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Theme of this edition: Research in Europe – Research for Europe

Transnational and visionary:
Today's information technologies

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Material innovations – analysis,
development and applications

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Your partner for EU-funding
advice, coordination, facilitation

> 4/5 | 18/19 | 21-23



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Theme of the next issue:
Innovations in energy technology
(available in German only)

'Research in Europe – Research for Europe': Important contacts

CORDIS (http://cordis.europa.eu/home_en.html), the Community Research & Development Information Service, is the primary information source for the 7th Framework Programme (FP). Calls for submission of proposals at http://cordis.europa.eu/fp7/home_en.html.

europa.eu, the 7th Framework Programme on the pages of the European Commission, complementary page to CORDIS http://ec.europa.eu/research/fp7/index_en.cfm.

German portal to the framework programme, official pages with information relevant to Germany and a full list of all german contact points: www.forschungsrahmenprogramm.de.

The 7th Framework Programme not only funds basic research, but also applied contract research. This is implemented in the specific programme **'Research for the benefit of SMEs' within the 'Capacities' programme**. Information and contact details for advice are available at: www.nks-kmu.de.

Competitiveness and Innovation Framework Programme (CIP), a new programme for Small and Medium-Sized Enterprises (SME), which supports European industry networks, provides access to capital and funds demonstration and dissemination activities in the area of energy and information technology: http://ec.europa.eu/cip/index_en.htm.

IPR Helpdesk, free advice on Intellectual Property Rights issues in EU-funded projects: <http://www.ipr-helpdesk.org/>.

Enterprise Europe Network, the European network to support businesses and innovation: www.enterprise-europe-network.ec.europa.eu.

A calendar of important European workshops, conferences and cooperation fairs is available on the events page.

EuroStars, new EU-programme for SMEs undertaking research: www.eurostars-eureka.eu.

ERA-NETs (www.euburo.de/arbetsbereiche/eranet/eranetzethematisch) join national and regional funding programmes with calls for proposals for transnational projects. Relevant ERA-NETs for SMEs are:

EraSME (www.era-sme.net/public), the equivalent to 'Research for SMEs'.

Cornet (www.cornet-era.net), the equivalent to 'Research for SME associations'.

Further useful links:

- 'The European Union online', the general portal of the EU: <http://europa.eu>
- Access to the Official Journal of the European Union: <http://eur-lex.europa.eu>
- Public procurement notices from the European Union, the European Economic Area and beyond: <http://ted.europa.eu>
- SME portal: <http://ec.europa.eu/enterprise/sme>

'Transfer direct' informs about excellent research at Technische Universität Dresden

You want to find out more about research at TU Dresden? Our 'Transfer direct' CD-Rom can help.

The multimedia CD Rom provides detailed information about all our current research projects and is searchable using simple navigation. Furthermore, it gives an overview about property rights, scientific publications, dissertation and diploma topics and much more. The expertise of the various university departments and professorships could be of interest to potential research partners in science and industry. Using the key word search, you can easily find the right contact person and establish contact via e-mail immediately. National and international companies offer jobs and internship opportunities to students and graduates.


Are you interested? Please order your free copy of "Transfer direct" by sending an e-mail to: Eva.Wricke@tu-dresden.de

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Research information, updated daily, can be found at:
<http://forschungsinfo.tu-dresden.de/recherche>






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 Photo: EPC



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Editorial **Boosting Europe's Research Potential**

Dear Readers,

In our globalised world, research and technological development happen at a faster pace than ever before. Today, researchers can exchange information and scientific results freely and easily around the World. However, we still have a long way to go to develop a true European research policy. Around 80% of publicly funded research in Europe is currently undertaken at a national level, and in particular, in the frame of national or regional research programmes. In other words, the research policy of the European Union and its member states is not yet fully coordinated. For this reason, efforts towards a joint research policy are not always successful.

The aim of the European Union's Framework Programme for research and technological development has always been to stimulate cooperation between partners in different countries. Since the beginning of the 1980s, this programme has contributed to a new concept of cooperation in a changing society, and a true 'European Research Area' (ERA) began to emerge.

The concept of ERA is based on a vision of a unified area across Europe, where researchers can move and interact freely, and where infrastructures, funding programmes and projects are developed and used jointly. The ultimate goal of the European Research Area is the development of a joint European Union (EU) research policy, which makes Europe a strong competitor to other nations, for

example in North America or Asia. For this reason, the European Council of Barcelona decided in March 2000 to increase investments in research and technological development to close the gap with Europe's main competitors. These investments should increase from 1.9 percent to 3 percent of the EU's gross domestic product (GDP) until 2010. Industry is expected to contribute two thirds to this increase. To achieve this goal of 3 percent of GDP by 2010, the public and private sector have to increase their research investments by around 6.5 percent and 9.5 percent per year respectively.

On the following pages we introduce to you the local actors and service providers in the area of European research funding. We also present a number of successful EU-projects, which can be seen as 'best practice' examples in their respective research and technology fields. They can also be seen as 'beneficiaries' and 'pioneers' in the European Research Area. ■

Matthias Winker,
 Director of the European Project Center (EPC)



A strong team in Saxony – in the centre of Europe.



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**TECHNISCHE
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The research capability of Technische Universität Dresden (TU Dresden) has been developed very successfully over the last few years, mainly due to the active interdisciplinary cooperation of researchers. In particular, research is becoming increasingly multi-international, and networks with international partners across the World are being developed. This positive trend comes with an increased administrative overhead however, resulting in time and funding being required to prepare and coordinate such projects. In June 2005, TU Dresden founded the European Project Center (EPC) to coordinate and efficiently manage international multi-partner research and cooperation projects.



Competence in EU-funding

European Project Center – Your partner for European funded R&D projects



The idea of a European Research Area (ERA) was developed in 2000 with the aim of implementing a joint European research policy to strengthen European competitiveness.

The ERA concept is based on a vision of a unified area across Europe, in which researchers can move and interact seamlessly, and where infrastructures, research programmes and projects are well coordinated to address major challenges together.

The EU's main instrument to realise ERA is the Framework Programme for Research and Technological Development. The current Seventh Research Framework Programme has a budget of more than 50 billion Euros and, for the first time, has a duration of seven years (2007 – 2013). It is thus in line with the financial plans ('financial framework') for all policy areas of the European Union. In addition to the Framework Programme, there are about 100 other funding instruments addressing the so-called 'European Higher Education Area' (Bologna Process) and the 'European Economic Area' (Lisbon Strategy) besides the ERA.

Scientists of TU Dresden are actively participating in the Research Framework Programme to improve integration within the international scientific community and help raise their reputation internationally.

The European Project Center (EPC) at TU Dresden is a competent partner and service provider whose purpose is to facilitate achieving this aim. It offers advice and support on all aspects of European research funding. Furthermore it provides project management services and, with its partners, solutions for the exploitation of research results and technology transfer.

Within the EPC, a team of 15 project managers advise interested researchers on the numerous funding programmes and instruments of the EU. Specific knowledge of the funding guidelines, EU policies and their application help to transfer ideas into successful projects. Apart from advice on funding opportunities, the core competences of the EPC are in the budgeting of projects, the development of efficient management structures and the search for project partners.

Once projects have been approved for funding, the EPC takes over the negotiation of contracts and the administrative and financial project management (including controlling and risk management). Furthermore, the EPC provides support for the exploitation of research results, and coordinates reporting to the European Commission or funding agency (Fig. 1).

Since the EPC was founded, the number of EU-funded projects managed by the EPC has grown continuously. For example, scientists of TU Dresden have participated in 99 projects within the Sixth Research Framework Programme (including 6 projects coordi-



Fig. 1:

Services offered by the European Project Center, Source: EPC, Pictures: © European Communities, 2008

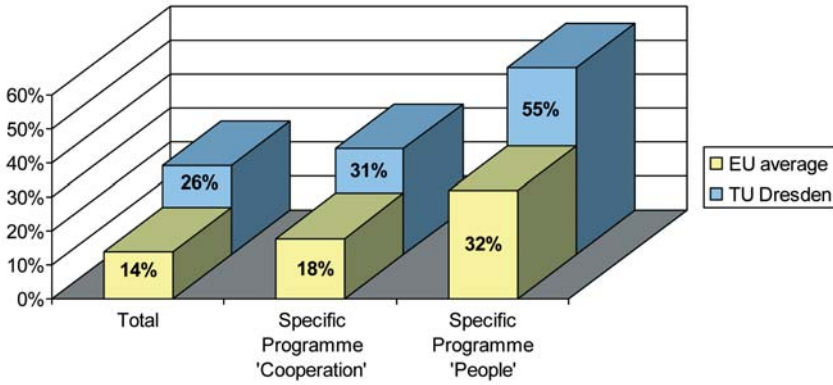


Fig. 2: Success rates (in terms of funded projects versus submitted proposals) in the Seventh Research Framework Programme in 2007
Source: EPC, European Commission



Abb. 3.1

nated by TU Dresden) corresponding to a funding volume of around 25 million Euros. Some of these projects are presented in this Transferbrief. Since the beginning of the Seventh Research Framework Programme (FP7) in 2007, TU Dresden has successfully secured funding for 52 projects. This includes 5 projects being coordinated by scientists of the University in cooperation with the EPC. The success rate in securing funding for submitted proposals through TU Dresden has been 32% in FP7, which is significantly higher than the EU average of 14%. In the specific FP7-programmes 'Cooperation' and 'People' the success rates of TU Dresden (31% and 55%, respectively) are well above the EU-average of 18% and 32% respectively (Fig. 2).

As of December 2008, the EPC is managing a total of around 220 EU-projects, which makes it the leading EU project management office in Saxony, and places it among the top ten in Germany.

Besides the EPC, the Research Promotion and Transfer Office supports the management of third

party funds at TU Dresden. This department focuses on national funding programmes and industry contracts, which make up the majority of third party funds received by TU Dresden (124.8 million Euros in 2007).

Members of the department provide information and advice on national funding opportunities and tenders. They support the development of project proposals, and help with contract negotiations. Their service is provided face-to-face, and is supported by the monthly publication of the brochure 'Research News' (Forschungsnachrichten). Research results are published by the department through the Research Information System (<http://tu-dresden.de/forschung/forschungsinformationssystem>) and on the CD-Rom 'Transfer direct'. The department also provides services to scientists who wish to present and market their research results at trade fairs and exhibitions.

In addition, through the 'Dresden Exists' Initiative (<http://www.dresden-exists.de>), funded by the Federal Ministry of Education and Research (BMBF), scientists interested in entrepreneurship can receive advice and individual coaching from an interdisciplinary project team headed by the SAP-funded Chair 'Entrepreneurship and Innovation'. ■

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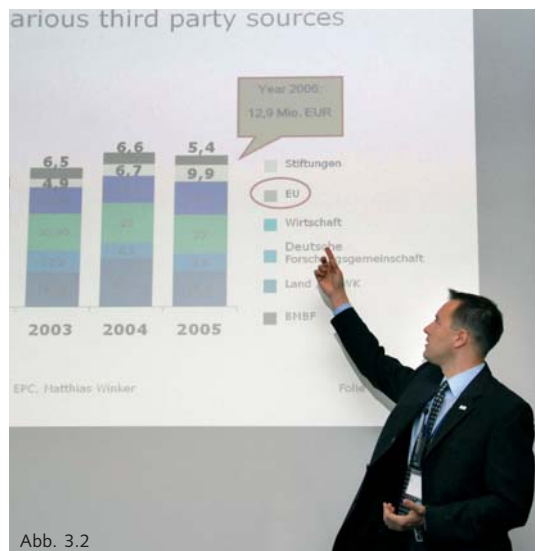


Abb. 3.2

Abb. 3.1 und 3.2: Presentation of the EPC at DAAD Conference, Photos: TUD, AVMZ, Liebert, Gelbke

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Grid computing bundles computing power of single computers as well as of high performance computers to allow a collaborative use of their capabilities. This makes computing and data intensive tasks manageable in contrast to the difficulties encountered when a single member of a community attempts to solve such a task. The vision of extensively utilising Grid computing is particularly interesting for researchers who want to execute a large number of tasks or to perform comprehensive calculations. One example are complex, workflow-oriented applications in chemistry.

Grid computing for chemical applications

CHEMOMENTUM – An infrastructure for complex applications in science

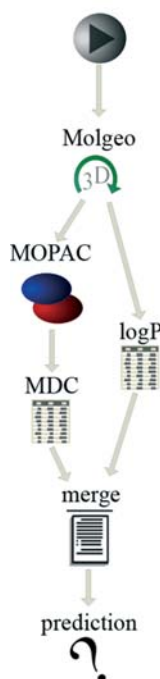


Fig. 1:
QSAR-Workflow

The REACH initiative of the European Parliament (Registration, Evaluation, Authorisation and Restriction of Chemical Substances), which came into effect in June 2007, formulates increased quality standards for the complex process of evaluating the safety of chemicals. REACH envisions the increased use of software simulations to support the risk evaluation process with the aim to reduce the number of necessary animal tests in this area of research significantly. While several applications for single issues already exist, an infrastructure is needed to combine them effectively in a user-friendly way. In July 2006, the EU project "Grid services based environment to enable innovative research – Chemomentum" was started to close this gap.

Chemomentum develops and tests Grid-based software solutions for complex, workflow-oriented chemical applications with a focus on data- and knowledge management. The aim is to provide users with a Grid system for evaluation and risk analysis of chemicals. The system is based on the European open source Grid middleware UNICORE, which includes a GUI (graphical user interface) client available for all common platforms. It allows submitting a job to the Grid with just a few clicks.

To meet the requirements of the REACH initiative, Chemomentum supports the execution of multi-staged, so-called quantitative structure-activity relationship (QSAR) workflows (Fig.1). Using these workflows the risk of chemicals can be estimated by running simulations instead of testing them experimentally. During the learning stage of a workflow, a QSAR model is built, which is then adapted during the adaptation stage to predict the behaviour of other chemicals. Such a model could draw conclusions about the toxicity of tested chemicals and then use this knowledge about the relationship between chemical structures to predict the toxicity of

untested chemicals. Workflows like that can easily be applied to numerous structures.

A considerable amount of data is produced during these calculations. To ensure the reliability of the system, data storage has to be distributed globally. However, access to the system should be independent of the physical location of the data. ZIH is developing a Grid data management system, which automatically generates and stores meta data for data that is uploaded. By using a plug-in for the UNICORE GUI (Fig. 2) the meta data can be browsed comfortably and the original data files can be identified and retrieved.

Chemomentum brings together nine partners from seven European countries, providing expertise in areas such as Grid development, quantum chemistry, and the development of GUI clients. Together, a European Grid infrastructure is created, which not only meets the objectives of the REACH initiative, but is also open for applications and workflows from other scientific fields ranging from quantum chemistry to supply chain management.

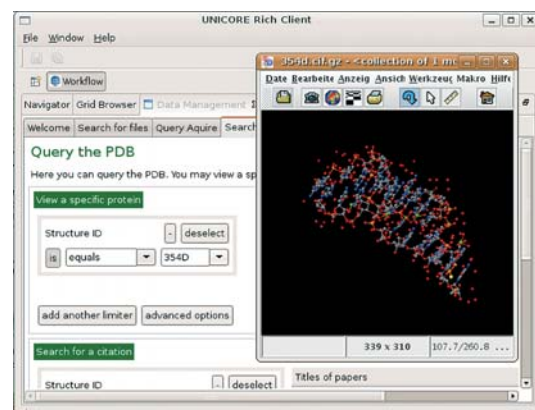


Fig. 2: UNICORE user interface
Screenshots: Chemomentum Project

A medical student and a senior surgeon both look at an x-ray. While the senior surgeon quickly makes a diagnosis, the basis for this decision is not clear to the medical student. Psychologists from Technische Universität Dresden (Germany) currently investigate this difference in perception and non-verbal knowledge in the interdisciplinary research project PERCEPT.



Fig.: The PERCEPT idea: View of Dresden by Canaletto (1749) with the depicted individual perception of the picture within the dark area (Photo: Applied Cognitive Research, TU Dresden)



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PERCEPT: Perceptual Consciousness – Explication and Testing Visualization of subjective perception with analysis of brain activity and eye movements

Can the experienced view of a distinguished art expert be used to assist interested lay-people in understanding and appreciating the intricacies of paintings and other objects of art? What is the "world view" of a severely disabled person who cannot speak and move or, in a different context, what do our children typically perceive when confronted with their textbooks? These are some examples of what insights into a person's perceptions, feelings and thoughts could offer if they were to become a reality. While we believe that 'mind reading' actual 'thoughts' will remain impossible, already today PERCEPT demonstrates that it is possible to measure nonverbal personal views, impressions and interpretations. The explicit scientific visualisation of perceptual experience opens new perspectives for research and applications, e.g. in the domains of psychology and medical science.

The international research project PERCEPT is coordinated by psychologists of Technische Universität Dresden together with the European Project Center and includes other European research centres in Amsterdam, Bonn, Budapest, Groningen, Copenhagen, Nice and Helsinki. The project is funded by the European Commission in response to the Measuring the Impossible call as part of the NEST (New and Emerging Science and Technology) -initiative.

The objective is to explicate a person's subjective interpretation of complex visual scenes and paintings based on the combination of different scientific methods. Therefore, paintings from the Old Masters Picture Gallery, Dresden, Museum of Fine Arts, Budapest, and Rijksmuseum in Amsterdam are presented on a computer screen and the distribution of attention as well as emotional responses are recorded. This is achieved by combining neurophysiological (fMRI, EEG, MEG) and behavioural (eye-tracking) methods. One important milestone is the synchronisation of both measurement techniques.

In an experiment, images of different emotional content were used, e.g. smiling or fearful faces and neutral or disgusting photos. The results demonstrate different patterns for certain emotions in the fMRI, but also the eye-tracking data show pronounced differences. The analysis of activation in different brain regions (e.g. fMRI) and the direct measurement of attention allocation (eye-tracking) allow investigation of perceptual processes.

A particularly complex procedure is measuring brain activity using fMRI. The subject has to lie in a large cylinder-shaped tube and react to instructions or tasks given by the experimenter. To obtain clear results, it is necessary to adopt research paradigms to the relatively slow reaction of the measurement system (2-7 seconds). For the first time researchers in PERCEPT could demonstrate possibilities to overcome these temporal limits. It was shown that brain activity can be analysed in relation to single fixations of the eyes with an average duration of about 250 ms. This approach will allow investigation of brain activity on the basis of eye gaze events. First results show that there are pronounced differences in information processing from one visual fixation to another.

The results of PERCEPT will provide new methods for scientific visualisation of subjective experience of complex meaningful scenes that can be used to make our perception more transparent than at any previous time in human history before. Finally it will be possible to demonstrate differences in visual inspection between the medical student and the senior surgeon, which will support learning processes and correct decision making. Besides applications in medicine and training the project results can be used in many other areas such as marketing and the design of human-machine-interfaces.

PERCEPT

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In an information society, security and privacy become more and more important to give users the right to make informed decisions when using the internet. The EU-project PRIME, which was successfully completed in 2008, developed new concepts and solutions for a European privacy-enhancing identity management preserving the right of informational self-determination of the European citizen.

Privacy-Enhancing Identity Management PRIME – Privacy and Identity Management for Europe



Fig. 1: PRIME toolbox to support multiple identities in the internet
Photo: PRIME project (2008)

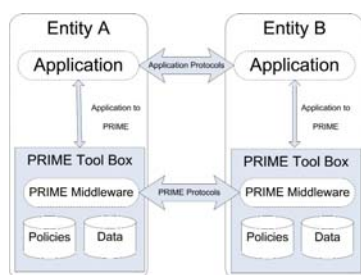


Fig. 2: PRIME architecture – overview
Photo: Prime project (2008)

Today, electronic communication and electronic business processes are part of our daily lives. On a daily basis, users disclose personal data using the Internet for activities such as checking time-tables of public transport, shopping, using translation services, etc. The so-called Web 2.0 services, offering user-generated contents and syndicated services, create a completely new kind of interaction and personal data disclosure by permanently sending data about location, items of interest, contact relations etc. hence security and privacy protection become more and more important.

Together with 20 European partners from industry, academia and public sector organisations, Technische Universität Dresden has developed new strategies for a privacy-enhancing identity management (www.prime-project.eu/). The project was funded by the European Union with 10 million Euro (IST-507591) for a period of four years. The overall budget of the project amounted to 16 million Euro.

The objective of PRIME was to develop a holistic approach for a user-controlled identity management to restore and preserve the freedom of speech and the sovereignty of Internet users in the digital world. The recent occurrences of "lost" data records in the UK and the misuse of user traffic data in Germany emphasize the necessity of data protection.

An important requirement within the PRIME project was to enable user control and to manage personal data-disclosure processes focussing on disclosure policies regarding, e.g. data usage or further transfer of data. The major PRIME design principles are to start with maximum privacy, to follow the data minimization principle, to achieve informed consent of the user with respect to further transfer and usage of the data (if any) and to enforce the specified use of the data. This guides the creation of technical and

legal foundations for strong and successful data protection within Europe and makes data protection comprehensible for European citizens.

The results of the PRIME project stand out from those of conventional identity management systems. PRIME created a collection of customisable identity management tools as a toolbox. The tools can be extended on demand by external components using a comprehensive application programming interface. Major features of the PRIME system are:

- nearly symmetric client-server-architecture (Fig. 2)
- privacy-enhancing data storage with built-in journal function to track disclosed data
- automated privacy policy management on client and server side
- increased transparency and usability of privacy-related processes
- extendible with external modules, for instance to handle certificate and signature services using web services
- user-friendly and extendible user interface

The results of PRIME have led to a so called "Privacy gateway", a commercial solution of one of our project partners. Furthermore, the European project PrimeLife (www.primelife.eu/) will use and enhance PRIME's results. The developed PRIME modules are available as Open Source under Eclipse1.0 License.

Detailed information is available on the Internet following the above mentioned references. A white paper with further details, facts and applications is available at www.prime-project.eu/prime_products/white_paper. ■

Rural roads are the most dangerous road category in Europe, given the number of journeys and proportion of accidents resulting in damage or injury. This is due to the characteristics of these roads which result in human error having especially severe consequences. Traffic safety on rural roads could be considerably increased if psychological factors are included in rural road design. In the European project RiPCORD-iSEREST, psychological aspects were combined with road planning and engineering approaches. By doing so, this project has contributed to increase safety on rural roads in the European Union. This short report presents an interesting result as a prototypical contribution of traffic psychology to the project. More detailed information together with several research reports and other publications can be found at www.ripcord-iserest.com



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Towards safer rural roads
A contribution of traffic psychology in the EU-project RiPCORD-iSEREST

In up to 90% of all accidents, human error is reported as having been either the single or a contributory cause. This proportion of accidents in which human error is a factor is especially high for rural roads. This can be attributed to the specific characteristics of these roads:

- the age of the roads, which means that safety considerations during design were often not in accordance with today's safety standards;
- the variety of different functions these roads have to fulfil;
- the large variety and variation in road-users' behaviour;
- high speeds;
- the potentially unforgiving environment (trees, ditches, etc.).

A prerequisite for overcoming these disadvantages in an effective and efficient way, is knowledge concerning the behavioural background of driving on rural roads. To achieve this aim and as part of the project RiPCORD-iSEREST (6th Framework Programme of the European Commission, contract no. 506184), the professorship traffic and transportation psychology at Technische Universität Dresden, managed by Prof. Schlag, has developed a driver and driving behaviour model for rural roads which was evaluated together with the professorship of road design (Prof. Lippold) and with the Fraunhofer Institute for Transportation and Infrastructure Systems (IVI) in Dresden.

This psychological model explains driving behaviour as a result of – amongst others – the drivers' expectations concerning subjective feeling of risk and workload. To validate the model assumptions, driving experiments were conducted in the field and in the driving simulator of the Fraunhofer IVI in Dresden. In the simulator study, different designs of rural road curves served to prototypically test the

model assumptions concerning the influence of estimated workload on speed.

Firstly, the significant differences in speed (Fig. 1), showed that the experimental variation induced by the different design variants was successful. More important with respect to the model assumptions is the relationship between estimated workload and

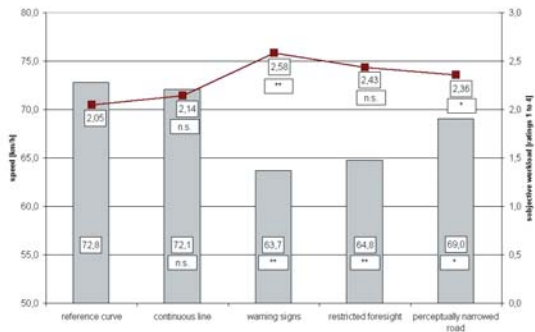


Fig. 1: Chosen results for model validation: speed and workload of different experimental variations. Source: TUD, Institute of Transport Planning and Road Traffic

speed; both variables show comparable effects, which support the model assumptions. This means that speed can be significantly reduced if aspects of estimated workload are taken into account in rural road design. From a road planning perspective the comparable effectiveness of formal cues on one hand, and subtle informal design aspects on the other hand, are of special interest. Restricting the foresight in curves by placing bushes (not trees!) in the curve apex, resulted in a similar reduction of estimated workload and speed like formal warning signs (signs no. 103 and 625 according to the German StVO). Thus, by purposefully applying such informal design variants in less dangerous curves, the number of signs can be considerably reduced without reducing safety. This will help to increase acceptance and thus effectiveness of warning signs at locations where no alternative design variants are feasible.

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Multi-scale modelling and simulation can change the science and technology of new material developments. These methods allow modification of material characteristics leading to the creation of materials with hitherto unknown functionality. Computation has become a major scientific tool in conducting research, playing a comparable role to experiment and theory.

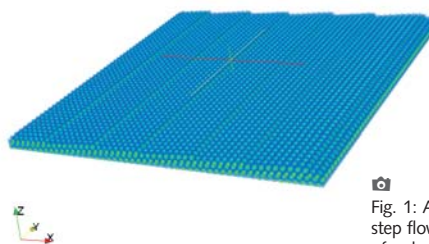


Fig. 1: Atomistic phase field simulation – step flow growth – atoms are maxima of a density field.

Institute of Scientific Computing coordinates international research project **MagDot – with mathematical research to new materials**

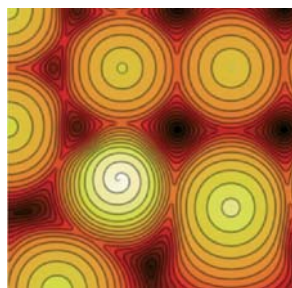


Fig. 2: Classical phase field simulation – spiral growth – color indicates the atomistic height of the growing film.
Source: TUD, Institute of Scientific Computing.

The need for reliable quantitative simulation results, the efficiency of high performance computers and the maturity of modern numerical methods, has recently shifted the focus of scientific computing towards more complex problems where classical single physics models are not sufficiently accurate. In particular there is an emergence of methods that replace heuristic and empirical observations in macroscale models by direct numerical simulations of more accurate models defined on finer, e.g. atomistic scales. It is often an impossible task to solve the fine scale equations over the length and time scales of the continuum quantities of interest. A new class of numerical methods is needed, which tackles this difficulty by exploiting separation of scales in the governing physical model. This type of multi-scale approach makes it feasible to treat problems that could not be handled previously and to obtain higher accuracy in the simulation of important physical phenomena. To achieve this goal and use computation as a major scientific tool mathematical research is required.

Within the area of 'Computational Materials Research' the EU supports in the 6th Framework Programme the development of such algorithms with an application in materials science. The goal of the American-European project MagDot (STRP 016447), which is coordinated by the Institute of Scientific Computing and the European Project Center, is the development of methods, which enable an ab initio design of new storage media. This is achieved through an integrated modelling approach, which combines atomistic and continuum scales. Modern modelling techniques, such as time dependant density functional theory, as well as atomic and classical phase field techniques are combined with advanced numerical methods, such as multilevel techniques, adaptive finite elements and parallel implementations on high performance computers.

The focus of the activities at Technische Universität Dresden is the simulation of self-assembly processes of nanostructures during epitaxial growth of magnetic materials. An ordering of atoms is achieved through various interactions, which can be used to guide the growth of magnetic nanowires or nanodots. Atomic phase field models (Fig. 1), hybrid approaches (Fig. 2) combining discrete and continuum equations and continuum models in terms of partial differential equations are used.

Besides the modelling aspects software development is an important part of the project. With the adaptive finite element software AMDiS, which was developed at the Institute of Scientific Computing, various problems can be addressed, such as classical continuum mechanics, dynamics of biomembranes, pattern formation on surfaces, or self-assembly of nanostructures. AMDiS is a flexible simulation tool, which combines efficient mathematical algorithms with modern software architecture. It is freely available and used at various institutes at TU Dresden for parallel computations using high performance computers at ZIH. ■

The current product range of photovoltaic (PV) modules available for use in architecture is limited. Many PV systems used in existing buildings are incompatible with the building or the environment. The European BIPV-CIS project examined the module design and constructive solutions for convincing integration with a focus toward improving the acceptance and distribution of these systems in both older and newer existing buildings.



Component and material tests.
(Photo: Institute of Building Construction)

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EU research project BIPV-CIS: New photovoltaic thin film modules for architecture

The BIPV-CIS (Building Integration of PV thin film modules using Copper Indium Diselenide technology) project combines functionally, technical and constructively creative approaches. The project consortium consists of an interdisciplinary team of international partners from research institutes and manufacturers.

The goal of this research was the development of building-integrated photovoltaic systems with proven and approved manufacturing procedures and standardised electrical and mechanical connections. Architects, engineers and scientists formulated new solutions based on PV thin-film modules used for roof and façade elements, as well as overhead glazing elements. The starting point for the development of these new modules, which goes beyond the previously visually-dominant appearance of their predecessors, was the European overview of potential

and legal requirements of PV components. Copper indium diselenide (CIS), used as solar cell material, provides for a wide spectrum of available surface modifications including flexibility of colour schemes that can better be adapted to the built environment. Opaque and semi-transparent sample modules using patterned, matt and coloured architectural glasses were evaluated and showed acceptable performance loss compared to conventional black modules. The most promising combinations were produced as full scale prototypes and integrated into component testing elements for trials appropriate for roof and façade components. An international survey of architects acknowledged the versatile application potential.

An economical, small junction box particularly suited for thin film modules was designed and a prototype of a hidden electrical connection in the insulated glazed building skin was developed. The Institute of Building Construction at Technische Universität Dresden contributed the sound basis for architectural and structural embedment. Numerical calculations as well as component tests were performed to prove the suitability of various module laminates for use in the building skin.

Finally two test façades with prefabricated elements were produced – a mullion-transom construction located at a German test site and a structural sealant glazing construction in Italy. All relevant façade tests were successfully passed. A PV tile for integration into roof structures was also developed but was curtailed at the planning and testing level for economic reasons.



European Union, 6th Research Framework Programme,
Priority 6.1 Sustainable Energy Systems
Project no. SES6-CT-2003-S03777

Partners:

- Ove Arup & Partners Ltd. London, GB
- Avancis Munich, D
- Joint Research Centre Ispra, Ispra, I
- Scheldebouw B.V./Permasteelisa Group Vittorio Veneto, I
- Saint Gobain Recherche SA Aubervilliers, F
- 3S Swiss Solar Systems Bern, CH
- Tyco Electronics AMP Swindon, GB
- Warsaw University of Technology Warsaw, PL
- Wrocław University of Technology Wrocław, PL
- Würth Solar Schwäbisch Hall, D
- Zentrum für Sonnenenergie und Wasserstoffforschung (ZSW) Stuttgart, D



Small samples of semi-transparent and opaque CIS thin film solar modules produced in coloured and patterned laminated glass. (Photo: ZSW)

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The specific properties of nano-materials are of fundamental interest for solid-state physics and material sciences. Their use, for example in sensors, actuators and computer electronics, is of increasing importance in high-technology industries. In order to understand, optimise and subsequently use the specific properties of nano structures, electron microscopy is used. The EU-project ESTEEM brings together the major electron microscopy centres in Europe.

> European Network of Electron Microscopy Laboratories

ESTEEM: Enabling Science and Technology through European Electron Microscopy

Nano-science

Today, many fields of natural sciences and engineering undertake research on nano structures. At nanometre scales (1 nm equals 1 billionth of a metre and the diameter of an atom is 0.1nm) materials can show completely new mechanical, optical, electrical or magnetic properties. As a result, Nano-materials consisting of nano-sized particles or only a few layers of atoms of different substances, show completely new properties. Manufacturing of nano-materials with the desired properties ('smart materials') is, however, an art in itself. Another challenge is to analyse the resulting new structures, since only then can the relationship between structure and material properties be understood and exploited.

Nano-analytics

Transmission Electron Microscopy (TEM) is the tool of choice for nano-analytics. It allows determination of the position of atoms and investigation of their bonding properties as well as measurement of electrical or magnetic fields between atoms. The resolution of a TEM is sufficient for resolving atomic structures since aberration-free electron lenses were developed around 10 years ago. These microscopes allow investigation of nano-materials and nano-properties, to answer questions such as: Where are which atoms? Which fields exist? What are the bonding properties?.

ESTEEM

Within the Sixth Framework Programme of the European Commission, leading electron microscopy laboratories in Europe (Antwerp, Delft, Cambridge, Oxford, Paris, Toulouse, Stuttgart, Dresden, Cadiz, Ljubljana, Krakow) initiated the 'Integrated Infrastructure Initiative' (I3) called ESTEEM. Building on the strengths of the individual partners, a European network of high performance electron microscopes has been created undertaking the following activities:

- **Networking Activities (NA)** aim to catalyse co-ordination and co-operation between the different users.
- **Joint Research Activities (JRA)** focus on the development of microscopy accessories and microscopy methods as well as on their application to nano-science.
- **Transnational Access Activities (TA)** were set up to ensure that researchers from all over Europe have access to the best available infrastructure that is required to perform their research on an equal basis.

TU Dresden in ESTEEM

The Triebenberg Laboratory of Technische Universität Dresden was opened at the Institute of Structural Physics in 2000. It is a laboratory specialising in high-resolution electron microscopy and electron holography. Due to its unique location the laboratory is protected from electro-magnetic and acoustic disturbances, vibrations and disturbing temperature changes. Innovative, new methods for electron microscopy are developed and applied addressing nano-science questions. Electrical and magnetic fields in solid bodies can be resolved and imaged by TEMs and electron holography down to atomic scales.

The Triebenberg Laboratory is led by Prof. Hannes Lichte, who is also leading the Joint Research Activity 'Mapping Nanofields' in ESTEEM. Within this activity, mechanical disturbance fields and electro-magnetic fields in solid bodies, such as semiconductors, ferroelectric and magnetic material, are investigated. Within the transnational access activities, the Triebenberg Laboratory offers its expertise to interested solid-state physicists and material scientists across Europe. ■



Fig. 1: Embedded within a forest belt, the Triebenberg Laboratory lies free from disturbance of civilisation. It was built to be the most protected specialised laboratory for high performance electron microscopy in the world.
Photo: Günter Schöler, Reitzendorf

Flooding is the most wide-spread natural hazard in Europe, with floods from rivers, estuaries and the sea threatening many millions of people. Floods cause distress and damage wherever they happen and insurance company data shows that the financial impact of flooding has increased significantly since 1990. The European project FLOODsite (www.floodsite.net) covers the physical, environmental, ecological and socio-economic aspects of floods. It is an 'Integrated Project' in the Global Change and Ecosystems priority of the Sixth Framework Programme of the European Commission. FLOODsite is funded from March 2004 until February 2009 and its consortium includes 37 of Europe's leading institutes and universities.



**TECHNISCHE
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Flooding – a challenge for European research

FLOODsite – Integrated flood risk analysis and management methodologies

FLOODsite involves managers, researchers and practitioners from a range of government, commercial and research organisations, specialising in aspects of flood risk management. Flood risk management is a process which comprises flood prevention, risk mitigation measures and preparedness backed up by flood management actions during and after an event. Research on these topics is integrated through decision support technologies, uncertainty estimation and pilot applications for river, estuary and coastal sites in Belgium, the Czech Republic, France, Germany, Hungary, Italy, the Netherlands, Spain and the UK.

FLOODsite actively promotes the uptake of research advances by publishing guidance for professionals, information for the general public and educational material.

Technische Universität Dresden, and specifically the Institute of Hydrology and Meteorology and the Institute of Soil Science and Site Ecology, are involved in 4 FLOODsite subprojects (Tasks), which cover a wide spectrum of research topics.

The topic of Task 1 was the identification of flash flood hazards. By applying the rainfall-runoff model PREVAH an increase in forecast accuracy could be achieved concerning peak discharge at a very early state of the flood.

Precipitation estimation using satellite data was the focus of Task 15. To analyse heavy precipitation events, several algorithms were applied to the data of the Meteosat-6 and -8 satellites. The investigations show that this method of precipitation analysis and forecasting is still very problematic and associated with high uncertainties. Therefore, operational applications have not yet been feasible.

Task 21 included three fields of work for TU Dresden. The Department of Meteorology investigated climate change in Saxony up to the end of the 21st century. Results show that annual precipitation will decrease by 5-10%. In summer, this decrease will be around 20%, while in winter precipitation is expected to slightly increase. Furthermore, an average increase of mean summer temperature of about 2.0 °C is observed. At the Institute of Soil Science and Site Ecology the impact of changed land use on flood dynamics was analysed. Results show that the impact of changes in land use will intensify with climate change. Appropriate land use could therefore potentially be an efficient means to reduce flooding by providing additional water storage capacity and slowing runoff. The Department of Hydrology investigated water retention capacity. Based on comprehensive data analysis, rainfall-runoff models for the upper Mulde catchment were developed and verified. Furthermore, a reservoir module was developed and implemented in the model system. Finally, in order to generate flood hydrographs with high recurrence intervals the method of the Mean Standardised Hydrograph after DYCK was applied.

Within Task 31, which is dedicated to knowledge transfer, the international master course FLOODmaster (www.floodmaster.de) was established at TU Dresden, in cooperation with the German Ministry for Education and Research (BMBF). ■

FLOODsite



Weißeitz-Flood, August 2002,
Pienner Str. in Tharandt
Photo: A. Solger

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The European economy has changed beyond recognition over the last century. The importance of heavy industry and manufacturing has decreased significantly as we have grown more dependant on information as a business and service oriented society. Mobile communication is an important economic driver generating growth. Researchers from the Vodafone Chair led by Prof. Gerhard Fettweis at Technische Universität Dresden have helped to significantly improve wireless transmission capabilities and contributed to the European projects ORACLE and WINNER+. The developed wireless technologies are increasingly required to support content-rich, data oriented services in order to connect people as well as machines in an information society.

TUD scientist participate in FP6

Research Projects on Wireless Communication Technologies

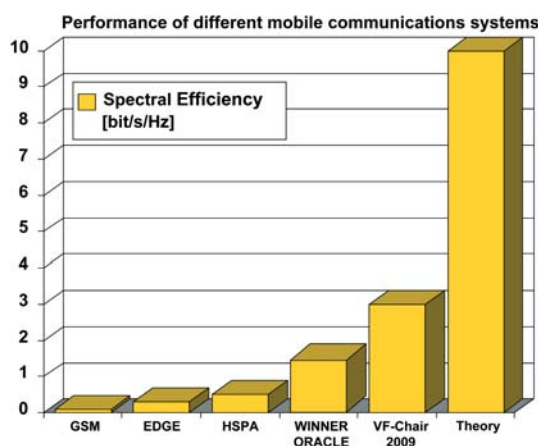


Prof. Fettweis and his team support the ORACLE project to develop mobile/wireless communication systems capable of meeting the needs of the nascent Information Society – both today and well into the future. The contributions anticipate that new spectrum access and spectrum management paradigms will appear in the near future, largely due to spectrum scarcity and the ever-expanding wireless technology sector. These circumstances have prompted TUD to develop intelligent radio terminals, which will be able to sense their environment in order to search for appropriate communication opportunities – with the overall aim of satisfying user needs for a high quality service. Since the radio devices autonomously analyse spectrum opportunities, this so-called Opportunistic Radio concept represents a completely new paradigm for the management of wireless communication systems. More specifically, and of particular interest to the ORACLE project, the designation opportunity refers to temporarily vacant radio resources regarding frequency, time or space. As a result, vacant frequency bands and time slots in certain geographical locations could be exploited to achieve more efficient spectrum usage. Flexible radio tech-

nologies, environmentally aware terminals, spectrum regulation policies, and flexible spectrum access strategies are at the heart of the ICT revolution being spearheaded by ORACLE.

The support of broadband services for mobile and wireless applications with excellent user experience are key trends for future radio access technologies. The team around Prof. Fettweis supports the WINNER+ project which addresses these challenges from a technical, standardization and regulatory perspective.

Based on the basic system concept developed in the previous WINNER and WINNER II projects, the WINNER+ project and its partners from Germany, UK, Canada, Spain, Sweden, Finland, France, Italy and Poland will develop, optimize and evaluate a competitive IMT-Advanced candidate proposal by integrating innovative and cost-effective concepts. This development is ongoing in a globally competitive environment with proposals expected from Europe, IEEE, China, Japan and Korea. In order to reduce fragmentation and to ensure a competitive European position in the global context, this project is mobilizing manufacturers and operators in Europe and the research community for a collaborative research effort. The consortium is based on the leading role of European companies in the global market on mobile and wireless communications. In this respect, the Vodafone Chair is contributing in two areas: Further refinement of Cooperative Relaying schemes and their seamless integration in the WINNER RRM and Protocol. In addition, a proof-of-concept by means of System Level Simulations is provided. Secondly, the investigation and integration of appropriate multi-antenna link adaptation concepts and their assessment using Link Level Simulations.



Fluid power, known as hydraulic and pneumatic drive and control technology, plays a major part in the plant engineering industry, ship and rail engineering as well as in aircraft and aerospace technology. Hydraulic drives offer many advantages due to their physical characteristics. They offer high power density and require little space for their installation. Furthermore, they



enable simple linear motion, which can be applied for automation in many areas. The Institute of Fluid Power at Technische Universität Dresden co-operates with many companies in the field of fluid power and supports industrial research and development on topics of current interest.

Fig. 1: Test machine at the Institute of Fluid Power
Photo: Institute of Fluid Power



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TU Dresden successfully co-ordinates EU-research project Virtual Prototyping as part of the Development Process

The requirements for stationary machines are growing continuously and complex technical issues have to be addressed during the development process of these machines. In the field of injection moulding technology (Fig. 1), the minimum available cycle time, the options and limits of process control and energy consumption are issues which need to be addressed. Although methods and tools to perform complex scientific and technical computations are available, their application during the development process is difficult, because of the need for multidisciplinary knowledge transfer between different domains.

A joint research project illustrates the development of an injection moulding machine using a virtual prototype (Fig. 2). Based on the specifications for the machine, a solution matrix for the required drives is developed. Mathematical models are then developed to evaluate the performance of the drive systems. The model helps to determine the performance of the components and their feasibility. One example is the newly designed and compact clamping unit of the electric-hydrostatic injection moulding machine. Using the multi-body system simulation, the technical feasibility of the concept could be proven. Furthermore, the virtual machine prototype is used to develop open loop and closed loop control strate-

gies for the drive systems, to realise high dynamic performance and to increase energy utilisation.

During processing of plastic materials, the process control influences the quality of the injection moulded plastic parts significantly. One method to investigate this complex interaction is the coupled simulation (Fig. 3). A field simulation is combined with lumped parameter simulation software to include the boundary conditions, such as the drive system properties and the nonlinear plastic melt flow. In the course of time abrasion can occur influencing the plastics injection moulding process and resulting in plastic parts of reduced quality. To



Sandretto Industrie, Torino, I
TU Dresden, Dresden, D
Moog Italiana, Caselle, I
Betapack, Irun, E
MPC-MCO PLASTICS, Bydgoszcz, PL
RWTH Aachen, Aachen, D
SIMCON Kunststofftechnische Software, Würselen, D
Warsaw University of Technology, Warsaw, PL

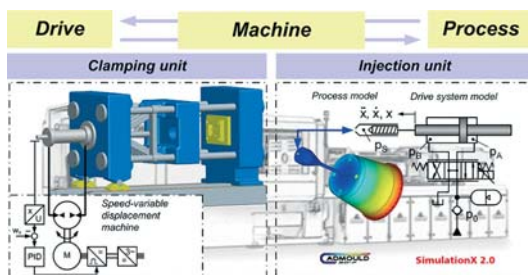


Fig. 2: Interaction between the drive system and the plastic injection moulding process

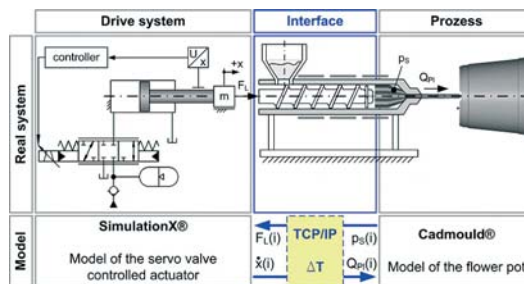


Fig. 3: Schematic of the developed coupled simulation

correct for this deviation, an adaptive control algorithm is used, which assures consistent quality of the injection moulded parts. The result is that a virtual prototype supporting the development of an injection moulding machine provides high dynamics, increased energy efficiency and consistent quality.

The results have been obtained as part of a project within the Sixth Framework Programme of the European Community, in co-operation between four companies and three universities across four European countries. The project has been coordinated by the Institute of Fluid Power (IFD) and the European Project Centre (EPC).



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Around 10 years ago, researchers in Europe started to investigate the applications of ultra-wideband (UWB) radio systems. Shortly afterwards, the first research projects on this topic were funded and promoted by the European Commission (e.g. whyless.com, UCAN). From the outset, the Chair of Communications Theory at Technische Universität Dresden (TU Dresden) and GWT-TUD GmbH played key roles in these projects. The most recent highlight was the successful completion of the PULSERS Phase II project in September 2008.



A contribution to the development of ultra-wideband radio transmission systems Integrated Project (IP) PULSERS Phase II



Fig. 1: Best Demonstration Stand Award
 Photo: Hrjehor Mark, GWT-TUD GmbH, Germany

PULSERS Phase II was a large-scale project funded by the European Union (EU), in which a total of 39 partners from 8 European and 3 associated countries took part. GWT-TUD GmbH coordinated this, as well as the predecessor project PULSERS. In doing so, GWT-TUD GmbH could build on experience in managing previous EU projects dating back to 2001.

With a budget of 20 million Euros, of which 12 million Euros were funded by the EU, this project was a new challenge. It is with pride that we can say to have completed this project successfully from a management point of view. This was confirmed by experts and reviewers of the European Commission during the Final Review in September 2008 in Paris. All challenges arising during the project's lifetime requiring a management reaction were dealt with professionally.

The PULSERS Phase II project was presented successfully at many international conferences. Of particular importance for the European Commission, as the main sponsor of the project, were the activities within the frame of the annual Mobile and Wireless Communications Summit. During the Summit in Stockholm in June 2008, many results could be presented in the form of conference presentations, and demonstrations as part of the exhibition. The commitment and the breadth of results achieved were recognised with the „Best Demonstration Stand Award 2008“. In addition, there were numerous other publications presented at important international conferences.

Many applications of UWB technology are under development. High data rates can be achieved over short distances. Robust and energy efficient data transmission systems with lower data rates can be realised over medium distances, which is of particu-

lar benefit in setting up sensor networks with reliable communication links. Moreover, when using UWB based transmission techniques, the distance between two stations can be determined in real time without additional technology making it suitable for applications in the field of positioning and tracking. In addition, UWB radar can be applied in medicine or used as ground radar, with applications in areas such as land mine detection. Overall, within the frame of the PULSERS Phase II project, several applications of UWB based communication systems were developed.

Currently, the relevant UWB standards, e.g. ECMA368, specify data rates up to 480 Mbit/s. Significantly higher data rates will, however, be required in future applications, such as the transmission of high resolution videos. In response to this requirement, demonstrators which make use of different UWB transmission techniques were developed in some of the work packages of the project. In particular multi-band-OFDM, multi-band impulse radio and UWB differential binary phase-shift keying (UWB-DBPSK) were tested. While all these technologies achieved high data rates, the multi-band-OFDM proved the most promising technology.

The project further addressed tasks related to efficient error protection in high data rate channels. The results were accepted by the WiMedia alliance who are carrying out further investigations in order to extend existing standards.

The Chair of Communications Theory of TU Dresden has contributed to the project significantly, implementing the base-band as well as partly implementing the MAC layer for the UWB-DBPSK demonstrator using VHDL software. Complementing parts of the MAC layer were developed

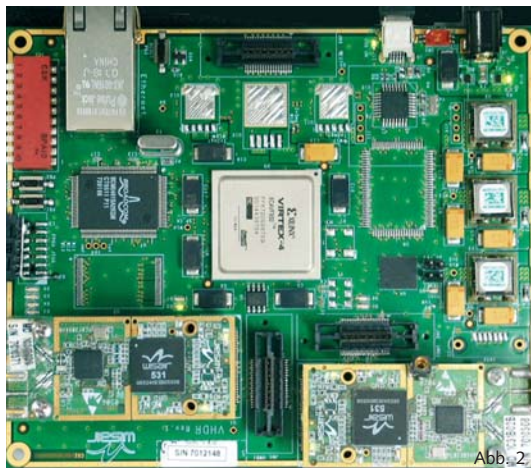


Abb. 2



Fig. 2: Multiband-OFDM verification platform
Photo: Amir Krause, Wisair Ltd., Israel



Fig. 3: UWB-antenna on flexible substrate
Photo: Jens Weber, TES Electronic Solution GmbH, Germany

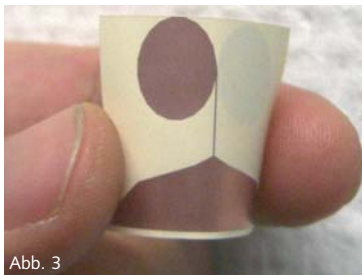


Abb. 3

and realised in software. The concept of the demonstrator dealing with the transmission of video streams was also developed and implemented. Within a second activity, tasks related to the multi-band impulse radio were carried out at TU Dresden. The University agreed to take on this additional work when one of the partners withdrew from the project.

The first low data rate UWB physical layer became a standard with the approval of Amendment 1 of the low-rate WPAN standard IEEE802.15.4 (now referred to as IEEE802.15.4a) in 2007. The applications of low-rate UWB radio systems are however much wider and a number of work packages within the project were dedicated to this field. For example, a sensor network was developed extending the standard IEEE802.15.4 to include mesh networking features. The physical layer chip developed within the project has ranging capabilities enabling positioning and tracking within the sensor network. Within this context, algorithms to calculate the spatial structure of the network (including the best routes through the network) were optimised. For applications in industry and logistics, methods of accessing and routing of large, fast-changing networks were investigated. Of particular importance was the inclusion of sensors, e.g. inertial sensors, outside the communication system to complement imprecise or incomplete data, enabling correct determination of positions under harsh environmental conditions. The result of this work was the development of a demonstrator, which shows the functionality of the whole system in a real environment. Another focal point of this work was the field of Body Area Networks (BAN). A number of tasks were carried out, including the development of special antennas and optimised communication protocols.

Within the field of low-rate networks, the work of TU Dresden has been mainly focused on the development and implementation of the network layer for a sensor network with positioning and tracking capabilities. To support the development of the entire system, emulator software was de-

veloped, which enables the connection of two devices on MAC level. This made the development of higher layers above the MAC possible even before a physical layer was available. The fully integrated network was successfully demonstrated at the final review of the project.

Another important topic was the support of worldwide and European regulation and standardisation activities related to UWB. Results from technical developments, data from measurement campaigns and thorough investigations including coexistence issues with other radio systems contributed to this. Project partners actively participated in meetings of several CEPT, ECC, IEEE, and ETSI working groups. The PULSERS Phase II project contributed to the approval of the first European regulation on UWB frequencies in February 2007, which paved the way for introducing UWB devices to the European mass market.

Through close co-operation between partners from academia and industry, important practical and theoretical results could be achieved within the frame of this integrated project. PULSERS Phase II was a success in both, political-economical and technical aspects. Work in the field of 'broadband radio technology' is ongoing as part of the follow-on project 'Coexisting Short Range Radio by Advanced Ultra-WideBand Radio Technology (EUWB), which started in April 2008. ■

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Fig. 4: Prototype of a UWB-sensor
Photo: Benoît Denis, CEA-Léti, France



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The developing biotechnology sector needs to build an education chain in order to secure qualified personnel in the future. The orientation of potential personnel towards this sector should begin at an early age, and continue throughout their professional career paths. The start of the BIO-TE[A]CH® Project at BioInnovationsZentrumDresden in 2008 is a step in this direction. As part of this project, a study is planned to assess the need for an additional course, such as a bridging package or conversion course, which would equip personnel to work in the biotechnology sector. This study is to be carried out in co-operation with the Institute of Vocational Education at Technische Universität Dresden, using EU funding.



> From Early Learning to Scientific Entrepreneurship BIO-TE[A]CH® – A High-Tech-Laboratory for Lifelong Learning

BIO-TE[A]CH®



📷
 BioInnovationsZentrumDresden,
 Am Tatzberg 47, 01307 Dresden, Germany
 Photo: TZD

Biotechnology is a high-technology sector prioritised and supported by the Free State of Saxony. Since 2000, around 200 million Euros have been invested as part of the biotechnology initiative, into building and developing institutions such as the BioInnovation Centres in Dresden and Leipzig. The Dresden site has rapidly developed into a dynamic cluster attracting new institutes, which has resulted in growing numbers of employees in this sector.

The core of the Biotech Cluster Dresden is made up of the following institutions:

- The Max Planck Institute of Molecular Cell Biology and Genetics;
- The Max Bergmann Centre of Biomaterials Dresden (funded by the Leibniz Association);
- The BIOTEC of Technische Universität Dresden;
- The Medical Theoretical Centre on the campus of the University Hospital.

Key to the development of an economic basis for the cluster was the InnoRegio Initiative of the Federal Ministry of Education and Research (BMBF) in Germany, which was coordinated through the BioMeT project in Dresden. Besides attracting new businesses to the area, a number of start-ups and

spin-offs from the research institutes were made possible by funding from the InnoRegio project.

The sustainable development of the Biotech Cluster requires a chain of value-adding organisations. Qualified personnel are the key to this process, and they must be recruited and retained for the process to be continued. Human capital, and therefore education, is often in the background, however, and treated as an add-on to fulfil funding requirements. In Dresden we wish to address this.

The BIO-TE[A]CH® project aims to engage suitable individuals (including trainees) early in their careers, and provide opportunities for qualified specialists to obtain an additional conversion qualification while working.

The project uses the BioInnovationsZentrum Dresden as a practical setting for education and training. The BIO-TE[A]CH® High-Tech-Laboratory was created in April 2008, in close proximity to research and technology activities, with funding support from the City of Dresden and sponsorship from GlaxoSmith Kline Biologicals Dresden. It fulfils the most up-to-date education requirements, and brings the topic of



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 Student experiment in group work on the use of enzymes in food technology
 Photos: BIO-TE[A]CH, Lobeck



Tour during the opening with Prof. Dr. Georg Milbradt, retired Prime Minister of Saxony, Dirk Hilbert, mayor for economic development of the City of Dresden, Dr. Peter Schu, CEO GlaxoSmithKline Biologicals, Students of the Marie Curie Grammar School

biotechnology closer to all age groups in education. It is the pilot project of the INNO-TE[A]CH[®] initiative, which has the aim of mirroring all technology sectors of the Dresden high-technology site in education institutions outside schools.

The concept of the BIO-TE[A]CH[®] project is based on three pillars:

- I. The early training of school, college and university students;
- II. Providing modules for professional training;
- III. Running Public-Relations activities to aid the public understanding of science and to provide a forum for questions related to biotechnology and its impact on society.

In addition, there are commercial opportunities for businesses, general management seminars and conferences for organisations in the biotechnology sector. Courses on scientific entrepreneurship are also offered for researchers interested in founding new businesses.

At the other end of the spectrum, the youngest participants in the BIO-TE[A]CH[®] laboratory are 5-8 years old. They experiment in their 'Science Lab' once a week and discover 'a world full of surprises'. This experimental scientific course is sponsored by AMD Saxony and continues over six months with increasing numbers interested in participating.

The student laboratory is aimed at secondary schools and grammar schools as well as vocational training schools. The core elements are modules based on current curricula and additional learning modules, which schools can choose from a catalogue according to the requirements of their curriculum. In 2008 the Free State of Saxony introduced the trans-disciplinary course 'Biotechnology and Bioinformatics' for grammar school students in year 11/12. The course curriculum requires the use of education institutions outside of schools for teaching. BIO-TE[A]CH[®] offers what schools cannot provide due to lack of equipment or the specialisation of educational material. A network of so-called 'premium schools' is being created, through close

cooperation between the project and schools in the context of professional orientation, and also through scientific research by the Institute of Vocational Education of Technische Universität Dresden.

BIO-TE[A]CH[®] is also planning a joint project with the Chair of Didactics of Vocational Education led by Prof. Dr. Hanno Hortsch at Technische Universität Dresden, to be submitted for funding by the European Social Fund (ESF). This project will determine the demand for any additional professional qualifications for qualified personnel in biotech and biotech-related businesses in the Free State of Saxony. The aim is to adapt the contents and organisation of professional qualifications, based on the requirements of industry. This will contribute to employees of these businesses maintaining state-of-the-art scientific knowledge, which helps to secure human capital for the Biotech Cluster over the long term.

Following the dynamic development of the Biotech Cluster, the BIO-TE[A]CH[®] Project will also address the topic of 'Scientific Entrepreneurship'. Cross-regional cooperation and partnerships are planned, with a focus on scientists, who will be supported by seminars and personal coaching on their way to becoming 'Scientific Entrepreneurs'. The scientists will address innovative tasks, focussed on the creative development and successful implementation of new scientific products and scientific organisations in research, education and knowledge transfer. Not only is entrepreneurial spirit needed, but also characteristics such as personal motivation, ability and patience, which make an entrepreneur. Only then new research and scientific institutes can be created with their own dynamics, and with improved chances for success in international competition, and in reaching their required target audience in society, the economy and of course in the globalised scientific world. ■



The youngest researchers during experiments in the ScienceLab. Photos: BIO-TE[A]CH, Lobeck



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„Regeneration and Repair“ – InnoTERE GmbH was established in Dresden in 2005. Our business strategy focuses on the development, production and marketing of innovative products for Tissue Engineering and Regeneration – in particular for bone tissue.

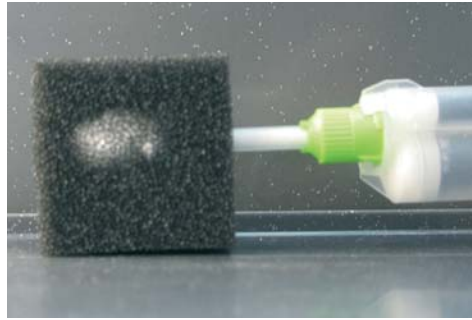


Fig.1: The new generation of our calcium phosphate and bioactive PMMA bone cements are mixed during the application process. A standardised model to demonstrate the injection of our bone cements into trabecular bone uses open-cell polymer sponges.

Repair and regeneration can be two sides of the same coin

New bone cements and bone implants for regenerative therapies

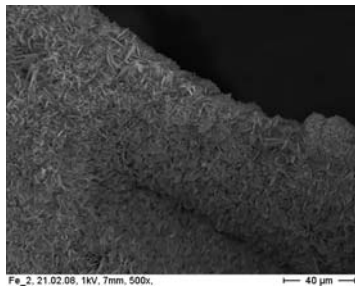


Fig.2: Complex structures of open cell metal foams can be homogenously coated with bioactive calcium phosphate phases using innovative technologies.

Our most important fields of activity are the development of innovative calcium phosphate and bioactive PMMA bone cements and intensive research on biologically activated and biodegradable metals and composite materials for the treatment of fractures and functional stabilisation of large bone defects.

These material innovations lead to new opportunities for minimal invasive therapy, for treatment of complex bone fractures – especially related to the increase of osteoporosis – and for the improved fixation of orthopaedic implants.

With support of the European Fund for Regional Development (EFRE) and in cooperation with Technische Universität Dresden we developed nano- and microstructured calcium phosphate cements for bone regeneration. Using specific nanostructuring we were able to create synthetic calcium phosphate minerals, which are comparable to biological bone minerals. Due to their large surface area, these nanostructured bone minerals can bind bone specific biomolecules, which stimulates bone cell adhesion and accelerates the remodelling of the implant material to natural bone. By simultaneous microstructuring of our calcium phosphate bone cements with pore sizes of 100 - 500 µm we could generate a pore system that allows the incorporation of blood vessels into the bone substitute material as an additional means to support implant integration and bone regeneration. The combination of both approaches leads to significant clinical advantages to repair large bone defects and to restore the full function and structure of damaged bones in less time.

In Spring 2008 InnoTERE was certified according to DIN EN ISO 13485. A manufacturing facility for bone substitute materials was set up, which provides the basis for commercialisation of the product lines.

Over the last 3 years the InnoTERE team has grown to 10 team members. Our technology innovations are protected by several patent applications and market leaders in the orthopaedic industry have already expressed their interest in InnoTERE technologies. We currently evaluate the potential for joint product developments and distribution.

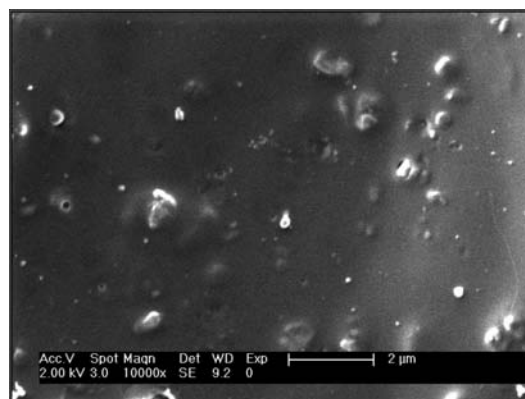


Fig. 3: Conventional PMMA bone cement sample after 7 days of incubation in simulated body fluid – no mineralization.

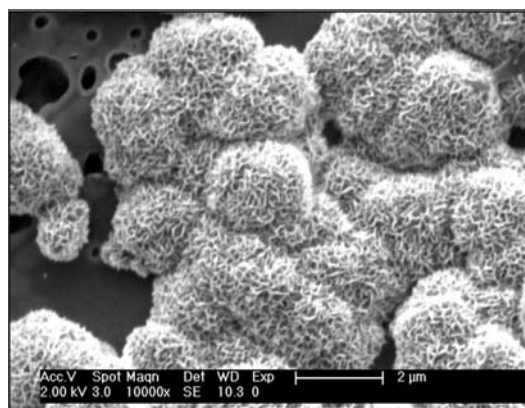


Fig. 4: Bioactive PMMA bone cement sample after 1 day of incubation in simulated body fluid. The mineral deposits are calcium phosphates with similar composition and structure to bone minerals.

Research and innovation are the keys to more growth and employment. In the age of globalisation, companies and research institutes must increasingly orient their activities towards an international market. Through the Seventh Framework Programme and the Competitiveness and Innovation Framework Programme, the European Union has created two important tools to accelerate the innovation process. By financing support networks, the EU is able to promote the transfer of technology and corporate initiatives in Europe, particularly for small and medium-sized enterprises.



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“One stop service” for small and medium-sized enterprises Enterprise Europe Network blazes a trail to Europe

The Competitiveness and Innovation Programme (CIP) is the EU's central framework programme which promotes innovation and competitiveness. In 2008, the European Commission created the Enterprise Europe Network as part of the CIP which unites under one roof the former “Euro Info Centres” (EU legal, funding and business networking services) and the “Innovation Relay Centres” (technology transfer). The new network includes around 600 partner organisations in 40 countries and more than 4,000 experts. The largest service network in the world offers information and support throughout the single European market and makes ideal cooperation opportunities available to businesses and research institutes across Europe. Its goal is to support mainly small and medium-sized enterprises (SMEs) in developing their innovation potential, raising company awareness about European Union politics, and the general funding of research, innovation, and knowledge and technology transfer within Europe.

BTI Technologieagentur Dresden GmbH is a member of the CIP Saxony pool of the Enterprise Europe Network, which represents the network in the Free State of Saxony. The network partners of the CIP Saxony offer companies in Saxony comprehensive services and know-how on the topic of Europe through work-sharing – all from one source. Thanks to co-financing by the Free State of Saxony, the services for the SMEs are normally free of charge.

Network partners in Saxony in addition to BTI GmbH are:

- AGIL GmbH Leipzig;
- TAC TechnologieAgentur Chemnitz GmbH;
- ETB-Eurotransfer- und Beratungsring Neisse e. V.;
- Southwest Saxony Chemnitz-Plauen-Zwickau Chamber of Commerce;
- Leipzig Chamber of Commerce;

- Dresden Chamber of Commerce;
- Leipzig Chamber of Trade;
- Dresden Chamber of Trade.

Our topics

Information on the single European market: The European Union, with its 27 countries and more than 490 million inhabitants, forms the largest common market in the world. This single European market offers SMEs excellent opportunities to become active transnationally, either through marketing their products, methods and know-how, business partnerships of all kinds, or by participating in public tenders.

Transnational partnerships: Transnational partnerships for businesses as well as research institutes are becoming evermore important against the backdrop of increasing economic globalisation.

(continued on page 22)



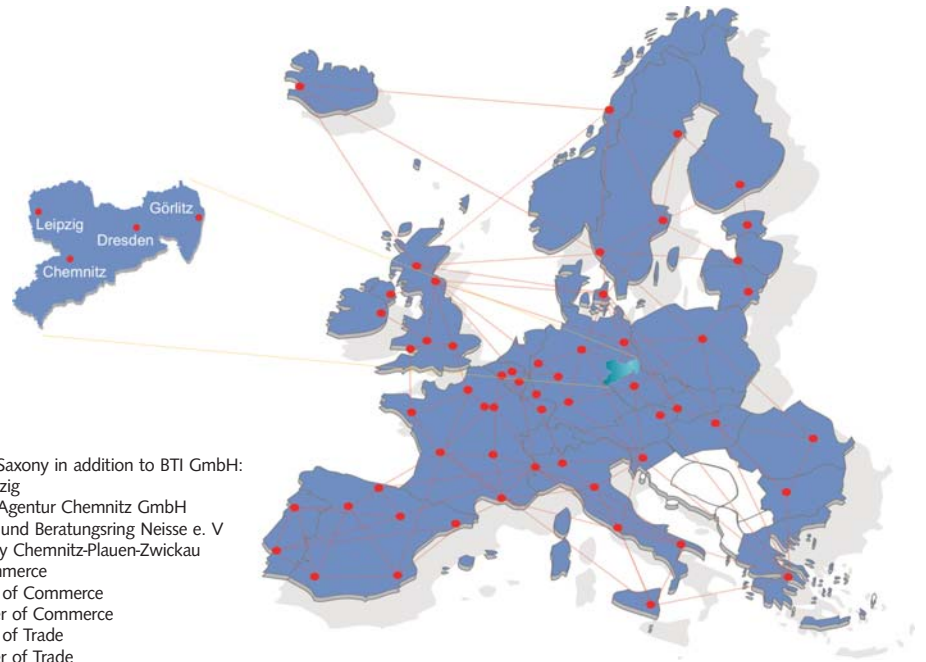
Wir stehen Unternehmen zur Seite



The Saxon network team (Photo: IHK Dresden)



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Wir stehen Unternehmen zur Seite

European research funding: Cooperation with European partners increases market opportunities and ensures a competitive edge. Participation in the EU's Seventh Research Framework Programme offers companies, institutes of higher learning and research institutes in Saxony access to European research excellence.

Feedback to the EU: The network is an important link between businesses and the Commission. The Commission is very much interested in receiving information about issues which arise through the application of European laws and directives. Various feedback channels are organised via the network.

Our services

We can offer you the following services in connection with other partners in Saxony:

- Distribution of technology offers and requests through the EEN network;
- Research into the technology profiles of potential partners;
- Targeted partner searches by topic, EEN partners from specific countries and/or industries;
- Contact to potentially interested parties;
- Screening of the dossiers of potential partners,
- Accompanying you to local contacts;
- Investigation of the general local conditions (legal regulations, EU directives, certification etc.);
- Offer of Europe-wide networking services, in particular, in the framework of international trade fairs and conferences;
- Organisation of topical entrepreneurial trips;
- Information and consultation on current requests for information as part of the Seventh EU Research Framework Programme;
- Involvement in the design of European politics by giving feedback on SME experiences.

The network's tools

Enterprise Europe Network maintains the largest European database of technology offers, technology requests and cooperation opportunities. The network's employees make use of their well-established knowledge about the industry and the region in their active search to bring together potential partners. Thus the potential for success is considerably higher in comparison with passive database retrieval.

The network organises technology transfer days throughout Europe. These often take place in connection with leading trade fairs of individual industries and fields of technology and offer the possibility to get in contact with potential cooperation partners.

Topical entrepreneurial trips present the know-how of a specific region and serve to initiate business contacts.

Topical work groups serve to focus the collaboration. BTI GmbH is a member of the "Intelligent Energy" (54 members from 19 countries) and "Nano and Microtechnology" work groups.

Practical examples

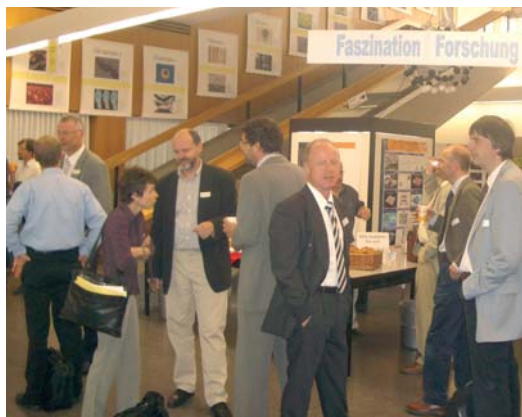
Two-day entrepreneurial trip to Switzerland with technology transfer day in June 2008

In June 2008, representatives from 13 companies and research institutes in Saxony and Thuringia took part in a two-day entrepreneurial trip to Switzerland, organised by the Swiss Embassy and Schweizerisch-Deutscher Wirtschaftsclub e.V. (SMWA).

All of the participants came from the field of nanotechnology and closely related fields. They visited the Nanoscience Institute at the University of Basel (one of the National Centres of Competence in



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Brokerage-Event at the ILA on 28. May 2008
(Participation of 3 Saxon representatives)
Photo: Berlin Partner GmbH



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Impressions from the company mission to Switzerland in June 2008
Photo: BTI GmbH

Research - NCCR), the Swiss Centre for Electronics and Microtechnology (CSEM), Neuchatel, as well as the companies Nanosurf AG in Liestal and PLATIT AG Advanced Coating Systems in Grenchen.

Representatives of the visited institutes, as well as 11 other institutions with similar interests to those of the trip participants met with the participants at the end of the visit as part of a brokerage event (technology transfer). On the back of a catalogue of 37 concrete technology offers and requests from all participants, there were 31 previously arranged face-to-face talks during the event between participants from Saxony and their Swiss partners. Of these, 17 led to profound interest and 13 to lasting contacts.

Enterprise Europe Network partners from Switzerland (Euresearch and EPFL-Alliance), Saxony (BTI GmbH Dresden) and Thuringia (STIFT Erfurt), who had organised this event, continue to follow and promote the development of these contacts.

Successful technology transfer project makes gardens bloom

The initiation and implementation of technology transfer projects often require stamina. Hence this example stems from the previous IRC network.

Humko, one of the leading companies for the production of substrates and fertilisers in Slovenia, was looking for an environmentally friendly and economical alternative to peat. Peat is an ideal material for growing plants, however, continuously increasing costs and delivery bottlenecks prompted the company to look for an innovative idea. Humko by no means wanted to reinvent the wheel. They were looking for a new idea for an "old" product. Humko discovered this idea with the help of IRC Slovenia. Our network partners from Slovenia published

a bi-weekly newsletter with technology offers and requests in the fields of energy, agriculture and environment as a summary of the technology database. An evaluation of the available information and the submission of a letter of interest brought the IRC partner in Saxony into play. Marghitta Wieloch, who is again active as an EU consultant in Chemnitz as part of the new network, contacted the company LEHMANN Maschinenbau GmbH. This company has process and technology know-how in the area of bio extrusion.

The IRCs in Slovenia and Saxony assisted both of the companies in formulating the project tasks. In addition to the regular exchange of information, translation was also one of the services offered. LEHMANN Maschinenbau GmbH not only sold a machine, it also developed a new application for its own process. Humko was able to improve its competitiveness, as it was the only supplier of a peat-free product in Slovenia.

The application of the European network's unique tools and the wealth of knowledge of its employees in the management of technology transfer projects are the basis of success. ■



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Bio-extruder – optimal pulping ensures high output of biogas
Photo: LEHMANN Maschinenbau GmbH

