian. Her monograph about Hypatia served as the basis for *Agora*, a Spanish motion picture (historical drama) directed by Alejandro Amenábar.

Collaboration

Collaboration in the Union Academique Internationale is worth mentioning as one of several dozen international research projects in which scholars from the Jagiellonian University Faculty of History participate. The projects include: "Corpus Antiquitatum Americarium" and "Carte de Monde Inca." They encompass publishing the findings of archaeological studies carried out in the Peruvian Andes and Argentina.

Thanks to collaboration with the Fulbright program (United States) and the Anthropos Institute in Sankt Augustin (Germany), the Institute of Ethnology frequently hosts foreign visitors from the United States, Great Britain, Germany, and Denmark, etc. Domestic partners include the German Historical Institute in Warsaw, the Shalom Foundation, and the Auschwitz-Birkenau State Museum.



Prof. Jan Ostrowski – works at the Institute of History of Art; he has served as the director of the Wawel Royal Castle since 1989. His greatest scientific achievement is the development of a programme for the inventory of historical monuments in the eastern borderlands of the former Polish Commonwealth. This resulted in 21 monumental volumes of monographs on churches in contemporary Ukraine. This programme led to the establishing of a research school and the shaping of a new generation of art historians.

Prof. Jan Chochorowski – an expert on the Bronze Age and the Early Iron Age in Europe and Eurasian Steppe. He gained worldwide fame for his studies on Scythian barrow, in Ryżanówka at Zwinogródka, which he led together with Ukrainian archaeologists. He has also explored the contemporary archaeology of Spitsbergen. He was the Chair of the Institute of Archaeology of the Jagiellonian University from 1996 to 2008. He has authored more than 230 publications, including three books.

Prof. Edward Dąbrowa – belongs to the group of outstanding researchers of ancient Near East history dating from the fourth century BC to the fourth century AD. He has authored eight monographs and almost 200 journal articles. He is the president of the European Association for Jewish Studies and a member of international scientific committees for journals published in Italy: *Parthica* and *Diadema*. He established and edits the international publications *Electrum: Journal of Ancient History* and *Scripta Judaica Cracoviensia*.

Prof. Halina Florkowska-Frančić – affiliated with the following Institutes at the Jagiellonian University: the Institute of History, the Institute of Polish Diaspora and the Institute of Ethnology and Cultural Anthropology, where she lectures on the ethnic history of Europe. She develops her accomplished research work by obtaining new sources and then interpreting them in a precise and innovative manner, as she did in her study on Józef Kraszewski's correspondence, in which she constructed a collective portrait of the Polish Diaspora in the United States. Her key research areas are Polish studies, Polish Diaspora and Switzerland. She publishes in Polish, German, French, and English. In 2013, she became an honorary member of the Polish Historical Society.

Specialisation

- History of Poland
- General History
- Preservation of Cultural Heritage
- History of Eastern Borderlands
- Mediterranean and New World Archaeology
- Historical and Cultural Anthropology
- Polish Composers
- History of Jews in Kraków
- History of the Jagiellonian University

Achievements

The academic staff of the Institute of History of Art prepared the two largest Polish art exhibitions held abroad: "The Power of Fantasy. Modern and Contemporary Art from Poland" in Palais des Beaux-Arts (BOZAR) in Brussels (2011), and "Symbolism in Poland and Britain" at the Tate Britain in London (2009).

Publishing a volume devoted to the history of Jews in Kraków (*Jews in Kraków*, eds. M. Galas, A. Polonsky, London, 2011) was also a significant event for the scientific world. It was the first comprehensive presentation of studies on various aspects of the history of Jews in Kraków, conducted by Polish researchers and published in the English language. This publication is a great promotion of Poland's scientific excellence.

The scope of the research of the workshop on Archaeometallurgy and Conservation of Monuments, conducted through the Institute of Archaeology, not only covers pre-historic monuments, but also covers valuable items such as the Szczerbiec (the Polish coronation sword), the Royal Sigismund Bell, and medieval Papal Bulls. The newest and latest apparatuses (for example, a plasma vacuum chamber) ensure that analyses of antiques are conducted safely. This equipment is used to identify, for example, the manufacturing centres of such items, including those that originate from the Roman Empire.

Among activities promoting historical knowledge, the activities of the musicologist society are worth mentioning, e.g. a project called "Respect Memories," conducted in collaboration with the Jagiellonian Library and the Library of Polish Song.

FACULTY OF HISTORY

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Major studies and research projects

Research conducted at the Faculty of Philology focuses on the study of literature, linguistics, and translation in their wide cultural context.

- **Teaching Intercultural Communication.** As part of the PICT project, the UNESCO Chair for Translation Studies and Intercultural Communication evaluates the current state of teaching intercultural communication in postgraduate translation programmes in the European Union. The Erasmus-Mundus-IANUS Lot 5 project, conducted at the Institute of Eastern Slavonic Studies, has a similar objective. It focuses on the intercultural dialogue between representatives of various cultures through academic collaboration with non-EU countries.

- **Translation.** The Chair for Translation Studies and Intercultural Communication is an active partner in the OPTIMALE project: Optimising Professional Translator Training in a Multilingual Europe. OPTIMALE aims at expanding the geographic reach of professional translation training and at strengthening existing relationships with institutions outside of the circle of universities associated in the EMT network ("European Master's in Translation").

- **Studies on a Collection of Romance-language Manuscripts.** The project is devoted to the study of manuscripts gathered in the so-called "Berlinka" collection of the Jagiellonian Library in Kraków. The collection comprises 500,000 manuscripts including texts by Boccaccio, Giordano Bruno, Calderón de la Barca as well as musical scores by Mozart and Bach. The research team led by Piotr Tylus, PhD, works on "breaking the 'Berlinka' code." Results of the research are available at: info.filg.uj.edu.pl/fibula.

- **Philological Studies on Greek Religion.** The aim of the project is to publish a corpus of source texts regarding animal sacrifice in Greek religion together with philological and historical commentary. The Greek texts will be accompanied by Polish translations. The leader of this research team is Assoc. Prof. Krzysztof Bielawski from the Institute of Classical Philology, Department of Greek Philology (Hellenic studies). Detailed information about the project can be found at: www.sacrificium.filg.uj.edu.pl.

- **Roots of European Culture.** The project plans the translation, edition, publication and promotion of nine monographs on the origins of European culture. Assoc. Prof. Krzysztof Bielawski, is the initiator and coordinator of this grant.

- **Studies in Kurdish Culture.** A group young researchers from the Department of Iranian Studies at the Institute of Oriental Studies received a grant to finance a research project on "How to Make a Voice Audible? Continuity and Change of Kurdish Culture and of Social Reality in Postcolonial Perspectives." The purpose of this initiative is to analyse the process of continuity and change in Kurdish culture and reality in relation to ethical, literary, religious, philosophical, political and social issues. The project is managed by Joanna Bocheńska, PhD.

Collaboration

A notable example of scholarly cooperation with foreign partners is the international research project entitled "Traduction comme moyen de communication interculturelle," where researchers from the Institute of Romance Studies work together with colleagues from Université Charles-de Gaulle-Lille 3 and Université de Mulhouse. Scholars from the Faculty of Philology are also partners in the research project "Western-Eastern Europe: Centre-Periphery Dynamics," whose objective is an interdisciplinary study of the topic of centre and periphery in modern culture.

Another example of a fruitful academic collaboration is the international conference "Points of View in Language and Culture – Audiovisual Translation" organised by the Faculty.

Guest lectures offered in many foreign universities by Piotr Tylus, PhD, from the Institute of Romance Studies cannot be omitted in this section. He has been invited to speak at the Sorbonne (Paris 3), Université de Paris XIII, and Université de Versailles-Saint-Quentin-en-Yvelines. Piotr Tylus maintains regular scientific contact with the international community of medievalists including professors from the College de France, the Sorbonne, and many others.





JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Scholars

Prof. Elżbieta Tabakowska was awarded "Jagiellonian Laurel" by the Rector of the University in 2012. Her research focuses on the application of cognitive linguistics in the theory and practice of translation. She is the former Head of the Chair for Translation Studies and Intercultural Communication, a position she held for many years. She is also a member of Collegium Invisibile.

Assoc. Prof. Piotr Tylus works at the Institute of Romance Studies (Department of Romance Linguistics). A prominent medievalist, his research interests revolve around the history of Old French literature, medieval manuscripts, textual criticism, and scientific editing of medieval works. He is the coordinator of the research project "The history of the collection of Romance manuscripts from the former Preussische Staatsbibliothek zu Berlin, kept at the Jagiellonian Library in Kraków." He is also a member of the Institut d'Études Avancées de Paris.

Assoc. Prof. Krzysztof Bielawski conducts research at the Institute of Classical Philology (Department of Greek Philology). His research interests include patristic theology, analysis of early Christianity source texts, and Greek lexicography related to ancient drama and religious cults. A large part of his research concerns ancient religious studies. He is also interested in defining and debating the aims, purposes and socio-cultural functions of classical philology as a scholarly field. In 2009, he received the medal of "Merit to Culture – Gloria Artis."

Joanna Bocheńska, PhD works at the Department of Iranian Studies and specialises in all things Kurdish. She is the Head of the research project "How to Make a Voice Audible?" (www.kurdishstudies.pl). In 2013, she received a prestigious scholarship from the Ministry of Science and Higher Education for outstanding young scholars. She is a member of the Advisory Board at the Institute of Research and Development – Kurdistan.

Specialisation

- Linguistics
- Literary Studies
- Translation Studies
- Cognitive Linguistics
- Medieval Studies
- Intercultural Communication

Achievements

Among the achievements of the Faculty of Philology literary translation must be mentioned first. Colleagues from the Institute of Romance Studies have published a number of important translations as well as theoretical commentaries on the process by which they confirm the culture-forming role of a literary translator.

Pioneering publications in the field of literary studies constitute yet another significant achievement of the Faculty. Among them is the first monograph published in Poland and Europe on modern literature of the United Arab Emirates ("Modern Literature of the United Arab Emirates") written by Prof. Barbara Michalak-Pikulska.

Another noteworthy publication is the book by Joanna Bocheńska, *Między ciemnością i światłem. O kurdyjskiej tożsamości i literaturze* (Between Darkness and Light: About Kurdish Identity and Literature), which is a pioneering monograph in Poland and one of very few in the world devoted to Kurdish literature.

FACULTY OF PHILOLOGY

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Major studies and research projects

The Faculty of Polish Studies sets modern standards of Polish language, literature and culture research, based on the achievements of modern humanities.

- **Cultural Literary Theory.** This is research devoted to cultural literary theory and to developing new methods of analysing literary phenomena. It also focuses on the poetry of cultural experience, anthropology of literature, gender studies, corporeality, the anthropology of place, Polish memory and cultural trauma, and borderlands literature, especially Polish-Jewish and Polish-Lithuanian. The bases of a new cultural poetics and anthropological aesthetics are being shaped in the framework of this research.

- **Comparative Studies.** These studies cover the relationships between literature, music and painting from both intersemiotic and intermedial perspectives. Moreover, they focus on the history of Polish literature in the context of global literature, from medieval to modern times, as well as on translation theory and intercultural communication.

- **Historical and Literary Studies.** These studies examine the Polish medieval era in a European context, as well as humanism and the Reformation in literary culture. They also cover cultural and social aspects of Enlightenment and Romantic literature, and delve into collective consciousness and symbolic heritage. The studies on literature from the turn of the 20th century, focused on the poetic imagination of Young Poland, are also noteworthy. This research involves preparing editions of works written by the most important authors of the 20th century. Another type of academic research involves exploring the history of Polish literary criticism, its modern varieties, and metacriticism.

- **Editorial Studies.** These studies explore the graphic makeup of Polish prints from the 16th and 18th centuries, as well as the electronic editions of both old and contemporary texts. They focus on the history of the book, the covers of old prints, and the work of Polish publishers in the 19th and 20th centuries.

- **Drama and Theatre Studies.** These studies include contemporary Polish theatre, the history of theatre in Kraków in the 19th and 20th centuries, and Jewish theatre. They also focus on the artistic achievements of outstanding representatives of world theatre and its transformations in the 20th and 21st centuries, as well as performance and dramaturgy studies, categories of memory and post-memory in performance studies, New Historicism, queer studies, and post-colonial studies.

- **Linguistic Studies.** These studies are devoted to interpersonal communication, focused on the analysis of the contemporary Polish language against the backdrop of the communication process. They explore the evolution of the Polish language, in its general and regional forms, as well as the linguistic pictures of the rural communities grounded in lexical sub-dialects. Linguistic studies also focus on teaching Polish as a foreign language, glottodidactics, and models of foreign-language teacher training. The intensive teaching methodology studies prepare students for the teaching profession.



Collaboration

World-famous image and media culture researchers (William J. T. Mitchell from the University of Chicago), literary philosophers (Rodolphe Gasché from State University of New York, Buffalo), and historians of ideas (Martin Jay from the University of California, Berkeley) have collaborated with the Faculty.

Scholars from the Faculty of Polish Studies are involved in numerous national and international research projects, and they belong to consortia whose members come from excellent universities in Europe, Asia, Australia, North America and South America, e.g. Interzones and SPeCTReSS. The Faculty has a full teaching module in English and its academic staff includes visiting professors from abroad (e.g. the United States).

Prof. Andrzej Borowski – a distinguished expert on old Polish literature and its European contexts. Today, his studies on Northern Humanism, relations between Polish and Dutch cultures, national identity, and Sarmatism are part of the canon of knowledge. Among Professor Borowski's most important works are: *Renesans* (The Renaissance; 1992/2002), *Powrót Europy* (The Return of Europe; 1999), *Iter Polono-Belgo-Ollandicum* (2007), and *Humanizm. Historie pojęcia* (Humanism: The Histories of a Concept; 2009). He is the Vice President of the Polish Academy of Arts and Sciences.

Prof. Jerzy Jarzębski – well-known in the world of scholarship as an expert on the works of Gombrowicz, Schulz and Lem, the most frequently translated Polish writers of our day. His studies provide the basis for knowledge about these authors, defining their position in world culture. His works are mandatory reading for all Polish philologists: *Gra w Gombrowicza* (Playing Gombrowicz; 1982), *W Polsce czyli wszędzie* (In Poland, i.e. Everywhere; 1992), Schulz (2000), *Wszelświat Lema* (Lem's Universe; 2002), and *Gombrowicz* (2004). Professor Jarzębski is a recipient of the prestigious Kościelski Award (1985) and the Wyka Award (1991).

Prof. Maria Korytowska – a world-famous researcher of Romanticism. She created a new school of research into Polish Romanticism from a comparative perspective. Her works include: *O romantycznym poznaniu* (On the Romantic Cognition; 1997), *O Mickiewiczu i Słowackim* (On Mickiewicz and Słowacki; 1999), *Romantyczne przechadzki pograniczem* (Romantic Strolls on the Borderlands; 2004), *Autor, autor!* (Author! Author!; 2010), *Te książki zbójcekie...* (These Treacherous Books...; 2011). Her research projects have resulted in an esteemed publishing series *Komparatystyka polska. Tradycja i współczesność* (Polish Comparative Studies: Tradition and Modernity).

Prof. Ryszard Nycz – a world-famous scholar who defined Modern Polish Studies, a theorist and historian of modern literature and culture, the founder of a literary studies research school from the perspectives of anthropology and cultural studies. Today, no studies on literature can ignore a number of his books: *Sylwy współczesne* (Modern Silva Rerum; 1993), *Tekstowy świat* (The Textual World; 1995), *Język modernizmu* (The Language of Modernism; 1997), *Literatura jako trop rzeczywistości* (Literature as a Reality Trope; 2001), and *Poetyka doświadczenia* (The Poetics of Experience; 2012). He is the editor of the prestigious *Horyzonty Nowoczesności* (Horizons of Modernity) series and *Teksty Drugie* (Second Texts) journal, which mark the paths for literary research in Poland. He is a member of the Polish Academy of Sciences and the Polish Academy of Arts and Sciences.

Prof. Marian Stala: – an expert on 19th- and 20th-century literature, and one of the most praised literary critics. He is the author of ten books that have found their place in the canon of Polish Studies, such as *Pejzaż człowieka* (The Landscape of the Human Being; 1994), *Trzy nieskończoności* (Three Infinities; 2001), and *Blisko wiersza* (Close to the Poem; 2013). His critical works have shaped the image of 20th-century Polish poetry. He is a juror for the Nike Literary Award, a Wyka Award winner, a member of the Polish Academy of Arts and Sciences, and a member of the Editorial Committee of *Polski Słownik Biograficzny* (The Polish Biographical Dictionary).

Specialisation

- Literary Studies
- Literary Anthropology
- Comparative Studies
- Cultural Studies • Translation Studies • Theatre Studies
- Editing • Linguistic Studies
- Polish Language in Social Communication
- Performance Studies

Achievements

The Faculty has been classified with the highest academic category (A+, a rating given to 3% of the best academic units in Poland) and has a reputation for being the most important Polish Studies centre in Poland. It publishes twelve prestigious series of fundamental importance to the development of Polish humanities, e.g. *Horyzonty Nowoczesności* (Horizons of Modernity), *Modernizm w Polsce* (Modernism in Poland), *Komparatystyka Polska* (Polish Comparative Studies), *Interpretacje Dramatu* (Drama Interpretations), and *Krytyka XX i XXI wieku* (20th- and 21st-century Criticism). It also issues seven highly-rated academic journals.

Several dozen studies and monographs recognised as essential for the development of knowledge about language, literature and culture – including a two-volume publication of *Kulturowa teoria literatury* (Cultural Theory of Literature) and breakthrough works on Miłosz, Schulz, Gombrowicz, and Kantor – are the fruits of innovative research conducted at the Faculty. Innovative didactic and glotto-didactic programs are being developed at the Faculty.

The Faculty organises the Jan Błoński Festival, and its representatives co-create large international literary festivals, such as the Conrad Festival and the Miłosz Festival.

FACULTY OF POLISH STUDIES

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Major studies and research projects

The Faculty consists of: the Marian Smoluchowski Institute of Physics, the Astronomical Observatory and the Cluster of Departments of Applied Computer Science.

Research at the Institute of Physics, one of the largest scientific facilities in Poland, covers a wide range of subjects: from research on the micro-world (elementary particle physics, nuclear, atomic, molecular and solid state physics, as well as nanotechnology) to research on cosmology. The research also represents several areas of multidisciplinary character, i.e. biophysics, cognitive science, econophysics, etc.

The most important research areas include:

- **Processes occurring in the Universe.** The scientists from the Astronomical Observatory focus their attention on studying the processes in the Universe observed on a variety of time and energy scales. This research is realised through observations in the full electromagnetic spectrum, as well as through theoretical investigations.

- **Intelligent computer systems and their applications.** Research conducted by the Cluster of Departments of Computer Science scholars encompasses problems that combine issues of both hardware and software. The research is relevant to a large number of disciplines, from humanities (sociology, psychology), through chemistry, biology, medicine, modelling and visualisations of problems in physics, to a wide range of topics in engineering.

- **FAIR (Facility for Antiproton and Ion Research in Europe).** It is one of the world's greatest scientific enterprises, in which researchers from the Institute of Physics partake. Experiments prepared at FAIR will provide complementary information about unknown states of matter and about the early evolution of the Universe.

- **Research on the fundamental interactions.** Physicists from the Faculty participate in research on fundamental interactions at the European CERN laboratory. In 2013, the Institute of Physics became a member of the research team of the ATLAS experiment at the LHC (Large Hadron Collider).

Research and investment projects:

The world-class level of research conducted at the Faculty is demonstrated by the increasing number of research grants obtained not only by experienced researchers, but also by young scientists (from around 40, 120, and 110 grants realised, respectively, in 2005–2007, 2008–2010, and 2011–2013). This concerns both national and international projects.

As a result of the "ATOMIN – Atomic Scale Science for Innovative Economy" investment project, which has increased the research potential of the Faculty in an unprecedented manner, the Faculty can now compete with other facilities located around the world having equal status.

The Marian Smoluchowski Kraków Research Consortium "Matter-Energy-Future," in which the Faculty participates, was recognised in 2012 by being awarded a Leading National Research Centre (KNOW) status. The Consortium creates a strong interdisciplinary research centre in the field of physical sciences.

In 2013, as a result of an evaluation of Polish research facilities that was based on scientific achievements, research potential and material results of research activity, the Faculty was awarded the highest A+ category (a rating given to 3% of the best scientific units in Poland) in the field of science and engineering.



Collaboration

The participation of Faculty scientists in the BOREXINO ("Boron Solar Neutrino Experiment") project is an example of broad international collaboration. During the realisation of the project, scientists obtained direct confirmation of the occurrence of geoneutrinos. It also allowed for the most precise measurement of the velocity of neutrinos emitted at CERN. The acquired results are of fundamental importance for astrophysics, particle physics and geophysics.

Another enterprise of this kind is research conducted by means of the LOFAR ("Low Frequency Array") equipment/radiotelescopes. It concerns the physics of the Earth's ionosphere, interstellar plasma, neutron stars and galactic nuclei. Other research that deserves attention is conducted within the Polish part of the consortium for the Cherenkov Telescope Array (CTA) project, which concerns high-energy cosmic ray particles that were produced as a result of stellar explosions, generated inside galactic nuclei, or remained from the early Universe.

Prof. Andrzej Budkowski – a physicist who devotes special attention to the surface phenomena of macromolecular systems. Prof. Budkowski is the author of the basic works on thin films of polymer blends. Together with his research group, he investigates the formation processes of organic nanolayers and micropatterns for solar cells, electronics, and biomedical coatings. His research group recently became engaged in two large European projects concerning the construction of biosensors that detect diseases (PYTHIA) and dangerous foods (FOODSNIFFER).

Prof. Elżbieta Richter-Wąs – works in the area of theoretical physics in the field of phenomenology of elementary particle interactions, e.g. high energy electron-positron and proton-proton collisions. She is a co-author of recognised Monte Carlo programs used for comparing precise experimental analyses with theoretical predictions. Prof. Richter-Wąs is a member of the team conducting the ATLAS experiment at the LHC accelerator at CERN, the coordinator of the research on the Higgs boson discovery signatures in the LHC experiments, and a co-author of the article on the discovery of the Higgs boson.

Prof. Maciej Ogorzałek – an IT scientist who conducts research on the applications of computational intelligence in biomedical data processing and aiding diagnostics. His second area of interest is new computational methods for the design of next-generation microelectronic systems. He is an author of over 280 articles, and a laureate of the Master programme of the Foundation of Polish Science. He exercises many functions in various international scientific organisations. He has been a member of Academia Europaea since 2012.

Prof. Michał Ostrowski – an astronomer with a wide range of interests, who specialises in the field of high energy astrophysics. He has authored a number of fundamental works on cosmic ray particle acceleration in shockwaves, as well as on the research of relativistic jets from active galaxies. He is in charge of the Faculty's part of the consortium for the gamma-ray astronomy project "Cherenkov Telescope Array," which is of critical importance for the studies of the Universe. He participates in the work of international councils and expert committees, including the ASPERA ("ASTroParticle European Research Area") and APPEC ("Astroparticle Physics European Coordination") scientific advisory committees.

Specialisation

- Experimental and Theoretical Physics
- Elementary Particle Physics
- Atomic and Molecular Physics
- Nuclear Physics • Solid State Physics • Biophysics
- Nanotechnology
- Astronomy • Applied Computer Science



Achievements

Among the achievements which Faculty scientists take pride stands the lung-imaging method that utilises polarised ^3He . The Faculty achieved great success (in collaboration with the John Paul II Hospital in Kraków) in obtaining human lung images by using magnetic resonance for the first time in Poland.

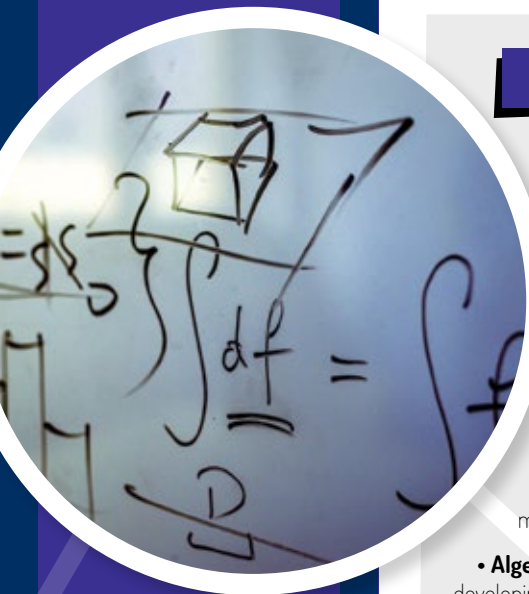
Another success is the construction of the Polish optical atomic clock. A next-generation clock, using ultra-precise lasers for frequency measurements in laser-cooled atoms, is being created in a cooperation with the Atomic, Molecular and Optical Physics National Laboratory (FAMO).

The Cracow School of Theoretical Physics, which has been organised annually for more than fifty years, reviews new results of scientific research in particle physics. The list of its speakers includes Nobel laureates. Proceedings are published in *Acta Physica Polonica B*, issued by the Institute of Physics, a journal that is on the Institute for Scientific Information list.

Science enthusiasts are continually attracted by the Faculty's scientific accomplishments and the Faculty's enterprises designed to popularise science, including physics labs and workshops, popular-scientific lectures, Physics Academy, Evenings with the Stars, and Radio Observations of the Milky Way.

THE FACULTY OF PHYSICS, ASTRONOMY AND APPLIED COMPUTER SCIENCE

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Major studies and research projects

Key research conducted at the Faculty includes, on the one hand, areas of study originating from mathematical analysis practiced in Kraków at a high level over a long period of time and, on the other hand, disciplines lying on the border between mathematics and computer science.

- **Functional Analysis.** A Polish specialty since the time of Stefan Banach, this area includes research on infinite-dimensional linear spaces equipped with additional structures. We explore objects that can be applied both in mathematics and theoretical physics, especially in quantum mechanics: operators in Hilbert, Krein, and Banach spaces; Banach and von Neumann algebras.

- **Complex Analysis.** The roots of this discipline lie in 19th-century studies on natural numbers. Currently, in addition to research conducted in traditional areas of the function theory of several complex variables, we work on its new branches that can be applied in physics and geometry. The main tool here is the Monge-Ampère equation, widely studied by mathematicians.

- **Algebraic Geometry.** Originated in studies on polynomial equations, this is one of the most intensively developing fields in modern mathematics. The research concerns Calabi-Yau manifolds, mathematical objects that play a key role in physical superstring theory. Inspired by this theory, the Mirror Symmetry Conjecture predicts that each manifold has its mirror partner. The relationship between them verified in many explicit examples is not yet fully understood.

- **Analytical Computer Science.** This discipline explores algorithms. The results obtained here are of both theoretical (computational complexity) and practical (development of software) nature. For instance, the scientists have found algorithms that recognise license plates of moving vehicles. Ongoing studies investigate the possibility of using similar techniques in medical diagnostics.

- **Computational Mathematics.** Research in this field focuses on numerical analysis of dynamical systems through the use of topology and interval arithmetic. In particular, this allows for the detection of chaos. The results obtained up to this point include a library comprising more than 60,000 lines of code for the rigorous analysis of the behaviour of solutions to differential equations. The library is used by researchers around the world.

Academic research and doctoral training are inseparable. During the past few years, many of the Faculty's PhD students have participated in three large projects: the international PhD programme "Geometry and Topology in Physical Models," the National PhD Studies on Mathematical Sciences, and the interdisciplinary PhD studies "Society-Environment-Technologies."

Collaboration

Research in mathematical sciences has a more individual character than in other scientific fields; thus, collaboration with other centres is rarely of an institutional nature.

Proof of a lively exchange between scholars from the Faculty and the world's leading scientists are the papers written in collaboration with mathematicians, physicists and computer scientists from top (according to the world rankings) universities, including Princeton, Paris 6, Texas A&M, Georgia Institute of Technology, Rutgers, Tel Aviv, Colorado, Paris 7, Pennsylvania, Toronto, Illinois, TU Berlin, Vanderbilt, Hannover, and many others, as well as numerous visits by computer scientists and mathematicians from the Faculty at leading universities around the world.



Scholars

Prof. Sławomir Kołodziej – the most important results of his research pertain to the existence of singular solutions of Monge-Ampère equations. They allow for the construction of spaces with prescribed Ricci curvature including Kähler-Einstein metrics, which play an important role in theoretical physics. The world's leading mathematicians, including Simon Donaldson (Imperial College London), who is a recipient of the Fields Medal, and Gang Tian (Princeton University), have used these results to demonstrate long-lasting conjectures in complex geometry. He was awarded the 2014 Stefan Bergman Prize by the American Mathematical Society.

Prof. Wojciech Kucharz – conducts research in real algebraic and analytic geometry. His most important findings concerning algebraic models of smooth manifolds and bundles over algebraic manifolds have been used by outstanding scientists in the field, including János Kollár (Princeton University), Selman Akbulut (Michigan State University), and Henry C. King (University of Maryland). His current research establishes new directions in the studies on phenomena described by the continuous rational function.

Prof. Marian Mrozek – gained worldwide recognition as a co-author of the first computer-assisted proof of the existence of chaos in the famous Lorenz equations. This started the research – still carried out today – on the use of computers in rigorous analysis of dynamics. His research team is a global leader in this field. He is one of the few scholars for whom a song has been composed. The lyrics for the song "Motyliada" (Butterfliad) were written by the poet Michał Zabłocki, while the music was composed by a leading Polish singer, Grzegorz Turnau, who performed the song several years ago.

Prof. Jan Stochel – is an expert on theory of unbounded operators in Hilbert spaces. The most important results of his research, obtained in collaboration with Franciszek H. Szafraniec, concern unbounded subnormal operators, a complex momentum problem, unitary dilations of contractions, and orthogonal polynomials. In recent years he has been investigating weighted shifts on directed trees.

Achievements

Recently, outstanding results have also been achieved by junior members of the Faculty. Sławomir Dinew, PhD, who is investigating the Monge-Ampère equation, showed – in particular – the uniqueness of its solution. He also proved the Calabi-Yau theorem for a wider class of Hessian equations. Studies on Calabi-Yau manifolds conducted by Michał Kapustka, PhD, turned out to be of particular importance for the Mirror Symmetry Conjecture originating from physical superstring theory. The results obtained by Marcin Kozik, PhD, on the computational complexity of satisfiability problems provided information about operation time of computer programs used in studies on artificial intelligence and databases.

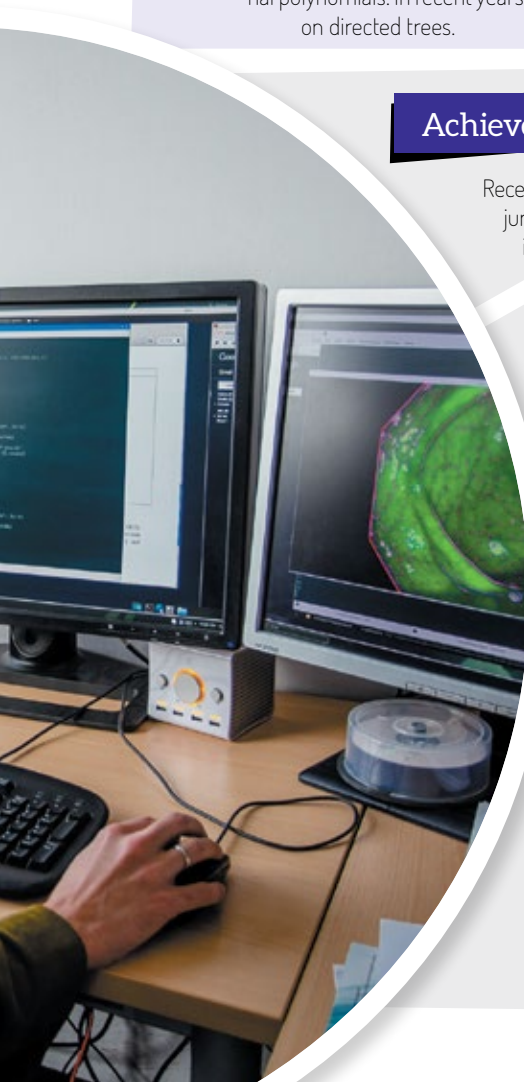
The 6th European Congress of Mathematics, organised in 2012, became the most significant event of the decade for promoting Kraków as an important centre for mathematical sciences. The very high reputation of the Faculty of Mathematics and Computer Science is due in part to its students' achievements in the ACM International Collegiate Programming Contests (ICPC) – gold medal in 2006; bronze medals in 2011 and 2013 – as well as to individual and team results (main awards received five times) earned at the International Mathematics Competition for University Students (IMC-US). These successes place the Faculty firmly among the leading European institutions educating young computer scientists and mathematicians.



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Specialisation

- Functional Analysis
- Nonlinear Analysis
- Complex Analysis
- Differential Geometry
- Analytical Computer Science
- Computational Mathematics
 - Applied Mathematics
 - Algebraic and Analytic Geometry
 - Dynamical Systems
 - Approximation Theory



FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

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Major studies and research projects

From 2009 to 2013, more than 200 national and several dozen international research projects were conducted at the Faculty of Chemistry. They represent major research areas, especially biomedical chemistry, studies on catalytic and photocatalytic processes, synthesis of new functional materials, organic chemistry, and theoretical molecular modelling.

- **New Materials.** Within the framework of projects concerning synthesis of new materials, studies have been conducted on the synthesis of nanostructured polymer assemblies for solar energy conversion. New polymer materials with biomedical uses, e.g. structural materials or carriers for controlled drug delivery systems, were synthesised and explored.
- **Borderlands of Chemistry and Biochemistry Studies.** The characteristics of protein responsible for the processes involved in the development of cancer were described at the Faculty. Moreover, compounds capable of selective inhibition of the inter-protein interactions were sought in order to develop new anticancer therapies. Studies on inhibitors of protein-protein interactions have continued during the project beginning in 2014, financed by a Symphony grant from the NCN. Research related to medical topics included studies on the use of infrared spectroscopic techniques for imaging biochemical changes in endothelial cells caused by stress, pathological changes, and drug treatment.
- **Organic chemistry.** The projects in organic chemistry involved researching carbon-carbon bonding reactions, modelled on natural processes. Moreover, an attempt was made to design asymmetric organic synthesis of chiral compounds, a research project inspired by natural processes.
- **Materials for Clean Technologies.** Under the "Applied Research Program," two research projects are being conducted that aim at developing an innovative modifier for fuel oil combustion and a catalyst for reducing emissions of nitrous oxide, which is a greenhouse gas. The Faculty of Chemistry is a member of the international "Knowledge & Innovation Community Innoenergy," in which it participates in research projects on the following subjects: sustainable power generation, clean coal technologies, the synthesis of new materials for the energy industry, and the process of conversion of energy.
- **Catalysis.** Research in this field includes photocatalytic phenomena, which are extremely important for developing new environmentally friendly technologies. These studies focus on physico-chemical processes that occur on the surface of illuminated semiconductors as well as on functions performed by small particles in light-activated catalytic systems.

Collaboration

Research teams from the Faculty collaborate with national and international institutions: universities, the institutes from the Polish Academy of Sciences, other research institutes, and chemical industry partners (e.g. LOTOS Oil, SK Innovation Co. from South Korea, and Scientific Computing & Modeling from the Netherlands). Together with four other scientific institutions, the Faculty created the KNOW "Matter-Energy-Future" Consortium.

Within the ERA-Chemistry network, under the EU "Open Initiative 2008" programme, the Faculty has an ongoing cooperation with the University of Coimbra in the area of photosensitizers for applications in photocatalysis, medicine, optoelectronics, and solar energy conversion. The Faculty has its representatives on the Steering Committee of the European network of Precision Polymer Materials.



Scholars

From 1998 to 2013, five scholars from the Faculty of Chemistry (Prof. Maria Nowakowska, Prof. Roman Nalewajski, Prof. Zbigniew Sojka, Prof. Grażyna Stochel and Prof. Artur Michalak) were awarded "Jagiellonian Laurel" by the Rector of the University for outstanding scientific achievement.

Prof. Maria Nowakowska – conducts research on nanostructured polymer and hybrid materials. She is the winner of the TEAM programme. Under Prof. Nowakowska's guidance, methods for detecting live cells were developed. She also guided the development of heparin antagonists, nanostructured bactericidal materials, superparamagnetic nanoparticles for magnetic resonance imaging (MRI), and polymer and hybrid photocatalysts.

Prof. Roman Nalewajski – works on applying information theory in formulating communication theory of chemical bonds. His quantum additions to traditional information measures have allowed for the full "thermodynamic" description of equilibria in molecules and their fragments, as well as the description of their evolution over time.

Prof. Zbigniew Sojka – explores catalysis and surface chemistry of solid materials with the use of molecular modelling and spectroscopic measurements. He participated in developing a new catalytic converter that decomposes nitrous oxide.

Prof. Grażyna Stochel – conducts studies on coordination and bioinorganic chemistry as well as photochemistry in relation to reaction mechanisms and the development of functional materials. She is a co-author of new photosensitizers for photodynamic therapy and microorganism inactivation.

Prof. Artur Michalak – specialises in theoretical chemistry. He is interested in modelling relations between structure and reactivity of catalysts, as well as theoretical research in polymerisation processes. He developed natural orbitals for chemical valence as a method to describe molecular bonds.

Specialisation

- Biological and Medicinal Chemistry
- Catalysis and Environmental Chemistry
- Molecular Modelling
- Spectroscopy
- Advanced Materials and Nanotechnology
- Supramolecular and Coordination Chemistry
- Forensic and Preservation Analysis
- Organic Synthesis

Achievements

Scholars from the Faculty developed a catalytic converter for low-temperature decomposition of nitrous oxide, beginning with laboratory synthesis supported by molecular modelling, and finishing with industrial scale synthesis and tests.

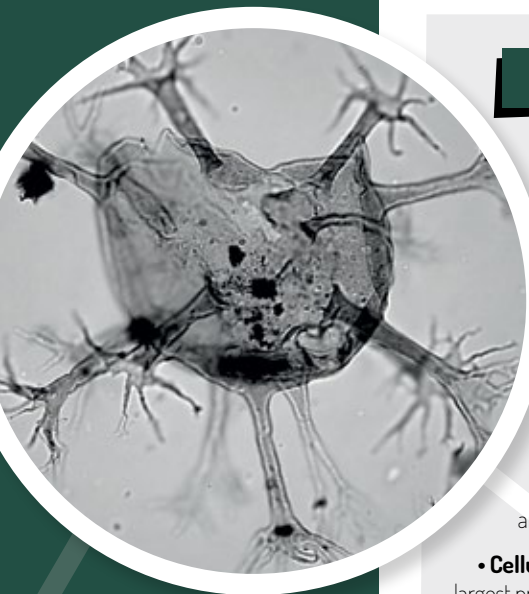
A Faculty research team participated in the MAGMA-Net Consortium, conducting research into magnetic molecular systems having potential uses in alternative methods for recording information.

As a result of their work, Faculty chemists introduced a new interdisciplinary field of research – bioinorganic photochemistry – to scientific literature. Another original contribution the Faculty made to the field of theoretical chemistry is research into the use of information theory in describing chemical bonds and developing descriptions of natural orbitals for chemical valence.

The Jagiellonian University Faculty of Chemistry is also engaged in activities that popularise chemistry and natural sciences. It has organised a series of exhibitions including one devoted to Marie Skłodowska-Curie and one to commemorate the 130th anniversary of the liquefaction of permanent gases.

FACULTY OF CHEMISTRY

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Major studies and research projects

- **Studies on Life Strategies of Organisms in Various Environmental Conditions.** Research in this field examines high aerobic capacity of selected bank voles, phytoremediation, and life strategies of social insects. Research also focuses on issues related to organisms' responses to chemical and physical stress, and the role of olfactory and sonic impulses in intraspecific and interspecific communication.
- **Genetic and Biochemical Diversity.** The subject of scientific analysis within this field is the variability of different species at individual and population levels, the influence of high concentrations of heavy metals in soil on the development of new genotypes (ecotypes) of plants, and interspecific hybrids.
- **Ecosystem Functioning.** Worth mentioning here are studies on the influence of natural and anthropogenic factors on the process of decomposition and carbon balance in nature, chemical analysis of land invertebrates, and interactions within food chains of aquatic ecosystems.
- **Cellular, Developmental, and Reproductive Biology.** Scholars from the Faculty participate in the world's largest programme of melanoma cell specification. Studies conducted by Faculty scientists also focus on researching genetic causes of human hereditary diseases and reproductive disorders, as well as researching hormonal mechanisms regulating the development and functioning of female and male reproductive systems.
- **Neurobiology and Immunobiology.** Significant research in this field involves analysing the mechanisms responsible for the functioning of the biological clock and the mechanisms of circadian regulation of various body processes, as well as studying the structure and functioning of the brain in order to learn the causes of the nervous system diseases, e.g. epileptic fits, and the mechanisms behind the regulation of immunity.
- **Anthropogeography.** Within this field studies on changing factors and barriers of local and regional development may be distinguished, including the influence of social and economic features on en-rooting and the sustainability of activities of large corporations. Other studies cover the ability of companies to restructure and provide more advanced products and services, the flow of knowledge, local entrepreneurship, and resilience to crisis.
- **Physical Geography.** Scholars from the Faculty analyse the functioning and transformation of abiotic environments with special attention paid to the mountains and highlands of Poland.
- **Paleoenvironmental Analysis and Geochemistry.** Research in this field investigates the reconstruction of paleoenvironmental changes on the basis of the fossil record of microorganisms (foraminifera, nano-fossils), trace fossils (ichnofossils), travertines, as well as biochemical signatures (rare earth elements, biomarkers).
- **Tectonics and Sedimentology.** The subject of scientific analysis within this field is geological structure as well as paleobiogeographic development and sedimentation of Carpathian sediment and the foreground of the Carpathians.

Collaboration

National and international cooperation result in research projects, PhD studies, scientific achievements, and numerous publications in prestigious journals. For example, the possibility of using antiepileptic drugs in support of chemotherapy is explored in collaboration with the Department of Neurology at Oslo University Hospital (Norway).

Researchers from the Faculty send data to the international journal *Atlas Florae Europaeae*, which presents the distribution of plants in Europe (sixteen volumes published), and to the global data network GBIF (Global Biodiversity Information Facility). The Faculty has also made a significant contribution to the development of the international scientific network "Science for the Carpathians" (S4C), which promotes interdisciplinary research about the Carpathians.



Scholars

Prof. Szczepan Biliński – an outstanding Polish embryologist. Studies on developmental and cellular biology are his most significant scientific achievements. He is a member of the Polish Academy of Sciences and the Director of the Class of Natural Sciences of the Polish Academy of Arts and Sciences.

Prof. Zbigniew Dzwonko – an ecologist who explores diversity and dynamics of plant communities in central and southern Europe. He also investigates factors and processes determining biotic diversity in contemporary landscapes. He is an active member of Polish and international scientific societies.

Prof. Jan Kozłowski – a renowned researcher of life strategies of organisms. He uses mathematical modelling methods and empirical verification of modelling methods. He is currently investigating the impact of temperature and oxygen availability on body measurements, cell size, and metabolism rate in cold-blooded animals. He is the Chair of the Committee on Evolutionary and Theoretical Biology of the Polish Academy of Sciences, and a corresponding member of the Polish Academy of Arts and Sciences.

Prof. Alfred Uchman – a geologist. His scientific research interests include invertebrate ichnology, stratigraphy, and sedimentology. Prof. Uchman is the President of the International Ichnological Association, a national representative of the Carpathian-Balkan Geological Association, the editor-in-chief of the journal *Annales Societatis Geologorum Poloniae*, a member of the Committee on Geological Sciences of the Polish Academy of Sciences, and a corresponding member the Polish Academy of Arts and Sciences.

Prof. Zbigniew Ustrnul – a climatologist and a Fulbright Program scholar. He explores climate change and variability, weather extremes, and atmosphere circulation through the use of latest methods as well as in collaboration with the Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB). He represented Poland in two pan-European projects for the EU.

Achievements

Some of the most significant scientific achievements of the Faculty's scholars include: discovering previously unknown species in different parts of the world, explaining the extra-testicular role during embryonic development, and discovering the phenomenon of circadian changes in the morphology of nerve cells and the connections between them.

Other achievements include proving that nervous and endocrine systems regulate the course of inflammatory reaction in vertebrates, reconstruction of paleoclimatic conditions of the Late-glacial and Holocene periods, as well as determining contemporary (natural and anthropogenic) regularities concerning changes in the natural environment and landscape.

Faculty employees obtained a patent for the technology that limits the growth of filamentous bacteria in activated sludge and using rotifers to prevent its bulking (this technology might be used in sewage treatment).

Achievements in knowledge popularisation include the noteworthy activity of the Botanic Garden, which is visited by approximately 70,000 people every year.



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Specialisation

- Biodiversity
- Botany • Ecology
- Embryology
- Nature Conservation
- Human Biology
- Zoology • Geochemistry
- Physical Geography
- Anthropogeography
- Sedimentology



FACULTY OF BIOLOGY AND EARTH SCIENCES

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Major studies and research projects

- **Entrepreneurship in Sport and Tourism.** The Department of Management in Tourism conducts research aimed at presenting solutions for promoting creative and entrepreneurial activities in organisation and sports events management including global solutions focused on cooperation and creating place brands.

- **Mass Media vs. Participation of Citizens and Public Political Discourse.** The research project "Mediatisation of the Election Game: Municipal Elections 2014" is conducted at the Institute of Journalism, Media and Social Communication. It aims to determine the real impact of media both on the participation of citizens and on public political discourse. Research findings are a meaningful contribution to knowledge about the shaping of the public sphere in Poland as well as a source of practical tips for politicians and local media.

- **Pedagogical Supervision.** The "Programme for Strengthening Quality and Effectiveness of Pedagogical Supervision and School Functioning Quality Evaluation: Stage 3," conducted at the Institute of Public Affairs, aims to improve the quality of Poland's education system through the introduction of modernised systems of pedagogical supervision consisting of the evaluation of school functioning. Modernised systems of supervision will be introduced in all schools and educational organisations listed in System Informacji Oświatowej (SIO; Educational Information System – EIS).

- **Internet Knowledge Resources.** The SYNAT project conducted at the Institute of Scientific Information and Library Science aimed to create a universal and open repository platform for hosting and communication to provide network resources for science, education, and the open knowledge society.

- **Sleep Deficiency: Brain Bioelectric Activity.** The research project "Neural systems for error monitoring: Activity patterns of detection and correction of erroneous saccadic reactions and their circadian stability in chronic sleep deficit state – simultaneous dense array EEG and oculographic study" is being conducted at the Department of Cognitive Neuroscience and Neuroergonomics at the Institute of Applied Psychology with the simultaneous use of two techniques: dense array EEG and oculography. The objective of the project is to identify patterns of brain bioelectric activity when making an error and correction of erroneous saccadic eye movements. The next stage will be to investigate whether these patterns change at different times of the day and whether they are sensitive to sleep deficiency. Research findings will be of particular relevance in relation to job positions in the field of highly developed technology.

- **New Study on the History of World Cinema.** These studies have been conducted since 2009 at the Institute of Audiovisual Arts in collaboration with leading Polish and international cinematography centres (the University of Silesia, the University of Łódź, the University of Warsaw, the University of Wrocław, and Northern Michigan University). Thus far, two large volumes on this subject have been published.



Collaboration

In a framework of cooperation between IBM and the Complex Systems Modelling Workshop in the Institute of Applied Psychology, analytical solutions are used that serve building prediction models, forecasting, and simulation of phenomena on the bases of complex data. The Workshop is included in the IBM Academic Initiative (2012–2017) under which student internships are implemented and access to software and training materials is possible.

From 2007 to 2010, the research project "LLP: School and World of Work" was conducted at the Institute of Economics and Management. Together with representatives of twelve EU member states work began on creating the largest European network of employers and contacts of secondary and higher education establishments – a system that would limit graduate unemployment as well as support their mobility.

Other Faculty institutes also carry out various scientific and educational activities based on multilateral cooperation with other centres.



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Scholars

Prof. Ryszard Przewłocki – Head of the Department of Neurobiology and Neuropsychology. His academic interests include mechanisms of action of endogenic opioids, the neurobiology and psychology of stress, pain and drug addiction, neuropsychology, and molecular and genetic mechanisms of action of psychotropic drugs. He has written nearly two hundred original works. He is the Head of numerous international research projects.

Prof. Barbara Liberska – Head of the Department of Globalisation and Economic Integration. She is particularly interested in international economics, globalisation, global financial and economic crises, European integration, new economic powers, the process of regional integration,

and changes in the world economy. She is a member of the Committee on Economic Sciences and the "Poland 2000 Plus" Forecast Committee of the Polish Academy of Sciences. She is also a member of the Scientific Council of the Polish Economic Society, and a member of the editorial board of the journal *Ekonomista* (Economist).

Prof. Mariusz Flasiński – Head of the Information Technology Systems Department and a member of the Polish Academy of Arts and Sciences. His scientific interests include image recognition and processing, artificial intelligence, IT in management, formal languages and automata theory, software engineering, and software project management. He is the leader of seven research projects, an author of approximately 130 papers and six books, including the textbooks *Zarządzanie projektami informatycznymi* (Software Project Management) and *Wstęp do sztucznej inteligencji* (Introduction to Artificial Intelligence).

Prof. Tadeusz Lubelski – Head of the Department of Polish Cinema History. His academic interests focus on the history of Polish cinema and European cinematography, especially the French cinematography. He is a member of the European Film Academy, the Scientific Board of the Institute of Art of the Polish Academy of Sciences, and the Scientific Editorial Board of *Kwartalnik Filmowy* (Film Quarterly). He authored the *Historia kina polskiego. Twórcy, filmy, konteksty* (History of the Polish Cinema: Makers, Films, Contexts). He is a co-editor of a multi-volume work entitled *Historia kina* (The History of Cinema).

Specialisation

- Economics
- Film • Informatology
- Computer Science
- Culture • Media • Politics
- Psychology • Tourism
- Management

Achievements

The remarkable achievements of Faculty scholars concern – in particular – different IT systems. These include the System for Teaching ElectroCardioGraphy, used to improve the diagnostic skills of students and young cardiologists; the computer-based analytical system of the Polish Sign Language; a cognitive-semantic user interface model for visually impaired people; SyNaT, a national scientific platform; and scientific and technical information systems.

An important area of scientific achievements are programmes and strategies for broadly understood social reality such as "Programme for Strengthening Quality and Effectiveness of Pedagogical Supervision and School Functioning Quality Evaluation," "Leadership and Management in Education: Developing and Implementing the System of Education and Improvement for School Principals," "Strategic Directions of Tourism Development in the 21st Century," and "EMPATIC: Introducing Information Competence Training in Education Programmes."



FACULTY OF MANAGEMENT AND SOCIAL COMMUNICATION

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Major studies and research projects

The Faculty is home to broadly understood political science and regional studies, with particular focus on cultural aspects. This duality of scholars' interests enables interdisciplinary and multidisciplinary studies related to global regions to be conducted and deepens the analysis of political issues through reflection on social, economic and cultural problems.

- **Political Theories, Systems and Thought.** It includes analyses of modern political systems, theory, philosophy and sociology of politics, the history of political thought including methodological issues, as well as contemporary debates on liberalism, republicanism, democracy, and human rights. An important project conducted with the Centre for Political Thought in Kraków is a published series entitled *Biblioteka Klasyki Polskiej Myśli Politycznej* (The Library of Classical Polish Political Thought), which includes sixty volumes of scripts of selected Polish intellectuals written between the 16th and 20th century.

- **Public Order, Security and Communication.** It includes the analysis of cause and effect of the collapse of public order and social structures and the related infringement of human rights, humanitarian catastrophes, mass migrations, and threats to international security. These studies are enriched with analyses of the shaping and changing of international order. They include research on civil society, public sphere organisation and management, communication and media, the shaping of global security, the institutionalisation of internal security policy, particularly in the European Union, changes in modern diplomatic and consular law, political and legal aspects of European citizenship, conflict theory, strategic aspects of politics in foreign countries and world regions, military politics, problems of Mediterranean countries, and the history of contemporary South Central Europe.

- **Countries, Nations and Civilisations.** In this field, issues related to the crisis of the nation-state and the phenomenon of nationalism, non-democratic mechanisms of change of the country's political system, as well as the cultural roots of integrating Europe and integration processes occurring at various levels – from economic to political and legal – are analysed. Moreover, studies are conducted on the history and perspective of the development of individual cultures and civilisations, prospects for the globalisation of international relations, social movements, migration, social mobility, and multiculturalism.

Research findings of the Faculty staff are recognised by public institutions (e.g. Ministry of Foreign Affairs) and frequently used by the media.

Studies on research projects conducted at the Faculty are published in monographs and in *Politeja. Pismo Wydziału Studiów Międzynarodowych i Politycznych UJ* (Politeia: Journal of International and Political Studies of the Jagiellonian University), as well as in two highly evaluated journals appearing at the Faculty: *Ad Americam* (published by the Institute of American Studies and Polish Diaspora) and *Problemy Współczesnego Prawa Międzynarodowego, Europejskiego i Porównawczego* (Problems of Modern International, European and Comparative Law – the Institute of European Studies). They can also be found in published series edited by academics from the Faculty, e.g. *Varia Culturalia*; *Rosyjska Literatura Emigracyjna* (Russian Emigration Literature); *Prace Amerykanistyczne UJ* (American Works of the Jagiellonian University); *Rosja: Wczoraj, dziś, jutro. Polityka – kultura – religia* (Russia: Yesterday, Today, Tomorrow; Politics-Culture-Religion); *Societas, Politika*; as well as series of course books on the social sciences entitled *Materiały Robocze Forum Europejskiego Natolin* (Working Materials of European Forum Natolin) by the Polish Scientific Publisher PWN.





JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Collaboration

Faculty scholars participate in numerous international projects and are members of the Association of European Migration Institutions and Academia Europaea. They participate in conferences organised alternately in Kraków and Moscow with scholars from Lomonosov Moscow State University. Faculty scholars also participate in symposia of the Polish Society of Political Science, the Polish Academy of Arts and Sciences, the International Political Science (IPSA), the International Studies Association (ISA), the Central and Eastern European International Studies Association (CEEISA), and the Standing Group on International Relations (SGIR). Guest lectures are conducted each year by recognised academics from abroad. In addition, courses are taught by visiting professors from various countries.

Specialisation

- **Political Science**
- **National and International Security**
- **International Relations**
- **European Studies** • **American Studies** • **Asian Studies**
- **Cultural Studies**
- **Intercultural Relations**
- **Russian Studies**
- **Ukrainian Studies**

Achievements

The Faculty was placed in the prestigious Excellence Group in rankings conducted by the Centrum für Hochschulentwicklung (CHE) in the discipline of political science, taking the highest place among Central and Eastern Europe centres (*Die Zeit*). In 2013, the Faculty was recognised as the best education centre in Poland in the field of knowledge of world regions.

Knowledge of international issues is popularised by the Faculty through, for example, lectures given as part of the Jagiellonian Diplomatic Encounters by ambassadors from foreign countries accredited in Poland and Polish diplomats accredited in other countries, as well as through Jagiellonian Lectures delivered in London.

FACULTY OF INTERNATIONAL AND POLITICAL STUDIES

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Major studies and research projects

The Faculty of Biochemistry, Biophysics and Biotechnology of the Jagiellonian University is one of the best national scientific research centres and institutions in the field of biological sciences. It received the highest possible grade, A+, in parametric evaluation, a rating given to 3% of the best scientific units in Poland. In addition, the Faculty received (along with the Jagiellonian Centre of Innovation) the status of the Leading National Research Centre (KNOW).

Key research areas include:

- **Biochemistry and Molecular Biology.** Genomics, proteomics, and lipidomics. This includes: proteomics of the nervous system and isolated fractions of stem cells and cancer cells; bioinformatics; genetic and protein engineering including gene therapy, targeted cell modifications and the production of modified monoclonal antibodies; interactomics, enzymology, and molecular bioenergetics including the study of interactions and energy flow between biological systems, short-lived radicals imaging, and protein-ligand molecular interactions; signal transfer including research on the role of signaling molecules in inflammatory state, cell interactions with the extracellular matrix protein, and the role of cell vesicles; the biology of normal cells and cancer cells.
- **Biophysics.** Molecular modelling; structure and dynamics of bioparticles and biological membranes; metabolic processes modelling; the development of methods based on various types of both magnetic resonance imaging and high sensitivity/resolution optical microscopy.
- **Microbiology, Virology and Immunology.** Encompasses studies on mechanisms of pathogenicity including newly identified microbial enzymes and regulation of immune response mechanisms; identification of new pathways of pathogen cell interaction (including eukaryotic microorganisms) with host cells.
- **Biotechnology of Plants and Environmental Protection.** Synthesis and evaluation of new photosensitizers used in therapy, studies leading to the improvement of photosynthetic efficiency in plants including organelle movement in plant cells, the xanthine cycle, and the development of methods of toxin degradation in water treatment.

Between 2009 and 2013 the Faculty collectively received 159 grants from various institutions with a total nominal value of more than PLN 125 million. The grants, which comprise research and infrastructure grants whose principal investigators are both senior and junior researchers, include, for example:

- "Serine Protease Inhibitors as Regulating Factors of Dendritic Cell Factors," principal investigator: Prof. Joanna Cichy;
- "New cancer therapy based on genetically modified Salmonella strain," principal investigator: Prof. Joanna Bereta;
- "Molecular biotechnology for health," principal investigator: Prof. Józef Dulak;
- "Consequences of faulty electron transfer induced by asymmetric cytochrome bcl for mitochondrial respiratory disease and aging," principal investigator: Prof. Artur Osyczka;
- "Protective role of heme-oxygenase-1 in endothelial cells – construction of helper-dependent adenoviral vectors for long-term heme oxygenase expression," principal investigator: Prof. Alicja Józkwicz;
- "Anticancer therapy of the future: Searching compounds for activation of tumour protein p53," principal investigator: Grzegorz Dubin, PhD.

Collaboration

The Faculty conducts fruitful scientific collaboration with more than 80 Polish and international academic centres. These partnerships carry out joint research, provide for student and academic staff exchange, and have implemented multilateral education programmes leading to a dual diploma. Two centres with which the Faculty has collaborated for an extended period include Lund University (Sweden) and Medical College of Wisconsin (United States). The Faculty frequently organises international scientific conferences (e.g. "International Workshop on EPR in Biology and Medicine").



Prof. Jan Potempa – explores virulence factors of *Staphylococcus aureus* and the bacteria responsible for periodontal disease. His pioneering research established a new paradigm in understanding the pathogenesis of disease caused by bacteria whose virulence depends on proteolytic activity. He is the principal researcher for various projects, e.g. "Unique System of Secretion of Bacterial Proteins Responsible for Periodontitis," "Protein Citrullination as the Cause of Correlation Between Rheumatoid Arthritis (RA) and the Objective of the Development of New Drugs for RA." He received an honorary doctorate from Lund University and won first prize of the Foundation for Polish Science, also known as the Polish Nobel Prize.

Assoc. Prof. Ewa Zuba-Surma – conducts research on the biology of stem cells and their application in regenerative medicine, particularly in cardiology. Her major projects include: "Studies on the Efficiency of Microfragments from Genetically Modified Stem Cells as MiRNA Carrier with Proangiogenic and Cardiomyogenic Effects" and "Bioactive Microfragments from Stem Cells as a New Tool for Tissue Regeneration." Her achievements include an award from the International Society for the Advancement of Cytometry, a scholarship from L'Oréal Poland for Women in Science, and an award from the President of the Council of Ministers for her habilitation dissertation.

Assoc. Prof. Krzysztof Pyrc – explores the mechanisms and pathogenesis of human coronavirus infection. He is also developing new antiviral and diagnostic measures for virology. His major projects include "Internalisation of Human Coronavirus to Host Cells" and "Mechanisms of Human Coronavirus NL63 and HKU1 Infections." Krzysztof Pyrc was awarded a scholarship from the Ministry of Science and Education, a scholarship from *Polityka* magazine, and an award for the best doctoral thesis in the Netherlands between 2005 and 2007.

Achievements

Every year, more than one hundred publications included on the Philadelphia ISI Master List are written at the Faculty. One of these publications, particularly noteworthy, is a paper published in the journal *Science*. It describes the findings of Prof. Artur Osyczka's team concerning molecular mechanism functioning of Complex III in respiratory chain.

A research project conducted at the Faculty, "Cancer Therapy Based on Genetically Modified Salmonella Strain," received the Polish Product of the Future award (in the category "Technology at the Pre-implementation Stage"). Moreover, among those innovations implemented in clinical practice that should be mentioned is the use of *in vitro* cultured skin cells in the treatment of hard-to-heal wounds. Prof. Jan Potempa and Prof. Józef Dulak, both of whom work at the Faculty, received honorary doctorates for their scientific research; Prof. Potempa was also awarded the Foundation for Polish Science award.

Successes achieved by the Faculty include various activities designed to popularise scientific knowledge: an annual series of lectures "Spotkania w samo południe z biochemią, biofizyką i biotechnologią" (Encounters at High Noon with Biochemistry, Biophysics and Biotechnology) and the "Lifescience dla licealistów" (Life Sciences for High School Students) workshop.



Specialisation

- Biochemistry
- Biotechnology
- Biophysics ● Molecular Biology ● Genomics
- Proteomics ● Molecular Modelling ● Bioenergetics
- Microbiology ● Cell Biology
- Plant Physiology

FACULTY OF BIOCHEMISTRY, BIOPHYSICS AND BIOTECHNOLOGY

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Major studies and research projects

Research is conducted at the Jagiellonian Library in the fields of source studies, book history, and the history of Polish culture from the 15th century to the 20th century.

- **Creating Catalogues.** On the basis of special collections, specialised catalogues are designed. The most significant ones include: *Katalog łacińskich rękopisów średniowiecznych Biblioteki Jagiellońskiej* (Catalogue of Latin Medieval Scripts in the Jagiellonian Library), *Inwentarz rękopisów Biblioteki Jagiellońskiej* (Inventory of Manuscripts in the Jagiellonian Library), *Katalog zbioru dyplomów pergaminowych BJ* (Catalogue of the Parchment Diplomas Collection in the Jagiellonian Library), *Katalog druków XVI w.* (Catalogue of 16th-century Prints), *Katalog starych druków XVII w.* (Catalogue of 17th-century Prints), *Katalog proveniencji i opraw druków XVII-wiecznych* (Catalogue of Provenances and 17th-century Print Covers), *Katalog najcenniejszych rysunków polskich XVII-XX w.* (Catalogue of the Most Valued 17th-to-20th-century Drawings) and *Katalog polskich druków muzycznych wydanych w latach 1800-1949* (Catalogue of Polish Musical Prints Issued Published from 1800 to 1949).

- **Studies on Hebrew Manuscripts.** A research project was conducted in order to create a database of Hebrew manuscripts. It was a part of the major project entitled "Les livres dans les livres: les fragments hébreux dans les bibliothèques européennes – Books within books: Hebrew Fragments in European Libraries" – in collaboration with L'École pratique des hautes études in Paris.

- **Texts on Medieval University of Kraków.** Research that aims to develop a catalogue of medieval Latin manuscripts, as well as research in medieval education and teaching.

- **Manuscript Heritage after Michał Pawlikowski (1887–1970).** An inventory of the manuscript collection from Michał Pawlikowski's home archives containing valuable materials on the history of Polish literature and culture. Two volumes of the inventory have already been published; additional volumes are in development.

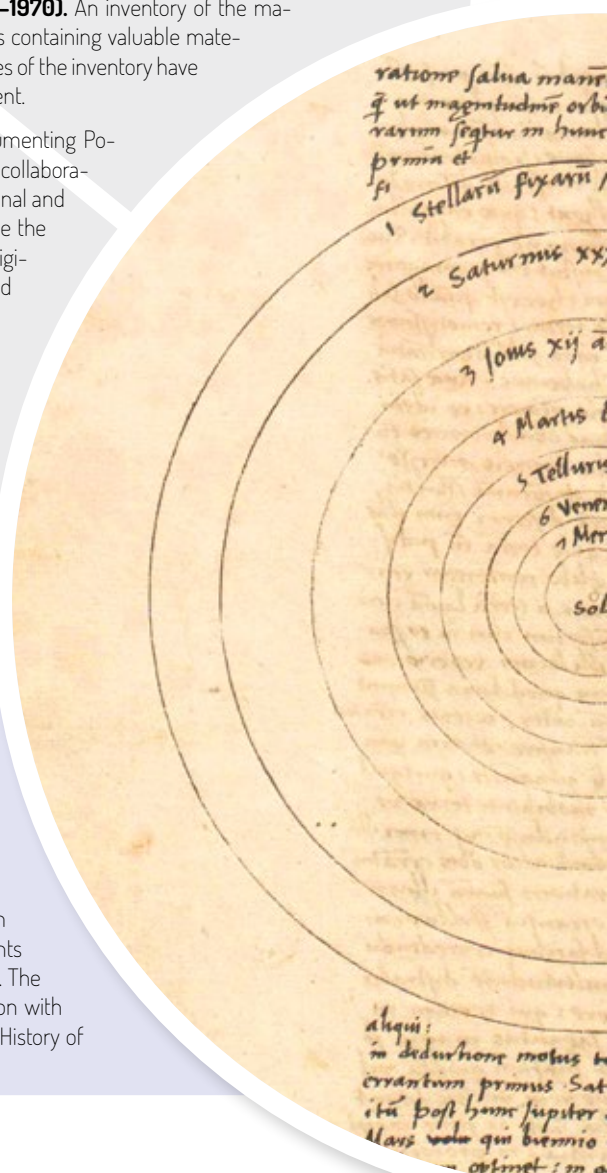
- **"Orientalia Polonica" Series.** A project devoted to documenting Polish research traditions on the Orient is being carried out in collaboration with the Faculty of Philology and the Faculty of International and Political Studies. One of the project's objectives is to digitalise the source material and make it available on the Jagiellonian Digital Library platform, as well as to examine selected works and prepare them for publication.

The staff of the Manuscript Section of the Department of Special Collections participates in studies that are conducted at the Faculty of Philology of the Jagiellonian University in the area of Romance-language manuscripts collection from the "Berlinka" collection of the Jagiellonian Library.

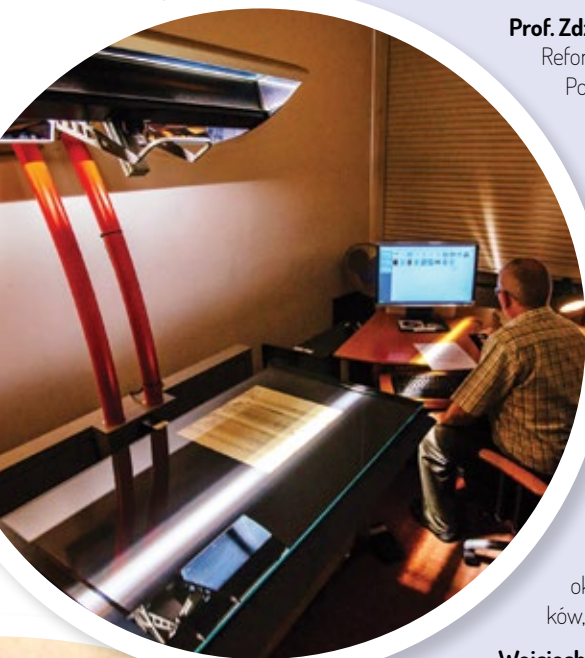
Collaboration

Scholars of the Jagiellonian Library arranged and made available significant material kept in the Polish Library in Paris which concerns the history of the Polish Diaspora in France. This research resulted in the publication of the volume entitled *Archiwum Zygmunta Łubicz Zaleskiego w zbiorach Biblioteki Polskiej w Paryżu* (The archives of Zygmunt Łubicz Zaleski in the collections of the Polish Library in Paris; Kraków 2011).

The next stage of the collaboration with the Polish Library in Paris aims at examining the priceless collection of documents concerning the life of Polish Diaspora in 19th-century France. The Jagiellonian Library has conducted this project in cooperation with the Polish Academy of Arts and Sciences and the Faculty of History of the Jagiellonian University.



Scholars



Prof. Zdzisław Pietrzyk – studies the history of culture, the Church and Reformation in the 16th and the 17th centuries, the research journeys Polish students took abroad in the 16th and 17th centuries, and the history of the Jagiellonian University. Prof. Pietrzyk's field of research covers cataloguing and editing historical sources, including the modern manuscripts in the Jagiellonian Library.

Marian Malicki, PhD – his domain includes studies in print culture (and typography) and book history in the 16th and the 17th centuries, "Polonica" in foreign libraries, the provenance of the 16th-century prints in the Jagiellonian Library, as well as editing and cataloguing prints from Jan Brożek's collection.

Monika Jaglarz, PhD – her interests include compiling manuscripts and editing modern sources, such as documents which concern the historical demography of Poland, as well as the history of books and bookselling in Poland, particularly in Kraków, in the 16th and the 17th centuries.

Wojciech Świeboda, PhD – explores medieval Latin manuscripts, conducts research in medieval diplomacy and the history of religious dissidents. He is the co-author of the catalogue of the parchment diplomas in the Jagiellonian Library.

Achievements

When listing significant results of research conducted at the Jagiellonian Library, it is essential to mention published catalogue volumes, such as *Katalog łacińskich rękopisów średniowiecznych BJ* (Catalogue of Medieval Latin Manuscripts in the Jagiellonian Library Collection in Kraków), *Katalog druków XVI wieku ze zbiorów Biblioteki Jagiellońskiej w Krakowie* (Catalogue of 16th-century Prints in the Jagiellonian Library), as well as inventories and indexes such as *Inwentarz rękopisów Biblioteki Jagiellońskiej* (Inventory of the Jagiellonian Library Manuscripts).

The research conducted by the scholars of the Jagiellonian Library has resulted in the publication of books, such as *Repertuar wydawniczy drukarni Franciszka Cezarego Starszego 1616-1651* by Marian Malicki (Repertoire of the Franciszek Cezary Starszy publishing house 1616-1651), and *Poczet rektorów Uniwersytetu Jagiellońskiego 1400-2000* by Zdzisław Pietrzyk (Portraits of the rectors of the Jagiellonian University 1400-2000). These books also contribute to the development of Poland's research.

The Jagiellonian Digital Library (bjc.bj.uj.edu.pl/dlibra) – a platform that makes available collections and digital copies of research publications of the Jagiellonian Library; has been in operation since 2010.

- Codicology
- History of Books
- Manuscripts • Old Prints • Cartography
- Graphics • Musicology
- Library Science
- Scientific Information

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DIGITAL JAGIELLONIAN LIBRARY

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Major studies and research projects

The Jagiellonian Centre for Experimental Therapeutics (JCET) is an extra-faculty unit of the Jagiellonian University. Its main objective is to develop experimental pharmacotherapy for civilisation diseases as well as to develop collaboration with industry in this area. The idea of establishing JCET involves collaboration between the Jagiellonian University, Łódź University of Technology, and the Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences in Kraków.

The main goal of JCET is to develop interdisciplinary research on the role of endothelium in civilisation diseases and to seek new pharmacotherapeutic mechanisms in the endothelium and vascular wall on the basis of interdisciplinary pharmacological, pharmacokinetic, analytical, and biochemical studies, as well as with use of a wide panel of imaging methods (Raman spectroscopy, EPR, and MRI). Of particular significance for the concept of establishing JCET is the specialisation of this unit in the research on original chemical compounds and drugs endowed with endothelial activity of potential therapeutic application.

Key research areas explored at JCET are:

- **Endothelium in Civilisation Diseases.** Research in the following areas is being conducted as part of the project coordinated by JCET: pharmacological effect of compounds in the models of endothelial inflammation in isolated endothelial cells and *in vitro* in the isolated aortic rings; therapeutic efficiency of compounds with endothelial activity in the unique models of animal endothelial dysfunction and hepatitis. This group of analyses includes studies on optical activity and intermolecular interactions of new chemical compounds as well as the development of a methodology for the phenotype assessment of endothelial inflammation using the Raman mapping method and infrared absorption spectroscopy. Additionally, JCET conducts pharmacokinetic (PK) studies on the selected compounds with vasoprotective actions as well as analytical research on biomarkers of endothelial dysfunction using the LC/MS/MS technique.
- **Endothelium and Cancer.** Research on the pharmacotherapy of endothelium, as well as prostacyclin-dependent platelet activation, nitrogen monoxide, and carbon monoxide is conducted at JCET laboratories. The objective of this research is to develop a new strategy for endothelium-dependent cancer metastasis prevention.
- **Pharmacology of Carbon Monoxide-Releasing Compounds.** Studies on antiplatelet and anticoagulant effect of carbonmonoxide-releasing compounds are conducted at the JCET Laboratory of Experimental Pharmacology of Endothelium in collaboration with France's Université Paris-Est, INSERM.



Collaboration

JCET's activity is based on extensive domestic and international cooperation, particularly in the field of medical chemistry and the development of original chemical structures acting on endothelium. The list of JCET's significant foreign partners includes the Institute of Organic Synthesis (Latvia), National Institute of Health (United States), University of Zurich (Switzerland), University of Exeter (United Kingdom), and Université Paris-Est (France). Domestic partners include the Łódź University of Technology, Poznań University of Technology and the Institute of Biotechnology and Antibiotics in Warsaw.

Scientists from JCET collaborate within the framework of research on endothelium and cancers with four institutions in Poland: the Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences in Wrocław, the Medical University of Gdańsk, the Medical University of Białystok, and the Medical University of Łódź, as well as with foreign partners such as the aforementioned Institute of Organic Synthesis in Riga. In the scope of the research project "Endothelium in Civilisation Diseases..." JCET collaborates with a total of seventeen research teams from nine scientific centres in Poland.

Scholars

Prof. Stefan Chłopicki – a pharmacologist and a professor of medical sciences. His main interests focus on pathophysiology, biochemistry, and pharmacology of endothelium, the role of lipid mediators in infection, and the pharmacology of platelets. He is the academic supervisor of the JCET Laboratory of Pharmacology of Endothelium and the Head of the Department of Experimental Pharmacology at the Chair of Pharmacology of the Jagiellonian University Medical College. Prof. Chłopicki has written more than 180 papers, numerous abstracts presented at international Conferences, and several patent applications. He has received numerous awards for academic achievement including the prestigious Professor's Subsidy from Foundation for Polish Science (FPS). One of Prof. Chłopicki's most important achievements is the discovery of COX-2 and PGI₂-dependent endothelial effect of 1-methylnicotinamide (MNA): nicotinamide metabolite and nicotinic acid. This discovery allows for a new understanding of the pharmacology of nicotinic acid and opens up new therapeutic perspectives.

Prof. Małgorzata Barańska – a professor of chemistry. Her research focuses on the analysis of biological compounds using spectroscopic methods, particularly Raman spectroscopy. She also focuses on imaging of animal tissue and endothelial cells in search for the markers of pathology and drug therapy with use of the atomic force microscope (AFM) and the near-field scanning optical microscope (SNOM). She is the scientific supervisor of the JCET Laboratory of Raman Spectroscopy, and the Head of the Raman Imaging Team at the Faculty of Chemistry of the Jagiellonian University. She is the winner of numerous prizes for academic achievement. Prof. Barańska's most important achievement is the development of a methodology for spectroscopic testing of bioactive compounds and complementary spectroscopic imaging of animal tissues and cells, that allows for the tracking of processes occurring in live cells: changes caused by dysfunction and drug treatment, as well as analysing the mechanisms of these processes.

Assoc. Prof. Maria Walczak – holds the degree of habilitated doctor in pharmaceutical sciences and is a specialist in clinical pharmacy. Her main scientific interests include the assessment of pharmacokinetic profiles of new biologically active compounds, the profiling of metabolic pathways of bioactive structures, the assessment of the extent of drug protein binding, the assessment of physicochemical properties of new substances, and the use of LC/MS/MS and capillary electrophoresis in the bioanalysis of new compounds and biomarkers. She is the Head of the JCET Laboratory of Analytics and Pharmacokinetics and works in the Department of Pharmacokinetics and Physical Pharmacy of the Jagiellonian University Medical College. One of her most significant achievements was the implementation of a new LC/MS/MS technique designed to assess the pharmacokinetic profile of compounds with beta-antagonistic effects, in particular enantioselective analysis of chiral compounds, determining the extent of their binding to blood protein, predicting metabolism pathways, and determining their physicochemical properties.

Achievements

One of JCET's significant achievements was establishing a unique scientific framework in Poland that conducts interdisciplinary research on endothelium.

JCET conducts advanced studies with several original groups of particles with potential therapeutic effect.

In 2013, JCET – as one of the few academic laboratories in Poland – implemented a Good Laboratory Practice (GLP) system, thus obtaining the related accreditation issued by the Polish Accreditation Centre.

JCET prepares a unique offer of an overall assessment of endothelial dysfunction and the effect of chemical compounds on the endothelium and the vessel wall. This proposal is addressed to the industry and other scientific centres.

As a result of research conducted in JCET, numerous patent applications for technologies have been filed, and these new technologies will be commercialised in the coming years. Patent applications resulting from projects coordinated by JCET include original chemical structures, markers for magnetic resonance imaging (MRI), and new technical solutions used in microscopy.

- Interdisciplinary Experimental Pharmacology of Civilisation Diseases
- Studies on Endothelium

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COPERNICUS CENTER FOR INTERDISCIPLINARY STUDIES



Major studies and research projects

The Copernicus Center for Interdisciplinary Studies was established as a joint-venture between the Jagiellonian University and the Pontifical University of John Paul II in Kraków. It was created on the initiative of Rev. Prof. Michał Heller, a renowned philosopher and cosmologist.

The Center supports and encourages scholars to conduct studies at the intersections of different scientific disciplines. These studies are carried out within the following research groups: "Biological Foundations of Law and Ethics," "History of Science and Philosophy of Nature," "Analytical Metaphysics," "Neuroscience," "History of Mathematics: People – Ideas – Philosophical Aspects," "Mathematical Structures of Universe," "Philosophy of Physics and Cosmology," "Science and Religion," "Copernican Group," and "Philosophy in Computer Science." The scope of research of these groups can be found at the Copernicus Center website: www.copernicuscenter.edu.pl.

Two research grants were conducted in the Copernicus Center:

- **"Philosophy of Science in European Perspective."** A research grant completed under the direction of Prof. Tomasz Placek. The project was devoted to several issues related to the modern philosophy of science: Are the world and our theories of it deterministic? Is the distinction between past, present and future (distinction between tenses) objective? How should quantum nonlocality that appears in Bell's inequality be interpreted?

- **"The Limits of Scientific Explanation."** A grant awarded by the Templeton Foundation and conducted by three research groups: "Physics and Cosmology," "Philosophy and Theology," and "Mind and Normativity." The objective of the studies carried out in these groups is to discuss the methodological opportunities and limitations in various scientific disciplines. In addition to the research, the groups are also involved in educational activities and undertakings popularizing science.

Collaboration

The Copernicus Center, as a joint-venture between the Jagiellonian University and the Pontifical University of John Paul II, associates not only eminent scientists from both universities, but scholars from other scientific institutions in Poland (e.g. the Polish Academy of Sciences, the Polish Academy of Arts and Science, AGH University of Science and Technology, the University of Social Sciences and Humanities, and Warsaw University of Technology), and abroad (the University of Michigan, the University of Bologna, Catholic University of Leuven, and the University of Namur).



Scholars

Rev. Prof. Michał Heller – the initiator, founder and director of the Copernicus Center for Interdisciplinary Studies. The author of more than 800 scientific and popular science publications about the philosophy and history of science, physics and cosmology, as well as interdisciplinary publications about science and theology. He is the creator of a cosmological model that uses noncommutative geometry to describe phenomena that probably occurred in the initial phases of the universe's evolution. He suggested the research programme of philosophy in science, i.e. philosophical reflection conducted in the strict context of scientific theories. Rev. Prof. Heller was also awarded the Templeton Prize.

Prof. Jerzy Stelmach – a philosopher and a lawyer. He received honorary doctorates from Heidelberg University and the University of Augsburg. He is the Head of the Department of the Philosophy of Law and Legal Ethics at the Jagiellonian University. His scientific interests are legal philosophy and theory of law. He is also the director of the research project "Naturalisation of Law" awarded by the National Science Centre within the MAESTRO programme.

Prof. Bartosz Brożek – a cognitivist and a philosopher, deputy-director of the Copernicus Center for Interdisciplinary Studies. He works at the Department of Philosophy of Law and Legal Ethics at the Jagiellonian University. He has received many prizes and scholarships, including scholarships from the President of the Council of Ministers, the Minister of Science and Higher Education, the Humboldt Foundation, and *Polityka* magazine. He has written numerous books and papers on the philosophy of law, ethics, the philosophy of science, the philosophy of logic, and cognitive science. He is the Head of the "Biological Foundations of Ethics and Law" research team.

• **Interdisciplinary Studies at the intersection of the Natural and Social Sciences, and the Humanities**

Achievements

The most significant scientific achievements of the Copernicus Center are connected with conducting "The Limits of Scientific Explanation" grant. Under this project, the problems of the limits of the scientific method were analysed from both the "internal" perspective (how it functions within specific scientific disciplines such as physics, cosmology, psychology, and neuroscience) and the "external" perspective (metascientific, philosophical and theological). The extensive research results include: the development of noncommutative models that unify the general relativity theory and quantum physics as well as the development of the structural approach to the philosophy of cosmology. It should also be noted that these analyses contributed to establishing the limits of modern logic in the context of theological problems, determining conceptual relations between empirical science and theology, determining the methodological and ontological limits of scientific explanation of normative phenomena, and developing the methodology for philosophy in science.

The Center runs the popular science portal GraniceNauki.pl (Limits of Science) and invites scholars from different disciplines to give weekly popular science lectures. The Center's youtube.pl web portal, where lecture recordings, discussions and interviews are uploaded, is also an important part of its activity. Since September 2013, the Copernicus Center Foundation has been running the De Revolutionibus Book & Cafe, a meeting venue for the scientific community. In May 2014, the Center, the *Tygodnik Powszechny* weekly, and the city of Kraków organised the first edition of the Copernicus Festival which emphasised the place of science in culture.



Major studies and research projects

Despite the fact that it has only been in operation for several months, MCB had already undertaken several key research projects:

- **Light – Circadian Rhythm – Retinal Degeneration.** This project is led by Prof. Tadeusz Sarna at the MCB Neurobiology Department. Research examines the influence of visible light waves on circadian rhythm and neural aspects of cognitive and emotional functioning in people; the research also seeks to understand the influence of light on retinal degeneration and pathology. The originality and innovation of the project lies in its holistic approach to the study of melanopsin potential (photosensitive pigment) in model and cell systems, as well as in various strategies that provide protection for retina from undesired phototoxicity. The expected research results should lead to deeper knowledge and understanding of the melanopsin system in physiology, psychology and pathology.

- **Studies on Epithelium.** Research connected with protein crystallisation and determining protein tertiary structure is conducted in the X-ray Laboratory at the MCB Structural Biology Department.

The close interactive collaboration of scholars representing two different branches of science will allow for the development of molecular probes, thus providing for the analysis of protease activity in *in vitro* cell cultures and in *in vivo* system. Although based on basic research, this project will lay the foundations for application studies on epithelium malfunctions. Furthermore, it may have an impact on the development of future anticancer strategies. This project is led by Prof. Jan Potempa.

- **Potential Anticancer Drugs.** These studies are conducted in consortium with Selvita S.A. The Jagiellonian University's team is led by Prof. Józef Dulak, and some project tasks are carried out in laboratories at the Malopolska Centre of Biotechnology. The objective of the project is to develop and study new heme oxygenase-1 (HO-1) inhibitors with a view of using them in the process of anticancer treatment.

- **Treatment of chronic obstructive pulmonary disease.** This project is conducted at the X-ray Laboratory at MCB Structural Biology Department by Stanisław Malicki, PhD. Studies are financed by the industry, in this case a biotechnological company.

Collaboration

Scientists from the Malopolska Centre of Biotechnology collaborate with various domestic and international research centres. The Malopolska Centre of Biotechnology signed cooperation agreements with Max Planck Gesellschaft in Germany (the research team is formed by MPG at MCB), Centre National de la Recherche Scientifique in France (the agreement allows for the financing of research at MCB laboratory), Kyoto University in Japan, and the National Institute of Agrobiological Sciences (NIAS) Tsukuba in Japan. Negotiations are in progress for a cooperation agreement with Oxford University.



Scholars

Prof. Kazimierz Strzałka – Head of the Małopolska Centre of Biotechnology and President of the Council of Małopolska Centre of Biotechnology at the Organisation Phase. The originator of the Małopolska Centre of Biotechnology project, Prof. Strzałka works at the Faculty of Biochemistry, Biophysics and Biotechnology of the Jagiellonian University. Prof. Strzałka's scientific interests revolve around issues related to biochemistry, biophysics and molecular biology of the photosynthesis process. Several of his scientific achievements concern the transport of protein into plastids, where it was proven that particular types of plastids differ in terms of the ability to transport various types of chloroplast proteins. Prof. Strzałka was the first scientist to describe the existence of a new enzyme family whose activity is dependent on the presence of lipids creating a reversed hexagonal phase. Many scholars from various faculties of the Jagiellonian University are involved in the MCB research.

Prof. Adam Dubin – one of the scientists most closely involved in establishing the Centre, the Vice-President of the Council of Małopolska Centre of Biotechnology at the Organisation Phase, professor of biochemistry, the Head of the Department of Analytical Biochemistry at the Faculty of Biochemistry, Biophysics and Biotechnology of the Jagiellonian University. He is an expert in enzymology and protein chemistry. His main scientific research interests are correlations between the structure and function of enzymes and inhibitors (mainly of bacterial origin), as well as applications of antibacterial peptides as potential broad-spectrum antibiotics. The characterisation of staphostatin and hemocidin families is a major achievement of the research group led by Prof. Dubin. He is also the founder of the biotechnological company BioCentrum, a member of the scientific board of the company Selvita (since 2008), and a member of the supervisory boards of the biotechnological companies Mabion (2010–2011) and Selvita (since 2011).

Prof. Zbigniew Miszalski – the first researcher holding the title of professor employed at the Małopolska Centre of Biotechnology. His scientific interests include studies on the impact of SO_2 , heavy metals, ozone and salt stress on the process of photosynthesis at the single organism, cell organelle, and molecular levels. Prof. Miszalski's most important scientific achievements include: confirming the impact of environmental pollution on the efficiency of the antioxidative system in arable crops and mycorrhizal fungi, as well as demonstrating a strict correlation between type of photosynthetic metabolism and resistance to pathogens. He is currently conducting studies aimed at explaining metabolic links during C3-CAM transformation and proving the significance of these changes for C3 plants. The practical aspect of these studies should be emphasised, as they are applicable in the analysis of physiological changes observed in arable crops.

Achievements

Research conducted in the MCB, which opened in May 2014, is more and more intense. Research results can already be discussed in 2015, with more to follow in the years to come.

- Biotechnology
- Drug Design • Stem Cells • Tissue Engineering
- Virology • Civilisation Diseases • Biosynthesis of Nanoparticles
- Contactless Interface
- Bioremediation

MALOPOLSKA CENTRE OF BIOTECHNOLOGY (MCB)

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Major studies and research projects

The Synchrotron Radiation Centre, established in 2009, is an interdepartmental unit of the Jagiellonian University. Its main and strategic objective is to build the SOLARIS National Synchrotron Radiation Centre, to provide scientists with access to a source of synchrotron radiation in the future, as well as allow scientists to conduct scientific and technological research in various fields of knowledge.

The **synchrotron** is the first tool in Poland with multiple research purposes, from physics, medicine and geology, to archaeology and the history of art.

Synchrotron studies lead to breakthrough discoveries in a broad range of research fields (they have contributed to the granting of several Nobel Prizes) and increase innovativeness and competitiveness of economies in the countries where they function. The synchrotron will be ready for use by research groups in 2016.

Scientists from the Synchrotron Radiation Centre also participate in other research projects which support the key project, that is, the construction of the synchrotron.

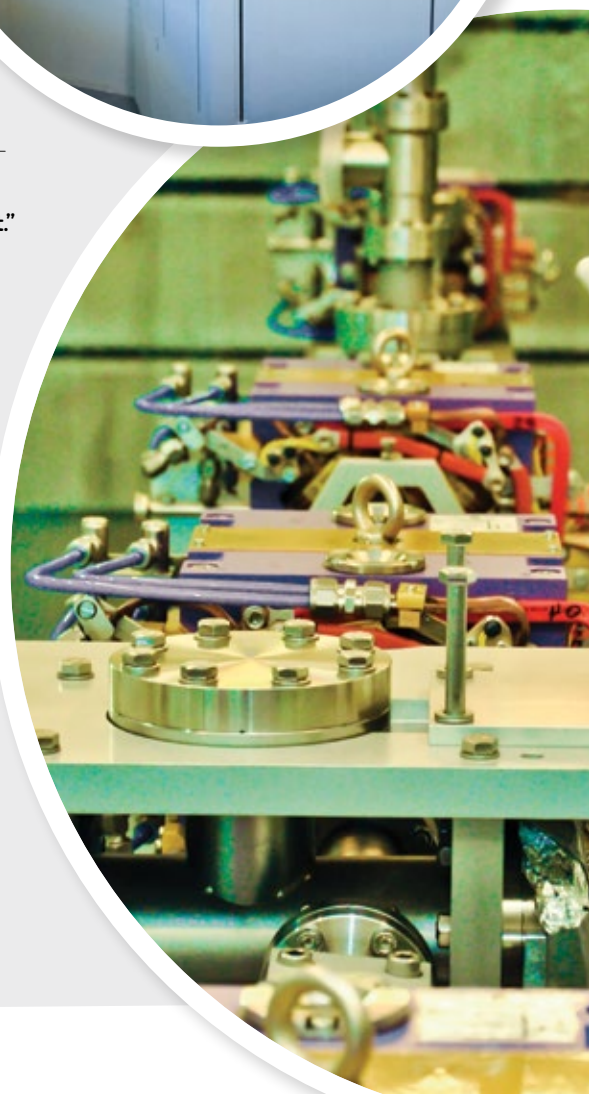
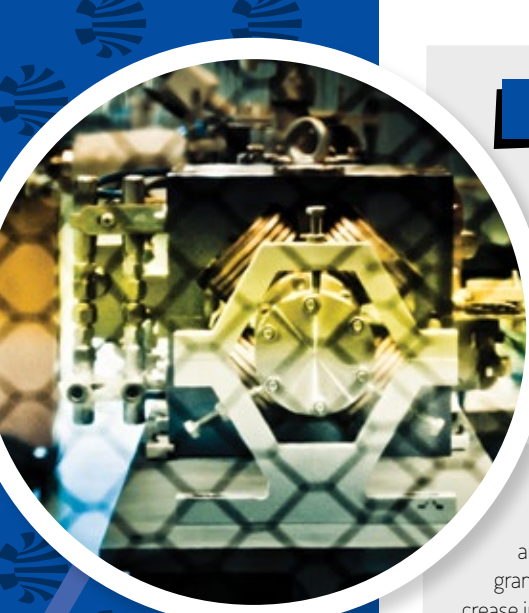
- **“PLGrid Plus.”** The SOLARIS team, in cooperation with scientists from Polish universities, take part in the project, which provides IT support to Polish research teams conducting their studies. Activities related to the “PLGrid Plus” project will enable the development of equipment and programming facilities for research conducted using synchrotron radiation.

- **“Swiss Light Source Performance Improvement Project.”**

Piotr Tracz, PhD, was the coordinator of the linear accelerator on the SOLARIS team. He conducted the project for improving storage ring optics, reducing adverse effects of nonlinearity in the optical network to improve the parameters of electron-beam, and optimising the process to improve electron beam parameters, and optimising the beam injection process into a storage ring.

- **Liquid Crystals Studies.** Adriana Wawrzyniak, PhD, is the coordinator for the maintenance and development of accelerators on the SOLARIS team. She participated in the research project “Investigation of ferroelectricity mechanisms in molecular systems built from rod-like chiral and bent-core achiral molecules.” These research results are a major contribution to knowledge about alignment of liquid crystalline molecules in an external electric field, which is an important issue for applications in Liquid Crystal Displays (LCDs).

- **DYNASYNC.** Marcin Zajęc, PhD, the coordinator of the experimental line of soft X-rays on the SOLARIS team. He participated in the international DYNASYNC projects and domestic projects in surface physics such as dynamics and magnetism in nanoscale.



Collaboration

The Synchrotron Radiation Centre works closely with international synchrotron centres, such as MAX IV Laboratory (Sweden), Elettra (Italy), CELLS – ALBA Synchrotron (Spain), and Swiss Light Source (Switzerland). Synchrotron Centre MAX IV Laboratory at Lund University (Sweden) is a strategic partner for the SOLARIS team. It carries out one of the most advanced projects in the world: the construction of two synchrotrons and a free-electron laser. This cooperation allowed for this expertise and know-how to be used in the construction of the Polish synchrotron, which will be a replica of the Swedish synchrotron. Scientists at the Centre, together with the Jerzy Haber Institute of Catalysis and Surface Chemistry at the Polish Academy of Sciences, collaborate with the Swiss Paul Scherrer Institut (PSI) and conduct final tests of the experimental station for the Polish synchrotron.

At each stage of the synchrotron's construction, scientists from SOLARIS collaborate with the Polish Synchrotron National Consortium, which includes representatives from 36 universities and research institutes in Poland. A similar cooperation is carried out in consultation with the Polish Synchrotron Radiation Society (PTPS), involving more than 150 scholars.

Scholars

Prof. Marek Stankiewicz – professor of physical sciences at the Institute of Physics of the Jagiellonian University. Since 2010 he has been the Director of the Synchrotron Radiation Centre of the Jagiellonian University. He is the author, co-author, and team member of many domestic and international projects, such as the first Polish synchrotron construction project and the following projects: "Ultrafast Processes Laboratory," "Development of Techniques and Systems Allowing Constant Characteristics of Free-Electron Laser Impulses," and "The Attosecond Project."

He has conducted or participated in Swedish, French and British projects in atomic and molecular physics using lasers, high power lasers, attosecond lasers, and synchrotron radiation. Prof. Stankiewicz has published 64 papers in peer-reviewed international scientific journals and has obtained 7 patents. He also designed systems for experimental devices, including devices to create supersonic molecular beams, electron energy loss spectrometry, time-of-flight mass spectrometry, measurement systems for fluorescence spectra, and numerous high-vacuum device systems.

Adriana Wawrzyniak, PhD – holds a PhD in physical sciences. She works at the Synchrotron Radiation Centre as the coordinator for maintenance and development of accelerators. She spent four years at the Swedish synchrotron centre in Lund (MAX IV Laboratory) to prepare for the start-up of the Polish synchrotron. Her current scientific interests focus on particle accelerators, designing the magnetic network for linear and circular accelerators, and transfer lines.

She also works on optimising parameters that allow a synchrotron to achieve high performance, which requires advanced computer-aided calculations electron-beam dynamics. These research passions have practical applications for work on the Polish synchrotron project.

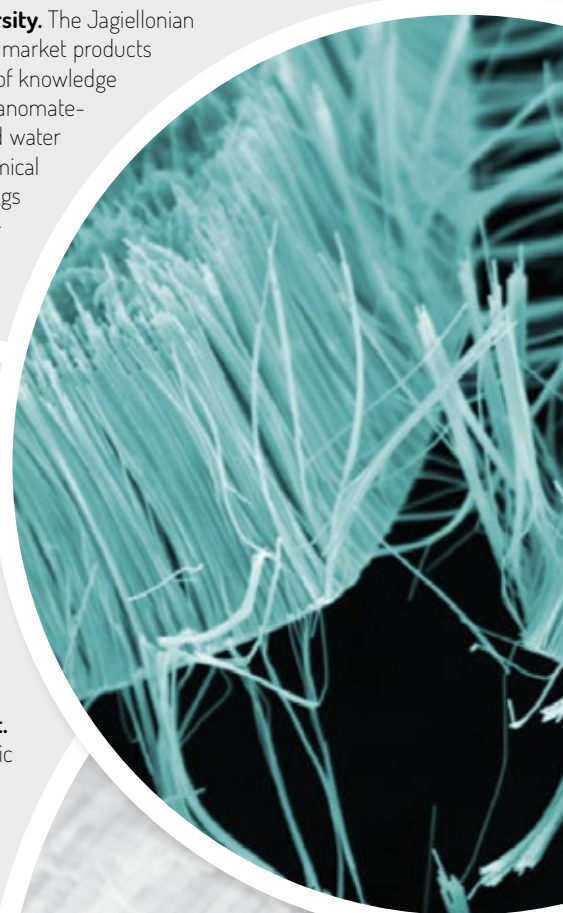
- Accelerator Physics
- Electronics
- Computer Science
- Vacuum Physics
- Electrotechnology
- Monitoring Systems
- Automation and Robotics





Major studies and research projects

- **Technological Offer of the Jagiellonian University.** The Jagiellonian University portfolio comprises more than 150 new market products and services. The portfolio refers to various fields of knowledge such as **chemistry** (new materials including nanomaterials and biomaterials, industrial catalysts, air and water protection technologies, new methods of chemical synthesis), **biomedicine** (new therapies and drugs for treatment of cancer, diabetes, epilepsy, peripheral neuropathy, central nervous system diseases, new medical products and preventive coatings for osseous implants), as well as **devices and measuring equipment** (new techniques for medical imaging, magnetometry, monitoring of atmospheric phenomena, laboratory analytics, equipment for measuring physicochemical properties of materials, and improvements for electronic systems).
- **“On Request” Research Offer.** More than 80 research teams are prepared to provide their research services for business, public institutions, and other research centres. The offer covers a wide range of topics in the six areas: analytical chemistry, medicine and pharmacy, mathematics and computer science, environment, new materials, the humanities and society.
- **Collaboration of Scholars with Economic Environment.** CITTRU is responsible for the complex coordination of economic cooperation of science and business: from identifying research projects with application potential, through analysis of market potential of the obtained results, their legal protection, marketing and active search of technology buyers, to the conclusion of commercial contracts. In case of “on request” studies, CITTRU is also responsible for the legal and administrative coordination of “on request” studies.



Collaboration

A key activity of CITTRU is identifying and starting business cooperation with companies: prospective buyers of innovations developed at the Jagiellonian University and clients of research services. Every year, CITTRU establishes cooperation with various national and international companies (e.g. Simcyp from Great Britain, and Unilab from the United States) regarding selling rights to discoveries made by the Jagiellonian University scholars or funding further research aimed at increasing the functionality of the discovery (implementation work). Moreover, CITTRU initiates industry meetings with business representatives in various countries and with international organisations that promote the cooperation of science with business (e.g. ASTP Proton). In creating scientific consortia with business (e.g. the US-based Unilab Inc.), it is important for this unit of the Jagiellonian University to be active, as it allows joint research and development projects to be implemented as well as to optimise developed “scientific products” to fit the needs of the market.

Nanostructured electrodes: silver (green) and copper (red).
Innovation developed at the Faculty of Chemistry as constituting element of technological offer of the Jagiellonian University

Achievements

In 2007, CITTRU developed and implemented the first regulations in Poland concerning the business applications of research results achieved by scholars from the Jagiellonian University. It provides comprehensive support to scholars in the process of transferring "scientific products" to business. It effectively coordinates the efforts of the Jagiellonian University in obtaining patent protection for discoveries (56 patents, more than 270 patent applications in Poland and abroad), as well as supports research teams in implementing studies for external entities: 115 studies for business partners from Poland and abroad, e.g., the United States, Great Britain, and the Netherlands, for a total value of PLN 5.5 million (2008–2014).

CITTRU is engaged in actively marketing the innovative offer of the Jagiellonian University during national and international trade fairs as well as networking meetings with business partners from, e.g. the United States, China, Russia, and most EU countries. These actions have resulted in several dozen prizes and distinctions for the Jagiellonian University innovations such as two gold medals during the 29th Annual INPEX (Invention and New Product Exposition fair), a gold medal in Moscow during the 17th ARCHIMEDES 2014 (The Moscow Salon of Inventions and Innovation Technologies), and two gold medals during the BRUSSELS INNOVA 2013 fair.

These actions have resulted in obtaining business partners for joint-research and implementation projects, as well as finding business applications for discoveries, e.g., software for the evaluation of the cardiotoxicity of drugs, photocatalytic materials for the disinfection of plastics, and the CleanCut technology for recombinant protein production.

- **Innovative Offer of the Jagiellonian University**
- **Finding Business Applications**
- **Know-How Transfer**
- **Legal Protection of Discoveries**
- **Patents**
- **Licenses**
- **"On Request" Research**
- **Innovation Marketing**
- **Market Analysis**
- **Consulting**

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