special issue

# innovaatika

ARCHIMEDES FOUNDATION
EU INNOVATION CENTRE

# Communicating European Research

## 14–15 November 2005, Brussels

### Estonia

Location: Southern coast of Finnish Gulf

Population: 1.36 million

Area: 43431 km$^2$

GDP per capita, in 2003 in PPS:
49% of EU25 average

Gross Domestic Expenditure on R&D (GERD) in 2004: 0.91 % of GDP

GERD as aim for 2006
in Estonian R&D strategy: 1,5 % of GDP

Number of researchers per 1000 workforce: 4.6

Population with tertiary education 30.4%

More about Estonia at **www.welcometoestonia.com**

In Estonia the tradition of finding and selecting talented young persons to promote science- and research-related activities has a relatively long history. It has been the interest of universities to gather the best brains, awaken their curiosity and excite their interest in unknown phenomena of the world, mankind and society.

Since 1953, Olympiads have been held for high school students in various disciplines. Now more than 10,000 students attend the all-Estonian Olympiads starting from the school and regional level, whereas only the best of them reach the final round. The winners of the All-Estonian Olympiads compete with their peers from other countries in international contests.

As in the case of adult researchers, National Prizes are awarded annually to the best young researchers at the higher and secondary level of education. Prizes for young researcher are also awarded by the Academy of Sciences and the President of the Republic's Cultural Foundation. These are the measures used to distinguish deserving young researchers.

There have also, however, been measures to offer good opportunities for extra training in science to more dedicated and gifted students.

In order to raise the quality of education, in the mid-sixties specialised secondary schools were created, where particular disciplines were taught in depth. The most curious students were involved in the Young Scientists' Association, which began its activities under the guidance of the Academy of Sciences and from this year continues under the coordination of the Archimedes Foundation. Students interested in the sciences, can obtain additional free schooling at the Gifted and Talented Development Centre, which was founded more than 30 years ago at Tartu University.

Most of these activities are supported by The Ministry of Education and Research.

In this issue of *Innovaatika*, one can read not only about all of the above-mentioned measures but also about other activities that have been initiated to bring more students to universities and to prepare more researchers and high-level specialists for society.

## Make science fascinating for youth!

communicating european research

# ahhaa centre

## The Role of the AHHAA Centre in the promotion of science in Estonia

The mission of AHHAA is to introduce science to the general public. The name AHHAA comes from the feeling of starting to understand something that was until now difficult- this usually makes people shout 'AHHAA! I understand it!' It's a good name, because it transcends language barriers – AHHAA means the same thing in every language. Using interactive and entertaining methods, we try to eliminate fear and prejudice associated with learning. With the support of Tartu's educational traditions, we hope to provide every visitor with the joy of gaining new knowledge.

Estonia, like many other countries, has the problem that young people do not want to study natural sciences like physics and chemistry – there are more places in the Universities in those faculties than there are students who wish to study there. One of the reasons why young people are not eager to study sciences is the notion that science is something difficult, complicated and acquires many years of concentration and study in the library or laboratory. There also seem to be a number of extremely tricky formulae that are required for studying physics, chemistry or other natural sciences. Of course, some of this myth is based on real facts, yet the difficulties are mostly exaggerated. This false impression comes from the fact that our schools do not offer enough interesting material and tests. If something is taught incorrectly or something is not understood in the beginning, it is complicated to maintain enthusiasm in those subjects. This problem has also been noticed at the government level. Therefore our Science Centre was established considering the fact that in order to interest children in studying science, one should make it look interesting and fun. So far, we have been successful. Since 1997, more than 400,000 visitors have visited AHHAA.

### History

AHHAA was established in 1997 as a special project of the Department of Research and Institutional Development of Tartu University. Initially there was only one project leader, who organised everything - including the first big exhibitions. Today there are six people employed at AHHAA, two of them part time. The AHHAA Science Centre does not have its own building yet. Currently we are situated in Tartu's Old Observatory, an interesting and beautiful building with an exciting history in the city centre. It is not, however, entirely comfortable for us, since it is often a problem for school groups to visit us. The number one problem mentioned is usually the lack of parking. There is no place to park a bus. The second problem is that we are unable to welcome more than 25 students for laboratory work, since there is insufficient room. Therefore we always have difficulty with big school groups. We are, however, expecting to move into our own building in 2008. The new building is presently in the planning stage. This will be the biggest Science Centre in the Baltic Countries, and will be one of the top tourist attractions in Tartu.

### School activities

AHHAA remained a Tartu University project under the Development and Research Department for many years. This University "umbrella", however, remained too small for us as the Science Centre grew bigger. Therefore the three institutions The City council, Ministry of Education and Science and Tartu University decided to establish the Foundation. This took place in March 2004. Despite the fact that we do not yet have our own house, we constantly organize science exhibitions all over Estonia. Typically we have one big temporary exhibition in Tartu every year plus several smaller ones in other cities. A special school program was also developed to support the formal education curricula by science centre activities. During the school year we offer the schools an opportunity to order lectures from a special list of science theatre shows and laboratories. We have called the bulletin an "A la Carte" program - like in Restaurants. This is like a menu where you can see the lectures and shows offered, their prices and a short conclusion about these. For example, it is possible to put together Molecule models, make chocolate, find your own DNA, and there are also several science theatre shows about physics and chemistry and other subjects. Students supervise most of our science theatre shows and laboratories; only a couple of physics theatre shows are given by University professors. It is always good to involve children in the experiments. This gives them a feeling of being useful and important, and is also good because it provides for immediate feedback – is the thing you are doing interesting? We try to involve them in our activities as much as possible.

Last winter we also started a new program, the school science days, in schools. A couple of schools requested that we come and do a full AHHAA day. We had to start very early in the morning, and usually the school had made arrangements in their schedules, and every class in

# ahhaa centre

the whole school had a couple of AHHAA lessons that had been tailored to their age and curricula. We also took a small exhibition with us, and usually displayed it in the gym. We also took a portable planetarium with us, and this was very popular.

Considering the fact that the buses cannot park around here, we had the idea of going to schools by bus ourselves. The year 2005 is the international year of physics. This gave us the idea of creating a science bus in co-operation with physicians. This came true thanks to a local bank, and at the moment the bus is one of the most popular things we offer.

In our exhibitions we always use students as guides. This is not because they are less expensive than professionals but because of the fact that the children trust younger people more than older people. Students have the energy to explain difficult scientific matters to children in a simple way. People are usually not interested in things that they do not understand. It arouses that uncomfortable feeling of being stupid. Nobody wants to feel stupid, and therefore it is not likely to be rare to sit in a science lecture and see people yawning away, and at the end of the lecture very few people want to ask anything. They probably lost interest in the subject a while ago, when they heard something they did not understand. Therefore it is extremely important to keep attracting public attention and to explain things in a relatively simple way. Professionals do not always understand this. Students do not have this problem.

The best example in this area is the fact that AHHAA is so popular in Estonia that one Gymnasium in Tartu decided to open a special AHHAA class. There are many pupils in this class. In winter they study our exhibits and put together things in our laboratories, and when we have our exhibition, the pupils are qualified enough to supervise the visitors in the laboratories, and they do extremely well. AHHAA guidance is qualified as practice in their school curricula, and they are given grades for it. The pupils are also interested in this project since guiding the exhibition gives them their first work experience, and this is valued highly among young people in Estonia.

Through our different activities, AHHAA has become an icon of science promotion in Estonia. Whenever the media talks about science promotion, AHHAA is mentioned. Whenever this subject is discussed, AHHAA has to be involved. Whenever we open an exhibition it is shown on TV. All of this is in many ways thanks to our leader Tiiu Sild, who has taken science promotion as one of her own personal priorities. In future we hope to continue with all of our activities and also provide different activities for youth in our own building.

Pilvi Põldmaa
Vice Director
**AHHAA Science Centre Foundation**
www.ahhaa.ee

The new building of AHHAA centre will be opened in 2008.

# world year of physics

## World Year of Physics 2005 in Estonia

### On the initiative of the European Physics Society, the United Nations Organization declared the year 2005 to be the World Year of Physics. Why?

We all use electric light, home appliances, computers, television, medical technology, cars, planes… At the same time, few people know of the connections between all of these undoubtedly useful inventions and physics. For most people, physics is dull book learning that they had to study when they were young. Now we, the physicists, would like to tell people about our work and activities. This is also the concept of the World Year of Physics.

The World Year of Physics is celebrated in Estonia through several interesting and unexpectedly popular undertakings. The science bus "Suur Vanker" ("Ursa Major") and physics news on the morning television programme are two that are worthy of mention.

"Suur Vanker" is a science bus or mobile science lab staffed by volunteers – researchers and students. The "Suur Vanker" shows science theatre: we offer young people the possibility of experiencing physics through exciting experiments accompanied by articulate talk about the essence of the topics under discussion. We also try to give insight into the everyday life of physicists or people with an education in physics. All of the activities are carried out in a cool way, and besides in addition to research, educational entertainment is offered to the audience.

Since the beginning of the World Year of Physics, Estonian public broadcaster ETV has broadcast physics news every Friday. The physics news introduce to the television audience interesting experiments and devices and their application in everyday life – in cars, microwave ovens, refrigerators, space flight, television, soft drinks…

The Estonian Physical Society organizes a series of public lectures year-round, where leading physicists and representatives of related fields of research talk about the development of physics, current issues and future perspectives. Topics that are dealt with in the lectures are connected to problems in the world around us – the scarcity of energy resources, security, etc. Lectures are open to all and can also be viewed on the Internet.

We continue the summer and autumn schools for young physicists that already began several years ago, but in the World Year of Physics this activity is also more spectacular than usual, because secondary school students and teachers have also been invited to participate. The participants in the summer and autumn schools of physics are usually students of the University of Tartu and the Tallinn University of Technology, who attend the presentations of specialists in their field in a free and pleasant environment. The presentations are followed by discussion groups where all of the hot topics in physics are examined.

The top event of the World Year of Physics in Estonia is the "Tähe Science Week", which takes place from 8–14 November. The main location of the science week is Tartu. An exposition introducing the thermonuclear synthesis, "FusionExpo", and the science exposition "ZeroCarbonCity" will be open to everybody in the physics

building of the University of Tartu during the science week. In other places in town, physicians organise events and performances, which otherwise are considered to be the rightful domain of artists. Videos and laser shows are exhibited at the town hall square in Tartu. The culmination of the science week is on Saturday and Sunday, when events take place in the physics building from morning till late in the evening – science theatre, science fiction movies, Foucault's pendulum, a contest of robots, workshops, physics games and other games, laser shows and many, many other interesting events.

All of the events mentioned and unmentioned here that are connected with the World Year of Physics, are published on the physics portal www.fyysika.ee. In addition to the regular tasks of a portal (news, forum, announcements), fyysika.ee has three other important tasks: a) connecting physics to technology and high-tech development and production in an understandable language. Using examples from real life, we offer answers to the question "Why do we need physics at all?" from various angles b) The portal is developing into a large scale interactive physics textbook: videos of experiments, texts and study materials for different levels of difficulty, an explanatory dictionary, chronologies etc. will be made available on the Internet. c) the portal will start functioning as a communication channel between scientists and people interested in physics.

Aigar Vaigu
ESTONIAN PHYSICAL SOCIETY
avaigu@ut.ee

# world year of physics

## The "Big Dipper" Science Bus[1]

The "Big Dipper" science bus has been driving the roads of Estonia for half a year. The second half-year of the project had its kick-off in the White Hall of the Estonian parliament, the Riigikogu. The year itself is special too – 2005 and the World Year of Physics, dedicated to the 100 year jubilee of the intellectual achievements of Albert Einstein and promoted in Estonia by the Estonian Physical Society.

The Big Dipper, however, is a bus, known colloquially as a science bus. The science bus was created to celebrate the World Year of Physics, and its main occupants are students of physics, the proverbial "boys with glasses", who sat in the front bench at school and were always sent to represent their school at Olympiads. Now they are no longer waiting for their teachers' explanations, but are instead demonstrating and explaining physics themselves. The physics you see them demonstrating will probably not seem to be the same physics that you remember from your school days, that is if you used to belong to the majority of people, who found the teacher boring and the subject dull. Is this not then the same E=mc2 and F=ma that ruined so many report cards of otherwise A or B students?

The physics shown in the Big Dipper is different in form, and it is more alive and exciting. That is as it should be when the presenters are young and electrifying. Naturally the physics in the science bus is the same as the physics in school books, only that simple drawings in books have become experiments in the Big Dipper, and students' sense of humour makes it all a lot more fun. After seeing this show start for the first time, many might prick their ears to hear what the physics teacher is talking about in the lessons and physics itself, which until then was lifeless and dry as dust, may suddenly turn out to be a juicy morsel waiting to be eaten.

13,000 students from more than 100 schools have already seen this "youthful" physics and hopefully at least as many more will see it in the future. The Big Dipper namely plans to continue visiting schools after the end of the World Year of Physics. The creators of the science bus still have plenty of ideas – under cover of secrecy, we can say that the best experiments have not yet made it into the Big Dipper.

Aigar Vaigu
**Estonian Physical Society**
avaigu@ut.ee

[1]The Estonian expression for the Big Dipper - Suur Vanker – refers to the constellation in Ursa Major, but literally means 'Big Wagon'.

# young scientists' association

## Young Scientists' Association

### The Young Scientists' Association (YSA) is an organization with the mission of supporting and cultivating the scientific creativity of students in upper secondary school.

In the YSA, young people interested in different fields of science get a chance to communicate with peers with similar interests. The YSA also offers them the opportunity to be involved in real science in action tutored by real scientists, to get to know what it looks and feels like to be a scientist, and enter deeply into real research in the field that most fascinate them. The YSA acts as a link between talented young school students and active scientists. Students can find personal supervisors, feasible but serious topics for research, carry on their research and present the results to other students and scientists, according to all of the rules for scientific theses.

The YSA was founded by the Estonian Academy of Sciences in 1980 and operated actively until 1995 – in its most active years it united more than 400 students. After 1990, when the Estonian government began to restructure the Academy of Sciences, and most of its research institutions were merged with different universities, the YSA could no longer continue as before.

In the end of 2003, the YSA was re-established under the initiative of former student members of the YSA and with the support of the Ministry of Education and Research and housed at the Archimedes Foundation. Former members, many of whom are now successful scientists, decided that as the YSA and the relationships created there played an important role in their lives and personal development over the years, it could also be useful for young people today. There are even cases from the history of the YSA where young people found their scientific supervisors in as early as the 8th grade (at the age of 14-15), and the very same scientists supervised them through their scientific careers up to PhD level. Of course such relationships are very rare, but for these people it would not have happened without the YSA.

After formal re-establishment and obtaining support from the heads of education in the Ministry of Education and Research, the YSA had to slowly begin to resume all of its activities and involve new talented young people. As the main principle of the YSA was to provide students with a unique opportunity to become involved with real science in action, we needed scientists to work with them. Furthermore, with quite tight funding, we needed volunteer scientists to be ready to work with young but also enthusiastic people.

We started from creating links with scientists in universities and research institutions – to find those who would be ready to work with students, let them into their labs and involve them in research groups with small feasibly tasks. Quite surprisingly, in the first month scientists sent over 100 research topics and areas for students to choose from and contact information.

The next step was to involve young people. For that, an opening conference was organized in the festive conference hall of the Academy of Sciences – the very same place where the YSA was first established. This time, however, the old hall could not seat all of the students who were interested in attending the event. The academics and a number of scientists were talking to those gathered about their every day work and the reasons they were attracted to science. After that everybody who wanted to participate in YSA activities and contact a scientist had a chance to fill in an application form. Later everyone was contacted, and most of the students found supervisors.

This was the beginning of the relaunching of YSA traditions – scientific conferences and summer schools. The first summer school took place in the summer of 2005, and this was an event at which young people could really get close to several of our famous scientists, discuss and argue around the camp fire till dawn, share their own ideas and listen to others. The next event will be the annual conference in December 2005 where YSA members talk about their own scientific findings and have to be able to answer tricky questions from their young and not so young colleagues.

Today the YSA is still developing; one cannot create this kind of active organization within a year or two, it definitely takes more time. But we have started – and every week we get emails from young people saying that their friends have told them about the YSA and that it is interesting, and asking whether they could join. Of course they can. Anyone who is curious and willing and eager to dive into the amazing world of science is welcome!

Terje Tuisk
**Archimedes Foundation**
Scientific Secretary of YSA

# centre for talented youth

## The University's outreach to young people

The development of young people with a talent for science has been systematically promoted in Estonia since 1965, when a distance learning school was established at the University of Tartu on the initiative of mathematicians from the University. The centre's objective was to find young people with a talent for mathematics and raise the level of mathematics knowledge among school students. Initially, the school's activities mainly targeted rural schools, where students' educational opportunities were more limited than in urban schools. At present, the school has developed into the Gifted and Talented Development Centre, www.ttkool.ut.ee), whose mission is to be the seedbed for the future national scientific elite. The centre's objective is to satisfy the academic and scientific interests of talented students through training and hobby activities and to provide them with a good preparation for purposeful academic self-realisation at the university level. The centre has developed over 30 courses in different academic areas, which students can acquire by correspondence (either through regular mail or e-mail), under the guidance of university professors and university students. In many schools these courses are used for the enrichment of talented students' curricula and in the preparation of individual curricula. Participation in the courses offers students the opportunity to involve themselves in depth with their favourite field and also acquire a more thorough impression of the scientific problems and research methods in that field.

In addition to distance learning courses, the centre also organises lectures and study sessions for school students that are based primarily on reaching university-level scientific competence and intended as one component of preparation for both Estonian and international Olympiads. Through these courses and study sessions, the centre seeks to provide as many talented young people as possible with better opportunities for personal development.

Since 1992, when the newly independent Estonia joined the international movement of Science Olympics for school students, the preparation of the Estonian teams that compete at the international Science Olympics was also gathered at the centre. The key to the success of Estonian students at international Olympiads (at various Olympiads, a total of over 100 medals have been won, 9 of them gold) is the more than 50-year tradition of national Olympiads and the continuous work with students with talent in science that has been done at the centre established at the university. The centre co-ordinates Estonian Olympiads, which today are organised in 20 subjects with the participation of tens of thousands of school students. The Olympiads are individual competitions with several rounds, participation in which requires students to be able to creatively apply the material they have acquired in the school programme. The Olympiads' role in motivating students in independent work is important, because Olympiad assignments require good knowledge of the subject area. In addition to Olympiads, the centre also organises various other competitions and quizzes. Considering the relatively low popularity of the physical sciences, the main objective of these events is to awaken interest in these fields and raise the reputation of those specialisations among students. The centre's home page offers elementary school students an interactive

puzzle page, where one can find mathematics, chemistry and physics assignments, and a nation-wide mathematics competition called Nuputa is also organised. The centre also coordinates the international Kangaroo mathematics competition in Estonia. The said competition is organised by L'association Kangourou sans Frontières, and 27 European countries have joined this association. 13,000 students from Estonia participated in this competition during the past academic year. Open competitions in mathematics, information science, chemistry and physics are organised for upper secondary school students.

The centre plays a considerable role in supporting the differentiation of studies in ordinary schools, which is mainly important from the point of view of the development of talented students to the full extent of their abilities. The teaching materials developed by the centre and the assignments with different levels of difficulty that are offered on the web page make it possible to use them in planning hobby rings or supplementing teaching materials for school lessons. At the same time, these public materials also offer auto-didacts an opportunity to involve themselves with their area of interest.

The centre's development plan provides for it to grow into an institution that will deal with all aspects of scientifically talented children's development, covering both the development of educational programmes research in the area of the pedagogy and psychology of talent. From this academic year, a new area of activity was added to the centre's functions – advising, which should help parents and educational institutions to determine the intellectual and emotional needs of talented children and create the ideal conditions for their development.

Viire Sepp, M.A.
Director of the
Gifted and Talented Development Centre
University of Tartu

# study tours: life sciences

## Study tours for secondary school pupils: university introduces itself

Since the spring of 2004, the Estonian Agricultural University has organized study tours for those secondary school students in Tartu who are interested in nature. The participants in these tours have been schools in Tartu where a nature or environmental study branch has been opened: Hugo Treffner Gymnasium, Miina Härma Gymnasium, Tartu Tamme Gymnasium and Tartu Kivilinna Gymnasium. Since autumn 2005, Tartu Commercial Gymnasium, Karlova Gymnasium and the Russian-speaking Annelinna Gymnasium have also participated.

Up to four students from one school can join a study tour, generally only those who are personally interested in the subject. The little competition required to participate in the study tours and the participation of several schools at a time have helped to achieve that there is little irrelevant talk on the study tours, and pupils mostly concentrate on the topic covered.

The obligation to make a short presentation in their class about the things they saw and heard on the excursion has also had a stimulating effect on the children.

The study tours take place after classes once in a month during the school year. The size of the group has usually been up to 25 students, in addition to teachers and supervisors.

During the study tours we have visited berry farms, soil practices, ant reserves etc. The bus transportation has been financed by the Estonian Agricultural University and the Archimedes Foundation.

Most of the study tours in winter take place in the buildings of the Estonian Agricultural University; the study tours in winter have taken the young people to a veterinary clinic, embryo technology laboratory, etc. In these cases children take care of their transportation themselves.

The supervisors of the study tours are top specialists in their field in the Estonian Agricultural University. By organizing these study tours, the Estonian Agricultural University wishes to achieve several goals.

Firstly, we believe that these study tours help students to make their future career choices. The sooner young people get an overview of the curricula that are offered, the more certain their choice will be. Since the autumn of 2005, we have invited students of the first year of gymnasium, i.e. the 10th grade, to attend the study tours.

Secondly, we hope to raise some students' interest in independent research work. The newly re-opened Young Scientists' Association has helped to organize the study tours and has also mediated contacts with pupils from other schools that have informed the Young Scientists' Association of their interest in the natural sciences.

An important aspect of the study tours is the fact that they make researchers and lecturers think about the next generation in their speciality. One of the professors, announcing his readiness to speak to the children, said: "Supervising students is one of the tasks of the 'nobility'."

### Study tours 2004 – 2005

Võrtsjärve limnology centre.

Haaslava fish farm.

Entomology lesson in Kärkna forest.

Soil research practise at Tähtvere forest.

Veterinary laboratories and anatomy museum at the Estonian Agricultural University.

Study tour to Laeva and Vorbuse cattle sheds.

Food science at the Estonian Agricultural University.

Embryo technology practise at the Estonian Agricultural University.

Järvselja study forest district.

Padakõrve ant reserve.

Study tour to the Pedja bottom-land meadows.

Juhani Püttsepp
ESTONIAN AGRICULTURAL UNIVERSITY
juhani@eau.ee

Note: The Estonian Agricultural University will be renamed as the Estonian University of Life Sciences in December 2005.

# next generation

## The NEXT GENERATION Project – a cross-media approach to attracting young people to careers in science

NEXT GENERATION is an EU 6th Framework Programme project funded from the "Researchers in Europe Initiative" call under Human Resources and Mobility.

The project is coordinated by the Archimedes Foundation and was completed in partnership with the Estonian Physical Society and Haridusmeedia OÜ, an SME that has been producing Educational and Science TV programs since 2001. The project runs from May till December 2005.

The main objective of the project is to bring the everyday work of scientists in fields of key importance closer to the general public and particularly to students between the ages of 14 and 18. The project will do this through a cross-media approach to get the message to as many people as possible, using different media channels simultaneously. The project combines TV, web pages, special newspaper issues and other printed materials with face-to-face meetings to bring the message to the target audience.

The fact that young people no longer find studying science and scientific careers sufficiently attractive is in many cases also connected with the general lack of information and/or role models among researchers. Students can relate better to positive role models that come from the same community and have the same background as they do. This is why the excellent programs and materials that are already available across Europe are insufficient, and programs need to feature local "heroes" in order to influence local children. However, good practices from other European countries have been studied and taken into account in designing the programs.

### The main tasks and activities of NEXT GENERATION:

1. As television is the preferred channel of information, especially for young people, this will be the primary channel for delivering the message. A series of 14 TV episodes will be produced and broadcast on the Estonian National TV channel. The TV programs will show the everyday life of young scientists. The "heroes" of the programs are not well known professors - there have already been a number of good TV programs about their activities, and the media in general is also more interested in them and covers their work much more. The selected researchers are young, but no less good, to make it easier for students to relate to them and to feel that they could also get to the same position and achieve what the "heroes" have achieved. Programs will be broadcast on Estonian National TV. On the basis of the TV episodes, additional educational materials on DVD will be produced and sent to all Estonian schools.

2. A special edition of the weekly newspaper Linnaleht dedicated to science, young researchers and important science-related problems such as ethics, the general role of scientists in society etc. will be published. Linnaleht is the only newspaper in Estonia that is delivered free of charge in our biggest cities with a circulation of 100,000 and, according to surveys, holds 5th position in popularity among readers of Estonian newspapers. In addition to its normal circulation, another 5000 copies will be printed and delivered to all Estonian schools and public libraries.

3. A second publication created within this project is the booklet "The beginning of a career in science". A publication with interviews with scientists from all stages of their careers in science – beginning from schoolchildren taking their first steps in developing an interest in science and ending with scientists at the peak of their scientific career. The interviews include flash-backs to their childhood - what were their dreams and whom did they want to become at age 6-7. The booklet will also be sent to all Estonian schools and public libraries.

4. "Introducing the work of physics to the general public" – a set of illustrated texts mapping the Estonian research groups active in different fields of physics will be compiled and published on the physics web portal www.fyysika.ee

At the end of the project students, young scientists and teachers, who are often the primary source of information for and the chief influence on students, will be gathered for the inaugural event. The conference will be organized by the project team together with the Young Scientists' Association and The Gifted and Talented Development Centre of the University of Tartu.

During the inaugural conference, in addition to presenting the results and all of the materials produced during the NEXT GENERATION project, inspiring European scientists will be asked to participate and talk about their careers in research. Young scientists from Estonian high schools will be given an opportunity to present their own scientific results and findings. For teachers, a separate session will be organized to introduce the educational package created and the possibilities for its use in everyday teaching. It will also give teachers an opportunity to discuss topics of promoting careers in science at schools and on how to recognize talent as early as possible.

We hope that this NEXT GENERATION project will help to take an important step on the road towards promoting science careers, and hopefully these activities will continue in the future.

Terje Tuisk
Project Coordinator
ARCHIMEDES FOUNDATION

Researchers in Europe

# robot competition

## Annual Robot Competition at Tallinn University of Technology

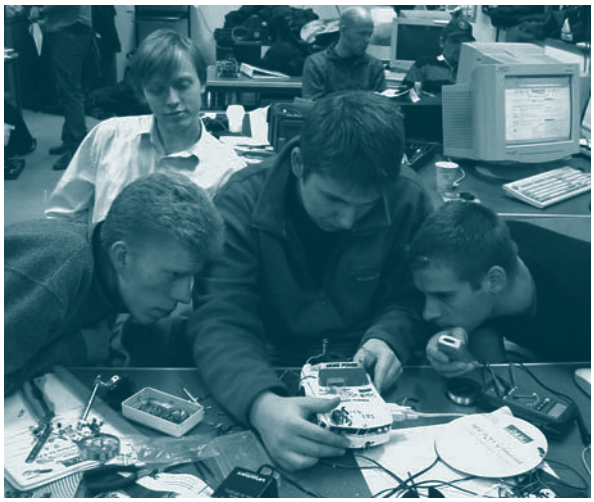
Each autumn since 2001, the annual ROBOTEX robot competition has been held at the Tallinn University of Technology (TUT). It has generated interest in several countries across Europe and Asia, and robots from Finland and Sweden participated during the first four years. The question might arise as to what makes robot building so attractive today, when even many home appliances and everyday goods contain a lot of sensors and logic elements, not to mention electrical drives or actuators. Tuning the whole structure for lower material and energy consumption, hand in hand with industrial design objectives, has gained a high level in industry, so why is it worth building something yourself if it might seem primitive compared to industrial design?

Hands-on activity has long been both an attractive and effective method in learning. Guiding the activity into an inter-disciplinary field always makes it more challenging, and if coupled with the possibility to make the process creative and develop a product that possesses some intelligence of its own, this convinces one that a self-made robot with limited intelligence is an embryo of some future high-tech product or scientific discovery.

This is why robot building activity ending with public competition has gained wide popularity at TUT and Tartu University and also at the Estonian Information Technology College. It is no longer a course project presented to a strict professor in a silent exam room, but the examiners are a broad audience, competitors and simply technology fans from all age groups. Moreover, the Robot Competition itself and the building process in the laboratory is available real-time via the Internet (www.robotex.ee and www.ttu.ee/robot). As a response to the Robot Competition, this kind of cross-disciplinary High-Tech oriented activity has been launched at several high schools across Estonia, resulting in successfully participating robots in the Robotex competition each year.

In parallel to the whole competition preparation process, expanding international collaboration in collaborative robot building is under way at both the Institute of Technology in Stockholm (KTH) (www.md.kth.se/mip) and at TUT (www.ttu.ee/mechatronics), whereas TUT students take part in the KTH robot competition. Despite the short history of the Robot Competition, the students who took part in the first Robot Competition in 2001 are already implementing very demanding industrial projects and supervising beginners in this challenging field.

The new Robot Competition takes place on November 25th 2005 at TUT, and everybody interested is welcome to take part in this event.



Mart Tamre
Professor of Mechatronics
TALLINN UNIVERSITY OF TECHNOLOGY

# students' research contest

## Honour and awards await the best young scientists at Tallinn University

Tallinn University has a tradition of organizing an annual conference each December in the assembly hall of the university, where the winners of the students' research contest make presentations, and the audience can take part in the ceremony honouring young scientists. The academic part of the conference is followed by the rector's reception, to which all of the laureates and their supervisors are invited.

The tradition of organizing a contest of students' research work began ten years ago at Tallinn University. Tallinn University was long the only university in Estonia, where the research work of students was encouraged in such a way.

The students' research contest is announced at Tallinn University each autumn. Research work prepared in the previous academic year can be submitted to the contest. Research work is evaluated in 4 categories: seminar and course papers; diploma and bachelor theses; masters and doctorate theses. Evaluations are made in six areas of research: the humanities, social sciences, geo- and biosciences, the exact sciences, educational sciences and sports sciences.

All works that are submitted to the contest are reviewed thoroughly by the sub-committees, and proposals are made to the contest committee. The contest committee is composed of all of the members of the sub-committees and the Vice-Rector for Research and Development. The selection of laureates is based on the innovativeness and freshness of the research work, the steadiness of the empirical analysis; the penetration into the problem and the correctness of the layout.

The first and second prize winners receive a financial award, the third prize winners receive a letter of honorary mention. The winner of the overall main prize is also selected from among all of the laureates.

Among the works that were submitted to the contest this year, there were works concerning the usage of garbage produced by a company's main production activities; school harassment; Estonian landscapes as a source of spiritual recreation; possibilities for bird-watching tourism in Estonia and about many other interesting and important subjects.

Many of the laureates of the students' research contest have continued their studies at university to reach a higher level in the career of a researcher.

Tiina Tambaum
**Tallinn University**
**Research and Development Department**
www.tlu.ee

# estonian academy of sciences

## The Academy and the Young People in Science

The Estonian Academy of Sciences (EAS) is an association that unites top-level scientists, with the main mission of fostering, relying on the intellectual power of its members and scientific knowledge in Estonia, thus contributing to the development of our country. Founded in 1938, the EAS has been the entity vested with responsibility for standing up for the successful economic, technological, social and cultural development of Estonia and for environmental conservation. Through epoch-specific transitions, the EAS of today is evolving into an organisation that has a clear-cut function in leading society towards a knowledge-based model.

The EAS understands the fundamental importance of young people to the knowledge-based society. It views the society as an integral unit composed of different segments which, in the context of contemporary social trends – require constant dialogue and cohesion between all of those segments. The EAS is concerned about the steady process of ageing within the scientific community, due to the slow growth of the young generation of scientists. This tendency stems from general societal developments in Estonia on the one hand, and on the other hand obsolete conceptions and attitudes regarding science, scientific research and the meaning of science for society have a direct bearing on the issue. Therefore, the EAS guidelines for activity formulate a number of adequate steps to be taken in order to promote knowledge in contemporary society, to attract talented youth for a career in science and to effect significant changes in the general way of thinking. In co-operation with other scientific organisations and governmental bodies, the EAS seeks feasible solutions to the problems typical to a small country that arise from limited (human) resources.

In 1975 the Presidium of the EAS decided to introduce annual Student Research Prizes, starting a tradition. Over thirty years, a distinctive activity uniting different generations of scientists has evolved. The aim is to highlight deserving young authors for fine results in research, and support talented students in their independent research efforts.

The research prizes are awarded on the basis of public competition open to the students of Estonian universities and university graduates of the year of competition, as well as students of Estonian descent studying abroad. Research papers written and completed during diploma, bachelor and master studies, as well as papers published as a result of student research are eligible. A panel set up by the EAS Board assesses the submitted papers; if needed, foreign experts are invited to advise the panel. The prizes are officially announced and the diplomas bestowed at a scientific conference where the best authors present their papers.

The current call resulted in 60 student research papers received from all four larger public universities in Estonia (University of Tartu - 26, Tallinn University of Technology - 22, Tallinn University – 10, Estonian Agricultural University – 2) and one paper from the Estonian Business School. The papers cover a wide spectrum of disciplines, including the humanities and social sciences, economics, mathematics and information science, engineering, as well as some specific fields of the natural and agricultural sciences. This year, 29 November will be the day on which different generations of researchers will be brought together on the Academy's premises, displaying a sign of transfer of knowledge and the sustainability of research in Estonia.

It is fascinating to follow the progress of the awardees. More than 70% of them have remained faithful to science, and have dedicated themselves to a career at various research institutions in Estonia. Many have defended their doctoral theses or are currently PhD students. Two laureates of the competition – Ain Kull (1995) and Indrek Ots (1996 and 1997) – have later been awarded the national science prizes of Estonia. Ain Kull was a member of the research team that won the national science prize in agricultural sciences for the series of works "Changes in agricultural landscapes: the impact on circulation of substances and regulation thereof by eco-technological techniques" in 2001. Next year, Indrek Ots belonged to the prize-winning working group in geological and biological sciences for the cycle of works "Fundamental research in evolutionary animal ecology – in the interests of biological variety".

*Dr. Indrek Ots (first from right) among his working group (2002). From left Prof. Raivo Mänd, Dr. Peeter Hõrak and Prof. Toomas Tammaru.*

The problems impeding the recruiting of talented students to science and obstacles to academic careers were tackled at a conference convened by the EAS under the title "The formation of the younger generation of scientists in Estonia – the institution of post-doctors", with the participation of experienced scientists as well as young scientists at the very beginning of their research careers. The conference formulated vital conclusions that should guide the future activities of all generations in science, reflecting a conviction fully shared and strongly emphasised by the participating scientists and scholars irrespective of their age: the main demand in research is excellence. To achieve that end, the requisite skills and competences of scientists must be

# estonian academy of sciences

supplemented with the effort to clearly define priorities, elaborate secure academic career paths and create the environment enhancing routine-free thinking and study.

In Estonia, the Science Competence Council was founded in 1997, to advise the Minister of Education and Research on the targeted R&D funding system introduced at that time. By recommendation of the Science Competence Council, the institution of post-doctors was created to support recent doctoral degree recipients at the start of a steady scientific career. Up to that time, Estonia entirely lacked the so-called scientific career ladder – now the ladder had acquired a stable lower rung with the position of post-doctor.

Professor Jüri Engelbrecht, present Vice President and former President of the EAS, and also the first Chairman (1997–2003) of the Science Competence Council, was very much responsible for the creation of the institution of post-doctors in Estonia. He regards the period immediately subsequent to doctoral studies as a crucial phase in the formation of a professional scientist. Proper funding of post-doctoral studies preceding high-standard PhD studies and a favourable research environment sustaining scientific achievement are the key factors to determine future progress in the path of science – Estonia not being an exception from the rest of the world.

Estonia is a small country. This advantage creates good conditions and opportunities for the rapid exchange of information, flexible and transparent procedures and open activities; however, there is a drawback – the scarcity of human resources. For that reason, various instruments supporting international co-operation are of essence. The EAS is networking with its partner organisations abroad to support researcher mobility and the sharing of knowledge. The scientific exchange programmes implemented under bilateral co-operation agreements are open to all Estonian researchers for participation, including the younger generation. Exchange visits by experienced researchers have often led to inter-institutional agreements on training programmes, exchanges of under- and postgraduate students, etc. Several agreements (e.g. the ones made with the Bulgarian Academy of Sciences and the Academy of Finland) include specific clauses defining reciprocal support to young scientists as a priority. In addition, during the years 1999–2001 the EAS ran a special funding programme covering the travel expenses of young scientists nominated for study visits under our co-operation agreements.

The book "The Young in Science" issued by the EAS in 2000 is a work that exhibits the product of our activities directed at young people, bringing together a selection of 21st century creators, a group that is small, but magnificent in its scientific potential. This choice selection of young researchers is to be taken very seriously indeed. In her foreword to the book, member of the EAS Professor Ene Ergma refers to them as fully fledged and authorised citizens of the world science community, who understand the secrets of nature and the processes of society. They are the makers of the new century. Writings by young authors address a variety of interesting issues, e.g. news in the area of historical linguistics, studies of spoken language in the light of the newest linguistic theories, the future of mycology, cultural studies in a psychological context, state-of-the-art and future perspectives in particle physics, matters of the heart as seen from the point of view of bioenergetics, etc. etc.

In addition to everything said above, one should not dismiss the individual responsibility of the members of the EAS as mentors and educators, transferring their knowledge, creating schools of thought, training – and also inspiring – the next generation. The interaction of Academy members with younger colleagues at universities, research institutes and laboratories, involving them in teamwork, drawing them into top-level science networks and integrating them into centres of excellence, is of substantial value for young scientists. In all its efforts, the Academy serves the needs of society, whose sustainability depends on the youngest of its members. This is the a very simple rationale for seeking a partnership with a wide range of organisations (including the recently created Estonian Academy of Young Scientists or the School Students' Academy) for initiatives targeting young researchers and young people interested in science and initiatives aimed at cultivating educated minds appreciative of contemporary scientific thinking. By influencing potential future stakeholders, the Estonian Academy of Sciences is fostering a free, stimulating and modern research environment, and enhancing development towards a knowledge-based Estonia as part of the European Research Area and the world of knowledge, in which our scientific community is a part of the European and global science community.

Ebe Pilt
Estonian Academy of Sciences
www.akadeemia.ee

# doctoral schools

## Doctoral School of the Estonian Agricultural University: the experience of the first semester

The Doctoral School of the Estonian Agricultural University (EAU) is not a separate educational institution to which doctoral students are admitted, but a centre under the aegis of the Department of Academic Development, which co-ordinates matters connected with the academic component of doctoral studies. The Doctoral School does not involve itself in the research component of doctoral studies.

The task of the Doctoral School is to organise shared general studies within doctoral studies curricula and develop interdisciplinary and international teaching.

The Doctoral School also organises EAU doctoral students' participation in other universities' doctoral schools in Estonia and abroad, analyses the effectiveness of teaching, advises and announces.

Through associated doctoral schools (for instance the University of Tartu's Doctoral School of Ecology and Environmental Sciences), we offer doctoral students the possibility to finance their own research, participate in international conferences in their specialisation, summer school and winter school or travel to leading foreign science laboratories for short-term practice.

There are 176 doctoral students at EAU. 30 doctoral students entered the doctoral programme in autumn 2005, two of them foreign students.

This academic year, the admission of doctoral students to doctoral studies at the EAU and the Doctoral School took place by competition, on research topics offered by advisors. A competition for advisors was also organised in advance, for them to obtain the right to advise doctoral students.

The objective was to bring together the best advisors and the best doctoral students.

Until autumn 2005, there were over twenty doctoral programmes at the EAU, but since autumn 2005, doctoral students are only accepted to five programmes: Environmental Science and Applied Biology; Agriculture; Veterinary Medicine and Food Science; Forestry and Technical Science.

Hardi Tullus, Vice Rector of the EAU, explains the reduction in the number of doctoral programmes as follows: "In this way, curricula become more concentrated, and we ensure that doctoral students are taught by the best instructors".

For doctoral students who register by the autumn semester of 2005, the following general studies courses are compulsory:

"Academic Writing and Presentation"; "The Protection of Intellectual Property" and "Philosophy of Science".

The courses "Education at the University Level", "Mathematical Statistics and Modelling" and "Research Methodology" will begin in the spring semester.

For doctoral students admitted before 2005, these courses are elective.

One of the objectives of the doctoral school is to promote scientific migration. For instance, the course "Academic Writing and Presentation" is offered by lecturer Carol B. Norris of the Helsinki University Languages Centre, and a course on research methodology is offered by Professor Henri-Charles Dubourguier from the Agricultural University of Lille in France.

Pille Urbas,
ESTONIAN AGRICULTURAL UNIVERSITY
Pille.Urbas@eau.ee

### EAU Doctoral School

On 17 March 2005, the Council of the Estonian Agricultural University founded the EAU Doctoral School.

The Doctoral School's webpage is located at www.eau.ee/doktorikool. At that site one can find new doctoral curricula, the rules and requirements for defending doctoral theses, opportunities for taking additional courses and obtaining stipends, the procedure for applying for doctoral support and academic leave, etc.

The Doctoral School has its own list (dokkool@eau.ee), through which doctoral students can obtain ongoing information about events in the doctoral school. The work of the doctoral school is organised by Pille Urbas, Chief Specialist in the Department of Academic Development at the EAU.

Pille.Urbas@eau.ee
tel. +372 731 3011

"The Doctoral School would have helped me indeed; in the case of many subjects, I had to find out myself where I could get the credits required."

Endla Reintam, doctoral student in agro-ecology, managed to earn her credits before the Doctoral School was founded, and is now waiting for the publication of the articles required for the defence of her degree.

# estonian science foundation

## Estonian science foundation - support for young researchers

### The Estonian Science Foundation (ETF) is an expert research-funding organisation. Its main goal is to support the most promising research initiatives in all fields of basic and applied research.

The Estonian Science Foundation operates within the administrative sector of the Ministry of Education and Research. It is funded through the state budget.

To ensure that science in Estonia retains a continuously high quality, it is important to have well-qualified young researchers. The involvement of students in active research and the supporting of promising young scholars have always been among the ETF's main objectives. The ETF supports young researchers in three ways:

- by involving postgraduate and doctoral students in active research ETF research grants can be used to cover a part of the costs necessary for training successful postgraduate and doctoral students and for paying scholarships to them.
- by funding postdoctoral research In 2005 the ETF became responsible for the task of funding postdoctoral research. The foundation was allocated 5.75 million EEK (approximately 370 thousand euros) for that purpose, and 24 postdoctoral grants were awarded in 2005. The call is launched on an annual basis.
- through the My first grant initiative

The aim of this initiative, which was first launched in 2002, is to support promising projects by young scholars.

### Involvement of postgraduate and doctoral students in active research

The participation of postgraduate and doctoral students is an important criterion for the assessment of research projects seeking funding from the ETF. Projects that involve students have better chances of being funded. ETF research grants can be used to cover part of the costs necessary for training successful students and, since 1999, for paying them scholarships. This has proved to be a successful tool for fostering the participation of students in research groups led by experienced scholars. Since 1999, the involvement of students in ETF-funded projects has grown steadily, as has the number of successfully defended Master's and PhD theses. Currently, 723 postgraduate (Master's) and 703 doctoral students participate in research projects. The amount allocated for scholarships was 13.5 million EEK (ca 860 thousand euros) in 2005, which represented 16.5% of the total grant budget.

### My First Grant

My first grant is a call for project proposals by young researchers up to 40 (in previous years 35) years of age, from all fields of study who have defended their PhD degree within the previous 3 years and have not yet been supported by the ETF. The aim of this scheme is to support promising projects by young scholars who would find it difficult to compete with renowned scientists, and thus help them to start their academic careers. The scheme was first launched in 2002, with a total budget of 1.026 million EEK (65 thousand euros), and 12 grants were awarded. By 2005 the budget had grown to 3.4 million EEK (217 thousand euros), and 23 young scholars received their first grant. It must be mentioned as a very positive fact that most of the awarded projects were strong enough to have competed successfully within the general call for proposals. My first grant and the postdoctoral grant scheme are two very promising tools to help young researchers overcome the initial hurdles in their career. Hopefully these funding mechanisms will also help to raise the attractiveness of research careers among young people.

The Call for My first grant is launched once a year as part of the general Call for research project proposals.

Helen Kurss
ESTONIAN SCIENCE FOUNDATION
www.etf.ee

### Lilian Kadaja-Saarepuu, PhD in cell biology:

I received my PhD on June 28, 2004 in the field of cell biology. Before that I had studied at the Institute of Molecular and Cell Biology at the University of Tartu from 2000 to 2004 under the supervision of Professor Toivo Maimets. I studied the biological activities of tumour suppressor protein p53, which is the gene most commonly mutated in human cancer. p53 is also called 'the guardian of the genome', because it plays an important role in preventing tumorigenesis. The main object of my PhD thesis was to study the modulation of p53 activity and its consequences for cellular behaviour. The greatest part of my work was carried out in projects that were supported by Estonian Science Foundation research grants. This year I have applied for My first grant, in order to start an independent research project in the field of tumour biology.

# estonian science foundation

## Mari Tarvas, Professor of German philology at the University of Tallinn:

I defended my PhD degree at the University of Vienna in 1997. My thesis was about Estonian literary scholar Ivar Ivask and his analysis of the Austrian literature of the period from 1950 to 1960. My current research topics include Austrian authors, comparative studies and diaries. My present position is Chair of the German Department at the University of Tallinn, and I am one of the youngest professors at my university.

Last year our research team decided to apply to the ETF for funding. We hoped that the research grant would enable younger colleagues to spend more time on their research and to establish contacts with other scholars both within Estonia and abroad. We were encouraged by the possibility to apply in a special junior category, and our application was successful.

Our research topic is history and tradition in literary and autobiographical discourse. One of the team members, Maris Saagpakk, specialises in autobiographies and the other, Aigi Heero, studies literary reception. In the first year, we organized an international symposium on the topic, which took place in May 2005 in Tallinn. The symposium was attended by several renowned scholars from various European countries. We also participated in the world congress of German language scholars in Paris. Some very interesting ideas for future cooperation were conceived at these meetings, which we certainly wish to put into practice during the coming three years of the project.

## Ivo Fridolin, Professor of medical physics at the Biomedical Engineering Centre, Tallinn University of Technology:

I did my PhD studies at the Department of Biomedical Engineering, Linköping University in Sweden, after having acquired a background in Telecommunication Engineering from Tallinn Technical University. My PhD thesis was called "Photon propagation in tissue and in biological fluids applied for vascular imaging and haemodialysis monitoring". In 2003, after acquiring the degree of PhD in Biomedical Engineering, I returned to my home country. I began work as a senior researcher at the Biomedical Engineering Centre (BEC), Tallinn University of Technology. Currently I am Professor of Medical Physics at the BEC. My main research interests include optics of tissues and biomedical fluids.

In order to continue my earlier scientific work, I applied for My first grant directly after starting work at the BEC. I was lucky – the application was approved. Since then I have been the leader of the project "Estimation of dialysis quality and adequacy with a new optical technique" for more than one and a half years.

The goal of the project is to develop a new technique to estimate dialysis adequacy and quality. Dialysis is the most common method used to treat kidney failure. Worldwide, about one million people are kept alive by dialysis treatment, and this number is increasing. Despite a history of more than 50 years, haemodialysis remains a complicated treatment, with several side effects. Moreover, dialysis is an expensive and time-consuming treatment in the clinical praxis. To overcome the difficulties and ensure that the dialysis patients are treated with sufficient adequacy and quality, different dialysis monitors are available. The disadvantages of the existing methods are the utilization of disposables or chemicals, the complicated measurement procedure, and the varying precision of some methods.

Our current research activities are directed towards the possibility of estimating the elimination of several retained substances during dialysis, using the UV technique. Preparations are underway for a new clinical study at the Department of Nephrology of the Northern Estonian Regional Hospital. This study should add new information to the analysis and revision of the quality and existing standards of haemodialysis.

The scientific work described above can be realised largely thanks to funding through My first grant. The grant offers an excellent possibility to start an independent scientific career, including actual research, the organisation of a team, guidance and supervision of students, etc. This is essential, because there are few financing sources in Estonia for young scientists who are not yet established. By now, however, what used to be my individual research topic has developed into a large team project involving several researchers, doctors, technicians, and students. This creates real synergy that allows us to take a deeper approach to the problem and to achieve results that cannot be achieved alone. This is the way to innovative development, allowing scientists to contribute to a society in which everyone's quality of life and welfare are ensured.

# mobility portal

## Smartestonia.ee – the Estonian Researcher's Mobility Portal

Smartestonia.ee is the Estonian National Researcher's Mobility Portal, which was created by the Archimedes Foundation and co-financed by the European Commission. The Estonian National Researcher's Mobility Portal, www.smartestonia.ee, helps researchers and mobility centres in matters concerning researchers' mobility to Estonia.

The Estonian Researcher's Mobility Portal is linked to the pan-European Researcher's Mobility Portal http://europa.eu.int/eracareers launched by the European Commission and linked to the European Network of Mobility Centres, ERA-MORE. The Researcher's Mobility Portal is a gateway for researchers seeking to advance their careers and personal development by moving to another country, and organisations in search of the best European talent.

The Estonian Researcher's Mobility Portal has been established together with the Students' Mobility Portal. Smartestonia.ee provides useful information on several topics concerning practical information, and also introduces Estonia and Estonian R&D more generally. Links to grants and vacancies for researchers in Estonia are also displayed.

### The portal consists of five parts:

- About Estonia, with general information on Estonia;
- Student Mobility, which contains information about the education system and studying in Estonia;
- Practical Training, with information on national and local training programmes; the practical training part is still under construction;
- Researcher Mobility, with practical information on grants and vacancies for foreign researchers coming to Estonia;
- Higher Education and Research Institutions, which gives an overview of higher education and research in Estonia.

The main aim of the portal is to provide practical information necessary for the mobility of researchers, students and trainees. The information has been adapted in accordance with the needs of the target group. The Researcher Mobility, Student Mobility and Practical Training sections all deal with visas, residence permits and health insurance.

Students can receive from the portal information for organizing their studies as well as for active participation in student life. The student mobility section deals with the higher education system, enrolment in universities, studies, qualifications, recognition of diplomas, services for students and information concerning student life and events.

A wide range of practical information topics is covered at the Researcher's Mobility Portal, including residence, work, transport, housing, taxation, health, family and various other everyday matters. The information in the Researcher Mobility portal is useful for shorter visits as well as long-term employment in Estonia, and also considers the needs of the researcher's family. The residence and work sections offer specific information for EU citizens and citizens of third countries.

The practical training section provides information about traineeship programmes, the labour market and the services


offered by the Labour Market Board, possibilities for volunteer work and practical everyday matters.

The section about Estonia gives an overview of the country in general and introduces topics such as culture, economy, nature and lifestyle. The higher education and research institutions section is dedicated to introducing the Estonian higher education and research system, research financing and strategies and the Estonian quality insurance system.

The Estonian Researcher's Mobility Portal also displays the contact information of Estonian Researcher's Mobility Centres that are connected with the European Network of Mobility Centres – ERA-MORE, and are ready to assist you when you need more specific information.

The whole Estonian Mobility Portal is constantly evolving, and new information is continuously being added in order to further support the needs of mobile researchers and students and thereby promote mobility as part of a researcher's career.

Liina Raju
ARCHIMEDES FOUNDATION
liina@archimedes.ee

# mobility centres

## Estonian Network of Mobility Centres

### Up-to-date information and personalised assistance.

The Estonian Network of Mobility Centres is a part of ERA-MORE, a Europe wide service providing mobile researchers and their families with customised assistance in all matters relating to their mobility experience.

Mobility centres help to solve all kinds of problems that might be related to researchers mobility between different countries. The services offered by ERA-MORE mobility centres are free of charge and are offered to all mobile researchers.

Estonian mobility centres started their work in 2004, by now the network consists of 6 mobility centres. The centres are located at the two most important research centres of Estonia – Tallinn and Tartu, but advice is given to researchers and R&D institutions all over Estonia.

The network gives counselling to incoming as well as outgoing researchers. Assistance is offered to individual researchers who are planning to undertake a mobility experience as well as to research and development institutions that are planning to invite a foreign researcher to Estonia for research activities.

Mobility centres provide information on various topics related to mobility and help to answer questions that might arise in connection with visas, residence permits, social security or taxation. Personalised assistance is also given in various everyday matters such as finding suitable day-care for children, dentist or even accommodation.

The ERA-MORE network connects mobility centres in all European Union countries, but also has members in Norway, Switzerland, Bulgaria, Romania, Israel and Turkey. The European Commission coordinates the activities of the network. Regular meetings of the bridgehead organisations and annual meetings of all mobility centres facilitate the cooperation between the mobility centres.

Mobility is a way to enhance the personal career as a researcher and is also as a way to strengthen the European Research Area. The ERA-MORE Network of mobility centres helps to make it a pleasant experience.

Liina Raju
ARCHIMEDES FOUNDATION
liina@archimedes.ee

**ARCHIMEDES FOUNDATION**
Väike-Turu 8
51013 Tartu
Contact persons:
Ms. Kristin Kraav & Ms. Liina Raju
Tel. +372 730 0337
mobility@archimedes.ee

**ESTONIAN ACADEMY OF SCIENCES**
Kohtu 6, 10130 Tallinn
Contact persons:
Ms. Anne Pöitel & Ms. Lehti Veeväli
foreign@akadeemia.ee
Tel. +372 644 8677

**UNIVERSITY OF TARTU**
Ülikooli 18, 50090 Tartu
Contact person:
Ms Lea Kivi
mobility@ut.ee
Tel.+372 737 61 14

**TALLINN UNIVERSITY OF TECHNOLOGY**
Ehitajate tee 5, 19086 Tallinn
Contact person:
Ms Riin Kobin
mobility@ttu.ee
Tel.+372 620 35 17

**TALLINN UNIVERSITY**
Narva mnt 25, 10120 Tallinn
Contact person:
Ms Marvi Pulver
mobility@tlu.ee
Tel.+372 640 91 17

**ESTONIAN AGRICULTURAL UNIVERSITY**
Kreutzwaldi 64, 51014 Tartu
Contact person:
Mr. Aret Vooremäe
mobility@eau.ee
Tel. +372 731 3011

Note: The Estonian Agricultural University will be renamed as the Estonian University of Life Sciences in December 2005.

ERA-MORE
European Network of Mobility Centres

# energy centre

## Energy Centre – fun and knowledge

Energy Centre is a fun and educating science centre that is fascinating for children as well as for grown-ups. The aim of the Energy Centre is to create a modern technology and science centre and promote informal and visualized learning in Estonia. The Energy Centre was established by the city of Tallinn, Tallinn University of Technology, Eesti Energia and Tallinna Küte.

Visitors can try out more than 100 interactive exhibits, participate in the performances of the science theatre or explore the secrets of the space in the virtual space show.

Most of the exhibits have a "hands-on" principle, enabling experimenting and exploring the concepts of science and physics. There are possibilities for playing and trying new things out also for small children, who maybe are not capable of understanding all the laws of the nature yet, but are eager to see new things in the world around them.

Several of the exhibits have been developed taking into account the curricula of different school years and programmes. This makes it possible to carry out in the Energy Centre practical lessons full of discoveries. Exhibits introduce electricity, mechanics, optics, sounds and voices, magnets, and several other topics.

Leonardo da Vinci's flying ship is one of the most outstanding exhibits. The flying ship was constructed according to Leonardo da Vinci's construction plans. Visitors can move the 8 metres long wings from the inside of the ship and pretend to navigate the ship.

Exhibits have been grouped according the following themes:

- There's electricity in the air
- The world of mechanics
- Optics and vision
- The secrets of fluids
- Sound and voice
- Perpetum mobile
- Mysteries of magnets
- Leonardo da Vinci's world of the air
- The power of sand
- Soap bubbles

The three different shows of the science theatre demonstrate physics in our everyday life; air and flying; and energy and heat. Experiments in the science theatre show the principles of physics and chemistry with the help of devices from everyday life like vacuum cleaners and coffee machines. Some of the experiments can be tried out and repeated at home. Making a rainbow from milk or batteries from sour milk will certainly explain science better than hours full of theories.

Virtual space show programmes have different degrees of difficulty for younger and older school age. The space show for younger children explores the secrets of the solar system and explains the reasons we have seasons or day and night. Secondary school students have a chance to fly virtually through different galaxies and see how a star is born.

The Energy Centre also organizes thematic temporary exhibitions and competitions for young people. In the spring of 2005 the Energy Centre organised the art competition "Beethoven's World" for which students submitted drawings, paintings and photographs that were later exhibited in the Energy Centre.

Energy Centre continues making science fascinating for young people and its' work is an important addition to the regular school curriculas. Most importantly, Energy Centre awakens students' imagination and inspires their own thoughts about science.

Kristel Mõistus
kristel@energiakeskus.ee
www.energiakeskus.ee

## Innovaatika special issue
# Communicating European Research

### Contributors:

| | |
|---|---|
| AHHAA Science Centre Foundation | www.ahhaa.ee |
| Archimedes Foundation | www.archimedes.ee |
| Energy Centre | www.energiakeskus.ee |
| Estonian Academy of Sciences | www.akadeemia.ee |
| Estonian Agricultural University | www.eau.ee |
| Estonian Ministry of Education and Research | www.hm.ee |
| Estonian Physical Society | www.fyysika.ee/efs |
| Estonian Science Foundation | www.etf.ee |
| Tallinn University | www.tlu.ee |
| Tallinn University of Technology | www.ttu.ee |
| University of Tartu | www.ut.ee |

The Estonian Gambling Tax Council has co-financed the Estonian Stand at the exhibition of the Communicating European Research conference.

innovaatika

ISSN 1406-6688

**EU Innovation Centre**
Archimedes Foundation
Väike-Turu 8, Tartu 51013, Estonia
Tel +372 730 0324
Fax +372 730 0336
E-mail irc@irc.ee
http:// www.irc.ee/

Editor: Rein Kaarli
rein.kaarli@hm.ee