International conference SCIENCE, INNOVATION AND GENDER

PROCEEDINGS

M. Curie

The conference is dedicated to the 100th anniversary of
Marie Sklodowska-Curie's second Nobel Prize

INTERNATIONAL CONFERENCE "SCIENCE, INNOVATION AND GENDER"

24-25 November 2011
Vilnius, Lithuania

PROCEEDINGS

The conference is dedicated to the 100th anniversary of
Marie Sklodowska-Curie's second Nobel Prize

Presentations are not edited

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Organizing institutions

Institute of Theoretical Physics and Astronomy of Vilnius University (ITPA VU)
BASNET Forumas
Kaunas Technological University (KTU)
Lithuanian University of Educational Sciences (LUES)
INFOBALT Lietuva

Organizing committee

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Content

Foreword

I am pleased to present the materials of the international conference "Science, Innovation and Gender" held in the premises of Seimas of the Republic of Lithuania in November 24-25, 2011. The conference was dedicated to the 100th anniversary of Marie Sklodovska-Curie's second Nobel Prize and taken under the patronage of Lithuanian National Commission for UNESCO. The conference was organized by Vilnius University ITPA, BASNET Forumas association, Kaunas University of Technology, Lithuanian University of Educational Sciences and InfoBalt association.

*The book contains summaries of plenary lectures, abstracts of poster presentations as well as a list of books published by Lithuanian women scientists exhibited during the conference. However, not all lecturers have sent us their talks. If you fail to find the talk you are interested in, please, refer to the conference site (*http://www.tfai.vu.lt/curie/*) where all presentations are published.*

*The presentations delivered by outstanding speakers from different European countries, work of Lithuanian women scientists who presented their research results, premiere of movie "*Marie Curie, au-delą du mythe*" conducted by French* Michel Vuillermet *and kindly organized by French Institute in Lithuania – all this made the conference a great success. However, the success would not be possible without the efforts and goodwill of many people who in different ways supported the organization of the conference and made it a major event. On behalf of the organizing committee I would like to thank Vice Speaker of Seimas of the Republic of Lithuania V. Baltraitienė, members of Seimas A. Zuokienė and M. A. Povilionienė as well as Seimas Chancellor J. Milierius for support. The conference was also pleased to receive the welcome sent from the Polish Ministry of Science and Education with a nice gift – a new book about Marie Curie.*

Many thanks to the large number of organizations, which supported the conference and helped to make it a real event. The logos of all these organizations are presented in the book. The photos that witness the most interesting moments of the conference are presented in the book too.

I would also like to express my thanks to all organizers of the conference. Special thanks to G. Tautvaišienė, director of Vilnius University ITPA, who added valuable input making the conference successful.

I would like to finish my short preface with the strong belief that the main task of the conference, which aimed to call the attention of the society and show the strong input of women scientists into the science as well as discuss the problems related to the rise of women involvement into research activities, was successfully achieved.

Chairwoman of the Organizing Committee

BASNET Forumas President
Assoc. Prof. Dr. Dalia Šatkovskienė

Opening speakers

Virginija Baltraitienė
Parliament of the Republic of Lithuania

Prof. Habil. Dr. Romas Pakalnis
Lithuanian National Commission for UNESCO

Prof. Habil. Dr. Aušrinė Marija Pavilionienė
Parliament of the Republic of Lithuania

Assoc. Prof. Dr. Dalia Šatkovskienė
BASNET Forumas

Dr. Albertas Žalys
Ministry of Education and Science

Prof. Habil. Dr. Valdemaras Razumas
Lithuanian Academy of Sciences

Prof. Habil. Dr. Jūras Banys
Vilnius University

Habil. Dr. Gražina Tautvaišienė
Institute of Theoretical Physics and Astronomy of Vilnius University

Dr. Małgorzata Kasner
Polish Institute

Pascal Hanse
French Institute in Lithuania

Opening remark

by M. A. Pavilionienė
Member of Parliament of the Republic of Lithuania

Good morning, dear participants of the conference.

Dear ladies and gentlemen, it is a great honour to welcome you at such a great event, dedicated to Marie Sklodowska Curie, who 100 years ago was awarded the second Nobel Prize for achievements in chemistry. The discoveries of Marie Curie, a passionate scientist, transformed the physical world we live in. She created and developed nuclear science, laid the basis for radiation therapy for treating cancer.

Marie Curie, commenting her work with radium, radioactive substancies, said: „Nothing in life is to be feared - it is only to be understood". This phrase has many shades of meaning, which can be applied to different life situations, let's say to gender policy. Sexual equality has changed women's lives: women got free from all kinds of fears and humiliation, negated stereotypical gender dogmas, stereotypical gender roles. Today women by their professional work are to make conservatively thinking males and females understand that in modern world, in democratic society gender equality and equal opportunities are the basis of social progress.

However, the problem of understanding is eternal, because individual systems of meanings differ due to different level of education, different cultural, social, religious influences, different individual mental structures.

In case of prominent historical personalities, such as Marie Curie, individuals with different mentality face the incontravertible facts, which they can not deny. Marie Curie, a talented woman, a bright personality had lust for science, passion for discovery, was devoted to science, therefore she has became a model for women in science, a model for scientists and researchers.

We came here today not only to commemorate Marie Curie's achievements in science. We came here for one more urgent task - to discuss gender disbalance in sciences and technology, the underestimation of women in sciences and technology. To discuss the initiatives how to change gender disbalance in academy and science, and as well as to confirm how much modern women have achieved in science and technology all over international community.

Before you start work in special sections, I would like to express gratitude to the organizers of this important conference, which has brought prominent women scholars together. Especially I want to thank Dalia Šatkovskienė, President of Basnet Forumas, who was one of the first in postsoviet Baltic countries to raise the issue of gender inequality in sciences and technology.

Gender inequality in sciences is still evident in the states of the European Union. But, comparing the past and the present of women's history, we witness a great progress in the development of social human relationship: women's suffrage, women's movement, feminist theories, women's rights, the laws of gender equality and equal opportunities have stopped in greater part of the world women's humiliation, exploitation and discrimination. However, the concept of the traditional family, the traditional gender roles in Lithuania are still belauded, though life has proved that career structures for women, based on the traditional family roles, are not suitable any more for shaping the future of modern society.

It is a paradox that in Lithuania the most educated part of society – academics, scientists, reseachers – are not active enough to revaluate stereotypical gender roles and the concept of the traditional family, the dogmatic understanding of sexual human nature. Keeping away from gender politics might mean either negation or support of stereotypical gender policy. Therefore in democratic, open society scientists, men and women, should perform their civic duty – clearly express their attitude towards human rights and freedoms, towards politics of gender equality and equal opportunities in any sphere of life.

Attempting to implement gender equality, European societies are to find the best ways how to combine the family life and professional work for both sexes. In the countries, where Christianity plays a significant role, the cult of motherhood narrows woman's life perspectives. It is undeniable that women scientists enrich society by their individual professional creative input. However, women continue to quit scientific careers because of their duties and responsibilities for the family. Inequalities in career advancement and drop-out rates are significantly higher for women with children. Differences in social security patterns, concerning maternity and parenthal leave, the lack of childcare institutions tend to increase the disadvantages for women researches with children. Therefore the special gender budget for funding women's science projects, for women mobility, research programmes should be foreseen. And age limitations for women researchers with children should be abolished.

In Lithuania skepticism towards women in politics and science still remains. The statistics show that women constitute about 50 percent of first degree students in many countries, but they tend to disappear from academic life before obtaining career posts. The higher the position in the academic hierarchy, the lower percentage of women. Women constitute less than 5 percent of scientific academies.

Though the European Commission promotes gender equality in science, though the target to reach gender balance in science is 40 percent participation of women at all levels in implementing and managing research programmes, the proportion of women in top positions in European science is still low.

In Lithuania there are no women Rectors of universities, no women heading scientific boards, though there are 45 percent women in science with a scientific degree and 60 percent women - university students.

In modern society we speak too little about the loss of human brain power thus excluding women from science and technology. It is too early to assume that scientific excellence is gender neutral. When women's creative potential enriches science and technology by 50 percent of women participation, then it would be just to confirm that scientific excellence is gender neutral.

Today, because of men superiority and gender disbalance in sciences and technology, women still lack self-awareness, self-confidence, self-revelation and self-improvement. The qualities, that make individual a personality, a scientist, a researcher.

Concluding, I once again paraphrase the words of Marie Curie – no one is to fear gender equality. It is only to be understood. Women in sciences and technology hasten the better world.

I wish you interesting and fruitfull discussions. Thank you.

Welcome message

Ministry of Science and Higher Education
Secretary of State
Prof. Maria Elžbieta Orlowska

Warsaw, November 23, 2011

Dear Madam,

Thank you very much for the invitation to participate in the international conference titled "Science, Innovation and Gender". Due to my professional duties, I am sorry to say that it will be impossible for me to take part in this important event.

I was happy to learn about the conference organized in Vilnius to discuss the role of women in the development of contemporary science and modern technologies as well as about the dedication of that event to the hundredth anniversary of the Nobel Prize award to our fellow countrywoman Maria Sklodowska-Curie.

Maria Sklodowska-Curie was an exceptional person, both because of her scientific achievements and personal qualities.

She devoted her entire life to scientific research and her discoveries revolutionized contemporary science. With her intense work on radioactivity, Maria Sklodowska-Curie created foundations of the radiochemistry, radiation chemistry and nuclear chemistry and gave rise to many new academic disciplines. That renowned scientist initiated a new era in the treatment of cancers giving rise to the irradiation therapy and nuclear medicine. The Radium Institute in Paris was established on Sklodowska"s initiative. It is worth adding that Maria Sklodowska-Curie and her daughter Irena were organizing military mobile roentgenology service stations during the World War I; they actively participated and trained the operating staff for such stations. Nearly three million of French soldiers took advantage of the help of mobile ambulatories called mini-Curie.

The discoverer of Polonium and Radium, the first woman in history awarded the Nobel Prize in two different branches of natural sciences, the first woman professor at the Sorbonne, Maria Sklodowska-Curie was a person blessed with an outstanding strength of spirit, passion and courage. She was consistently and strenuously breaking up stereotypes in science and in life. She proved that sex or nationality is not as important as the intellect, passion and persistence in aiming for the desired goal. Stressing the need to combine research with practical solutions, she was as example of the modern thinking about science.

Wishing you a fruitful debate, I remain

Sincerely yours,
Prof. Maria Elžbieta Orlowska

Conference Programme

24-25 of November 2011
Vilnius

24 of November

11:00-12:00	**Registration and coffee**
12:00-12:30	**Opening Ceremony, Chair - Assoc. Prof. Dr. D. Šatkovskienė (BASNET Forumas, VU ITPA)** (Virginija Baltraitienė (Lithuanian Parliament), Prof. Habil. Dr. Romas Pakalnis (Lithuanian National Commission for UNESCO), Prof. Habil. Dr. Aušra Marija Pavilionienė, (Lithuanian Parliament), Dr. Albertas Žalys (Ministry of Education and Science), Prof. Habil. Dr. Jūras Banys (Vilnius University), Habil. Dr. Gražina Tautvaišienė (Vilnius University Institute of Theoretical Physics and Astronomy), Pascal Hanse (French Institute in Lithuania), Dr. Małgorzata Kasner (Polish Institute), Prof. Habil. Dr. Valdemaras Razumas (Lithuanian Academy of Sciences).
	Session I
	Women in Sciences and High Technology **Chair — Habil. Dr. G. Tautvaišienė (VU ITPA)**
12:30-14:30	Prof. J. Bell Burnell (Oxford University, UK) "An Introduction to Pulsars — Pulsating Radio Stars" Prof. A. Leliwa-Kopystynska (Warsaw University, Poland) "Marie Curie and the World Science" Prof. D. Adlienė (Kaunas Technological University, Lithuania) "Medical Physics: Struggling for Proper Radiation Doses" Dr. J. Razumienė (Vilnius University, Lithuania) "Carbonaceous materials for bioelectrocatalysis"
14:30-15:00	**Coffee break** **Opening of Exhibition „I am an author of scientific monograph and textbook"** **Start of the poster session „Newest scientific results by Lithuanian women-scientists"**
	Session II **Development of Women Potential: Influence of Academic and Work Culture to the Career** **Chair —Assoc. Prof. Ž. Rutkūnienė (KTU)**
15:00-17:00	Prof. F. Zucco (CNR, Italy) "Challenges For a Women Biologist: Science, Ethics and Gender" Dr. E. Lohkivi (Tartu University, Estonia) "One, Two, Three, or Many Cultures? Some Reflections on Science as Workplace Culture on the Example of Physics and Humanities in Estonia" M.Glodas (Microsoft) "Professional Women Initiative" Prof. E. Czerwosz (Poland) "Participation of Women in HT Scientific Projects"
17:00-18:00	**A new documentary movie "Marie Curie, au-delą du mythe"** **(Marie Curie, beyond the Myth);dedicated to M. Curie (France, 2011) and discussion with the Director of the movie Michel Vuillermet.**
19:30	**Conference dinner & concer at Vilnius City Hall**

25 of November

	Session III
	Women Scientist's Input into Sciences and Innovative Technologies **Chair — Prof. D. Dzemyda (VU IMI)**
09:00-11:00	Prof. E. Fabry (ECWT, Norway) "Women for Smart Growth" Prof. J. Bell Burnell (Oxford University, UK) "Women in Science, Technology, Engineering and Mathematics in Scotland" L. Corugedo Stenberg (European Commission) "Great Careers for Great Women" V. Misiukonienė (INFOBALT) and I. Vyšniauskienė (Hewlett-Packard, Lithuania) "Challenges for Women Professionals in IT Industry"
11:00-11:30	**Coffee break**
	Session IV **Science and Youth: Women Scientist's Contribution in Attracting Young Generation to Science** **Chair — Assoc. Prof. A. Rimeika (LUES)**
11:30-13:30	Prof. C. Hermann (Ecole Polytechnique, France) "The Actions of French Women Scientists to Encourage Girls and Boys into Science" Prof. P. Mata (Universidade Nova de Lisboa, Portugal) "Principles of Chemistry, Physics and Microbiology in Everyday Life" Dr. A. Novelskaitė (Vilnius University, Lithuania) "Youth's Attitudes Towards Physical and Technological Sciences in Lithuania: How does Gender Matter?" Assoc. Prof. D. Rutkauskienė (Kaunas Technological University, Lithuania) "E-skills in Digital Age: Importance for Youth"
13:30-14:30	**Lunch**
14:30-15:30	**Review of the poster session and book exhibition** (Habil. dr. G. Tautvaišienė, dr. A. Kupliauskienė, prof. Ž. Lukšienė, dr. A. Novelskaitė) **Chair — Prof. V. Laurinavičius (VU BCHI)**
15:30-16:30	**Round table dicussion "Sciences and High Technologies: women's perspectives"** **Moderator Prof F. Zucco (CNR, Italy)** **Members of the roundtable will be announced later**
16:30	**Closing of the Conference**

Invited speakers

Prof. Jocelyn Bell Burnell

Now a Visiting Professor at Oxford University and a Fellow of Mansfield College, she was previously Dean of Science at the University of Bath and for ten years Professor of Physics at The Open University. She had a year as a Distinguished Visiting Professor at Princeton University, USA. She read a Physics degree at Glasgow University, which was followed by a PhD at Cambridge in radio astronomy. During her time there she was involved in the discovery of pulsars' work, which was recognised by the award of a Nobel Prize to her supervisor! Learned bodies in the UK and the US have presented her with prizes and medals, and many universities have conferred honorary doctorates on her. In 2008 she became the first female President of the Institute of Physics. She is a Fellow of the Royal Society and a Foreign Member of the US National Academy of Science.

Prof. Claudine Hermann

Claudine Hermann (born 1945) is Honorary Professor of Physics at Ecole Polytechnique, the most renowned French engineering school. She is alumna of Ecole Normale Supérieure de Jeunes Filles and her PhD (1976) was in Solid State Physics. She was the first woman ever appointed Professor at Ecole Polytechnique (1992). Since then, in parallel with her activities in physics, she has been studying the situation of women scientists in Western Europe and promoting science for girls, by papers and conferences, in France and abroad. At the European Union, she was a member of the expert group that produced the 'ETAN report' on women in academia in Western Europe (2000); she was a French member of the Women and Science ('Helsinki') group at DG Research between 1999 and her retirement at the end of 2005. A co-founder and the first president of the French Femmes & Sciences (Women and Science) association, she is now its President of honour and is Vice-president of the European Platform of Women Scientists. She is involved in various activities related to scientific culture.
She is the author of 85 refereed papers in physics, of 35 papers in the field of promotion of science among young people and on the analysis of the situation of women in scientific and technical careers.

Prof. Paulina Mata

Paulina Mata graduated (1978) in Chemical Engineering and got a Ph.D. (1989) in Organic Chemistry. She is an Assistant Professor at Faculdade de Ciźncias e Tecnologia - Universidade Nova de Lisboa.
Her research interests are Computational Chemistry, Stereo-chemistry, Chemical Education, and Molecular Gastronomy. Since 2005 she is a Member of the Advisory Subcommittee of the Chemical Nomenclature and Structure Representation Division of IUPAC.
She has worked, since 1996, on the introduction of experimental science teaching in primary schools. Since 2001 has been involved in activities aimed at improving the public understanding of science, particularly "A Cozinha é um Laboratório" (Your Kitchen is a Laboratory) which uses food related themes for the introduction of scientific knowledge.
She coordinates a MSc in Gastronomical Sciences.a joint iniciative of two Portuguese Universities Faculdade de Ciźncias e Tecnologia - Universidade Nova de Lisboa and Instituto Superior de Agronomia – Universidade Técnica de Lisboa.
She is author of two science dissemination books and wrote for a national newspaper and several magazines on themes related with cooking and science. She also participated in several TV Programs.

Prof. Flavia Zucco

Flavia Zucco retired on 2009, after being Head of Research at the Institute of Neurobiology and Molecular Medicine (CNR) in Rome. F. Zucco is author of 80 scientific publications, a member of the Editorial Boards of three international scientific journals (ATLA, Toxicology in Vitro, Cell Biology and Toxicology). In 1991 she was founding member and the first President of CELLTOX (Italian Association of Toxicology in Vitro), from 1994 till 1998 she was the President of ESTIV (European Society of Toxicology in Vitro). From 2003 to 2007 she was member of the Board of ECOPA, was the member of other European organizations (ECVAM, ETCS). She initiated and coordinated several scientific international projects. Prof. F. Zucco is an active speaker on gender equality in science issues. She is author of 60 papers on the topics of advancement of science, women and science, bioethics. From 2004 to 2008 she was the member of the Board of the European Platform of Women in Science (EPWS). In 2003 she founded the Associazione "Donne e Scienza" of which is the actual President.

Prof. Eva Fabry

Eva Fabry is a Director of the European Centre for Women and Technology (ECWT), Chair of the Global Women and Technology (GWT) Network, European Affairs Manager at the Regional Innovation Centre Papirbredden Innovasjon. Eva got her university degree at the Eötvös Lorand University Faculty of Arts, Budapest, Hungary and the Oslo University Faculty of Arts, Norway. Between 1976 and 1990 Eva was working as a diplomat at the Hungarian Embassy in Stockholm. Eva is since 1990 involved in European Affairs and EU project development and management of Structrural Funds and Framework Program projects. Since year 2000 Eva has been intensively involved in building the international network of the Swedish National Federation for Resource Centres for Women (Member of the Board 2000-2007) and the WINNET Europe Association (2006-2007). Eva is since year 2005 Member of the Steering Committee of the International Taskforce for Women and ICTs (ITF), recognized as a Community of Expertise by the UN Global Alliance for ICT and Development (GAID). Eva played a key role in starting up the European Centre for Women and Technology (ECWT) and she was elected as Director in July 2008. Eva is also Project Manager for the European Directory of Women and ICT launched by the European Commission the 8th of October 2009.

Prof. Aleksandra Leliwa-Kopystynska

Aleksandra Leliwa-Kopystynska is a famous Polish scientist, professor at Warsaw University. In 1976 participated in the discovery of a new phenomenon called "energy-pooling collision". She was the first to observe the diffused molecular band in case of sodium and the autoionizing state in indium atom. Prof. Aleksandra Leliwa-Kopystynska had her internships and was a visiting professor in Universities of Siena and Pisa (Italy), many times was employed in CNR in Pisa (Italy) as well. She is the author of about 30 papers and several books. For her achievements in science several times was honoured by Minister of Education and received an award. She was the General Secretary (2002-2003) of main board of Polish Physical Society. She founded Women in Science department in Polish Physical Society and is active in solving gender equality in science problems.

Prof. Elżbieta Czerwosz

Elżbieta Czerwosz is a professor at Radio- & Teleresearch Institute, Warsaw (Poland) and is head of NanoTechnology Lab. She graduated physics in Warsaw University. In 1990 she defended her doctoral thesis in quantum and physical chemistry field on a subject of oscillation spectroscopy. In 2002 she received habilitation by defending thesis on a subject of physics/nanomaterials. Prof. Elżbieta Czerwosz actively cooperates on international level, coordinated and participated in several European projects. Her scientific experience plays key role in evaluating FP6 and FP7 programme projects. Professor initiated and coordinates national project DetecH. She actively participated in foundation of Women in Science department in Polish Physical Society, was the coordinator and representative of Polish physicists in BASNET project. She plays an important part in implementation of policy of gender equality integration in science in Poland.

Plenary and Invited Lectures

Marie Curie and the world of science

A. Leliwa-Kopystyńska

Maria Skłodowska-Curie was born on 7th November 1867 in Warsaw and died on 4th July 1934 in Passy in France. She was one of the first woman scientists to achieve worldwide fame and indeed one of the greatest scientists of the XX century. She had scientific degrees in mathematics and physics.

Maria Curie was a winner of two Nobel Prizes: for physics in 1903 and for chemistry in 1911. She is only one woman scientist who won twice the Nobel Prize and only one scientist who won Nobel Prizes in two different fields of science. She received also 15 golden medals, 19 degrees of doctor honoris causa and many other titles.

How it is possible that up to now such phenomenon as Maria Skłodowska-Curie occurred only once. In my opinion there were at least three factors which determined her success: intellect, diligence and serendipity. It is worth to mention that the historical determinant also played very important role.

Maria Skłodowska

She was born in the poor country, which for years was under Russian occupation. Maria was fifths and last child in a middle class family. Her parents were teachers. When Maria was 9 the eldest sister died due to typhus and two years after also her mother died. She had tuberculosis and was ill and cure for long time. Also for this reason the economical situation of the family was difficult. In spite of this Maria and her siblings, two sisters and brother, wanted to continue the studies.

At the turn of the century in the eastern part of Europe universities were closed for women. Studies abroad were very expensive. Maria established an agreement with the elder sister Bronia. After the school she would remain in the country and work as a governess in order to sustain the family and to help Bronia during her study of medicine in Paris, then Bronia should help Maria.

Maria Skłodowska graduated from a high school in Warsaw at 1882 as the best student and won a gold medal. After she learnt at home physics and mathematics from Russian, French and German textbooks. If not an unfortunate love she could remain in Poland for ever and became a teacher. A wealthy and noble family for which she worked decided that she is not enough good party for their son and he was not enough strong man to marry Maria in spite of the parents' opinion.

In such situation in November 1991 in the age of 23 Maria left for Paris. She entered the university and became one of 23 females, mainly foreigners, among 1825 students of Faculty of Science in Sorbonne. In 1893 on July 28 she graduated as a „licenciée des sciences physiques". She was the best in a class of thirty students. In 1894, also on July 28, she graduated as

Marie and Pierre Curie (1895)

„licenciée des sciences mathématiques". This time she was the second in her class.

Instead to come back to Warsaw immediately she decided to remain and work one year longer in Paris. During that year Maria met Pierre Curie and in 1895 on July 26 she became his wife and received French citizenship. She was 28 and Pierre was 36 years old. In 1897 on August 12 their first daughter Irčne was born and in 1904 on December 6 was born the second daughter Eve.

At the beginning Marie and Pierre performed their researches independently. She studied magnetic properties of tempered steel (*Comptes Rendus* **125**, p.1165 (1897)) and Pierre worked in the field of crystallography. Then she decided to do doctorate and started to study a new phenomenon observed for the first time by Henri Becquerel. He examined various phosphorescent materials and by case discovered an unknown radiation of uranium salts. Becquerel started to study this effect, but the conclusions of his observations were rather wrong. For example he stated that uranium radiation has an ability to reflect and refract as it is in the case of the X radiation, which was discovered a few years earlier. When Becquerel decided to leave this field of research, Marie Curie took the subject and very soon noticed that the origin of the new radiation was not explained enough profoundly.

"It appeared that the results of my work were so interesting that Monsieur Currie interrupted his crystallographic work and join me to take part in the experiments. Since then we worked together trying to extract and investigate new radioactive bodies" – has written Maria Skłodowska-Curie, who on June 1903 received Ph.D.

On April 12, 1898 in *Physique* Maria published information about radiation emitted by compounds of uranium and thorium. She called the phenomenon *radioactivity*, so it was obvious that the nature of such radiation is different from the nature of X-rays. Together with Pierre they started to look for a new radioactive elements. In such a way, using very precise instrument invented by Pierre Curie, they discovered polonium (July 18, 1898) and radium (December 26, 1898).

In 1903 in spite of hostile propaganda against Maria she shared a half of the Nobel Prize in physics with her husband. The second half received Henri Becquerel for discovering the natural radioactivity. Maria and Pierre Curie obtained the Prize for discovering polonium and radium.

On April 19, 1906 Pierre Curie perished in a tragic street accident. Maria Skłodowska-Curie remainded with two children – 1,5 years old Eve and almost 9 years old Iréne.

Some important events in her later life were as follows:

1. May 13, 1906 – the Sorbonne Physics Department gave her a chair after Pierre Curie; she also became a director of their laboratory.

2. November 5, 1906 – she was the first woman to give a lecture at the Sorbonne. This event was widely announced in newspapers, so she had a big audience full of casual listeners.

3. 1908 – she was the first woman appointed as a professor at the Sorbonne.

4. January 24, 1911 – not elected to The Academy of Sciences, but lost only by 1 vote.

5. In October 1911 she participated in the first Solvay Council in Brussels. This was a very important meeting of the best physicist in the world. Marie Curie was only one woman there.

In 1911 she had also a love affair with physicist Paul Langevin. Unfortunately the story became public and Maria Sklodowska-Curie paid for it a high price. Another man in her life turned out to be so week as left her alone in such circumstances.

The information about the affaire reached the Nobel Prize Committee, which earlier decided to give Maria the Nobel Prize in chemistry for study and extraction radium. In such situation the members of the Committee asked Maria Currie to resign from this honour or at least did not come to Stockholm. Maria responded that her work has nothing to do with her private life and went for the ceremony.

Unfortunately, even being a laureate of two Nobel Prizes, her life and work suffered very much. Also her health was in a very bad condition. Maria Curie together with both daughters went to Great Britain for some time.

At the beginning of the First World War Maria Curie organized and directed a mobile radiological service. In 1914 – 1918 together with the daughter Irčne they played a key role in radiography help close to the front line. After the war in 1924 again she was the first woman, but this time as a scientist elected to the French Academy of Medicine.

Maria Skłodowska-Curie died of leukemia on July 4 in 1934. She gave her life for the research, which she loved so much.

In 1995 thanks to the decision of President Francois Mitterand both coffins of Pierre Curie and Marie Curie were put in Panteon in Paris.

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[2] F. Giroud. Une Femme Honorable
[3] J. Bernstein. A Theory for Everything
[4] E. Curie. Maria Curie
[5] A. Kajetan Wróblewski. The Greatness of Maria Sklodowska-Curie

Medical physics: struggling for proper radiation doses

D. Adlienė

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Radiotherapy is a powerful tool to treat the cancer cells and is used in a line with a surgery and chemotherapy. There is no doubt that delivering proper doses to the cancerous tissue or organ may safe the live or at least improve the quality of life of cancer patients. However there are a lot of thoughts concerning doses to patients during radiological investigation. In radiology there are more possibilities to choose a type of examination, but in many cases modern imaging technologies are preferred which may cause higher doses to patients. The number of such examinations has been increased dramatically during the last decade in the whole world. So, it is a challenge for medical physicists to evaluate the doses and find the methods and techniques preventing unnecessary exposure of patients during radiological examinations.

Our group initiated dose measurements in mammography screening examinations of patients participating in a National preventive program against breast cancer (2005-2009). Special multi dosimetry method [1] was used, more than 2000 measurements using termoluminescent dosimeters were performed and the doses to patient's breast were evaluated. Special database MAMOLIT was created which hosts individual data of patients, parameters of their irradiation procedure and corresponding dose values. Results of dose measurements were used for the reconsideration of the recommended dose level in mammography in Lithuania.

Another important step in dose optimization was investigation of doses to patients in the head CT examinations. Special method which allows choosing of CT examination's parameters according to the individual biometrical data of patients has been proposed [2]. This method is especially useful when head CT patients are children.

Recently we are working on the development of the new experimental in vivo dosimetry methods for the estimation of doses in high dose head and neck brachytherapy. More certain doses estimation around the Ir-192 sources will enable us to apply inovative dose to the target delivery methods. This work is being performed in collaboration between Kaunas University of Technology and Lithuanian University of Health Sciences within the frame of national project MIP- 082/2011 "Head and neck brachytherapy: clinical and physical aspects", which is granted by Lithuanian Research Council.

Scientific field: Physics and Clinical physics

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Carbonaceous materials for bioelectrocatalysis

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One of the most outstanding features of carbon nanomaterials is that they comprise a class of materials with unique, diverse and tunable properties (mechanical strength, electrical conductivity, chemical reactivity, etc.). For that they find application in the most diverse fields: electronics and photonics, composites, membranes and coatings, catalyst and catalyst support, biology and medicine, etc. [1]. Numerous examples where the carbon nanomaterials are applied for prothesis, neurotransmitting, drug delivery, biological imaging, biosensing, etc., are reported in the literature [2].

In this work a number of bioelectrocatalytic systems have been created on a base of modified graphitized carbon and nanostructured carbonaceous materials using nicotinic acid 6-hidroxylase, membrane-bound and soluble type of PQQ dependent alcohol, aldose or glucose dehydrogenases and constructed mutants from *Acinetobacter sp*. PT15 strain: M42, M35, M33, glucose oxidase, tagatose izomerase, from *Geobacillus lituanicus* 5, urease as well as *Sinorhizobium* sp. L-1 intact cells. Newly proposed techniques were applied to convert or to determine wide range of carbohydrates.

The acceleration for the growth of the national research and experimental development system was provided by the implementation programme of the National Lisbon Strategy approved at the end of 2005. That also stimulated the rising of women researchers' involvement into research activities. This scientific work was done by financial supporting of national program of Development of industrial biotechnology in Lithuania , Y. 2007-2010 and also big contribution for dissemination of these results has been received by COST program action CM0107, Y. 2008-2012. In fact, the scientific programs like the COST program are very helpful tool for scientific activity.

Scientific field: Biochemistry

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Challenges for a woman biologist: science, ethics and gender

F. Zucco (biologist)

Donne e Scienza Association, Rome, Italy

I started my scientific career in the 1970s at the National Council of Research, the main research institution in Italy. I retired 2 years ago as Head of Research.

Looking back at my working experience I have to acknowledge that it has been a very special one, from the historical point of view: indeed I lived an exciting period, packed with a lot of innovations, contacts and new horizons. In fact, back during the preparation of my graduate thesis, written in a very advanced laboratory of Genetics and Biophysics in Naples, I was involved in a sort of revolution in the field of biology in the post II WW years.

The scenario

Biology was becoming a *big science,* as had physics the decade before: this discipline attracted a lot of interest in terms of funds, professionals, societal and institutional investments. That was due mainly to the advent of molecular biology just after the war, followed by the discovery in the 1950s of DNA, the *magic* molecule coding for all living beings, and the genome project, in the 1970s.

The discipline flourished thanks to physicists who left Germany for the United States and who also decided to leave their discipline and to move with its theoretical tools and practical approaches to biology. The II World War and the use of nuclear power, drove their moves. The so called "Cold Spring Harbor group" (Max Delbruck, Gunter Stent and others) was convinced that it would be possible to discover fundamental laws at the basis of life, as it was the case for physics. Life is, however, a very complex system and the rules governing the living system cannot be summarized only in mathematical equations. But even if the original idea was in some way naḷve, the contribution of those scientists was fundamental to develop biology into a new discipline: tone for all the use of elementary organisms (bacteria and viruses) to elucidate the basic mechanism of reproduction/duplication, functional regulation in living processes. The biggest accomplishment of this approach was the attention paid to the nucleic acid molecules and the discovery of DNA structure and functions by Watson and Crick. At the very same time, great advances were also recorded in other areas of research (biochemistry, computer science, technology), that suggested Dulbecco and others to launch the genome project in the 70s: the basic idea was to sequence the entire Human genome by analytical methods, and then analyze the meaning of the results to discover structural and regulatory genes.

At that time several controversies emerged due to this unusual approach: the lack of an underlying theory made classical geneticists protest. Other scientists were concerned by the fact that such a project attracted most of the funds set aside for research. However the project was launched and produced several results, including specific knowledge of the genes, new techniques and related technologies, an enormous database appropriately collected and recorded in data-bank. The last point was very controversial too, due to the fact that the project was started by a private corporation chaired by Craig Venter and, the data would be not made public. As a consequence, a public project chaired by J Collins, was also launched and eventually an agreement was reached on the use of the results.

The previous description allows me to introduce another wider perspective on what is now called post-academic science. In fact, the Genome project is a good example of the changes that modern science has undergone with respect to classical science. This is illustrated in the following table, presenting the classical as it was described by Merton and the post-academic one described by Ziman

Robert Merton	**John Ziman**
The sociology of science, Chicago University Press, Chicago 1973	*Real science: what it is and what it means. Cambridge University Press 2000.*
Communitarian	Proprietary
Universal	Local
Disinterested	Commissioned
Original	Exclusive
Skeptic	Authoritarian

The above changes in science have ethical implications with regard to the scientific community and the society at large.

Post-academic science is strongly market-oriented: its aim is to produce innovation (technologies) rather than to increase basic knowledge. The accelerated process of producing applicable knowledge leaves no time for cultural adaptation and ethical evaluation. This is particularly relevant for biology, since life is surrounded by emotional and symbolic meaning grounded in cultures and traditions.

Thus, other attitudes are essential to keep under control the impact of science on cultural and ethical values acquired by the widening of democracy. Indeed, the following are required:

- A more holistic vision in the knowledge Time and space for philosophical and ethical thinking on science
- A responsible dialogue with society
- Intuition and imagination (not only creativity for innovation)
- cooperation among big groups of researchers

Moreover the need to close the gap between sciences and humanities was called for, many years ago, by C.P. Snow in his book: Two cultures and the scientific revolution, Cambridge University Press,1 959, which has been recently republished.

In my scientific life I was personally connected with this scenario: when I was a student, I met Gunter Stent, when I was a young researcher I met Francois Jacob and John Kendrew (both Noble prize winners for their contribution to molecular biology) and ended my career in the Institute of Rita Levi Montalcini. I invited J Ziman to our first meeting of Donne e Scienza Association in Rome.

Thus you can easily imagine the kind and number of stimuli I received during my working life.

My research activities

My main field of interest, after a thesis on genetics of microorganisms, has been in vitro studies of cellular differentiation and in vitro toxicology. Bioethics and women in science were topics of great interest to which I devoted part of my studies.

Concerning in vitro toxicology I also experienced a sort of revolution: classical pharmacology and toxicology were bound to animal experiments, due to consolidated international regulations imposing the use of animal for safety studies, before the introduction in the market of new products.

Even if in all biomedical sectors cell culture was the leading experimental model, in pharmacology and toxicology it was very seldom used. I was one of a small group of colleagues from the EU who were the first to introduce cell culture in these fields. In 1980, we organized the First European Conference on in vitro toxicology (NL), which is still held every two years. In 1995 we established the European Society of in vitro Toxicology (ESTIV), publishing a scientific journal (Toxicology in vitro).

I also dealt with the ethical implication of animal experimentation, since cell culture was seen as a possible alternative by animal rights movements. For that reason I proposed a project called *Alternative methods in animal experimentation: evaluating scientific ethical and social issues in the 3Rs context* to the EU Commission and it was approved.

Anim.Al.See (http://www.inemm.cnr.it/animalsee) was dealing with the scientific and ethical aspects of both models (in vivo and in vitro). The aim was to improve the use of in vitro models in toxicology, due to the fact that human cells can be used in culture, thus allowing experiments on our species. Moreover, at cellular level several mechanisms of action by toxicants and drugs can be better elucidated. However we realised that, coping with complexity, it means that no straight and simple solution are available. In fact, in ethical choices we also face counter-indications (same risk need be accepted; unwanted/unexpected outcomes may result).

In the area of in vitro human cell differentiation I coordinated another EU project (www.liintop.cnr.it) aimed at selecting the best available in vitro human cellular models for pharmacological studies; performing an extensive characterization of them and optimisation of culture conditions; providing protocols to be adopted to obtain relevant and reproducible results, and setting up techniques suitable for automation and miniaturiasation.

Also on that occasion, I had to cope with some aspects that were new for me and not related to scientific competence but more with the challenges of post-academic science: I had to promote collaboration among partners with different interests (public research institutions and small/medium enterprises). The industrial partners, in particular, were reluctant to fully share the results. I had to overcome unexpected difficulties, such as a small enterprise being taken over by two multinationals during the three year long project, and, thus, not being able to perform their duties, due to continuous restructuring. I also addressed wo*men in science* issues, as all the partners were unaware of the EU policies in the area.

Women in science

Stereotypes on women in research were first analyzed by Evelyn Fox Keller who described why women were considered not dedicated to hard sciences:

- Science is neutral: science deals with things (objectivity) and women with persons (subjectivity).
- Female identity is bound to the natural world; male identity is based on the dualism of human species and nature and on the search to dominate and control nature;
- Male knowledge is more scientific, analytical and objective; female knowledge is based on intuition.
- Science is rationality completely separated from feelings: science is tough and rigorous while women are irrational and emotional.
- Science is the search for power, while women search for harmony.

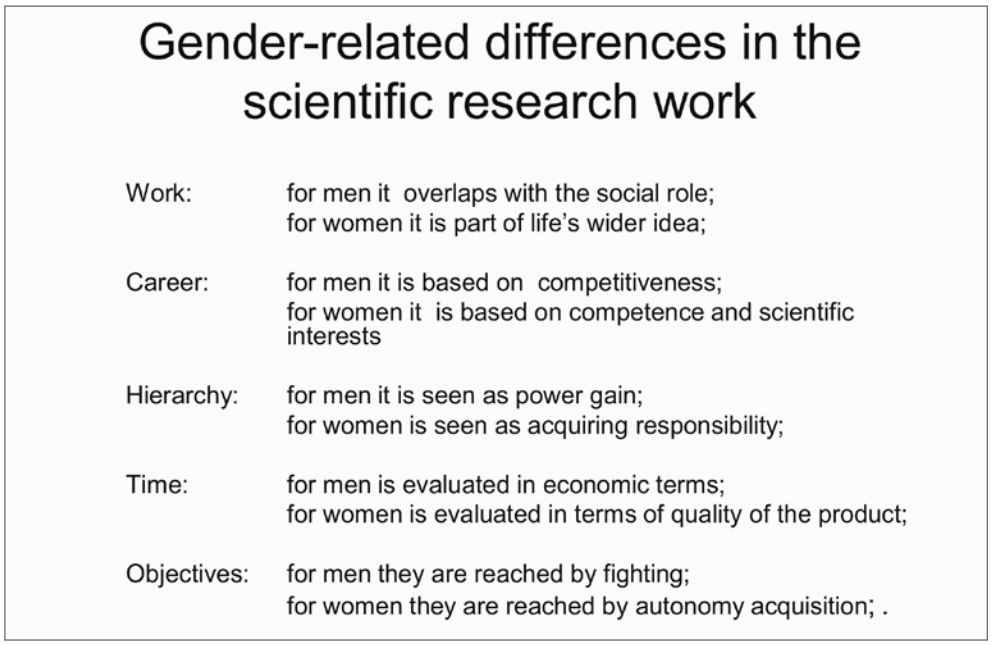
It has been shown that several of those stereotype conflict with reality, however they do not change spontaneously. Thus, action is needed.

Changing gender stereotypes needs at least three levels for actions: the Individual level that impacts on identity and behavior; the institutional/structural one that implies social re-organisation; and the symbolic/cultural one that means working on languages, norms, values. The last one is essential, because the previous ones, even if implemented, do not stand any longer if there is not a deep cultural change.

The actions to be taken must break the reciprocal influence of gender stereotypes and social gender roles, promote the awareness of this problem, offer counter-stereotypical thoughts and invent distracting models.

As stated by Claudine Haigneré, Chairperson of the Jury of the 2007 Descartes Prize for excellence in scientific research: Women have their own qualities, their differences…They have to keep their specificity…..They don't have to enter a masculine mould….

Indeed it is becoming clear that nowadays for a healthy science to be appreciated we need other qualities than the traditional ones (*Beyond bias and barriers (2006) NSF).* Assertiveness and single mindedness were much evaluated, this must now be the case also for flexibility, diplomacy, curiosity, motivation, dedication. Women in research have shown those characteristics an may well fill the needs of the post-academic science.



In conclusion, it is worthwhile to report what J.S. Mill suggested more than a century ago in *The subjection of women* (1869) *…to abolish the privileges of men in the academy.* Women scientists want to be evaluated according to merit, by transparent procedures and in relation to the resources obtained. They do not like quotas, at least concerning their careers. On the contrary, for cooptation in boards and committees a more equalitarian distribution among sexes is accepted. Moreover, another statement by J.S. Millin a letter to August Comte (30 Oct. 1843) should be taken into account, one which appears nowadays visionary for the future of science and society:

….to consider how the institutions, goals, and research priorities of science might be restructured by taking into account the experience of women, because that is a perspective that has been neglected.

One, two, three, or many cultures?

Some reflections on science as workplace culture on the example of physics and humanities in Estonia

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In the renowned Rede lecture 1959 at the University of Cambridge, C.P. Snow gave a picture of the two radically different cultures of the natural sciences and the humanities. On the occasion of the 50th anniversary of Snow's lecture, Professor Jerome Kagan, Harvard University, published his reflections on the contemporary scientific cultures which he counted upon three as separate areas of practices. In traditional philosophy of science, culture was either not addressed at all (culture of no-culture), or the entire scientific enterprise was seen as sharing one single objective knowledge pursuing culture. Thus one might still wonder whether it is adequate to talk about one, two, three, or even more scientific cultures.

In my presentation, I shall reflect upon some of the results of the international co-operation project UPGEM (Understanding Puzzles on Gendered European Map: Brain Drain in Physics through the Cultural Looking Glass, www.upgem.dk) which studied the physics institutes in five European countries and identified three cross-cultural workplace cultures: the Hercules, the Caretakers and the Worker Bees, each endorsing different mechanisms of inclusion and exclusion of people, ideas, work styles and methods.

Also, I shall compare the local Estonian results of the study of physics culture with the local analysis of the humanities' culture. In the humanities in Estonia, the classical scissor-model is at work – the number of female students is decreasing by the study levels ending in the least number at the level of academic top positions, whereas in physics female students have been rare from the first year of BA level. Related to physics, the masculine stereotypes strongly dominate, obviously restricting female students' access to the area. In the humanities, the number of female professors and associate professors is especially low in the traditional well-established disciplines such as history where the conservative workplace cultures reproduce the traditional communication and organisation patterns excluding women from decision making.

Scientific field: Philosophy of science

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Participation of women in scientific projects

E. Czerwosz

Figure 1 Logo of project

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National scientific policy bases on the Polish Constitution and new Polish law concerning Polish high schools and research institutes. In all these documents, the problem of gender equality is treated in very general way and none particular solution is proposed (e.g. concerning maternity and its consequences on woman's career). No special regulations are proposed regarding special founds or support for women (for example shorter working time during pregnancy or flexible working time during even short period after maternity leave). Only the project "Girls as Engineers" (logo of project is shown in Fig.1) is directed to young women starting their study. This project calls for changes in mentality and explains the benefits of careers as engineer, scientist or inventor. Girls are persuaded that such job may give woman not only great opportunities that facilitate future job finding, but brings also economical independence and social prestige. It may be also a chance to have the influence on the development of science, creation of new technology, control the industry and economic strategies. On the other hand, realities are different and after studies women meet problems as they are pregnant and/or having a child or children. This affects the low number of women as PhD. students, scientists and managers of scientific projects. In Fig.2 a percentage of girls (pink colored part) and men (blue colored part) as PhD. students in technical universities is shown. Such situation results in delayed scientific careers of women and men and it concerns all field of science, as can be seen in Fig.3. The worst situation is observed in Engineering and Natural Sciences. There are some data on scientific career, but there is still no data related to number of women participating in scientific projects and number of women acting as coordinators or leading persons of scientific projects. We can only report our personal experience and try to change the situation in our nearest environment.

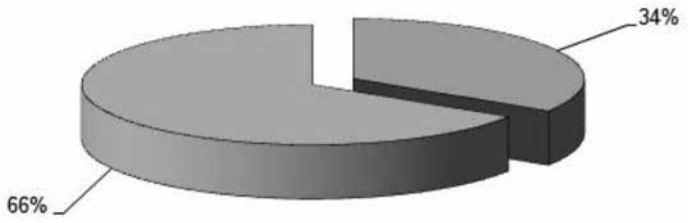


Fig.2 Percentage of women and men as PhD students in year 2010/2011 in Technical Universities (blue – men, pink – women).

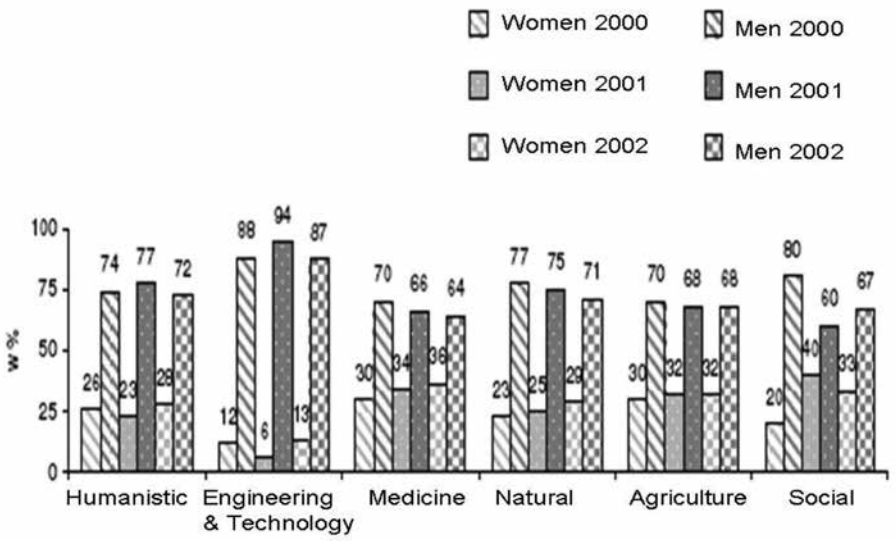


Fig.3 Professors nominations in years 2000-2002 (source Central Statistical Office - GUS, Warszawa, 2005)

Here, there are some data related to the project (acronym deteH) financed by the European Regional Development Fund within the Innovative Economy Operational Programme 2007-2013 (No UDA-POIG.01.03.01-14-071/08-06). This project is devoted to preparation of hydrogen sensors based on nanostructural carbonaceous-palladium film. This project is realized by consortium composed of six institutes (both industrial and from universities). Numbers of persons from different group of participants are presented in Table 2. The number of women in each group is shown in parenthesis. During three years of realization of this project, the number of women participanting increased from 14 to 16.

Tab.2 Number of persons participating in the project

	Partner's number	years		
		2009	2010	2011
number of researchers (women)	P1	7(5)	9 (7)	10(8)
	P2	11	12	12
	P3	3	3	3
	P4	5(2)	5(2)	5(2)
	P5	7(1)	7(1)	7(1)
	P6	4(2)	4(2)	4(2)
number of students (women)	P1	0	1(1)	1(1)
	P2	5	6	6
	P3	1	1	1
	P4	4(4)	4(4)	0
	P5	1	1	1
	P6	0	0	0
number of PhD students (women)	P1	0	1(1)	2(2)
	P2	2	2	2
	P3	2	2	2
	P4	0	0	0
	P5	1	1	1
	P6	0	0	0

What we should do to improve this situation? What is important in scientific work for women? What can help them to choose such careers?

Taking into account only my personal experience, I can mention several conditions that should be fulfilled encouraging women to work as researchers. The most important are: proper and friendly work environment, lifestyle, founding advantages and at last overcoming a pay gap. In our ITR group (partner P1) we try to join all these needs and conditions resulting in a high number of employed women in all groups (researchers, PhD. student and students). Women and men can participate in many conferences and trainings, young parents can work with flexible time of work, there is special place for meeting and having rest (coffee and dinning area). We eliminated problem of pay gap and promote scientific activity. As the result, we have well cooperating group without conflicts among women between women and men. As it is presented in Fig.5, in our group women in all ages work.

Fig. 4 Our young colleague with her daughter during maternity leave visiting our lab.

Fig.4 ITR group of women participating in deteH project.

As a result of our good practice we can show many scientific publication (papers and conference presentations) prepared during the last three years, two PhD dissertations that are being prepared by women-colleagues from our group, new projects under preparation (three new projects) and some national patents submitted. Our group has built new experimental equipment and technological instructions for our technology have been also prepared.

Women in STEM* in Scotland

J. Bell Burnell

Oxford University, United Kingdom

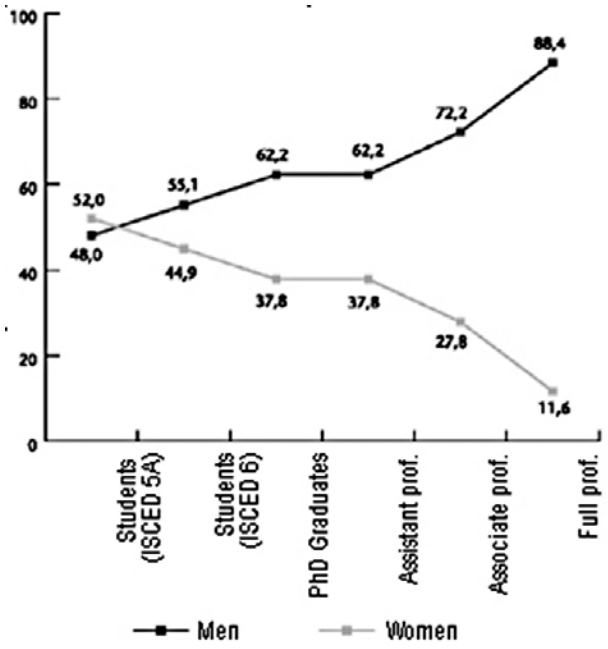
Women in STEM in Scotland' is the title of an inquiry which I have been leading for the Royal Society of Edinburgh, Scotland's academy. Our report will come out early in 2012. Clearly conditions are very different in different European countries, but I hope some of this will be of interest in Lithuania. I will touch on the historical background and say a little bit about the data, report some recent initiatives in the UK and then talk about this academy report's recommendations.

In Britain in 1955 a woman's magazine gave the following advice to a young wife: "Have the dinner ready when your husband comes home. Put a ribbon in your hair, tidy the house, have the children clean and quite. When he comes home, listen to him, what he wants to talk about is much more important than what you want to talk about. And don't complain if he's late or if he stays out all night. Remember, he is the master of the house; you have no right to question him. A good wife knows her place." This kind of society could be found then in Britain. It probably occurred in part because at the end of the war the men came back from fighting and needed jobs. The women, who had been in the jobs, had to be encouraged back into the home to free the jobs for the men. We've come a long way since 1955 but the journey is not yet complete.

In Scotland we have looked at the women who have degrees in science, technology, engineering, mathematics and we have asked how many of them are still working in academia or industry that is scientific or technological. And the number is quite small (see the diagram). It is 27% with 73% leaving STEM, whereas for men 48% leave STEM. Eva has already talked to you about how important it is that we have a smart economy to get out of the recession; it is important that women are part of that smart economy and that they are trained technologically and scientifically. Besides the economic argument there are other arguments but just at the moment in Britain the economic argument is the strongest argument.

The next diagram is the famous scissors diagram that some of you may be familiar with. On the left hand side is percentage of the cohort and along the bottom are the different ranks in academia - from entering student to full professor. The yellow line is women, and the purple line is men. This is done for all EU countries and for all sciences together, although we know there is quite a bit of difference between different sciences. You see we start with more women than men undergraduates, by the time we have PhDs the women are far fewer than the men, and by the time we get to full professor there are very few women and lots of men.

*Science, Technology, Engineering, Maths



The shortage of women in the senior posts is due to three factors: too few coming in, too many leaving, and those remaining making slower progress than the men. The details are different in each of the different science subjects but broadly the pattern is the same.

To compare countries I want to say just a little bit about women in astronomy around the world; the data are curious and interesting.

International Astronomical Union – countries with >100 members

Country	% delegation female	√N error	Country	% delegation female	√N error
Argentina	37	5	Belgium	15	4
Ukraine	27	3	Poland	13	3
Italy	25	3	Sweden	13	4
France	24	2	Canada	12	2
Brazil	23	3	USA	12	1
Spain	18	2	UK	12	2
Mexico	17	4	Netherlands	12	2
Russian Fed	17	2	S Korea	10	3
Greece	16	4	Germany	10	1
China	15	2	India	8	2
Australia	15	3	Japan	6	1

All member countries: 15% female

This table shows the countries who have more than a 100 people as members of the international astronomy body and they are listed in order of the percentage of their membership that is female. It runs from 37 per cent female in Argentina to 6 per cent female is Japan. (Lithuania does not show on this graph because it has only 15 members. 4 of those 15 are women. So if it were in the table, it would be in here, like Ukraine, at 27% - an encouraging number; but because it is a small number, the 'root N' error for Lithuania would also be 27%.) The range (37% to 6%) is amazing. First, it shows it is not women's brains but the culture in the country that determines whether women are astronomers. The world average is 15% female and I note that: the English speaking countries, are all at or below the world average; the Mediterranean countries – Italy, France, Spain – are high, but the Northern

European countries - Netherlands, Sweden, Poland – are low; South America is high, former Soviet Union countries quite often high. The reasons are different in every country, I believe. The data have been taken from www.iau.org/administration/membership/individual/distribution/. Note that you have to be tenured to be appointed to this body, so the younger women will be under-represented, and that you have to be nominated by your country's astronomical society (and the countries' astronomical societies are often male, and they less often notice the women). There are similar distributions for physics and mathematics.

Women are lost at every hurdle, every stage in the academic ladder faster than the men and even in areas where women have been for a long, long time the majority of undergraduates, the professors are still men. Often there is repeated but small discrimination. Often the definition of merit and the evaluation criteria contain some items that disadvantage women. Recruitment panels are most often comfortable recruiting people like themselves. There is also what we call institutional sexism. In a university everybody maybe very keen to have lots of women but the structures are determined by men. An example of institutional sexism from Britain which may apply in your country too – when we have to fill out a form we are asked are we male or female. In your country, what order do those two come in, is it men first? In Britain using alphabetical order it would be "female" then "male". But it rarely is! Why? Why still now? That is an example of institutional sexism.

In olden days in Britain, in underground mines, the miners carried a canary in a cage to test the air. The canary was more sensitive to bad air and if the canary became unconscious, you knew it was time for the humans to get out. Today women in departments are like the canaries in cages. If there are few women, if they are not senior women, it suggests there's something wrong with the atmosphere. Not deliberately so, just because it is the way it always has been.

There have been two important projects in the UK to try and improve the position of women. One is by the Institute of Physics, called project Juno. It is to judge university physics departments on how women-friendly or women-unfriendly they are. And there is a similar one, run by Athena SWAN, which applies to all universities and all science and engineering departments. They recognise women-friendly departments. There has been an important development this summer when the chief medical officer, a woman, says that only departments that hold one of these awards will be eligible for funding from the health authorities. A big, important step; watch what happens!

The inquiry in Scotland was initiated by a man with two daughters. Men with daughters are great - they begin to see the world through their daughters' eyes! In the inquiry we have decided to concentrate only on post-graduate women. Of course, there are big issues about the number of school girls doing science and the number of girls going into science and engineering but our expertise is in the post-graduate area.

In Britain there have been many initiatives to support women scientists and engineers and increase their numbers, started by concerned women who have voluntarily introdced something. Often these initiatives have been local and there has been no connection between them. There has not been follow-up to see how successful the initiatives have been. In Scotland we aim to look more strategically and have an overview. The chief scientific adviser to the Scottish Government is a woman and is one of our panel. We are asking the Scottish government to commit to this issue and because the Scottish government buys many things we are asking the Scottish government only to buy from companies that have good women-friendly policies. The government has leverage this way. We are asking the government of the whole of the UK to change the arrangements for leave for parents who have small babies, so that men and women share equally the responsibility. This will take away some of the stigma for employing young women who might have children. We ask business and industry to have part-time jobs that are honorable and well regarded. At the moment in Britain part-time working is not normal. We ask academies and scientific societies and professional bodies to make a statement and put it on their website that they consider the participation of women important. When they are electing people to membership of their academy we ask that they put the criteria publicly on the web and that they make sure the words used are actually equally applicable to women as to men. We are asking the bodies that give funding for research to also require that universities have this Athena Swan award (or something equivalent) to show that they are women-friendly. We are convinced that such an intervention would have a huge effect.

The actions of French women scientists association to encourage girls and boys into science

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As an introduction, I will make a brief presentation of the situation of women scientists and engineers in France and will list some stereotypes on the reasons why girls would not choose scientific studies or careers. Then I will describe some French actions to promote science for young people and finally I will present the European Platform of Women Scientists (EPWS) and indicate how its members are acting in this objective.

Women scientists and engineers in France

In 2009, France occupied an intermediate position at European Union (EU) level with 34% of women in academia, 21% in Research and Development in the private sector. Nowadays 26% of the engineering degrees are attributed to women. This average situation in Europe is resulting from the French general social situation and not from specific measures designed for women scientists.

Professional women networks

In France, branches of international women associations, like Business Professional Women, or University Women, are present. Among other networks or associations of executive women in enterprises, Cercle Inter'Elles (women in High Technology) and Grandes Ecoles au Féminin (alumnae of elite Higher Education institutions) were founded about 10 years ago.

There are several women scientists associations, among which "Elles bougent!" (Women on the Move), which provides mentoring of secondary school girls by women engineers from the transportation and energy sectors; the associations "Femmes & Sciences", "*femmes et mathématiques*" (Women and Mathematics, www.femmes-et-maths.fr) and Femmes Ingénieurs (FI, Women Engineers, www.femmes-ingenieurs.org), which jointly work in their activities towards teenagers. Being one of the founders and the first president of "Femmes & Sciences", I will present in more details this association, the mission statements of which are to:

- improve the position of women in science, both in public and private sectors;
- promote a positive image of science among women and of women in science;
- encourage more girls and boys to enter science.

Why Girls Don't Choose Scientific Careers…

Let us first look at the reasons usually listed to justify the lack of girls in scientific careers.

- *Studies are too long?* However, there is majority of girls in medical studies which last longer!
- *Studies are too difficult?* But in French medical studies, the first year is particularly selective (less than 30% of the students succeed). In Literature "classes préparatoires" (classes preparing to selective entrance examinations in Higher Education institutions) 75% of the students are women in spite of the very strong competition and the few careers after such studies.
- *Science is supposed to lack human relations*? This is just a stereotype! Scientists are all working in teams.
- *Girls wish to help other people*? But many girls are in marketing jobs, which are not particularly helpful…

Actions to Encourage Girls to Do Science

These actions also concern boys in the general context of decreasing enrolment of young people in science and technology.

Let us first quote some French websites which describe scientific jobs, like www.onisep.fr, related to the ministry of Education, or www.lesmétiers.fr , which depends on Paris region. Some websites are dedicated to girls, like www.elles-en-sciences.net, a coproduction of the three women scientists associations "Femmes & Sciences" (F&S), "*femmes et mathématiques" (fetm)* and "Femmes Ingénieurs" (FI), which provides information on scientific and technological careers for girls, their parents and their teachers and also offers mentoring for girls.

The members of these three associations go in secondary schools, in job fairs, they participate to round tables as role models and make presentations to teenagers about scientific jobs. A slide presentation (http://www.femmesetsciences.fr/diaporama/diaporama.html) has been realized about the variety of studies and jobs around an item of everyday life (mobile phone, car, plane, health-related devices). It can be used by the associations' members or by teachers.

Whatever the item described, the presentation stresses the pleasure experienced by people working in science and technology: pleasure of being recognized at work of creating, of being useful, of sharing knowledge, of understanding the word around us, of taking part in progress, of shaping our future… We try to evidence that jobs in science and technology are of all kinds, at all education levels (technician, engineer, researcher), in various sectors; we emphasize that young people need to be trained for jobs to-be, as nobody can tell now which new jobs will appear in ten or twenty years. So Science and Technology and ICT are opening a future for boys and girls, who must be ambitious when choosing their studies, and should dare these jobs, which are within their reach.

The associations F&Sc, *fetm*, FI, understood that it is also important to reach the educators and they produced a booklet on gender-related orientation stereotypes (http://www.femmesetsciences.fr/Documentation/ideesrecues.htm), a popularization of scientific studies and results in sociology and education sciences, which has a good success.

For the 10th anniversary of F&S, at the end of 2010, an assessment was made of the past actions of the association. Over 10 years, almost 500 presentations were done through France, 70% of which towards young people and a total of 30,000 young people were met. This is indeed a lot for a small association but not much with respect to the total number of children in a French

generation (500,000). Fortunately, other associations deliver similar messages to young people, but fall together only a small fraction of a generation is visited…

The European Platform of Women Scientists

EPWS, a non-profit Belgian association under Belgian law (Association Internationale Sans But Lucratif, AISBL), acts as European level. Its missions are to:

- represent the concerns, needs, ideas, aspirations and interests of European women scientists in all disciplines and all stages of their career paths;
- coordinate support activities for women scientists to facilitate their active role in the European Research Area as researchers as well as participants in the research policy debate in Europe.

Its goals are to:

- increase the participation of women scientists in European research policy and the shaping of the EU research agenda;
- promote the understanding and the inclusion of the gender issue in science and research;
- strengthen contacts and collaboration among women scientists.

EPWS members are networks like BASNET Forumas, F&S, *fetm*, FI… and also individuals, from the public and private sectors, over Europe, from all disciplines, mainly from Social Sciences, Natural Sciences and Engineering, Multidisciplinary associations… It carries the voice of 12,000 women scientists from Europe.

In its first period, until Oct 2009, EPWS was a rather wealthy European project. It is now a standard association based on volunteer work, with an annual General Assembly, linked to a Conference (Brussels in 2010, Budapest in 2011); it has a website, issues several Newsletters per year, writes policy papers. EPWS is present in conferences, round tables all over Europe on the situation of women scientists in Europe, and in European events on the promotion of science and technology for young people, such as the 1st European Innovation Summit or "Girls, Expand your Horizons", an event targeting over 200, 12 years old, girls that took place in Geneva in 2009 and 2011.

Conclusion

A European women association such as EPWS experiences the difficulties of geographical distances and of the cultural barriers between its members, arising from various pasts and cultures (traditions, school system, professions images and values, "democracy" experience in associations…). But its successes or its satisfactions arise from the exchange of good practices, the extremely rewarding mutual experience, and the pleasure of learning Europe in a friendly atmosphere like in the present international conference.

Acknowledgments

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Principles of chemistry, physics and microbiology in everyday life

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Science is part of almost every aspect of our lives, although we rarely realise it, or think about it. This fact, coupled with the intense pace of technological advancement, makes science a crucial part of education. An important component of education should be to promote a critical awareness of the role of science and technology in contemporary societies and an understanding of their beneficial impacts on our daily lives. This is important not only to bridge the gap between science and the public, but also to attract young people to science careers, which is becoming increasingly difficult. [1] Opportunities must be created for scientists and the general public to share views in a two-way exchange based on mutual respect and trust.

In this context, initially as part of the *Ciźncia Viva*[1] programme, Portuguese scientists were encouraged to use experiments with food and cooking to attract the interest of the general public, and particularly young people, in science and scientific activities. [2] This project was named "The Kitchen is a Laboratory", and it draws on principles of chemistry, physics, biology and microbiology to make sense of many of the chores performed every day in domestic kitchens. The characteristics of the activities depend on the background and interests of those involved in their development, on the context in which they will be presented (for example, science dissemination activities, school projects, seminars, TV programmes…) and on the audience (general public, primary schools, secondary schools…). Hand-outs are prepared to extend the scope and impacts of each activity beyond the moment of the activity itself, and this has proven to be a particularly important factor contributing to the multiplication of the effect of the activities.

These activities have been received with great interest and very positive feedback by the public in general, as well as by schools at all levels of education. Many of the activities have been very often repeated by teachers, within their own classrooms. This was the driving force for the development of a wider range of activities for the application of this methodology in the European Project "Pollen: Seed Cities for Science" [3], and for the publication of two books [4, 5]. This work, and the interest it attracted from the media, also created the opportunity to publish pieces in several newspapers and magazines and to participate in various TV programmes, including a series of 13 science dissemination programmes (*ABCiźncia*) broadcast on a national TV channel.

This work made us realise that food and cooking is a good starting point for introducing experimental science education, including inquiry-based science education activities, to pre-school, junior and secondary level schools.[6] These kinds of activities enable children to acquire scientific ideas and concepts, scientific attitudes, handling and communication skills and a sense of accuracy and meticulousness; they instil a taste for learning, and they also stimulate and satisfy their curiosity about the world around them and their own everyday routines. In addition, these activities can also help to foster the interest of the greatest possible number of children in continuing their science studies. They can be very easily adapted to a wide range of ages, situations and areas of science, and their effects are often felt beyond the classroom, as they can be designed to involve families and even the community.

[1] *Launched in June 1996, the Ciźncia Viva programme aims to promote scientific and technological culture among the Portuguese population. (www.cienciaviva.pt)*

Using food and cooking as a starting point for public science dissemination, or to introduce several aspects of the school curriculum, and for inquiry-based science education, contributes to:

1 - Develop an understanding of the links between science and daily life.

Science is frequently considered very far removed from daily lives, taking place in an unfamiliar laboratory environment and associated with abstract and complex concepts and theories. Exploring food and cooking, themes which are familiar to everybody, regardless of age, gender or other cultural factors, and which are often invested with strong positive feelings, makes it possible to attain this goal efficiently.

2 - Attach value to the empirical knowledge of previous generations.

The appreciation of accumulated experience and knowledge may result in the entire community contributing actively to increasing its scientific knowledge in a stimulating and enriching way.

3 - Incentivise cross-generational communication and enhance the quality of the time spent together as a family.

Children often like to repeat at home the experiments they have conducted in the classroom, and hence they transmit their knowledge about food and cooking techniques to the family.

4 - Sensitise people to the importance of food products as a part of a society's culture.

These activities raise families' and teachers' awareness of the importance of healthy eating; allow learning about other cultures and their food and cooking traditions; and create opportunities to share food, and thus create or strengthen bonds.

These aims can be achieved through the development of a wide variety of activities, such as:

1- Activities related with the five senses and their role in food perception and enjoyment.

2 – Exploring the tasks involved in preparing a meal. This can be a very rich approach allowing for interdisciplinary learning, as it will involve: choice of recipes based on the availability of the ingredients (geographical and seasonal) and their nutritional characteristics; reading and writing of the recipes; compilation of lists of ingredients and calculation of the necessary amounts and the costs; acquiring the ingredients; understanding cooking processes and the science behind them; and decorating the dishes and table.

3 – Field visits to farms, markets and shops with tasting activities to introduce healthy food products.

4 – Creating a school garden.

5 – Inquiry-based science activities to improve scientific knowledge and understanding of food and cooking processes. Using a kitchen as a laboratory can make science accessible to all and is connected to every student's life experience.[7]

Two examples of activities and talks conducted in schools are presented in Table I (experimental sessions for kids between 6 and 10 years old) and Table 2 (talks for secondary school students).

Table 1: Activities for young kids to make them aware of the nature of chemistry and the kind of work performed by chemists.

Activity (Included in the book "The fun-flavoured way to learn science") [4]	Themes Explored
Making Pop-corn	Some of the characteristics of scientists (Inquisitive, Explorative and Analytical) The study of the composition of materials
Baking a Chocolate Cake	Synthesis of new products
Analysis of "white powders" (sugar, starch, baking soda, plaster)	Chemical analysis

Table 2: Talks for secondary school students based on a common breakfast menu.

		Themes Explored
	Bread	- Starch – its characteristics - Gelatinisation and retrogradation of starch - Gluten and proteins - Yeasts and fermentation - Maillard reactions
	Butter	- Polar and non-polar compounds - Emulsions and emulsifiers; - Lipids – structure and properties
	Jam	- Osmosis - Pectin – role and structure - Gelation process and the influence of pH - Hydrogen bonds - Sucrose inversion - Food Preservatives - Caramelisation

Food and cooking are topics with widespread appeal and the interest and excitement they generate can make a positive contribution to a better understanding of the role of science and scientists in everyday life, as well as providing motivation for children and young people to study science. In addition, this approach creates space for inter-disciplinary teaching, helps to awaken interest in an environmentally-friendly healthy diet, and also raises awareness of the social and emotional dimensions of food.

However, in the application of this methodology, it is important to not let the "entertainment" component of the activities become too dominant or central; it is essential to keep in mind that the primary purpose of these activities is science education. It is not enough just to see the spectacular results of a science, we must understand it, reflect on it and relate it to the reality.

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Youth's attitudes towards exact sciences in Lithuania. Once again: how does gender matter?

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Statistical data and findings of empirical studies suggest that exact sciences are not attractive as a field of academic/professional studies among Lithuanian young people. For example, results of representative national survey among the XI grade secondary school pupils demonstrate that only a little bit more than 10% of pupils were seriously thinking about applying for studies of informatics, physics or engineering after graduation from the secondary school; roughly counting, about half of them expressed strong negative disposition towards studying enumerated subjects [1]. Schoolgirls' and young women's dispositions towards the exact sciences are even more negative than their male peers: in 2008 only 6-7% of the XI grade schoolgirls at the secondary school planned to go for studying engineering and informatics, only 3% of them planned to go for studying physics [2]; in the later years, proportion of female students hardly reached 25% among all students in physics and in informatics [3], and in the field of technological sciences [4].

Exhaustive analysis of literature in the field of gender and science [5] demonstrate that „there are three dominating themes under this multidisciplinary research area" [6]. The first one is concentrated on exploration of the evidence for **differences in inborn cognitive abilities between men and women**. In this realm, number of studies convey that „widely reported differences between girls and boys in mathematical performance and science aptitude are too small and inconclusive" [7] and that „gender gaps do not seem to be wide enough to explain differences between males and females in science education and trajectories in SET" [8]; in other words, "nowadays boys and girls have similar levels of ability" [9]. Thus, "as the sex gap has narrowed in the last decades and gender disparities in education seem to be turning in favor of girls (in terms of participation and performance), there do not seem to be differences in performance for the biological and cognitive theories to explain" [10]. The second theme – the **social construction of gender identity** – also has attracted quite a lot of scientific attention and recently exist large amount of publications exploring the unequal presence of women and men in science via rational choices theory, role modeling and, in particular, gender roles and socialization. Finally, the third theme encompasses studies which had been focused on "**the social construction of science** mostly through the analysis of conceptual reflections on the epistemology of science, the hegemonic position of masculinity and its effects on the gendered order within scientific/professional opportunity contexts" [11]. However, notwithstanding the numerous studies in the field, the above mentioned exhaustive expert review of existing literature on gender in science issues in eastern (i.e. post-soviet/socialist) countries led to conclusion: "It seems to be easier to speak about the gaps than the findings since this area requires major development in the future. On the one hand, the gender topic gained ground somewhat later in the Eastern countries at large. On the other hand, gender policies were established in the first years of the new millennium and the time that has passed since then has not been enough to make a systematic evaluation of the outcome. Better cooperation, joint action, data and research are needed in order to progress and achieve a critical mass in gender policies" [12]. Responding to this challenge and extending previous analysis [see e.g. 13, 14, 15, 16], in this paper we strive to explore a specific aspect of young peoples' attitude towards exact sciences

in Lithuania: the factors which may lurk behind (a) pupils' intentions to study specific fields of exact sciences at the higher school and (b) students' intentions to continue studying in the field of selected exact sciences (i.e. physics, mechanics, informatics).

Empirical data on the pupils' situation came from national questionnaire survey (representative national sample N=1398, 2008). The Women in Science Scale [17, 18, 19] with number of various statements defining different aspects of women's and men's involvement in the sciences (e.g. career, employment possibilities, gender equality, etc.) was used in the survey. Pupils' evaluations of the 15 statements from the scale were used as independent variables hypothetically predetermining the dependent variable (i.e. degree of agreement with the statement *"I do not need studying this field of science absolutely"*) in the linear regression equation. (Detailed description of the survey methodology can be found in [20]. Empirical data on students' situation came from national questionnaire survey (representative national sample N=475, 2007) (for more detailed description of the survey methodology see [21]. Students' evaluations of the 34 statements which defined their personal experience and relationships, conditions of studying and vocational internship, etc., were used as independent variables hypothetically predetermining the dependent variable (i.e. degree of agreement with the statements *"I plan to continue studying the field striving for MA"*). Bellow are briefly discussed the main results of linear regression analysis (see Appendix A for models in pupils' samples and Appendix B for students' samples) presenting simplified visualization of models of statistically significant interrelations between the variables or, in other words, models of interrelations between dispositions, internal/external factors and young peoples' intentions to (start/continue) studying a subfield of exact sciences (for simplified visualization see Figures 1 and 2, where straight lines denote positive effect and dotted lines denote negative effect of the factors which emerged as having statistically significant effect on the dependent variables).

To answer the question why pupils do not strive for studying exact sciences at the higher school is not very simple, as relatively more of them tend to think that they need such studies. That is, in language of statistical data, 25-40% of pupils declared they "absolutely agree" or "more agree than disagree" with the statement *"I do not need studying this field of science absolutely"*; schoolgirls are majority among those who think they don't need studying the sciences. However, 40-55% of the survey participants declared they "absolutely disagree" or "more disagree than agree" with the statement (which means no, I do need such studies). Hence, relatively more pupils think they need studying different subfields of exact sciences. Linear regression models suggest that strive for career in mathematics, informatics, physics, and engineering is the stable factor which strongly predetermines both schoolgirls' and schoolboys' intentions (Figure 1). The absolutely logical result – the stronger is strive for career in the field, the stronger is intention to choose the field for studying at the university (Betas = from 0.468 to 0.707, $p<0.001$) – denotes strong career ambition and professional concentration among both young women and young men (so there is no gender difference). However, on the other hand, such interrelation suggests predominance of quite narrow attitude, which could be translated into saying that "I do not need knowledge which is not directly related to my career".

Not getting into detailed descriptions of each model (Figure 1), it worth to be mentioned that pupils' need to study different subfields of exact sciences predetermining factors slightly differ depending on the subfield, but more evidently differ depending on gender. More specifically, realization of ambitions related concerns (e.g. abilities to make significant contributions, to reach the highest positions in the field) are more evident in schoolgirls' population than among schoolboys. Such results may denote increasing professional ambitions among young women. In addition, emphasis on employment possibilities in the fields related to exact sciences is also stronger among schoolgirls than in schoolboys' population. This result may imply that young women are more pragmatic than their peers. However, on the other hand, these two tendencies also can be reflections of girls'/young women's concerns about possibilities to enter the field which is absolutely preoccupied by men (and absence of job finding concerns in mathematics studying model would support this way of thinking); as well as girls'/young women's concerns about possibilities to be independent active agent in the "masculine" field.

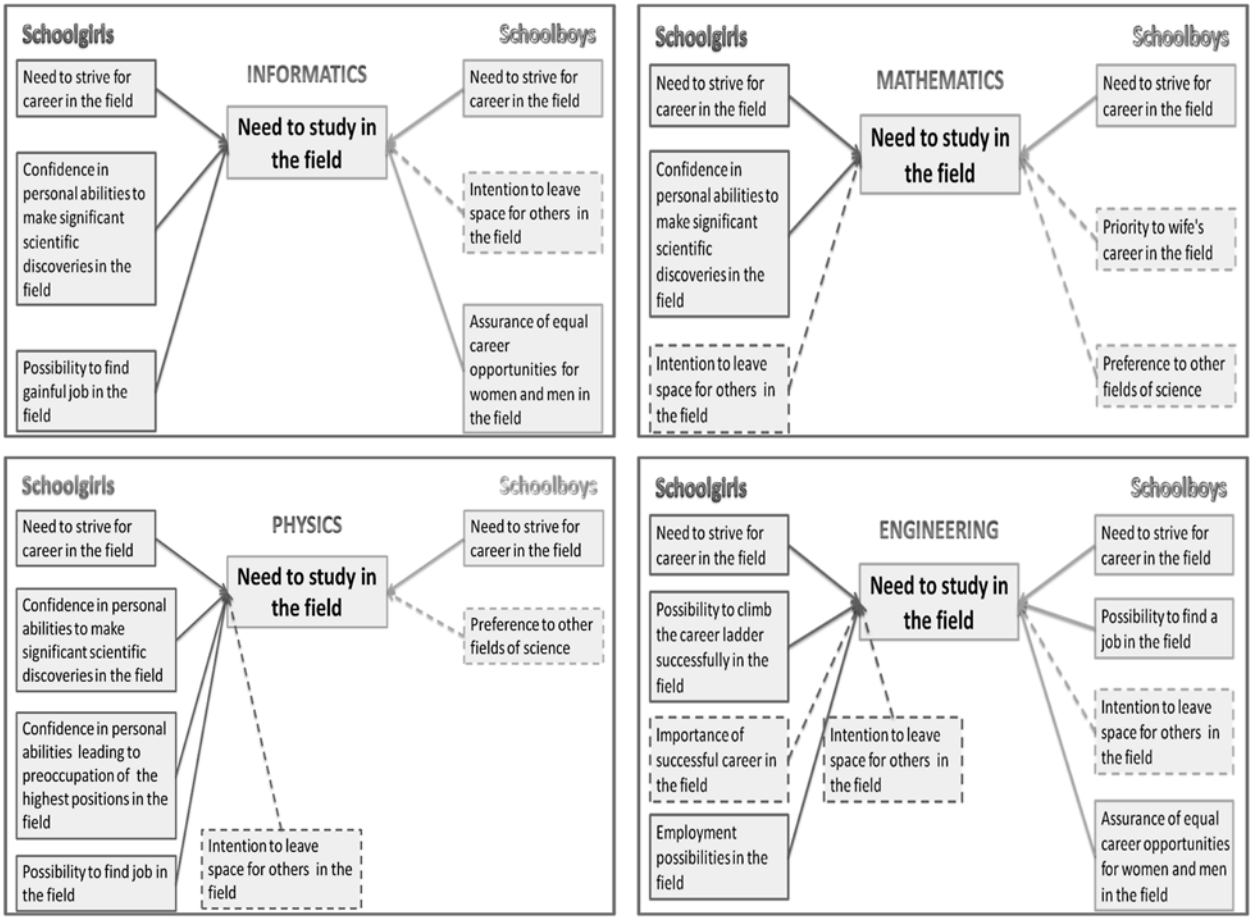

Figure 1. Pupils' need to study subfields of exact sciences predetermining factors by gender. (Simplified visualisation of linear regression results.)

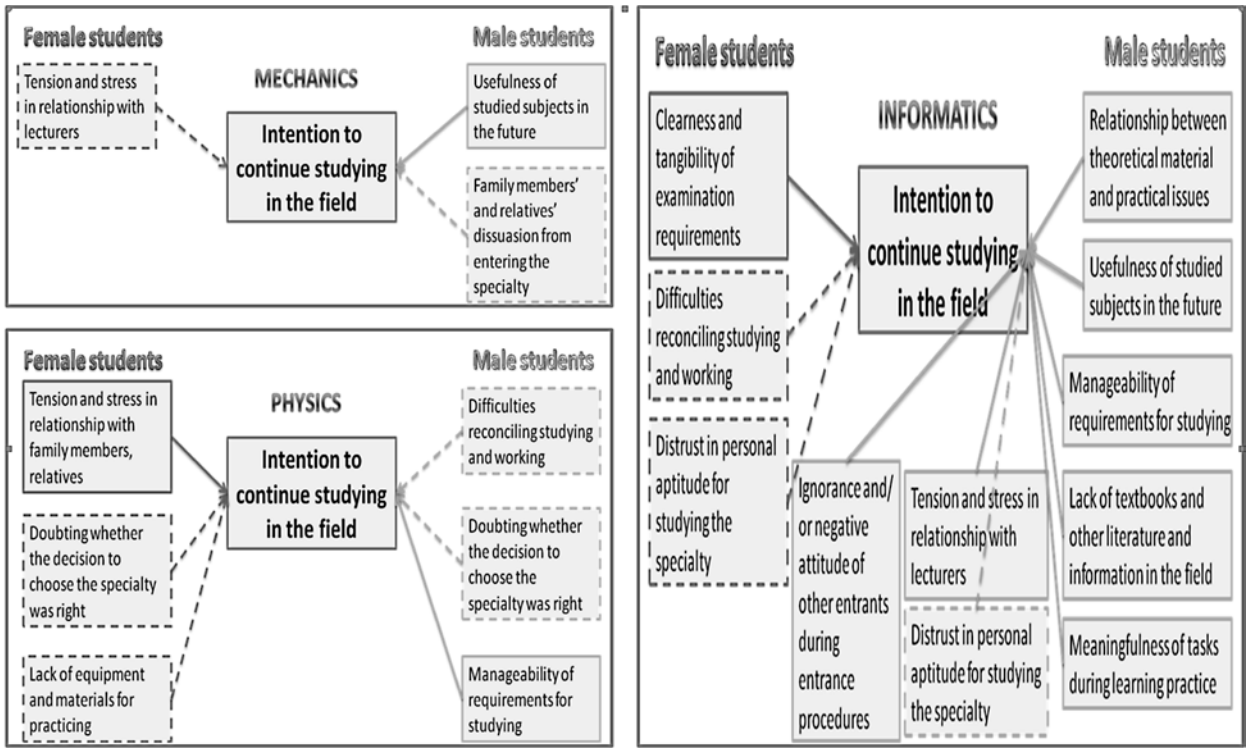

Figure 2. Students' intention to continue studying in the field of exact sciences predetermining factors by gender. (Simplified visualisation of linear regression results.)

Results of linear regression in case of students suggest that different factors predetermine young women's and men's intentions to continue studying mechanics, physics and informatics (Figure 2). For example, the models of interplaying factors are rather simple in cases of mechanics and physics, but quite complicated (especially in case of male students) in case of informatics. On the other hand, interplay of personal features, personal life and studying conditions defining factors are evident in both female and male students' samples. Such results once again denote different attitudes towards the subfields (e.g. stronger conception that physics is academic science vs. mechanics and informatics as fields of professional activity) and similar female and male students' attitude towards status of their profession in the society [22].

The just presented results of statistical analysis of empirical data from national surveys tackle one of problems, which directly predetermine expansion of human resources for research in future: young peoples' attitudes towards sciences and their intentions in the fields provide background for forecasting how will develop science in terms of human resources in the future. The findings suggest rather threatening conclusions: most of young people in Lithuania are not interested in physical and technological sciences; they are not willing to relate their future with fields of the sciences. The problem, indeed, steams from intertwine of micro level (i.e. social actors' dispositions and personal projects) and macro-level (political dispositions towards science, economical situation in the country, cultural traditions of scientific thinking and other) factors. On the one hand, such situation can be defined as "wasting of talents" [23], or, in other words, as inefficient usage of existent human potential. Concretely, as our study demonstrate, especially girls tent to avoid physical and technological sciences, young women tent to retreat from the fields in larger numbers than young men do. Such decisions predetermining factors denote patterns of "doing gender" [24]: prevalence of "gendered practices" and active "practicing gender" [25] in fields of physical and technological sciences at the secondary school and at the university in Lithuania. In other words, most of pupils and students are "naturally" inclined to behave according traditional gender lines while choosing their future profession (e.g. girls avoid "masculine" fields such as physics, informatics, engineering, etc.; women strive to leave from the "masculine" fields of studies). It is believable, pupils' attitudes are grounded on the behavior of their teachers who maintain traditional attitudes towards gender and science relation (e.g. "women are not capable for science"), and openly fractionate girls not only as incompetent, but also as not interested in science (e.g., in a teacher's words: "why does a beautiful girl need math?") [26]; students' attitudes are objects to officially "gender neutral" (but actually hostile to women) exact science cultures, where women simple "are absent" [27, 28, 29].

On the other hand, some from top to down spreading efforts in this realm are already taken on national level. For example, *Program of Actions for Development of Human Resources for 2007–2013* [30] includes a priority "Strengthening of researchers' capacities" which is aimed at "increasing of number of researchers and decreasing researchers' age average in Lithuania", "deepening and spread of knowledge about research, technologies, innovations among pupils and youth" appears among foreseen measures of the *Program of Researchers' Careers* [31], one of expected results of implementation of the *Strategy on assurance of equal opportunities for women and men in science* [32] during 2008-2013 is increase of women's participation in physical and technological sciences, gender aspect is included in almost all secondary school teaching programs already [33]. Hence, there is a base to believe that situation will change in Lithuania: hopefully, the problem of girls'/women's attraction to the sciences and women's retention in the fields will be resolved in Lithuania in the future.

Scientific field: Social sciences, sociology.

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Appendix A. Results of linear regressions for factors in pupils' population

Schoolgirls	Unstandardized Coefficients B	Std. Error	Sig.	Adjusted R Square	Sig.	Unstandardized Coefficients Std. Error	B	Schoolboys
Mathematics								
(Constant)	0.736	0.173	0.000	0.578	0.535	0.631	0.210	0.101 (Constant)
13. I do not need striving for career in this field absolutely	0.707	0.045	0.000			0.000	0.061	0.468 13. I do not need striving for career in this field absolutely
15. I wouldn't strive for working in this field of science if there would be lack of available positions for all who wants	0.113	0.046	0.015			0.000	0.063	0.352 14. It would be more important for me to study home economics than this field of science
2. Having proper preparation I could make significant scientific discoveries in this field	-0.112	0.046	0.016					
3. I do not feel I am enough trusty so I could preoccupy the highest positions in this field of science ever	0.124	0.053	0.022			0.034	0.057	0.122 6. If my wife/husband would be working in this field of science, I would help her/him to develop career and only after would care about my career
Informatics								
(Constant)	1.092	0.226	0.000	0.514	0.450	0.000	0.274	1.048 (Constant)
13. I do not need striving for career in this field absolutely	0.651	0.050	0.000			0.000	0.065	0.542 13. I do not need striving for career in this field absolutely
10. If I would acquire this field of science related specialty, it couldn't find a gainful work	0.269	0.077	0.001			0.001	0.065	0.216 15. I wouldn't strive for working in this field of science if there would be lack of available positions for all who wants
2. Having proper preparation I could make significant scientific discoveries in this field	-0.178	0.059	0.003			0.005	0.056	-0.160 8. I have to have the same career possibilities as representatives of other gender in this field of science
11. If I would acquire this field of science related specialty, it would be very difficult for me to find a job	-0.156	0.075	0.038					
Physics								
(Constant)	0.600	0.297	0.045	0.527	0.573	0.003	0.168	0.510 (Constant)
13. I do not need striving for career in this field absolutely	0.591	0.056	0.000			0.000	0.068	0.670 13. I do not need striving for career in this field absolutely
2. Having proper preparation I could make significant scientific discoveries in this field	-0.181	0.070	0.011			0.026	0.072	0.163 14. It would be more important for me to study home economics than this field of science
11. If I would acquire this field of science related specialty, it would be very difficult for me to find a job	0.144	0.061	0.019					
15. I wouldn't strive for working in this field of science if there would be lack of available positions for all who wants	0.113	0.056	0.045					
Engineering								
(Constant)	1.166	0.299	0.000	0.652	0.575	0.003	0.302	0.902 (Constant)
13. I do not need striving for career in this field absolutely	0.673	0.051	0.000			0.000	0.066	0.543 13. I do not need striving for career in this field absolutely
7.I would have perfect employment possibilities in this field of science	-0.202	0.056	0.000			0.002	0.065	0.209 15. I wouldn't strive for working in this field of science if there would be lack of available positions for all who wants
1. I could climb the career ladder very successfully in this field of science	-0.192	0.060	0.002			0.001	0.058	-0.196 8. I have to have the same career possibilities as representatives of other gender in this field of science
16. Successful career in this field of science would be very important for me	0.153	0.057	0.008			0.033	0.073	0.159 11. If I would acquire this field of science related specialty, it would be very difficult for me to find a job
15. I wouldn't strive for working in this field of science if there would be lack of available positions for all who wants	0.134	0.050	0.008					

Appendix B. Results of linear regressions for factors in students' population

Female students	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Sig.	Adjusted R Square	Sig.	Unstandardized Coefficients Std. Error	Unstandardized Coefficients B	Male students
Mechanics								
(Constant)	6.250	.633	.000	.605	.175	.000	.465	2.525 (Constant)
(9.5) Experience much of tension and stress while communicating with lecturers	-1.074	.235	.001			.001	.125	.440 (12.1) All subjects you are studying will be useful in the future
						.041	.180	-.374 (6.1) You were dissuaded from entering the specialty by your family members and relatives
Physics								
(Constant)	5.245	.617	.000	.571	.334	.000	.438	6.031 (Constant)
(6.8) You doubt whether the decision to choose this specialty was right	-.779	.167	.000			.000	.100	-.413 (6.8) You doubt whether the decision to choose this specialty was right
(9.7) Experience much tension and stress from the relationship with your family members, relatives	1.003	.372	.014			.005	.103	-.301 (9.4) It is difficult to reconcile studying and working
(12.2) Lack of equipment and materials for practicing	-.337	.151	.037			.018	.128	-.313 (12.3) The requirements for studying are hardly manageably
Informatics								
(Constant)	2.822	.775	.001	.295	.281	.000	.474	3.458 (Constant)
(12.4) Requirements for examination are clear and realistic	.430	.166	.012			.000	.093	-.386 (9.8) You distrust your aptitude for studying the selected specialty
(9.4) It is difficult to reconcile studying and working	-.309	.133	.024			.000	.095	.369 (9.5) Experience much tension and stress while communicating with lecturers
(9.8) You distrust your aptitude for studying the selected specialty	-.281	.125	.029			.011	.084	-.218 (9.7) Theoretical material are dissociated from practical issues too much
						.000	.102	-.364 (12.3) The requirements for studying are hardly manageably
						.004	.083	.239 (12.1) All subjects you are studying will be useful in the future
						.009	.082	.218 (12.6) Lack of textbooks and other literature and information in the field
						.028	.147	.327 (6.5) [going for studies at the university] you has been feeling ignorance and/or negative attitude of other entrants
						.034	.102	-.218 (16.3) Working on meaningless, unworthy your knowledge tasks during learning practice

Exhibition „I am the author of scientific book and the textbook"

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The development of human resources in the physical sciences is one of the most important goal of European Union (EU) strategy up to 2020, the base of competitive and science-based economy. The importance of women talent prior use in physical sciences to R & D development is highlighted in all EU policy strategic documents related with the development of science. Historically, social conditions determined late women involvement into the research in physical sciences, so the contribution of women scientists in society has not yet been properly assessed.

Already in the ancient times, people were afraid of the independent educated woman; she was despised, and her participation in the public domain, except for the certain cult rituals, was strictly limited. The thoughts of authorities were often adjusted according to the needs of time, therefore the free-educated woman left quite a significant footprint there. Early Christianity proclaimed the equality of all people, but the question of gender equality goes back to ancient traditions already in the first centuries of our era. The most famous woman scientist of that time was mathematician, philosopher Hypatia (370-415) , but her scientific works were simply burnt as she was murdered by angry first Christians.

In the early Middle Ages only in monasteries women could acquire an education and pursue a scientific career. So we can say that woman had the possibility to choose whether to become an educated nun, or a housewife.

Lithuania also joined the Western European culture with the spread of Christianity. The participation of Certain Lithuanian women in public life and some freedoms were determined by their financial situation. Noble and wealthy women's education was severely limited by home educational goals, which conformed to the provisions of the estates of women; they were able to deepen their knowledge for self-education, and could only show their literacy in a closed circle of relatives and to transfer it only to the children. The first University was established in Vilnius in 1579. Women have tried to attend lectures or even to teacher there, but at that time there was a provision that women who are interested in science, are dangerous (they can not give a birth). Dangerous phenomenon of a woman raised the threat to Christian concept, so it was not surprising that this period coincides with the witch-hunting. The first witch was sentenced in Lithuania in 1552.

Later, after Lithuania joined the Russian Empire in 1759, more educated masculine society tempered their views on intelligent woman, and the possibility of women training (of course, only a rich and noble) had appeared. The girls had a possibility to obtain upper secondary education in St. Petersburg, Moscow, and other major Russian cities. The Superior courses for women were established in St. Petersburg in 1869 and they prepared teachers and doctors. Only a single training book, written by Lithuanian author - Ludvika Didžiulienė - Žmona (1856 -1925) " Gaspadinystės knyga, arba Pamokinimai kaip prigulinčiai yra sutaisomi valgiai" was published in Tilsit in 1893. The possibility to establish girls' gymnasium with teaching in Lithuanian language was given after 1905 revolution in Lithuania. The first educational books of women authors from a contemporary point of view might seem not serious, but they demonstrate the commitment to women's educational activities: the book „Bičių knigelė su daugel abrozdelių" was prepared by Šatrijos Ragana (1877-1930) and issued in Tilsit in 1908; Lazdynų Pelėda „Šeimininkėms vadovėlis" (issued in Seinai, 1911).

The possibility for research career and education seems to occur in Lithuania in 1904-1911, but the prevailing attitude that a woman's life career is a "good wife" prevented its further development. Later, in the interwar years, woman's intelligence becomes a symbol of quality. However, the number of women in sciences remains low. The first thesis by Lithuanian woman was defended in medical sciences (V.Janulaityte) in Germany,1908.

The preparation and publishing of textbooks became very important as the number of Lithuanian schools had increased. Lithuanian Scientific Society (established in 1907) after its start has immediately set up a commission to prepare and authorize the textbooks. There were 156 members in Scientific Society and only six women (Žemaitė, G. Petkevičaitė, B. Burbytė, Z. Pribilauckienė, Em. Bražiukė, Em. Vileišienė). The researchers that could be called professionals made only about 7 percent of all members (among them - two academics and nine men professors). Higher education courses were opened according to Lithuanian Scientific Society initiative on October 24, 1919 and they were closed by Polish authorities on April 14, 1921. There were 53 men and 64 women listeners in the first semester.

University of Lithuania was established in Kaunas in 1922 and the name of Vytautas Magnus University was given in 1930. Only a few women professors worked at a Faculty of Humanities, while exclusively men taught in the Faculty of Natural and Technical sciences. The first Lithuanian woman Antanina Glebavičiūtė-Prielgauskienė (1898 -1943) had defended thesis at the university in the field of Zoology in 1939. Only about 10 women scientists are known in Lithuania up to the Second World War.

Women's integration into the academic community has intensified after the Second World War during the Soviet period. At that time the first women's thesis were defended by Janina Vizbaraitė (physical sciences and technology, 1955), by Vaclova Zelionkaitė (chemical sciences, 1955), etc. During the period of mature socialism we already have the first doctors of sciences (under the current classification of degrees – habilitated doctor of sciences), professors - Eugenija Šimkūnaitė (doctor of Biological Sciences, 1971), Vydas Kęsgailaitė-Ragulskiene (doctor of Technical Sciences, 1977), Aldona Džiugaitė Aleškevičienė-Statulevičienė (doctor of Physics and Mathematics, 1982) et al.

Women were better educated than men during the last years of the existence of Soviet Union, but the pursuit of scientific career, especially in physical and technical sciences, has always been hampered by the prevailing view that science is unfeminine. Although women scientists of that time actively published their works, wrote scientific books, they had not reached an adequate evaluation. It was considered that a "serious" training book or a textbook can be only written with a man co-author. Therefore, relatively speaking, the number of women authors of scientific monographs and textbooks for higher education is not high. Most women wrote educational and methodical books.

The striving for scientific career for women became easier after the gaining of independence (1990). Lithuanian women scientists defended 1052 dissertations during the period of 1990-2000. The number of scientific papers increased also; the scientific monographs, books, educational books in Lithuanian language were written also. The validation of textbooks and scientific books became easier. Writing textbooks and books on teaching are partly financed by the European Structural Funds for research projects within the limits after Lithuania's accession to the European Union. Women are also demonstrating there activity and issue scientific books.

The purpose of today's exhibition is to show hard way of women scientist in historical perspective. The books that were issued with the blessing of the USSR Academy of Sciences (not many, but most of us have learned from them) are shown in the first part of exhibition The second part presents the books that were issued during the times of Lithuanian independence. Most of them are from natural and technological scientific fields and are divided by branches of science. The third part includes the books funded by the European Union structural funds.

The exhibition organizers sincerely thank all Women that regardless to period strived to education and science, wrote books, shared their knowledge with the public.

Poster Contributions

Astronomy

1. E. Stonkutė, G. Tautvaišienė, R. Ženovienė, B. Nordstrom "Satellite remnants in the Milky Way galaxy"
2. Š. Mikolaitis, G. Tautvaišienė "E-infrastructure in Lithuania and its application in astrophysics"
3. G. Tautvaišienė, G. Barisevičius, S. Berdiugina, Y. Chorniy, I. Ilyin "Chemical element abundances in photospheres of RS CVn stars"
4. G. Tautvaišienė, Š. Mikolaitis "Tracers of stellar chemical evolution in red clump stars of open clusters"
5. R. Ženovienė, G. Tautvaišienė, E. Stonkutė, B. Nordström "A new kinematically identified stellar group: chemical composition study"

Physics

6. R. Giriūnienė, J. Pesliakas "Stimulation of chemical reactions by acoustic waves"
7. V. Jucienė, J. Požela, E. Širmulis, K. Požela, A. Šilėnas "Terahertz electromagnetic waves in polar semiconductors and alkali halides"
8. A. Kulbickas, L. Rastenienė, M. Franckevicius, M. Bloomfield, E. Gaubas and R. Vaisnoras" Features of irradiated diamonds by heavy protons and light helium ions"
9. A. Borovik, A. Kupliauskienė "Electron-impact excitation of the 5p56s2 2P3/2,1/2 autoionizing states in Cs atoms"
10. R. Plukienė, A. Plukis, G. Duškesas, A. Gudelis, R. Gvozdaitė, R. Druteikienė, V. Remeikis "Nuclide composition in irradiated graphite of Ignalina NPP RBMK-1500 reactor"
11. S. Pralgauskaitė "Low frequency noise characteristics of multiple quantum well laser diodes"
12. J. Stupakova, N. Samuolienė, E. Shatkovskis, J. Gradauskas, V. Zagadskij, A. Sužiedelis "Inovative application of advanced silicon nanotechnology (II): development microwave detectors of high sensitivity"
13. Assoc. Prof. Dr. D. Šatkovskienė "Application of reduced density matrix formalism for study of characteristics of saturated molecules"
14. E. Šatkovskis, J. Stupakova, R. Mitkevičius, V. Zagadskij "Innovative application of advanced silicon nanotechnology (I): significant enhancement efficiency of silicon solar cells"
15. J. Ščiukaitė, A. Pelanskienė, A. Lankauskas, M. Kiriliauskis "Electric to thermal energy conversion: research of hydrogen plasma cell"
16. J. Tamulienė, L. Baliulytė, V.S. Vukstich, L.G. Romanova, R. Lutsyuk, A.V. Snegursky "Quantum-mechanical study of the alanine molecule fragmentation by low energy electrons"
17. N. Žurauskienė "CMR-B-scalar sensor for high magnetic field measurements"

Biochemistry, Biophysics

18. E. Čirbaitė, J. Razumienė, V. Gurevičienė, D. Tauraitė, R. Meškys, V. Razumas "New redox mediators for electrochemical biocatalysis"
19. Ž. Lukšienė "Light technologies for inactivation of food pathogens"
20. R. Mickienė, V. Kaškonienė, A. Maruška "Antimicrobial effects of some phyto-organic compounds"
21. I. Šakinytė, J. Razumienė, J. Barkauskas, V. Gurevičienė, R. Baronas "Carbon nanomaterials in bioelectrocatalytic systems"
22. E. Voitechovic, A. Bratov, N. Abramova, J. Razumienė, D. Lakshmi, P. K. Ivanova-Mitseva, S. Piletsky "The study of bioelectrochemical systems based on PQQ dependent enzymes and conductive polyaniline polymer using method of electrochemical impedance spectroscopy"

Chemistry

23. I. Kerienė, A. Maruška, J. Sitonytė "Analysis of phthalates in the river Venta by solid phase extraction and gas chromatographic-mass spectrometric method"
24. Ž. Ruželė "Formation of micro- and nanostructured molecular assemblies through in situ synthesis on functionalised surfaces"

Material and Technological Sciences

25. R. Klevaitytė, V. Masteikaitė "Investigation and evaluation of elastic fabrics deformation non-uniformity"
26. A. Lazauskas, A. Guobienė, J. Puišo, I. Prosyčevas "Morphology of thin films with silver nanoparticles from plant extracts on glass substrates"
27. R. Plaipaitė-Nalivaiko, D. Adlienė, A. Meškauskas "Ionizing radiation impact on changes of polymer structure"
28. V. Sacevičienė, V. Masteikaitė "Evaluation of deformation behaviour of coated and laminated materials"

Social Sciences

29. Assoc. Prof. Dr. D. Šatkovskienė, A. Kupliauskienė and Ž. Rutkūnienė "Baltic States association BASNET Forumas: activities and perspectives"
30. I. Tiknevičienė "Professor Vyda Kėsgailaitė Ragulskienė. Scientist, inventor, the first woman habil. dr. of technical sciences in Lithuania"

Satellite remnants in the Milky Way galaxy

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Milky Way galaxy is a laboratory for astrophysicists helping to make a real life "experiment" and helping to answer open key questions in the present Universe. Formation and evolution of our home Galaxy is still not fully understood. By means of the high resolution spectroscopy of the solar neighborhood stars we are able to improve our models and understanding of crucial information on the star formation history, the origin, and the evolution of the Milky Way galaxy. Helmi et al. [3] have used a homogeneous data set of about 14.500 F- and G-type stars from Nordström et al. [4] catalogue to search for signatures of past accretion events in the Milky Way disk. From correlation between orbital parameters such as apocentre (A), pericentre (P) and z-angular momentum (Lz) (so called APL-space) Helmi et al. [3] identified three groups of stars and suggested that they might correspond to remnants of disrupted satellite(s). In the APL-space, these stars cluster around regions of roughly constant eccentricity; they have the distinct kinematics, metallicity [Fe/H], and age distributions.

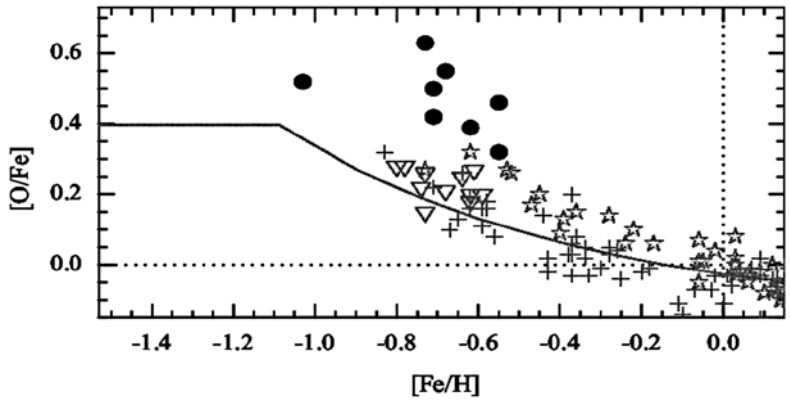

Fig. 1 [O/Fe] as a function of [Fe/H]. Results of the investigated Group 3 are indicated by filled circles. Results obtained for the Galactic disk dwarfs are indicated by: plus signs [1]; stars [2]; triangles [6] and solid line - modeled Galactic chemical evolution trend [5].

In this study we aim to determine the chemical composition of stars in one of the newly identified kinematic group (Group 3).

From the high-resolution spectra taken with the spectrograph FIES at the Nordic Optical Telescope, we determined abundances of the oxygen, α-and iron group elements. α-and iron group elements are useful not only as a diagnostic tool for physical conditions in the stellar atmospheres, but also are good indicators of Galactic evolution. The mean metallicity of the Group 3 is – 0.69±0.05dex. and age determined from photometry is about 14 Gyr.

The detailed chemical compositions of investigated Group 3 show that the sample of stars is chemically homogeneous and abundances of oxygen (see Fig.1) and alpha-elements are overabundant in comparison to Galactic disk dwarfs and modeled Galactic chemical evolution trends by Pagel and Tautvaišienė [5]. The homogeneous and distinct chemical composition of

the investigated stars in Group 3 is providing further evidences of their common and maybe extragalactic origin. These findings will have important implications for the theory of chemical evolution of our Galaxy.

Scientific field: Astrophysics

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E-infrastructure in Lithuania and its application in astrophysics

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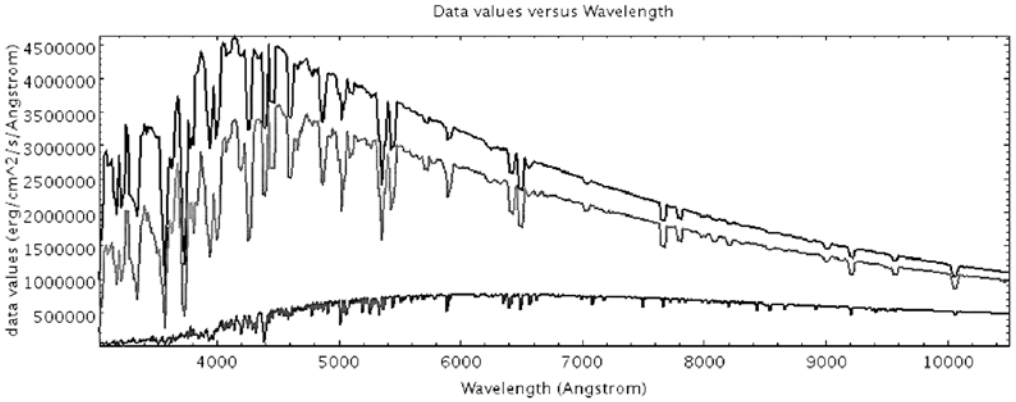
We present a gridified stellar energy flux modeling tool SYNTSPEC for stellar spectra analysis. It is an example of data- and compute-intensive application running on the testbed of the EGEE GRID compatible infrastructure, which brings the new quality to the research in astrophysics. The multi job application is running within the Gridcom system – the user friendly interface that allows a common (virtual) work of a physically spread scientific group. Atomic and molecular structure of stellar photosphere redistributes the initial energy flux through the entire spectrum employing absorption, reemission, scattering processes and paints a unique shape of flux image of the specific star. SYNTSPEC software calculates the energy flux and normalized to the continuum stellar spectra that are applied for stellar classifications and determinations of e.g. chemical compositions, effective temperatures and surface gravities of stars. The specific energy flux modeling is an important tool for analysis of data, which will be produced by the European Space Agency's GAIA space observatory.

The special added value is the implementation of the energy flux modeling, which makes an application ready for processing of very specific data from GAIA and other modern observatories. Integration with the Gridcom graphical interface makes the application usage much more intuitive for users and enables the group work of scientists independently of their physical location. The BalticGrid-II project established the production-level, interoperable and complementary with the EGEE grid infrastructure, providing to scientists in the Baltic States and Belarus the access to critical resources, supporting the effective research collaborations and sharing efficiently unique

Fig. 1 The interval of synthetic spectrum examples at 330 - 1050 nm for stars with (T, log g, [Fe/H]) equal to: (6400, 2.2, 0.0), (5700, 4.4, 0.0) and (4200, 2.0, 0.0) from the top downwards.



instruments and data (for more information see Tautavaišienė et al. 2009, Mikolaitis & Tautvaišienė 2011). The gridification of the application was performed at the Institute of Theoretical Physics and Astronomy of Vilnius University. It is set by FORTRAN and C++ coded programs joined together by scripts. Parametric submission is performed by GRIDCOM interface. A single job runs for 8 – 10 hours. About 50 jobs are required to derive the main parameters of a star and about 15 jobs for determining of the chemical abundances of every other chemical element. In general it takes to run more then 400 jobs for one star. Depending on the initial atomic database, the program stores more then 100 GB temporary space. The output follows VOTABLE standards to be compatible within the Virtual Observatory infrastructure.

The GRIDCOM itself is a Simple Grid User Interface for Complex Applications it automatically generates as many jobs as it is needed, launches them on a grid, resubmits aborted jobs automatically and without a user computer turned on, collects the results and do any other actions required. The system itself is a server with gLite UI installed. Each application is in fact a Linux command-line application, and the application controlling code is a regular Linux executable code. Each application is launched in a directory, which is accessed via the HTTP protocol, so every file, created by an application, automatically has its own URL. Applications are free to publish different HTML files and PHP scripts for controlling the application, placing links to files, showing different Java or ActiveX result viewers.

Scientific field: Astronomy & Astrophysics

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Chemical element abundances in photospheres of RS CVn stars

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(3) Astrophysical Institute Potsdam, Germany

Our aim is to investigate correlations between abundance alterations of chemical elements in RS CVn star atmospheres and their physical macro parameters, such as the speed of rotation and the magnetic field. A detailed study of photospheric abundances was already carried out for the following RS CVn stars: Lambda And (Tautvaišienė et al. 2010), 29 Dra (Barisevičius et al. 2010), 33 Psc (Barisevičius et al. 2011), AY Cet (Tautvaišienė et al. 2011) and 3 Cam (this work).

In Fig. 1 we compare $^{12}C/^{13}C$ and C/N ratios of the RS CVn stars investigated with the theoretical model of the first dredge-up and the current models of extra mixing: `cool bottom processing' (CBP) model proposed by Boothroyd & Sackmann (1999), and `thermohaline mixing' (TH) model proposed by Charbonnel & Lagarde (2010).

The low-mass 33 Psc star, whith almost negligible activity, has the normal carbon isotope ratio as well as the other RS CVn stars of higher masses (AY Cet and 3 Cam). The C/N ratios in almost all of the stars lie slightly above the theoretical model.

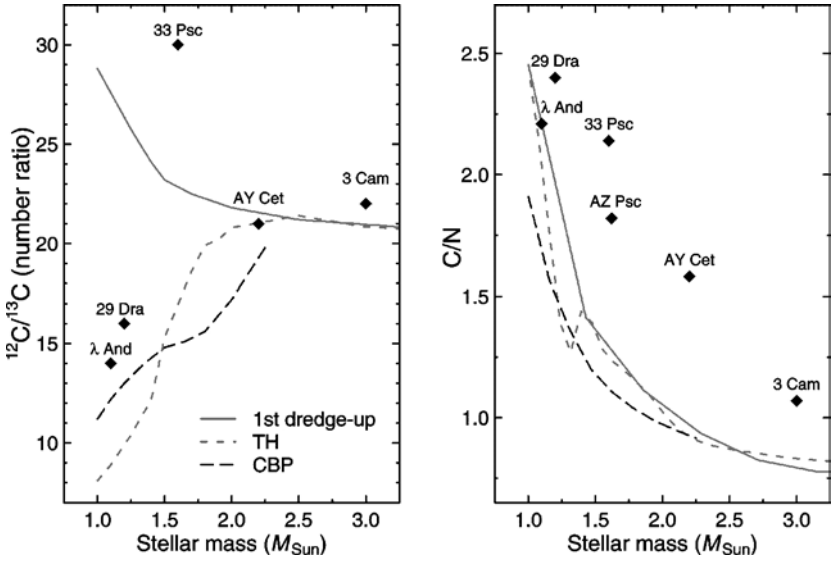

Fig. 1. Comparisons of C/N and $^{12}C/^{13}C$ ratios in the RS CVn stars investigated (Tautvaišienė et al. 2010, 2011, Barisevičius et al. 2010, 2011 and this work) with the theoretical models explained in the text.

Scientific field: Astrophysics

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Tracers of stellar chemical evolution in red clump stars of open clusters

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Galactic open clusters (OC) are known as excellent tracers of stellar and Galactic chemical evolution. The carbon and nitrogen abundances, C/N and especially carbon isotope ratios $^{12}C/^{13}C$ are key tools for stellar evolution studies. In this presentation we overview available up to date analyses of C and N abundances in red clump stars of OCs along with our recent results obtained for the open clusters NGC 6134, IC 4651, NGC 2506, Cr 261, NGC 6253. The clump stars have accumulated all chemical composition changes, which have happened during their evolution along the giant branch and during the helium flash, it is trustful source of information. We discuss the observational data in the light of theoretical models of stellar evolution.

OCs provide a unique possibility for the investigation of a number of stars of nearly the same age, distance and origin, as OC stars are claimed to be formed in the same protocloud of gas and dust. We chose stars of OCs for a better reliability of mass, distance, evolutionary phase, and abundance determinations.

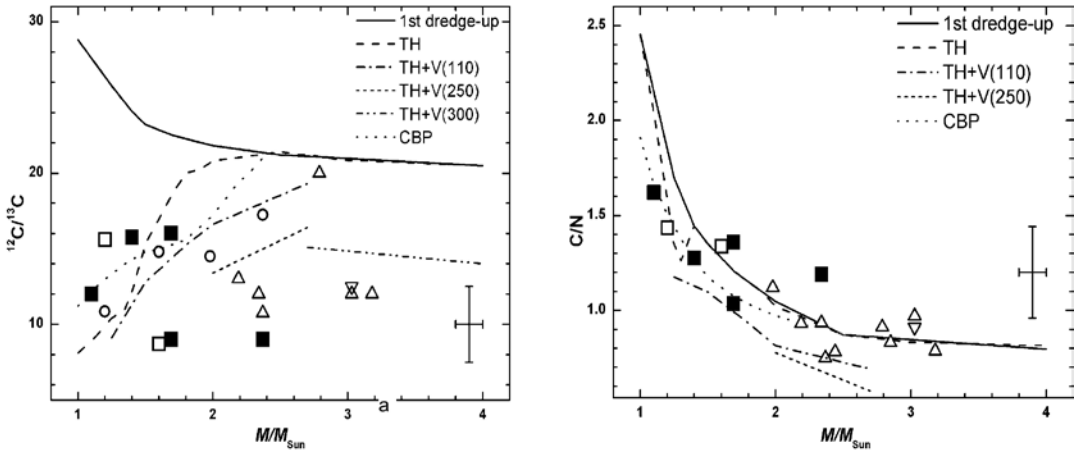

Fig. 1 The averaged $^{12}C/^{13}C$ (a) and C/N (b) in clump stars of OCs as a function of stellar turn-off mass. Results of Mikolaitis et al. (2010, 2011a, b) and two clusters of this study are marked by filled squares; Smiljanic et al. (2009) – open triangles; Tautvaišienė et al. (2000, 2005) – open squares; Gilroy (1989) – open circles. The models of TH mixing and the 1-st dredge-up are from Charbonnel & Lagarde (2010). The CBP model from Boothroyd & Sackmann (1999).

Time consuming observations of faint clump stars in open clusters and complicated procedures of the investigation of C, N and O abundances, probably, is the main reason of a small number of studies. We overview results of carbon isotope and C/N ratio determinations in six recent studies: Mikolaitis et al. (2010, 2011a,b) investigated 6 clump stars in 3 OCs NGC 6134, IC 4651 and NGC 2506. In this study we provide new results for two more OCs Cr 261 and NGC 6253. Smiljanic et al. (2009) explored clump stars in 6 OC's. Tautvaišienė et al. (2000, 2005) have analyzed 6 clump stars in OC M 67 and 3 clump stars in NGC 7789. Gilroy (1989) determined $^{12}C/^{13}C$ ratios in 4 OC's. In this presentation we compare observational results with the theoretical models of extra-

mixing: "Cool Bottom Processing" (CBP, Boothroid & Sackmann 1999) and the most recent model of Thermohaline Mixing (TH, Charbonnel & Lagarde 2010).

The comparison shows (see Fig. 1) that processes of extra-mixing in the stars smaller then 2 Solar turn-off masses is modeled well, however in stars of 2–3 $M_{\odot}$ are larger than predicted by currently available theoretical stellar evolution models. We will continue investigations of mixing sensitive chemical elements in open clusters in order to increase the observational data sample.

Scientific field: Astronomy & Astrophysics

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A new kinematically identified stellar group: chemical composition study

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Helmi et al. (2006) searched for signatures of past accretion events in the solar neighbourhood using Nordström et al. (2004) catalogue wich contains accurate kinematic, metallicity and age information for about 14000 nearby stars. From kinematic parameters: apocentre (A), pericentre (P) and z-angular momentum (Lz) they identified three coherent groups of stars. Those stars were suspected to belong to disrupted satellites.

We studied a chemical composition of those kinematically identified groups of stars and present detailed chemical abundances analysis for the Group2.

We analysed the spectra obtained with the spectrograph FIES on the Nordic Optical Telescope using high-resolution mode. Abundances of alpha process and iron group elements were determined in order to characterize this group of stars and make a comparison with Galactic disk stars. We aim to proof the extragalactic origin of those stars and possible hierarchical formation of our Galaxy. F- and G- dwarf stars are very useful in studying the ancient history of our Galaxy since they are long-lived and numerous, and their atmospheres reflect their initial chemical composition.

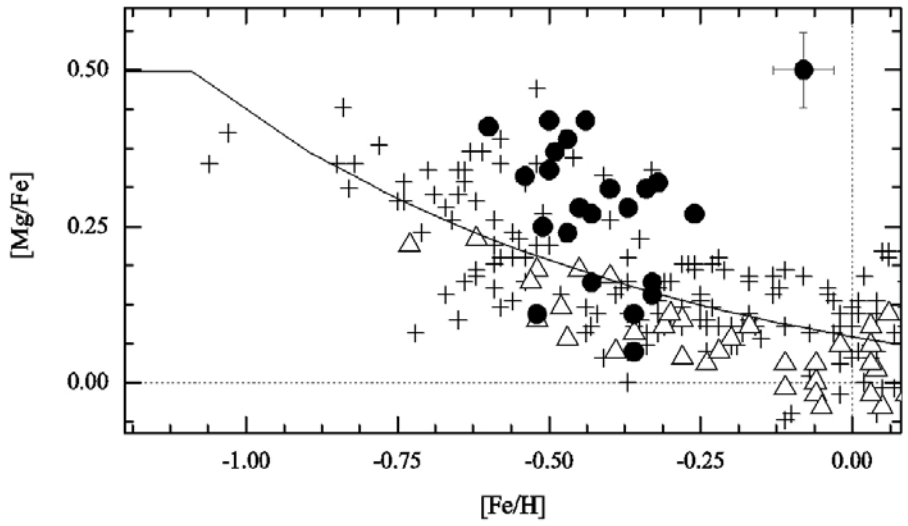

Fig. 1. [Mg/Fe] ratio as a function of iron [Fe/H] in the investigated stars suspected to belong to a disrupted satellite (dots). The data for the Milky Way disk dwarfs are taken from Edvardsson et al. (1993, plus signs), Bensby et al. (2005, open triangles). Galactic thin disc chemical evolution model is shown by solid line (Pagel & Tautvaišienė, 1995).

Our investigations show that the sample of stars Group2 is chemically homogeneous wich support a common origin of those stars. We conclude that the alpha-elements are overabundant relative to iron in comparison to Galactic disk dwarfs (Edvardsson et al. 1993, Bensby et al., 2005) and modelled Galactic chemical evolution trends by Pagel and Tautvaišienė (1995). The distinct chemical composition together with the kinematic properties and ages of the stars in Group2 provide evidences of the ancient merging event.

Scientific field: Astrophysics

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Stimulation of chemical reactions by acoustic waves

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The promotion of physical and chemical processes by ultrasound is not new and is used in various technologies. With development of technologies in this area there are new interests. Aqueous solutions, which are characterized by the respective identities of intense dissociation of water molecules often, are used in various technologies. Ultrasound-induced dissociation of water molecules is well known, and the numbers of created ions are used to evaluate the intensity of ultrasound.

We have studied the dissociation process in ultrasonic cavitation range and found that electrical conductivity of water was changed by increasing ultrasound intensity [1]. It was found that this change is induced by several electrokinetic processes. The relaxation curves of ion concentration showed that then the concentration increases ions life expectancy is volatile, and their recombination is influenced by the intensity ultrasound [2]. This kind of development is significant not only to promote the dissociation of water molecules (e.g. hydrogen production process), but also in aqueous mixtures (fluids and electrolytes), risks to price stability. Ultrasound-promoted chemical processes in mixtures have modified significantly the composition of the mixture (e.g. it caused degradation of washing mixture). Not an exception when one chemical compounds becomes into the other.

After exposure to ultrasound solution structure has changed - it has acquired new properties. Irreversibility of the process enables to maintain that the new structure is more stable. According to receive approval were measured the spectral characteristics of the exposed solution. Structural studies of samples were carried out in solution not exposed to ultrasound, as well as after ultrasound exposure.

Surface acoustic wave (SAW) in solids surface physics and chemistry are considering two aspects: first - the SAW as a tool for study surface properties and physico-chemical processes, the second - actuate and control these processes by SAW. Since the catalyst surface properties are reflected in surface acoustoelectric phenomena, is used to study the kinetics of chemical reactions. Contactless semiconductor surface research method by measuring the acoustoelectric parameters: the longitudinal and transverse acoustoelectric (AE) voltage, the character of transverse AE voltage pulse growth and decline, attenuation coefficient of SAW was applied for study and control of surface adsorption and heterogeneous reactions on catalyst surface [3].

It was found that the SAW changes the electrical properties of semiconductor surfaces and continuous-SAW mode was begun to use for activation of physical and chemical processes in the semiconductor surface.

Scientific field: Physics

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Terahertz electromagnetic waves in polar semiconductors and alkali halides

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The terahertz (THz) region of the electromagnetic spectrum is of great importance due to rich physical, biological and chemical processes in this range [1–3]. In this report, we are looking for possibilities to create the THz radiation source with beam power larger than 10 mW. The THz source can be used for active regulation of biomedical processes in living tissue.

Far-IR Fourier transform spectroscopy (FTS) and THz time domain spectroscopy (TDS) are the most popular techniques successfully used in the 0.3–6 THz range. However, the mean power of the emitted THz signal beam using these techniques does not exceed 0.1 mW due to the limited active THz emitter area (in TDS case, ~10^{-4} cm^2). In FTS case, limitation by size of the emitted beam area is ~$10^{-1}cm^2$ [4, 5].

In the report, we propose to use the resonant reflectance in the 5–22 THz range from alkali halides and polar semiconductor plates with large reflector area (~ 1 cm^2) for separating a narrow spectral band from the heated-body emission spectrum. That allows us to increase the THz emitted beam area and to achieve the higher emitted THz radiation power. The terahertz portion of the electromagnetic spectrum of black body thermal radiation in the range of 9–10 THz is sufficiently large: 10 mW/cm^2 [6].

The dielectric function peculiarities of polar semiconductors and alkali halides in the THz frequency range are investigated. The resonant reflectance spectra in the 5–22 THz range from polar semiconductors: InSb, AlAs, InP, GaAs, GaN, GaAs/AlGaAs heterostructures, and alkali halides: KCl, BaF_2, CaF_2 are investigated experimentally. In the ternary compound $Al_xGa_{1-x}As$, the phonon frequencies depend on Al content x and lie between the frequencies of GaAs and AlAs, and these frequencies are regulated by the composition of the ternary material [7]. It allows us to regulate the resonant frequency by choosing the material composition. This means that resonant filters covering the full 5–22 THz frequency range can be created. The semiconductor resonant reflectors for the separating a narrow spectral band from the heated-body emission spectrum are proposed.

The compact size relatively simple continuous wave THz radiation monochromator with an output power up to 10 mW in the frequency range of 5–22 THz is created. The output spectrum is regulated by using the semiconductor and alkali halide resonant reflectors.

Scientific field: Physics

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Features of irradiated diamonds by heavy protons and light helium ions

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Natural or synthetic diamonds contain defects introduced during growth or synthesis process. The interaction of these preexisting defects with vacancies and interstitials created by radiation damage has contributed to our present understanding of a nitrogen produced diamond defects. Understanding the role of nitrogen-vacancy (N-V) defects is important for many of the technological applications of diamond.

In this study structural properties of HPHT grown type Ib diamonds irradiated by heavy protons with high energy of 9 MeV and light helium ions by HRTEM and AFM microscopy were investigated. Spectroscopic properties by UV-Vis, photoluminescence and Raman spectroscopy at 300-3,6 K in visible region have been studied. Incorporation of nitrogen impurity by irradiation leads to the formation of a luminescent defect and being either neutral (NV^0) or negatively charged (NV^-) detected at 575 nm and 637 nm respectively. Average inter planar distance 2.1 Å of protonated diamond from HRTEM micrograph in plane (111) was obtained and the lattice constant 3.637 Å of the irradiated diamond was calculated. This result is close to XRD analysis were the lattice constant 3.592 Å was evaluated. The proton radiation damage cause graphitization processes which start in the diamond at fluency 3×10^{14} protons cm^{-2}.

Nitrogen-vacancy (N-V) defects created by proton or helium ions irradiation demonstrating very stable and bright fluorescence at low temperatures. Photoluminescence and Raman NV spectra at room temperature are weak pronounced as well as at low temperature spectroscopy enable to monitor and control behavior and small changes of nitrogen impurities. Content of (N-V) defect in the diamond strongly depend from fluency and irradiation time.

Scientific field: Physics

Nuclide composition in irradiated graphite of Ignalina NPP RBMK-1500 reactor

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From the very beginning of nuclear energy graphite is an important material used to moderate neutrons in nuclear reactors. The decommissioning of graphite moderated reactors and management of used graphite encounters some problems. In spite that nuclear graphite is very pure material, it still contains some impurities of various elements. These impurities are activated by (n, γ), (n, p), (n, α) reactions partially resulting in long lived elements (e.g. ^{14}C, ^{36}Cl, transuranium elements). Radiologically it is very important to know graphite nuclide composition. This can be the basis for further technology selection steps. For power reactors the key issue to this problem is the knowledge of reactor neutron spectrum, flux, and impurities of the graphite. In spite of the fact that reactor power history is known, separate parts of reactor graphite moderator undergo different conditions: neutron spectrum and flux changes with the radial and axial position in the reactor core causing inhomogeneous activation of graphite impurities. Knowledge of integral neutron flux is very important answering many i-graphite management and disposal questions.

Numerical modelling is an important tool for estimation of the radioactive waste production in the nuclear energy sites. [1] In the present work we applied MCNPX v.2.6 [2] code for calculation of activation of the graphite stack in the RBMK-1500 reactor. The simplified 3D model of the RBMK-1500 reactor core fragment with 14 fuel assemblies and 2 control rods distributed according to the real Ignalina NPP RBMK-1500 reactor core geometry was created.

The graphite samples were taken from Ignalina NPP unit 1 RBMK-1500 reactor graphite sleeves of fuel assemblies. By coupling the mass spectrometry for identification of the impurity concentration in raw graphite, MCNPX and CINDER'90 modelling for the evaluation of the realistic neutron irradiation conditions and validation of the model by nuclear spectroscopy analysis of the irradiated graphite we developed a complex method to obtain the radiological characteristics of irradiated graphite from RBMK-1500 reactor. [3] The impurities analysis has shown what ^{14}C, ^{60}Co, ^{55}Fe, ^{238}Pu, ^{241}Am and ^{244}Cm makes the major input to graphite activity and radiotoxicity. The obtained results are important for further decommissioning process of the Ignalina NPP.

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Low frequency noise characteristics of multiple quantum well laser diodes

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Three main fluctuating quantities are considered in the laser diode (LD) noise investigation: emitted optical power (optical noise), phase (or frequency) and LD terminal voltage (electrical noise). The level of noise is a measure of an uncertainty in the system and increases if there are more individual sources of defectiveness [1,2]. Noise characteristic investigation can clear up the reasons of various effects observed in laser diode operation and physical processes that took place during these effects, gives valuable information on LD quality problems and can be used for reliability prediction, device design and technology improving. This report overviews the low frequency noise characteristics of electrical and optical fluctuations, and their cross-correlation characteristics for different multiple quantum well laser diodes.

Worse characteristics (larger threshold current, lower efficiency) and poor reliability of LDs are caused by the presence of defects at the surface of the active region. These defects increase the leakage current that leads to the larger LD threshold. Presence of such defects in LD structure manifests as additional negatively correlated Lorentzian type noise (especially evident at the threshold operation). During ageing, these defects migrate, form clusters, deteriorate the laser characteristics, and, ultimately, cause the failure of LD. Low-frequency noise investigations can detect the presence of these defects.

Lorentzian type noise peaks observed during mode-hopping effect in Fabry-Pérot laser operation are related to the recombination processes in the barrier and cladding layers through the centers formed by the defects involving electrons and holes having different capture cross-sections, what is reflected in different cut-off frequencies of the Lorentzian spectra.

The experimental data suggests that electrical and optical noise tests (especially cross-correlation factor investigation at the threshold), that are quick and undestructive, can be used as the lifetest screen to distinguish reliable and unreliable laser diodes without traditional long-time lifetime tests.

Scientific field: Physics

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Innovative application of advanced silicon nanotechnology (II): development of the high-sensitive microwave detectors

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Microporous silicon (por-Si) is a promising nano-material opening new possibilities for many applications due to its unique properties in various aspects. Optoelectronic structures, photonic crystals, sensors, photodetectors and other devices have been produced by adapting relatively simple porous silicon technology. However, research on porous silicon and its applications in the microwaves is relatively poor. Most of it is devoted to the residual effect of microwaves on por-Si luminescence; transfer of charge carriers and to microwave attenuation on porous silicon layers. Some studies of physical effects in the microwave field are summarized in this contribution. It is shown there that microwaves influence on electrical conductivity of porous silicon and cause formation of electromotive force in complex some por-Si structure. The strength of the electromotive response may be altered by changing the architecture of a porous silicon layers in the structure. This study continues these investigations in order to determine the peculiarities of electromotive force depending on the porous silicon layer architecture. Two types of por-Si structures modified by por-Si homogeneous and por-Si inhomogeneous layers are studied for this purpose.

Crystalline silicon (c-Si) p-type wafer (100) orientation, 0.4 cm thick, and 0.01 Wcm resistivity were used to produce of modified porous silicon samples. Formation of all porous silicon structures have been carried out using an electrolytic etching in fluorine acid : ethanol, 1 : 2 electrolyte. Homogeneous porous silicon structures were made while maintaining constant etching current density producing por-Si layer. Etching current density was 10 mA/cm2 and the etching time of 5 minutes while production of the upper p+PSiL1 porous silicon layer. Current density 80 mA/ cm2 etching, etching time 10 min was used to obtain the second, basic, porous layer PSiL2. Non-homogeneous porous silicon structures were made of two layers and PSiL1 PSiL2 also. However, etching current was continuously uniformly varied from 10 mA/cm^2 to 80 mA/cm2 while time of manufacturing of non-homogeneous porous silicon layer PSiL2. Ohmic aluminum contacts were produced on the both surfaces of the samples by a vacuum sputtering technology. Base contact to the crystalline silicon was full. The contact site to the porous silicon was 100 mm in diameter. Similar control sample of the no-modified crystalline silicon (c-Si) were produced from the same material under the same conditions. Electrical tests carried out by measuring the modified and unmodified samples resistance and current-voltage characteristics. Study have been made of the influence of microwaves on electromotive force response of the samples were carried out in the microwave 3 cm rectangular waveguide with an electric field building section. Microwave pulses of frequency 10 GHz, 2 ms in duration were used for excitation.

The research goal is to locate the place where the electromotive force is induced, whether on the upper boundary between the porous silicon layers or on the lower boundary between the porous and crystalline silicon. We found this by comparing the sign of the response signal to microwaves in homogeneous and inhomogeneous structures and in c-Si sample, and by mark its position on microwave power scale. First of all it has to be mentioned that the microwave-induced electromotive force has the same sign for all the samples under study. It means that the point contact configuration is the same in all samples, and it is analogical to a classical geometry of the point contact. Indeed, in the cases of por-Si samples the point contact is actually technologically

positioned in the lower boundary of porous silicon layer PSiL2/c-Si. This polarity of the detected signal shows that the electromotive force is induced in the lower boundary of porous silicon layer. This was not finally elucidated previously in our works during the study of homogeneous porous silicon samples only. The results of this work confirm previous assumption that besides other electromotive forces induced in upper boundaries of the por Si structure, the major part of the response to microwaves is generated in the lower boundary of the homogeneous porous silicon layer.

The investigated samples can be used as microwave detectors. All the samples studied had similar external geometrical structure: the lower contact was all-over bulk, the upper metal dot contacts were 100 μm in diameter. The samples modified with porous silicon structures have advantages compared with a classical point contacts on crystalline silicon. First, they sensed microwave pulse of two orders of magnitude lower power than the satellite crystalline silicon samples did. Second, the induced signal values may range for tree orders in magnitude. It is interesting to compare voltage-power sensitivity of the modified and unmodified samples. It was found that the modified porous silicon samples show sensitivity about one to two orders of magnitude higher than the unmodified crystalline silicon samples do. In addition, the dynamical range of the porous silicon sample reaches almost four orders of microwave power. It is worth noting that the sensitivity of the PoSi-modified samples depends on their resistance which in turn is the result of etching conditions. This opens possibility for the search of optimal parameters of such PoSi modified microwave detectors.

Application of reduced density matrix formalism for study of characteristics of saturated molecules

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The classical organic chemistry is attributing the chemical compounds to the classes of molecules on the bases of similarity of physical and chemical characteristics. It should be mentioned that the each member of the class has both common and individual, specific properties. As the number of the compounds composing the chemical class in principle is infinitive the common properties are important. Quantum mechanical description of molecules is based on the study of the single molecule. The properties of the molecule are determined by its Hamiltonian. Thus it is evident that the mentioned approach is not the best solution when studding common properties of classes of the molecules.

The analysis of self consistent Fokians of saturated molecules in the basis of *sp3* hybrid atomic orbital's (AO's) reveals properties allowing generalize the quantum mechanical problem for the class of saturated compounds and solve it using perturbation theory worked out for reduced one-electron density matrices .

It was shown [1, 2] that the suggested approach leads to the substantiation of the intuition – based chemical hypothesis and concepts of the classical chemistry (the short – range nature of inductive effect as being due to weak inter-bond delocalization in alkanes, additivity of the heteroatom influence and a large extent of additivity of intra-molecular interactions) and gives the possibility to formulate the quantum mechanical analogues.

As one of the examples of practical asserts of the approach is the possibility to apply it for prediction of conformational energies arrangement on the energy scale for saturated molecules.

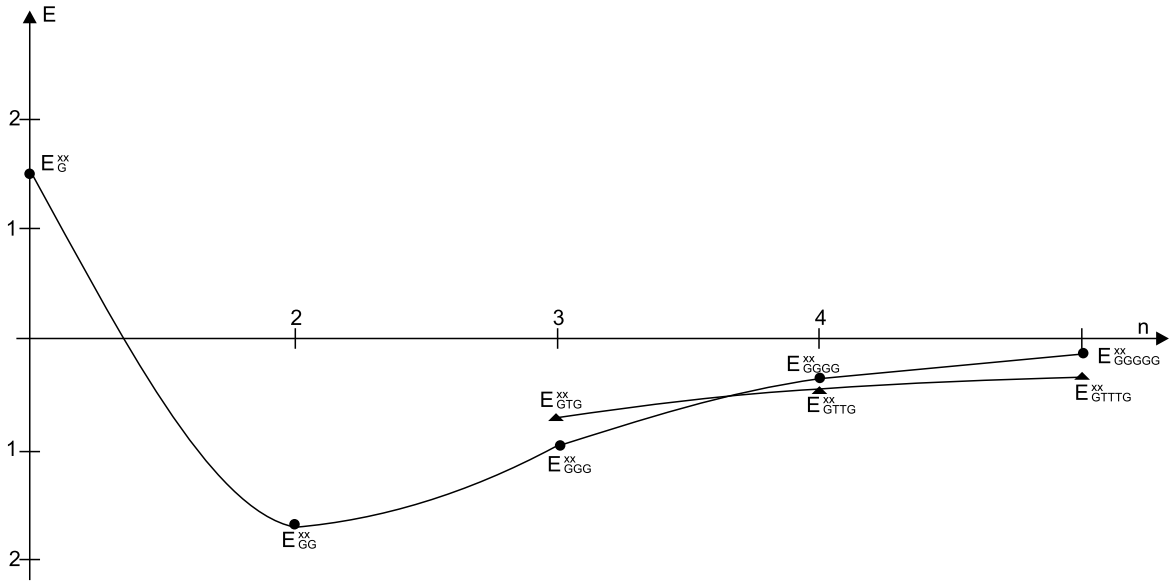

Fig. 1

Using the mentioned above approach the analytical expression for total energy of the molecule was obtained. Taking into account the experimentally well known fact that the bond lengths, valence and dihedral angles a only little affected by conformational changes it was possible to divide the conformational energy of any saturated compound into the sum of transferable components corresponding to the energies of separate conformational segments and their sequences [3,4].

For working out practically useful tool for prediction of mutual arrangement of conformational energies in saturated molecules on the energy scale, the evaluation of additivity increments corresponding to the energies of separate conformational segments and their sequences was made both using quantum mechanical calculations and "additivity rule"[5]. Fig. 1 shows dependence of additivity increments (kcal/mol) on the number (n) on conformational segments in chloroalkanes.

The "additivity rule" series convergence is the argument proving the possibility of practical use of the worked out method in the biology and molecular devises [6].

Scientific field: Physics

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Innovative application of advanced silicon nanotechnology (I): significant enhancement of efficiency of silicon solar cells

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Photoelectric conversion of solar radiation energy into electrical energy is one of the most attractive ways supplying of the ecological energy. Solar cell research, development and industrial production experienced a breakthrough over the past's years. Manufacturing of solar cells, solar modules and building of solar plants has grown significantly. Great interest is observed in the research of solar cells and in attempts to improve its efficiency. Enhancement efficiency of solar cells is one of general factors for growing its competitiveness along reduction of its fabrication costs. In spite of constructing new types of solar cell, the highest part of the global solar cells products is of crystalline silicon. Silicon is one of the most widespread surrounding materials, one of the most common, environmentally friendly, compatible with human biological life and the environment. Silicon is the cheapest semiconductor material. Silicon technology is the most advanced, mature, well-developed and least expensive compared to the technology of complex other semiconductor. A solar cells manufactured of monocrystalline silicon occupies a leading position among a wide range of products of the photovoltaic industry. Laboratory-derived silicon solar cell efficiency is of 24,5 %, however the industry cell efficiency not exceed 20%. The theoretical efficiency limit of silicon solar cells evaluated by 31%, is a target for cells to be competitive with other solar cells, energy sources and acquisition methods. Improvement of solar cell efficiency seeks by reducing losses due to light reflection from the cell surface, optimization of light absorption and the useful usage of charge carrier generated by solar radiation. Porous silicon nanotechnology adapted to modify cells specimens in our research. This modern technology is used to produce of diverse porous silicon structures, offers many diverse opportunities for the production and modification of silicon devices, and silicon solar cells among them. Adapted in original way,* this technology allow us to enhance silicon solar cell efficiency.

Silicon solar cells produced by an comon technology in p-type crystalline silicon wafer are investigated. Manufactured solar cells were of total thickness 450 m, the p-n junction depth was of 0.5-0.7 mm. Continuous lower and upper grid contacts were made of copper by vacuum sputtering. Finished surface of the cells were protected by the a few tens of nanometers thick silicon nitride layer. In the experiments, solar cell panels were cut into (5 x 10) mm^2 specimens. All the metal contacts were protected by chemically resistant and electrically-tight paint during etching process. Porous silicon technology operations were carried out in the teflon electrochemical cell. Lower continuous solar cell contact was used as anode. The cathode contact of the electrolyte was made of platinum. Fabrication of nano-structured porous silicon has been carried out in the HF: ethanol = 1:2 electrolyte. Samples were illuminated by 50 W halogen lamp light during etching. Etching current was controlled by a computer in the limits of (6-14) mA/cm^2, etching time interval was limited in (10-30) s. Electric charge passed through the unit of the area was controlled in the ranges of (260-420) mC/cm^2. Computerized equipment package consisting of multimeters Tektronix CFG 253, Ketley 2000, Metex MXD 4660, oscilloscopes Tektronix TDS 3032B have been used by measuring current-voltage (*IV*) characteristics. Investigation of the spectrally integrated solar cells efficiency have been made using the 35 W Xenon lamp radiation with a spectrum close to 5000 K black body radiation spectra. Halogen 50 W lamp light and diffraction grating monochromator were used during the spectral measurement of *IV* characteristics.

The electric power P generated by solar cell changes noticeably after modification of samples by manufacturing porous silicon nanostructure. The change occurs both in the IV shape, spectral position of P_{max} as well as in absolute value of the power. Notable is a change in integrated P_{max} value found after modification of the solar cell. We observe it is in the range of tens to hundred percent in the samples investigated. The spectral peculiarities of the power increase were studied. It was reviled P_{max} value depends on spectral location of the incident light. It was found, that this dependence is essentially different in modified and unmodified samples The most increase in power generated was found close to the wavelength l @ 700 nm. It is suggested, the increase of power generated originates from better absorbance of exciting light and greater collecting factor of charge carriers in silicon solar cells modified by porous silicon nanotechnology used. In conclusion it has been demonstrated in our research that porous silicon nanotechnology is effective tool to improve the silicon solar cells performance.

*Patent application in progress

Electric to thermal energy conversion: research of hydrogen plasma cell

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The increasing demand for energy promotes the continuous search for new technological solutions that allows to increase energy safety and to solve ecological problems. During the last twenty years had been done many experimental investigations, that proves electric to thermal energy conversion opportunity using water electrolysis in plasma (Japan, Russia, USA, Italy). Although theoretical justification of physical and chemical phenomena of this process is ambiguous, it is already designed and patented various types of water plasma electrolysis generators. According to the authors, their energy efficiency index is up to 20 - 30 [1, 2].

In this paper are presented results of research of electric to thermal energy conversion in hydrogen plasma cell. These results were carried out in Siauliai University, Faculty of Natural Sciences. Were conducted a series of experiments with copper and tungsten cylindrical cathodes and chromium and steel variuos forms anodes. Electrolytes – potassium (*KOH*), sodium (*NaOH*) hydroxides and baking soda ($NaHCO_3$) variuos concentrations solutions in water.

Experiments were performed on static and dynamic operating modes. Dynamic mode used different frequency and penetration rectangular impulses. Electric to thermal energy conversion's efficiency index $k = Q/W$ (there Q – released amount of heat in a cell, W – used amount of electric energy). To determine this index were performed calorimetric experiments in water boiling temperature and a temperature below the boiling point. In a cell generated thermal energy is stored in electrolyte, water vapors and gases of hydrogen, oxygen and ozone. Gases of hydrogen, oxygen and ozone are released in plasma electrolysis process. Also light and sound energy is

Figure 1. Hydrogen plasma cell

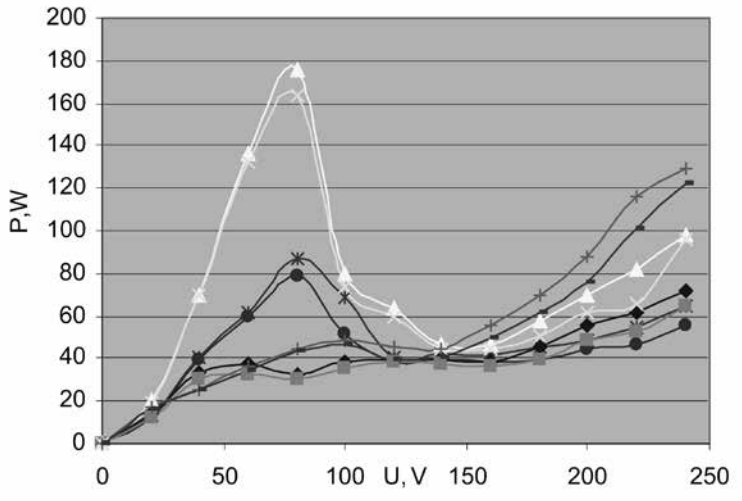

Figure 2. Changes of power consumption in hydrogen plasma cell (experiments with variuos electrolytes)

released. In this paper only the thermal energy stored in an electrolyte was measured. Determined efficiency index is up to 300% [3]. Also in this paper were determined plasma ignition's existence and stability range, voltamperic characteristics. These parameters were determined in a various operating modes and in a variety of cell's structural parameters and electrolytes. Processes in a cell are often sporadic, depending on the variety of random effects. Figure 2 shows how power consumption in a cell depends on voltage between electrodes. It was found that at a certain voltage between the electrodes a sudden jump of intensity of ionizing radiation is obtained [3]. The obtained results will contribute to produce research-based thermal units and formulate recommendations for the use of such units.

Scientific field: Physics

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Quantum-mechanical study of the alanine molecule fragmentation by low energy electrons

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Proteinogenic amino acids, which alanine belongs too, are those amino acids that can be manufactured by the human body, and does not need to be obtained directly through the diet, but the molecule plays a key role in glucose-alanine cycle between tissues and liver.

Currently, the determination of the appearance energies for the ionized fragments is of specific interest in view of tracing the possible consequences of the live tissue interaction with ionizing radiation. It should be mentioned that there are known several most stable conformers of alanine, thus the question arise: "are some significant differences in the conformer fragmentations?" To answer the above question and to determine the appearance energies the theoretical investigations have been performed by using the generalized gradient approximation for the exchange-correlation potential in the density functional theory (DFT) as it is described by Becke's three-parameter hybrid functional, using the non-local correlation provided by Lee, Yang, and Parr (B3LYP method) [1]. The cc-pVTZ basis set has been used as well [2].

Obtained results indicate that the vertical and adiabatic ionization potentials of the alanine conformers are different that corresponds to the data of other authors [3]. However based on the bond length and bond order analyses, it is concluded that the detachment of the hydrogen atom of the -COOH group is more probable for both investigated conformers. Other most probable and provided fragmentation ways for both investigated conformers are as follows:

1. COOH group detachment;

2. Detachment of one hydrogen atom of the -NH_2 group.

The COOH group elimination has been studied deeper. It is necessary to mention that the COOH group detachment leads to formation of the COOH (m=45 a.m.u.) and C_2NH_6 (m=44 a.m.u.) fragments, which may have different charges, i.e. two cations, two anions, two neutral fragments, cation and anion, cation (or anion) and neutral fragments could be formed. Comparison of the appearance energies of the above fragments indicates that formation of the C_2NH_6 (m=44 a.m.u.) cation is more probable. This result is confirmed by our experimental data on dissociative ionization of the alanine molecule as well as with those of other authors (see, e.g. [4]).

Other processes of alanine decomposition were studied as well to find possible fragmentation mechanisms for the above molecule.

Scientific field: Physics

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CMR-B-scalar sensor for high magnetic field measurements

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The measurement of pulsed magnetic fields with peak-amplitudes ranging from several up to 100 Tesla is a demanding technical task [1], in particular if the amplitude and direction of the magnetic field change simultaneously. In the most cases the inductive B-dot, Hall or magneto-optical sensors are used [2-3]. However, for the exact measurements the direction of magnetic field has to be known in advance. For some applications such as study of electrodynamical processes during electromagnetic launching, magnetic flux compression or metal forming, the direction of magnetic field is not exactly known and could change during an experiment, thus several sensors have to be used, what makes it laborious to measure magnetic fields locally. Therefore, sensors capable of measuring magnetic fields independently of their direction and in a very small volume are of great importance.

It was demonstrated that the Colossal Magnetoresistance (CMR) phenomenon in thin manganite films [4] can be successfully used for the development of B-scalar sensors [5-11], which are able to measure the magnitude of high pulsed magnetic fields up to 40 T in a very small volume (less than 0.05 mm^3). These sensors were used to measure magnetic diffusion processes in railguns [6-8] and the distribution of highly inhomogeneous transient magnetic fields during coilgun experiments [9]. The CMR-B-scalar sensor's operation is based on an electrical conductivity change of thin polycrystalline La-Sr-Mn-O films due to external magnetic fields. At field amplitudes higher than 2 T the sensor measures the magnitude of magnetic induction locally (about 0.02 mm^2) and with an accuracy better than 3% [10]. The main parameters of the sensor depend on film preparation conditions, substrate used for deposition, film thickness, composition, ambient temperature [11-12].

In this work, the design and main characteristics of the CMR-*B*-scalar sensor based on polycrystalline $La_{1-x}Sr_xMnO_3$ films are presented. The investigations of the influence of film preparation conditions, i.e. deposition temperature and Sr content, on the sensitivity of the sensor operating at room temperature are presented. It is demonstrated that for design of CMR-*B*-scalar sensor the films with composition x=0.17 having low enough anisotropy effect and significant magnetoresistance values are preferable.

Scientific field: Physics

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New redox mediators for electrochemical biocatalysis

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The implementation of industrially promising biocatalysts especially oxidoreductases is confronted with difficulties concerning availability of an efficient redox mediator, which promotes an electron transfer between active site of enzyme and electrode surface. A great number of electron donors or acceptors are known and used in chemical technologies however there still is a lack of cheap but efficient redox mediators applicable for enzymatic redox reactions. In this work a set of 10 new compounds have been synthesized enzymatically using laccase from *Coriolopsis byrsina* GRB13. Bioelectrocatalytic systems using synthesized mediators have been investigated on a base of glucose and ethanol oxidation reaction catalyzed by pyrroloquinoline quinone-dependent soluble glucose (s-PQQ-GDH) and membrane-bound alcohol (m-PQQ-ADH) dehydrogenases, respectively.

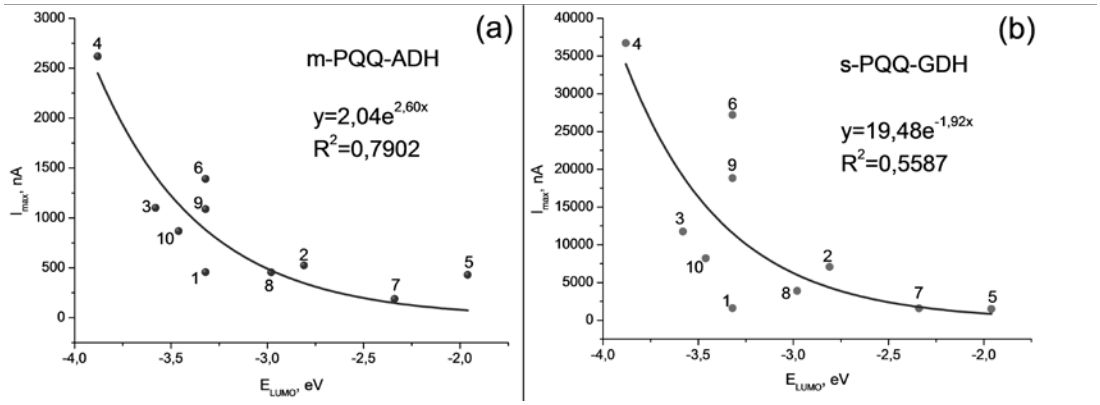

Fig. 1. Exponential correlations between E_{LUMO} and I_{max} of systems with m-PQQ-ADH (a) and s-PQQ-GDH (b).

Electrochemical measurements showed that the efficiency of biocatalytic systems as a factor of the electron transfer rate between the active site of enzyme and electrode surface via redox conversions of mediator varied in wide range. Aiming to discover all essentials for effectiveness of the redox mediators in parallel with experimental approach, quantum chemical calculations (made by using density functional theory with Becke's three-parameter exchange hybrid functional combined with the Lee-Yang-Parr's correlation functional) have been applied for the evaluation of molecular properties of mediators. It was detected that the correlation between maximum current (I_{max}, that correspond to the maximum enzymatic reaction rate) and energy of the lowest-unoccupied molecular orbital (E_{LUMO}) can be fitted by exponential function (Fig. 1). Systems based on both PQQ-dependent enzymes and all synthesized mediators showed analogous effectiveness.

In accordance with these measurements, database with E_{LUMO} and I_{max} correlations could be done, and efficiency of new mediators could be predicted. The approach of purposeful synthesis of effective electron transfer compounds could be used for bioelectrocatalysis by other oxidoreductases.

Scientific field: Biochemistry

Novel approach to decontaminate food or food-related surfaces: photosensitization

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The discovery of antibiotics raised the belief that human being has found powerful tool to control pathogens and infectious diseases. Unfortunately, after seventy years of hard work we must state, that the fight against microbes is still continuing and remains as one of the permanent challenges. Despite tremendous progress in food microbiology, the number of reported food-borne diseases continues to rise. Health experts estimate that every year food-borne illnesses in USA cost 5-6 billion US dollars in direct medical expenses and lost productivity. Infections with the bacteria Salmonella alone account for 2.5 billion dollars yearly. Obviously, existing antibacterial technologies to decontaminate food or food-related surfaces are not enough effective.

Photosensitization is a treatment involving the interaction of the two non-toxic factors, photosensitizer and visible light, which in the presence of oxygen results in the selective destruction of the target cell. Different microorganisms, such as multidrug-resistant bacteria, yeasts, microfungi and viruses are susceptible to this treatment. After irradiation by visible light, reactive oxygen species induce rapid disruption of the cell wall. Reactive ROS interacts with unsaturated fatty acids, amino acid residues, nucleic acid bases of DNA. Of importance to note, that Gram (+) bacteria are more susceptible to photosensitization than Gram (-) bacteria. Spores and microbial biofilms being extremely resistant to any antibacterial treatment are susceptible to photosensitization. High antimicrobial efficiency of chlorophyllin-based photosensitization has been used to inactivate harmful and pathogenic microorganisms on the surface of different foods (vegetables, fruits, berries), to sterilize various food-related surfaces, to develop photoactive smart packaging.

Therefore, a photosensitization phenomenon might open a new avenue for the development of non-thermal, effective and ecologically friendly antimicrobial technology.

Scientific field: Biophysics

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Antimicrobial effects of some phyto-organic compounds

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Microorganisms are opportunistic biological agents of ubiquitous nature. It is well established that some plants contain compounds able to inhibit the microbial growth. The potential antimicrobial properties of plants had been related to their ability to synthesize, by the secondary metabolism, several chemical compounds of relatively complex structures with antimicrobial activity. The complexicity of essential oils are attributed to their terpene hydrocarbons and their oxygenated derivatives such as alcohols, aldehydes, ketones, acids and esters [3].

The main reasons for using essential oils as antifungal agents is their natural origin and low chance of pathogens developing resistance. Recently, there was extensive research on the antimicrobial activity of essential oils against pathogens seeking natural and safer means for hygiene. Antifungal properties of plant essential oils have been reported by researchers throughout world [1, 2].

The antimicrobial activity of such essential oils from *Mentha piperita* L., *Malaleuca alternifolia* L. and *Thymus vulgaris* L. was tested on moulds species: *Paecilomyces variotii, Cladosporium herbarum, Fusarium moniliforme, Aspergillus versicolor, Aspergillus fumigatus, Aspergillus niger* and *Aspergillus oryzae.* Quantitative and qualitative analyses of essential oils were carried out using gas chromatograph with mass spectrometric detector.

As a conclusion, it can be stated that the tested essential oil, can be used for air purification.

Scientific field: Biomedicine

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Carbon nanomaterials in bioelectrocatalytic systems

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Carbon nanomaterials are widely used in bioelectrocatalytic systems, including amperometric biosensors [1]. These materials are highly attractive due to their unique electronic properties, biocompatibility, and big variety of forms, which can be tuned to the different enzyme-containing systems. Variety of carbon nanomaterials is yet increasing, since the discovery of new forms from that group (graphene, nanohorns, nanorings, etc.) is reported.

The aim of this research was to discover carbon materials prospective to be employed in the third generation reagentless biosensing systems, which are able to operate on the principle of the direct electron transfer (DET). In this research functionalized single-walled carbon nanotubes (SWNT) and a few types of graphite nanoparticles have been manufactured and tested as the electrode material for the amperometric biosensors working with pyrroloquinoline quinone dependent glucose dehydrogenase (s-PQQ-GDH) from *Acinetobacter calcoaceticus*. The SWNT were pre-treated enzymatically using laccase from *Basidiomycete Lac* and graphite nanoparticles were obtained as a result of the oxidation in alkaline media.

It was revealed that using native SWNT or graphite oxide as the electrode materials the DET effect was not achieved in the biocatalytic systems. This effect can be achieved only in the presence of oxidized graphite products synthesized in the alkaline media or enzymatically pre-treated SWNT.

The morphology and the local electric properties of the constituent parts of the biosensors have been characterized by scanning probe microscopy. The sensitivity and stability are described for typical types of the biosensors and the mathematical model of their action is proposed.

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Scientific field: Biochemistry

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Electrochemical impedance spectroscopy as a sensitive method to study of bioelectrochemical systems based on dehydrogenases and conductive polymer

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The behaviour of pyrroloquinoline quinone (PQQ) dependent enzymes immobilized on a three-dimensional interdigitated electrode array (3D-IDEA) impedimetric sensor [1] covered by a new poly-*N*-(*N*′,*N*′-diethyldithiocarbamoylethylamidoethyl)aniline (polyNDDEAEA) conductive polymer [2] is studied.

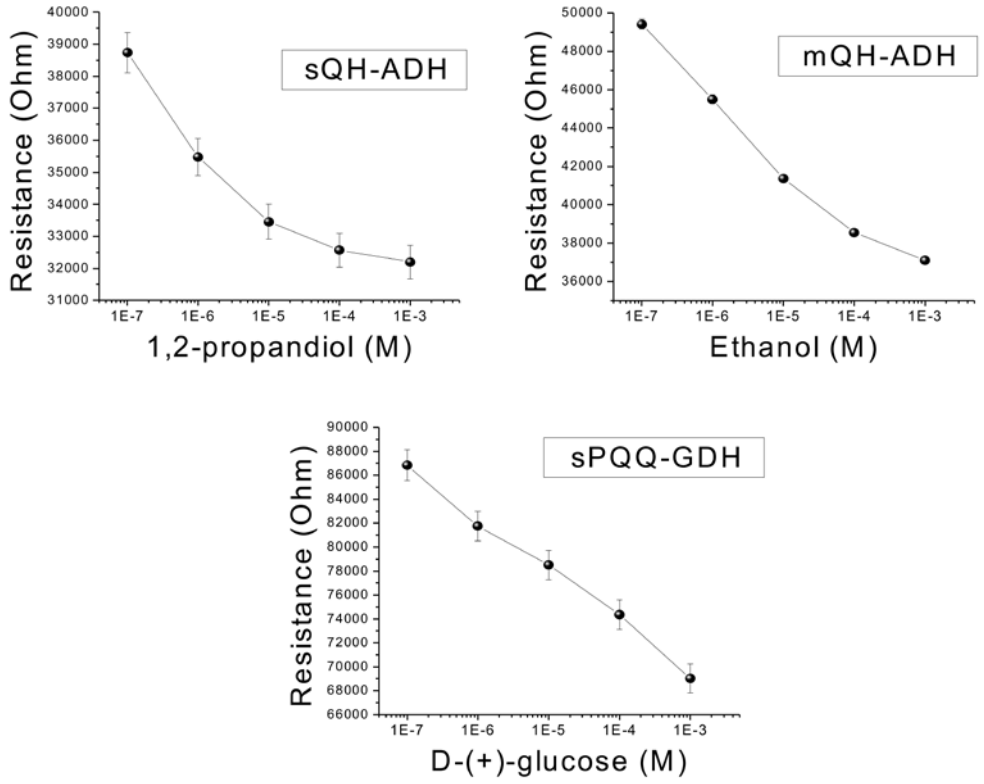

Figure 1. The response of bioelectrochemical systems with polyNDDEAEA and adsorbed PQQ dependent enzymes to addition of enzyme substrate. Ordinate axis shows the enzymes substrates concentration in the 10^{-5} M $CaCl_2$ backgrownd solution. .The sensors response is registered in the 10^{-6} – 10^{-3} M substrate concentration range.

It was found that the conductivity of polyNDDEAEA polymer films deposited over 3D-IDEA sensors is sensitive to changes of the solution redox potential. Different PQQ dependent enzymes: soluble alcohol dehydrogenase from *Pseudomonas putida* HK5 (sQH-ADH), alcohol dehydrogenase from *Gluconobacter sp*.33 (mQH-ADH) and soluble PQQ dependent glucose dehydrogenase from *Acinetobacter calcoaceticus* (sPQQ-GDH) were immobilized by physical adsorption on the polymer layer surface. Interaction of immobilized enzymes with subsequent substrates (1,2-propandiol, ethanol, D-(+)-glucose) resulted in changes of the overall impedance of the studied bioelechtrochemical systems, as presented in the figure below.

It is shown that the enzymes can be re-oxidised on poliNDDEAEA via direct electron transfer (DET) from an enzyme active site to the polymer surface. Moreover, taking into consideration that sPQQ-GDH has no heme c active site in the enzyme molecule [3] and the behaviour of all studied enzymes is similar, it may be concluded that DET occurs from the PQQ moiety. However, in the case of alcohol dehydrogenases [3, 4] we cannot exclude that heme c also participates in the electron transfer to polyNDDEAEA as this is energetically favourable way.

Obtained experimental results show for the first time that the studied PQQ dependent enzymes can be re-oxidized on the polyNDDEAEA via DET. It may be also noted that interdigitated impedimetric sensors are used for the first time to study electron transfer from electroactive enzymes to a conductive polymer.

Scientific field: Biochemistry

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Analysis of phthalates in the river Venta by solid phase extraction and gas chromatographic-mass spectrometric method

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In the last decades it has been revealed that certain compounds, referred to as environmental estrogens, can interfere with the endocrine system of hormone production and transmission. Among them are phthalates, widely applied as plasticizers. In plastics, they do not have chemical bonds therefore under favourable conditions they can migrate from plastics and spread in the environment [1].

Phthalates concentration in natural waters is very low therefore they have been analyzed by solid phase extraction (SPE) pre-concentration and gas chromatography-mass spectrometric analysis [2, 3].

Samples were taken from River Venta flowing across Kuršėnai town, Lithuania, below the outlet of biological water treatment plant (Fig. 1).

Two standard mixtures of phthalates were used for the method optimization and validation: self composed diethyl phthalate (DEP) and di(*n*-butyl) phthalate (D*n*BP) standard mixture (EBS) and EPA506 standard mixture consisted of seven phthalates. SPE was performed using a cartidge filled with C-18 silicagel adsorbent and the extraction system isolated from the environment contamination.

Analyses carried out in December to April show that phthalate esters presumably enter the river together with sewage.

The main contaminant is D*n*BP, the minimum pollution by D*n*BP was 0.14 µg/L (SSN = 7 %) in December, whereas in April the concentration of it was 2.2 µg/L (SSN=11 %) (Fig. 2).

Very high pollution with phthalates was determined in January: D*n*BP concentration was 154 µg/L and DEHP concentration was 2.1 µg/L. In another sample taken in January concentration of

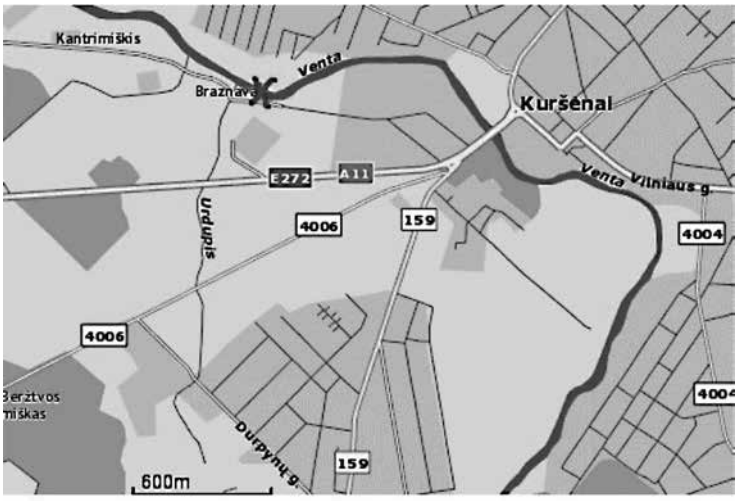

Figure 1. Place of sampling

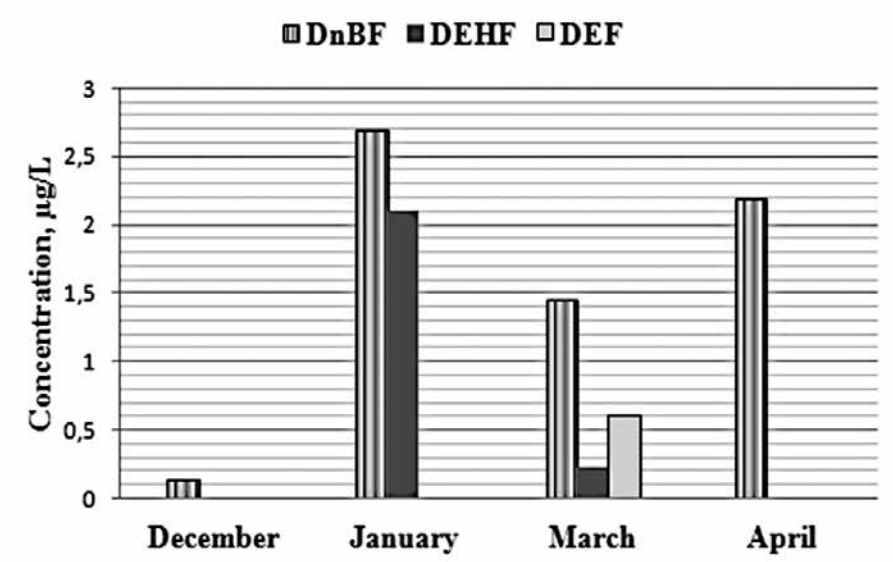

Figure 2. Phthalate distribution in the River Venta

D*n*BP was 2.7 µg/L (SSN= 7 %). DEP was detected in this sample however its concentration was below the limit of determination.

In March, D*n*BP concentration was 1.45 µg/L (SSN = 2 %), DEP concentration was 0.61 µg/L (SSN = 7 %) and DEHP concentration was 0.23 µg/L (SSN = 30 %).

Background contamination with phthalates is unavoidable: all extraction solvents showed traces of D*n*BP concentration of ca. 0.15 µg/L.

The determined concentrations of phthalates may be regarded as concentrated pollution. Further downstream the contaminants are diluted however the concern is about the fact that this River of the Baltic Sea basin is contaminated with environmental estrogens.

Scientific field: Chemistry

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Formation of micro- and nanostructured molecular assemblies through in situ synthesis on functionalised surfaces

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We are developing chemical strategies, physical detection methods and fabrication tools for biochip technologies, diagnostic and other biomedical and life science applications. Here we present some molecular self-assembly and microcontact printing (μCP) - based alternatives to obtain functional patterns for immobilization of proteins and cells. For example, we have synthesized a series of alkylthiol compounds with the general chemical structure HS(CH2)15CONH(CH2CH2O)6CH2CONH-X (X refers to the extended chains of either -(CH2) nCH3 or -(CD2)nCD3, with n = 0, 1, 7, 8, 15) to study the formation and structure of complex self-assembled monolayers (SAMs) consisting of oligo(ethylene glycol)(OEG) modules stabilized by intermolecular hydrogen bonds. We have investigated the quality, conformation, orientation, defect structure and infrared signatures of these OEG SAMs prepared by spontaneous adsorption from dilute solutions on gold.[1,2] Such alkyl SAM platforms may be employed in precise engineering of nanoscopic architectures for applications such as cell membrane mimetics, molecular nanolithography, and so forth.

Microcontact printing is based on elastomeric transfer of organic materials to soft and solid substrates and it is particularly suitable for patterning of molecular monolayers. We are using this soft lithography technique to prepare functional domains on different substrates such as gold, metal oxides, silicon, glass, biopolymers, hydrogels and different synthetic polymers. Recently, we have explored the use of μCP in prototyping biomarker chips for clinical diagnostics of cervical cancer. In our proof-of-principles study we have demonstrated the advantages of miniaturized diagnostics immunoassays that consist of patterned cytology specimens and antibody-functionalised quantum dots. Efficient control of physicochemical properties of the surface seems to be crucial in such devices and we are further working on patterning and chemical modifications of polyethyleneglycol(PEG)-based hydrogels providing them with both cell, protein-repellent and attracting domains. Beside diagnostics, such hydrogels could be used as scaffolds in tissue engineering and translational medical science. For this purpose, we are collaborating with scientific groups specialized in corneal implant development. We expect to obtain new nano-composite materials comprising bioactive, multi-functional 3D architectures that will promote tissue regeneration from stem cells.

Scientific field: Surface Chemistry, Nanoengineering

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[1] R. Valiokas. J. Electron Spectros. Relat. Phenom., 172 (2009), p. 9.
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Investigation and evaluation of elastic fabrics deformation non-uniformity

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This research describes a method that allows to evaluate the deformability properties of the textile fabrics when they are subjected to tensile forces of a different directions. The method allows identifying of the cases and the causes that influence the uneven deformation of a square shape specimen, that partially vary from a direction of a force vector [1]. During wear different parts of a garment undergo mechanical forces of a different intensity and directions that may cause a different deformations, elongations or even breakage. The parts of a garment should be prone to deform at a certain level in various directions and should regain an initial shape when load is removed [2]. Unevenness of the deformation was described by geometric parameters: extension of the specimen, transversal deformation, displacement angle, specimen's edges length difference and specimen's bottom inclination angle. The method is tested investigating deformation unevenness of elastic fabrics. It was found that fabric structure parameters and especially fabric structure mobility as well as magnitude and direction of acting forces influence the character and magnitude of the deformation unevenness. The designed methodic is applied for the analysis of the deformation of textile fabrics joined with seam during uniaxial tension. During the stretching of the fabrics joined with a seam, that have a different orientation in a system, the unevenly deforming system elements cause a complicated seam deformation – the seam without a vertical displacement can move in a horizontal direction, then rotate at a certain angle and change it's length dimensions. The method for the determination of deformability properties of the textile systems can be successfully applied during an apparel design process when it is extremely important to predict chosen fabrics behavior in a garment and in order to choose a relevant construction of a garment.

Scientific field: Materials Engineering

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[1] R. Klevaityte, V. Masteikaite. Fibres and Textiles. in Eastern. Europe, Vol. 16, No. 46 (69) (2008), p. 52–56.
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Morphology of thin films with silver nanoparticles from plant extracts on glass substrates

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Silver nanoparticles have many important applications including optical sensors [1], spectrally selective coating for solar energy absorption [2], antimicrobial agents [3] and etc. The advantage of using plants for the synthesis of nanoparticles is that they are easily available, safe to handle and possess a broad variability of metabolites that may aid in reduction. In the present study, we reported on the characterization of microstructure of thin films with silver nanoparticles synthesized from oak bark and green tea leaf extracts. The extract used for reduction of Ag^+ ions to Ag_0 was prepared by taking 10 g of oak bark / green tea leaves in a 200 ml Erlenmeyer flask with 100 ml of distilled water. The suspensions were boiling for 2 hours and filtered. To obtain silver colloids 150 µl of oak bark / green tea leaves extract was used and 50 µl 0.5 M $AgNO_3$ was added to 10 ml of distilled water. Solution was heated at 70 °C for 1 hour. Prepared solutions were spin-coated on glass substrates of thickness 1 mm. Spin speed was ~ 1100 rpm and spinning time was 30 s. Films were dried at 70 °C 30 min in the oven. AFM experiments were carried out in air at room temperature using atomic force microscope NT-206 and SPM-data processing software SurfaceView. The topographical images were collected using a V-shaped silicon cantilever (spring constant of 3.0 N/m) operating in the contact image mode with 12 µm × 12 µm field of view.

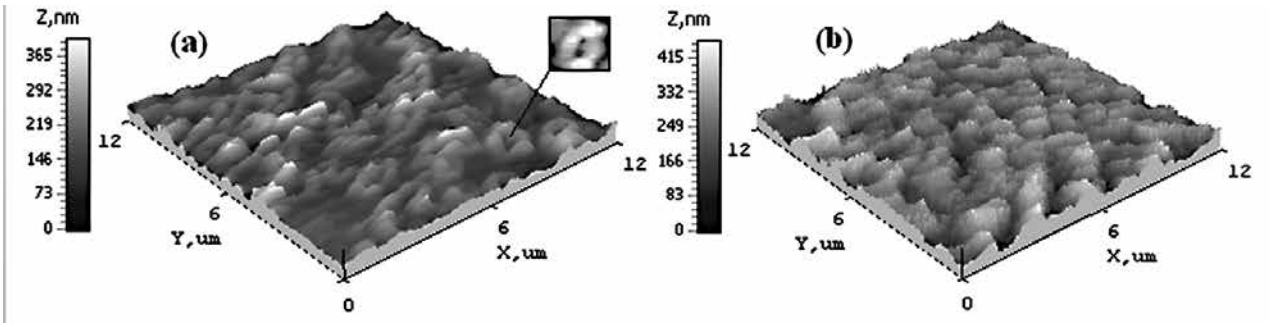

Figure 1. AFM characteristic 3D topography images: (a) thin films from oak bark; marker indicates 2D image of characteristic "eye" like elliptic hill (b) thin films from green tea leaves

AFM topographical images of thin films from oak bark and green tea leaves are shown in Figure 1a and b respectively. We observe that thin films from oak bark have a surface with randomly distributed "eye" like elliptic hills with root mean square (RMS), R_q roughness of 48.2. In contrast, thin films from green tea leaves show surface with densely distributed islands with root mean square (RMS), R_q roughness of 60.34. The bearing ratio goes to zero beyond ~62 nm for thin films from oak bark, and ~54 nm films from green tea leaves, indicating that the hills and islands are

connected to each other at this depth from the surface. Both surfaces exhibited near equal kurtosis values of 3.12 (from green tea leaves) and 3.27 (from oak bark) and both have minor regions where thin film coating failure could be observed contributing to statistical interpretation on surface skewness values. More porous films with silver nanoparticles could be fabricated from green tea leaves extract. Additionally, it is confirmed, by AFM, that the morphology of thin films with silver nanoparticles depends on the nature of the plant extract.

Scientific field: Technological sciences

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Ionizing radiation impact on changes of polymer structure

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Polymers are large molecular mass materials with unique technological features. They can be applied in many fields, including medicine. This is a great low-cost structural material, characterized by good chemical, physical, mechanical properties. Ionizing radiation is a tool to change the structure and properties of polymers. The rapid development of technology has the opportunity to create materials with properties (mechanical, optical, etc.) which are much better than it is now used. Materials can be created with specific properties that would be appropriate for certain specific applications.

Present work has been carried out to study the internal structure, radiation induced stress and intermolecular distance changes of the material. Analysis was performed using two-layer polyethylene-polyamide (PE/PA) samples, which were exposed to ionizing radiation in the medical Co-60 unit up to 50 Gy doses. Therefore, Fourier transform infrared spectroscopy, glancing-incidence small-angle X-Ray scattering analysis has been applied. Based on the results it has shown that gamma radiation has destructive and constructive character of the investigated structure. This suggests that due to irradiation the brake of the bonds, decomposition, cross-linking and creation of new structural groups in polymers took place. Special attention was paid to radiation induced effects on the interface between the crystalline and amorphous regions in polymers. It was found that irradiated polymeric structures became less elastic and less soluble. The degree of crystallinity and the intermolecular distances were increasing in both crystalline and amorphous phases of polymers with the increased irradiation dose.

Scientific field: Physics

References:
[1] R. Plaipaitė-Nalivaiko et al. Med. Phys. (2011). p. 119.
[2] A. Meškauskas et al. Med. Phys. (2010). p. 122.

Evaluation of deformation behaviour of coated and laminated textile materials

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This research develops original methods based on the evaluation and analysis of bending, tension and shear for the evaluation of deformability of coated and laminated materials. It is found that the behavior of textile materials during production and exploitation is best defined by its deformability described by tension, bending rigidity and shear characteristics that are mainly determined by thickness, surface area density and other structural properties of the materials. Garment deformability is greatly influenced by above mentioned characteristics of materials, thus it is very important to make a proper choice of the materials in garment design process. Coated and laminated materials of different structure and properties are characterized by two types of bending curves. A different nature of loop deformation was found: linear and exponential. Linear deformation nature of the loop is characteristic to stiff materials and exponential is characteristic to more flexible laminates. It was found that hanging loop method is not sensitive to materials of different structure and the differences of bending rigidity values are not significant enough [1]. It was found that compressed loop method can be applied for the rigidity measurements of zippers and apparel compounds. The bending rigidity of the zippers is greatly dependent on the width of zipper's teeth and structure: the wider are teeth the more rigid loop is formed. The rigidity of apparel compounds depend on structure of materials and the thickness of polymeric coating. The phenomenon of instability i.e. curling is obtained in compressing spiral zippers [2]. According to the newly created, technically simple method and research methodic for the investigation and evaluation of the structure mobility of coated and laminated materials at low loads it was found that the mobility of the coated and laminated materials depend on their structure parameters: density of textile base (r = 0,75), thickness of the material (r = 0,81) [3].

Scientific field: Materials Engineering

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Baltic states association BASNET Forumas: activities and perspectives

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The activities and experience of regional association BASNET Forumas based on the member institutions of the unique network linking women scientists and science policy makers for insurance of equal gender opportunities in sciences in the Baltic States region are presented. The association was established in 2009 for continuation tasks of FP6 project BASNET (Baltic States Network: Women in Sciences and High Technology, www.basnet-fp6.eu), initiated by Lithuanian women physicists [1]. The main purpose of BASNET Forumas is to mobilize the efforts to support the implementation of BASNET Women in Sciences strategy in the Baltic States region.

The activities of association is targeted to: better understanding EU gender in science policy and shaping science policy in the Baltic states for implementation of gender mainstreaming in science and research; Participation in the projects targeted to change science policy in the Baltic States making it more favorable for women doing their research in sciences; Strengthening national, regional and international women scientists networks; Dissemination activities.

BASNET Forumas is full member of prestigious European women organization European Platform of Women Scientists (EPWS) - an umbrella organisation bringing together European networks of women scientists. This allow women scientists from Baltic States participate in EU science policy debates on European level. The invitation of BASNET Forumas to take part in the European Research Area Bord events as stakeholder opens ways for women physicists together with other scientits from the Baltic States region be in the line with up-to date European science policy. 2010 BASNET Forumas initiated and together with other partners 30 of September organized in Vilnius international conference „Challenges to Science in the Context of Globalization"[2]. The purpose of the conference was to present to the scientific community and science policy makers the science development visions of the most competitive Research Areas (EU and USA) in the world and in this context to discuss the perspectives of science in the Baltic States. One of the conference sessions was devoted to the social dimension of EU science policy-gender equality in science.

The BASNET Forumas initiated national Lithuanian project LYMOS and is implementing it. LYMOS project is financed by European Structural funds and aiming implementing Lithuanian Strategy for equal opportunities in sciences.

Association is active in maintaining national and international women scientists networks. It is seen as an important tool in retaining and promotion of women in sciences.

BASNET forumas dissemination activities are very important playground of association. The BASNET Forumas web site (http://www.basnetforumas.eu/), participation in international and national conferences as well as collaboration with mass media is used as tools for dissimination.

References:
[1] Women in Sciences and High Technology in the Baltic States: Problems and Solutions. FP6 BASNET Project Results, Vilnius 2007, p. 299
[2] D. Satkovskiene. International Conference on Science Policy in Vilnius Initiated by Women Scientists. EPWS News Letter, Issue 27, November 2010
http://enterthecompany.org/EPWS/LINKS/EPWS_NEWSLETTER_NOVEMBER_2010_corrected.pdf

Professor Vyda Kęsgailaitė – Ragulskienė. Scientist, inventor, the first woman habil. dr. of technical sciences in Lithuania

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Vyda
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The first Habil. Dr. of technical sciences in Lithuania Vyda Kęsgailaitė – Ragulskienė (1931 06 04 – 2009 01 04) [1] (see Figure 1) is a well known scientist, professor, habilitated doctor, patriot of Lithuania and especially Samogitia.

She was born and grew up in the family of Leonas Kęsgaila – Kenstavičius (1895-1979) and Stefanija Stanevičiūtė – Kęsgailienė (1899-1984) in the village of Dapšiai. In 1955 with honour graduated from Kaunas Polytechnical Institute, worked in industry, was a research associate of the Lithuanian Academy of Sciences, from 1967 of Kaunas Polytechnical Institute, later of Kaunas University of Technology. While studying in the Kaunas Polytechnical Institute graduated from J. Gruodis Higher Musical School (now it is a conservatory).

In 1965 she defended the dissertation of candidate of technical sciences (now it is a doctoral degree), in 1973 she defended the dissertation of doctor of sciences (now it is a degree of habilitated doctor) and in 1977 the scientific title of professor was given to her. She and with coauthors wrote 6 research monographs, about two hundred research papers, made 97 patents. For her research work she was awarded a State prize and also was awarded by a number of diplomas and medals of various exhibitions. Professor Vyda Kęsgailaitė – Ragulskienė was a scientific supervisor or consultant of more than half of a hundred defended dissertations.

Her research revealed and explained new phenomena of non-linear vibro-impact systems. She created systems which operate on the basis of new principles. The professor generalized her investigations in research monographs and research papers. The research work of the professor generalizes the results of experimental, analytical and computer studies on the basis of which new theoretical problems and new applications of vibro-impact mechanisms and devices were solved. On the basis of the results of the investigations a number of original devices of vibro-impact type were created which were recognized as inventions.

Vyda Kęsgailaitė – Ragulskienė translated from the English the book by historian Ch. L. T. Pichel about Samogitia, she was active in the collection of data for the encyclopedia "The Officers of the Lithuanian Armed Forces 1918-1953".

She prepared the material about the history of the village of

Dapšiai. From this village many prominent Lithuanian people originated, among them the creator of the science of artillery and multi-stage rockets Kazimieras Semenavičius. The history of parents and relatives of the professor reaches the XIV century: Kęsgailos were governing Samogitia and were high standing in the government of Lithuania.

She was a talented scientist and a caring mother, strong support of the family.

Scientific field: History of technical sciences

Reference:
[1] Profesorė Vyda Kęsgailaitė – Ragulskienė (1931 – 2009) / Monograph. Science and Arts of Lithuania. Book 74. Vilnius: Mokslotyros Institutas, 2009, 568 p.

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