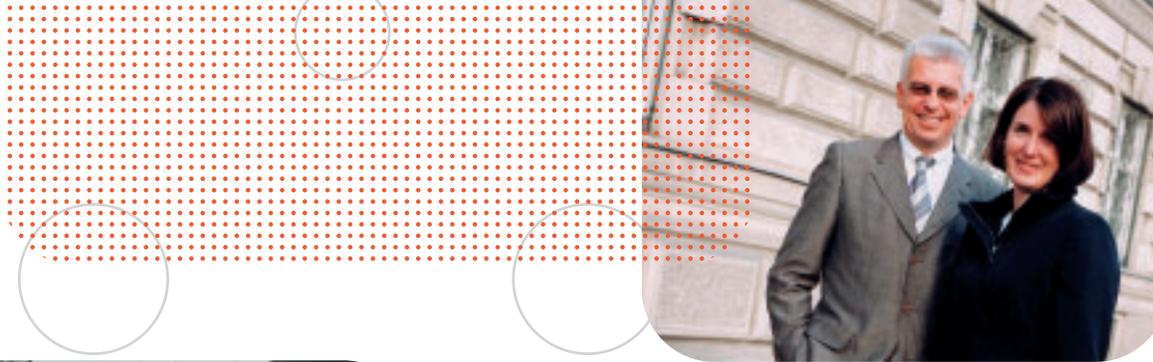




# FFG SuccessStories



The "House of Research" in the 9<sup>th</sup> district of Vienna:  
The new location of the FFG

## Foreword

*This Booklet presents a cross-section of projects supported and funded by the Austrian Research Promotion Agency (FFG). Although it shows only a small selection, it demonstrates vividly Austria's exceptional innovative strength in industry and science.*

*Projects from various fields and industries are introduced, which range from product developments that have already proved their worth on the market to feasibility studies and international networks. These also include numerous products and processes that enhance security, comfort, health and environmental protection in everyday life.*

*The Booklet is an important extension of the FFG's annual report, as it illustrates clearly otherwise abstract figures. It indicates where the funds entrusted to the FFG are allocated, i.e. towards the efficient promotion of domestic research and technological development in order to strengthen the competitiveness of the Austrian economy.*

*The selection of the published projects is subjective and does not represent any valuation. We endeavoured to illuminate successful project examples from a very wide spectrum of more than 30 programmes funded by the FFG. Therefore, the Booklet also provides a "stock-taking" of two years of unified FFG activities, and can perhaps increase the impetus for more innovative initiatives. In any case, the FFG will be on hand to assist as a competent and strong partner.*

Dr. Henrietta Egerth  
Geschäftsführerin FFG

Dr. Klaus Pseiner  
Geschäftsführer FFG

## Introduction

FFG SuccessStories provides detailed insight into selected Austrian best practice examples from the FFG's funding programmes. On the following 52 pages, this new brochure showcases 52 exemplary Austrian projects, which mirror all facets of Austria's innovative power.

### General Programmes

In its General Programmes, the FFG's research funding is subject to a successful application. It serves as the foundation of modern technology policy and assists companies to advance their technological base.

FFG SuccessStories presents 26 up-to-date examples, ranging from a boxhole drilling system to wood plastic composites.

### Structural Programmes

The Structural Programmes of the FFG help optimise the basic conditions of research and innovation in Austria, thereby mitigating specific structural deficits. Most notably, it supports efficient networking of players within the innovation system and strengthens cooperation between science and industry.

FFG SuccessStories highlights 7 exceptional projects, including the use of bee poison against cancer and a virtual guide dog.

### Thematic Programmes

With its Thematic Programmes, the FFG sets specific thematic priorities for funding, thereby promoting research activities focusing on future issues. These Programmes aim to achieve a critical mass in strategically significant research activities for technological development.

FFG SuccessStories introduces 6 successful joint projects. Five of them derive from the Austrian NANO Initiative, ranging from ISOTEC and NaDiNe to a project dealing with enhanced rail traffic safety.

### European and International Programmes

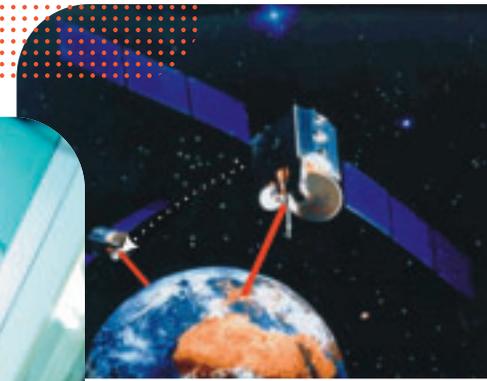
The European and International Programmes of the FFG specialise in consultation services encouraging Austrian businesses and institutions in their participation in international research and technology programmes.

FFG SuccessStories demonstrates 6 top innovations from the EU's 6th Research Framework Programme, ranging from a global early warning system for climatic change to innovative noise barriers.

### Aeronautics and Space Agency

The Aeronautics and Space Agency is the FFG's flagship representing Austria's interests in international bodies and participating in European networks. It is the key contact partner for coordinating all aerospace related activities in Austria and the main link to the international aerospace community.

FFG SuccessStories has chosen 7 exceptional examples, from the digital co-pilot RONCALLI to quantum communication in outer space.



## Alcatel Austria AG Enhancing Rail Traffic Safety

*In the future, automated measurement stations, so called “checkpoints”, positioned along railway lines will monitor the technical condition of passing trains. This is expected to enhance the safety of train traffic and reduce maintenance and potential accident costs.*



Rail traffic accidents are very rare. Nevertheless, technical problems can arise, such as hot brakes, defective wheels or a shift of cargo, which can cause dangerous situations. In order to be able to recognise such defects at an early stage and react to them in good time, a system for automatic train inspection has been devised and tested in the framework of a joint project of Alcatel Austria AG, ÖBB Infrastruktur Betrieb AG, and two institutes of the Vienna University of Technology. The inspection facilities, called “checkpoints”, will ensure higher safety in rail traffic, cost-savings in train inspection procedures, and lower consequential costs in the event of an accident.

### Train Inspection Sensors

The checking of a passing train has been the responsibility of train station inspectors. The purpose of this inspection is to recognise potential risk factors at an early stage. For economical reasons, this staff-intensive inspection task will be replaced by a network of checkpoints. Such a network allows for the recognition of defects in a standardised way on a high technical level, the automatic processing of the collected data and the forwarding of them to the respective decision-making unit.

### Automatic Reaction

A complete checkpoint requires several sensor systems. Hot box detectors are used for recognising problems with brakes and wheel bearings. Dynamic scales calculate wheel and axle weights, the data of which provide information on



Test train passing the train gauge monitoring system of the Checkpoint



possible unbalanced or uneven loading. Dynamic scales can also give information on vehicle problems at the contact point of wheels and rails, such as flat wheels. Loading gauge violations can be detected by means of optical sensors. Infrared sensors are employed for fire detection. Derailed axles can be discovered via derauling detectors. As soon as a value exceeds its threshold, the information is automatically and, if urgent, immediately transmitted to the service centre, depicted visually to the train station inspector, or transferred to the safety system.

the visual inspections are replaced, must be equipped with a technical equivalent, and secondly, track sections with a higher risk potential, such as bridges and tunnels, must also be secured with checkpoints. By weighting the costs against the benefits, the position and equipment of the checkpoints can be optimised, thereby reducing their quantity to a reasonable volume. Since autumn 2004, a prototype of a checkpoint has been tested on the Eastern railway section, between Vienna and Bruck an der Leitha, to the full satisfaction of the project members.

### Successful Testing at the Austrian Eastern Railway Section

For the positioning of the checkpoints within the Austrian railway network two considerations must be taken into account. Firstly, the train stations, where



The project was supported within the FFG's Thematic Programmes.

Information:  
Alcatel Austria AG  
Scheydgasse 41  
A-1210 Wien  
Phone: +43-1-27722-5368  
Fax: +43-1-27722-1173  
E-mail: Roland.Stadlbauer@alcatel.at  
Website: www.alcatel.at



Checkpoint system tests with an especially test train at the Checkpoint prototype on the Vienna – Budapest line near Himberg

## alpS – Zentrum für Naturgefahren Management GmbH Rapid Help for Avalanche Victims

*In Austria 148 avalanche accidents with a total of 353 people involved were recorded in the winter of 2004/05. Researchers from the “Zentrum für Naturgefahren Management” alpS (Centre for Natural Hazard Management) now seek to improve the method of pinpointing buried individuals by means of radar technology.*



Search at a suspected location identified by radar (fine probing)

The quick discovery of buried victims after an avalanche significantly raises their chance of survival. However, this might prove difficult and time-consuming especially if victims are not wearing an avalanche victim search device. The avalanche victim search instruments that are currently used either depend on the ability of the user to activate them or on a sufficiently manned search party. This situation is aggravated by the fact that the rescue team usually has to remain in the immediate danger zone for an extended period of time. The duration of a search can take from several hours to several days. The cost of an organised search operation can reach 100,000 Euros per mission.

### Radar Technology as a Life Saver

At present, the Competence Centre alpS is undertaking a planned two and a half year research project, which it is realising in cooperation with the company “Wintertechnik Engineering” located in Pottendorf/Lower Austria and scientists from the Leopold Franzens University of Innsbruck. The project’s overall aim is to devise an instrument capable of detecting avalanche victims with a high degree of accuracy within a very short time, which would increase the rate of people unburied alive. The researchers centred the project’s focus on radar technology, as people and objects buried in snow reflect radar signals in different ways. The research activities revolve around the optimisation of intelligent image recognition and the development of a software for automatically analysing radar data. Eventually, this innovative technology is intended to be made available to a wide user base.

### Basic Research in Physical Snow Properties

In addition, computer simulations are performed to examine the accuracy between the actual place of detection of an avalanche victim and the suspected

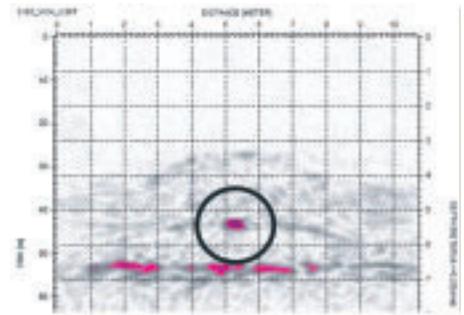
Attaching the radar device on the helicopter



Practical outdoor research mission



location determined by radar. Supplementary basic research into how the physical properties of snow, i.e. snow cover, affects and influences the radar results is also undertaken. Research partners in this project are the Institute of Computer Science and the Institute of Infrastructure, Unit of Geotechnical and Tunnel Engineering, of the Leopold Franzens University of Innsbruck. Further partners are the Swiss Federal Institute for Snow and Avalanche Research Davos, the engineering firm Detlef Bardenz (Bochum), Alpine Safety & Information Center ASI Tirol, and the Österreichische Bergrettungsdienst (Austrian Alpine Rescue Service) of Tyrol.



Detection of the hyperbola in the extracted snow layer

### Comparative Evaluation for Maximum Safety

At the end of the project, the new system will be compared with the avalanche victim detection systems currently in use by means of a practical test. alpS expects this project to yield a reliable measurement and detection system, which ensures quick retrieval of avalanche victims as well as a decrease in the average duration and cost of an organised search mission. If the project proves to be successful, the researchers will extend the radar data by the use of 3D visualisation.

The project was supported within the FFG’s Structural Programmes.



Information:  
alpS – Zentrum für Naturgefahren Management GmbH  
Grabenweg 3  
A-6020 Innsbruck

DI Christian Trojer, Project Supervisor  
Phone: +43-512-39 29 29-26  
Fax: +43-512-39 29 29-39  
E-mail: trojer@alps-gmbh.com  
Website: www.alps-gmbh.com

## Austrian Aerospace GmbH Electronic Core for Galileo Satellite Navigation

*By the end of 2008, the first four operational Galileo satellites are planned to be sent into orbit on top of a Soyuz rocket. Austrian Aerospace develops and supplies the core electronics module for the Navigation Signal Generator Units (NSGU), the interface electronics for the On-Board Computer, thermal insulation, as well as other essential ground support and test equipment.*

Supplementing the existing US American navigation system GPS, Galileo will be used independently for navigational and positioning purposes in European water, air, rail and road traffic in particular. In the medium term, 30 satellites are planned for launch, providing positioning precision within 5 metres. The satellites will orbit the Earth in an average altitude of 23,000 km. By order of the European Space Agency (ESA), the Austrian space technology specialist Austrian Aerospace (AAE) devised the know-how for the core modules of the satellites' innovative NSGUs. These Units are responsible for the transmission of navigation signals, the key task of the satellites. They will be tested onboard the experimental satellite GIOVE-B, which will be launched later this year. It also serves as the basis for the simultaneous development of a

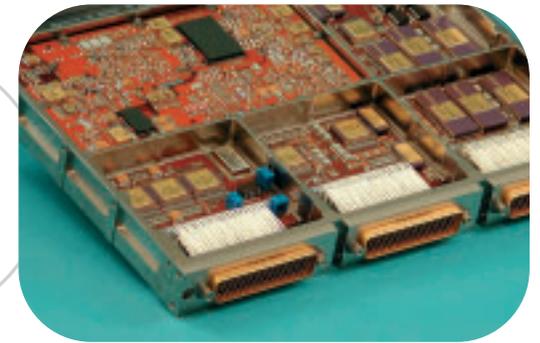


Model presentation of a Galileo satellite by Astrium

signal generator, which has just been started and will last during the project's test phase of several years.

### From Central Computer to Thermal Insulation

The Interface Unit is another high-quality component, Austrian Aerospace has developed and supplied for the new generation of satellites. As such, the company has contributed significantly to the development of the Galileo satellites' central computer, which controls and monitors the entire data communication



The Navigation Signal Generation Unit (left) and interface module of a central satellite computer (right)

between the instruments onboard the satellites. Also the required thermal insulation against the extreme temperatures in outer space is produced at a new AAE production site. AAE's contracts are worth a total of 8 million Euros for the Galileo test phase – including the mechanical ground support equipment for the assembly and transport of the satellites – providing a favourable basis for the future. Meanwhile another 26 satellites of the Galileo system wait to be supplied with Austrian high-tech equipment.



### Internationally Acclaimed Space Technology

Austrian Aerospace GmbH is the largest Austrian space technology company. It has won an excellent worldwide reputation by equipping satellites with electronics, mechanics and thermal hardware. Its current product portfolio focuses on digital signal processing, mechanics and thermal insulation. Austrian Aerospace is a member of the Saab Ericsson Space Group and employs a staff of 120. In 2005, its turnover equalled 19.1 million Euros.



The project was supported within the Aeronautics and Space Agency of the FFG.

Contact:  
Dr. Max Kowatsch  
**Austrian Aerospace GmbH**  
Stachegasse 16  
A-1120 Wien  
Phone: +43-1-801 99-0  
Fax: +43-1-801 99-6950  
E-mail: max.kowatsch@space.at  
Website: www.space.at

## Bartenbach LichtLabor GmbH

### Letting the Sun Shine in Rattenberg

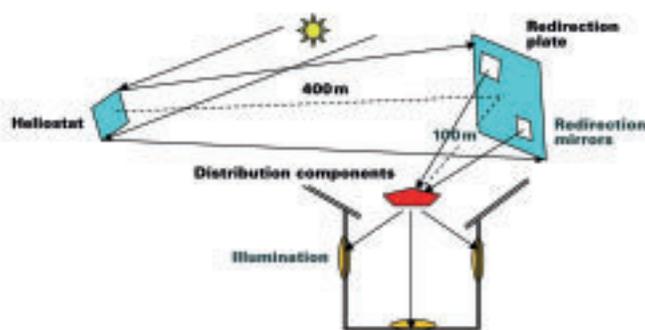
*The one thousand year old town of Rattenberg in Tyrol harbours a “dark secret”. Every year, from November until mid February, the town’s inhabitants cannot see the sun. During these cold winter months, the Stadtberg mountain, located south of the town, casts its shadow upon it. Now, Bartenbach Lichtlabor, headquartered in Aldrans, near Innsbruck, has developed a solution for letting the sun into Rattenberg.*

The solution consists of three key parts: heliostats that track the sun’s position, a redirection plate, and distribution components. The heliostats are placed north of Rattenberg at a distance of approximately 400 meters. From that location, the sun’s radiation, which is abundant there, is collected by the heliostats and redirected accurately towards the secondary reflectors. The reflectors are movable on two axes, and, controlled by a computer, adjust fully automatically to the respective position of the sun. The

redirection plate is mounted on the Stadtberg above Rattenberg, and from precisely calculated and shaped redirection mirrors, the sunlight is finally projected onto various locations in the town.

#### Glitter and Glare

These distribution components make sure that the town enjoys the same sunlight effects that are common in nature,



With heliostats, high-precision mirrors and automatic control, nature is helped along a bit



Reflections and glitter are supposed to create a natural effect

such as high intensities of brilliant light, rich light/shade contrasts, spectral colour dispersions, and glitter effects. Even though this solution does not illuminate the entire town, its inhabitants and visitors can experience the sun’s light and subsequently the psychological lift, and revel in the knowledge that Rattenberg gets some sunshine when the sun is out. Unfortunately, as sunlight is not emanated perfectly parallel (angle approx.  $0.5^\circ$ ) and the redirection mirrors naturally possess some unevenness, a major part of the light’s intensity gets lost at each reflection, and so the characteristic properties of sunlight disappear after several reflections.

#### Need of High Precision

In order to recover the intensities that are required for the feeling of sunlight in Rattenberg, two essential factors must be taken into account. First, the geometrical tolerances (unevenness) of the

mirrors and the tracking precision of the heliostats must be improved by a factor of ten. Secondly, special devices, so called concentrators, must be developed to focus the dispersed light. In early 2005, Bartenbach LichtLabor began the detail development of this project on the basis of a feasibility study. However, in view of the complexity of the challenge – extensive insolation of shadowy areas in an urban environment – a longer planning period and multi-level development process are required, before the idea can become a reality.

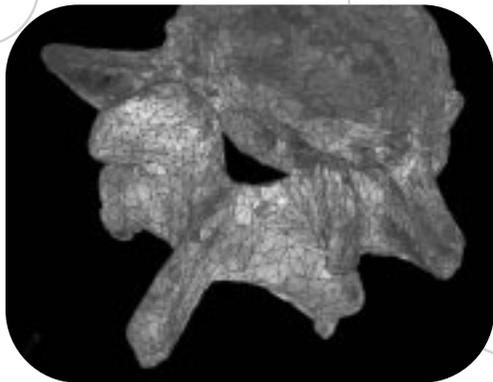
## Bartenbach LichtLabor

The project was supported within the FFG’s European and International Programmes.

Information:  
**Bartenbach LichtLabor GmbH**  
 Rinner Strasse 14  
 A-6071 Aldrans/Innsbruck  
 Phone: +43-512-3338  
 Fax: +43-512-3338-88  
 E-mail: [info@bartenbach.com](mailto:info@bartenbach.com)  
 Website: [www.bartenbach.com](http://www.bartenbach.com)

## CAE Simulation & Solutions GmbH Realistic Bone Modelling for Implant developments

The Viennese company CAE Simulation & Solutions enables the increasingly efficient development of implants by taking into account, in its simulation models, the detailed mechanical material properties of human bones.



Vertebral body L4

The Viennese company CAE Simulation & Solutions enables the increasingly efficient development of implants by taking into account, in its simulation models, the detailed mechanical material properties of human bones. Simulation has become an indispensable, universal tool in modern product development. Biomechanics, and implant development in particular, is among the manifold fields where simulation methods are applied. Simulation primarily answers mechanical questions regarding the strength of implants, the implant design and the load bearing capacity of bones. In 2004, with the support of the FFG (Austrian Research Promotion Agency), CAE Simulation & Solutions initiated an innovative

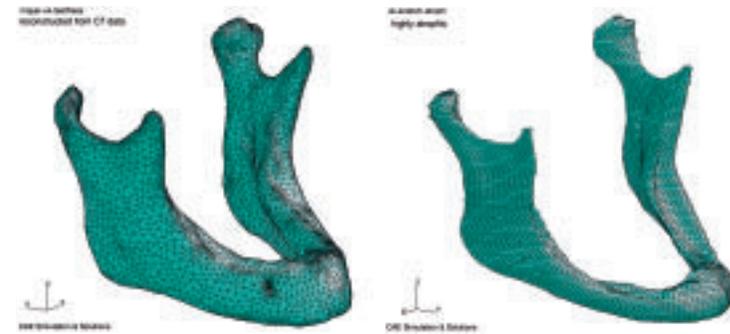
research project titled “Realistic Bone Modelling for Implant Development”.

### Superior Implants Last Longer

Bone fractures, osteoporosis, implant lifespan and implant fractures are issues that are of vital interest in orthopaedics, accident surgery and many other medical fields. Forecasting bone fracture risks and developing superior implants require not only profound knowledge of the biological, but also of the mechanical properties of bones. On the basis of CT data and micro-CT data, CAE's project collects the mechanical properties, and in particular direction dependent material properties, of human bones more precisely than before. This will allow even more efficient and accurate implant development in the future, thereby decisively prolongating the implants' durability.

### Mandible and Spinal Column as Examples

The various mandibular implantation methods in different stages of atrophy pose a major biomechanical challenge. In such cases, the simulation method is



Healthy adult mandible (left) and highly atrophic mandible (right)

able to answer questions about the implant position within the mandible, the layout of reconstruction plates in fractures or the design of fracture plates using biodegradable materials. Spinal surgery is another main area for orthopaedists and surgeons. In the case of vertebra fractures due to osteoporosis or other diseases, simulation models and patient specific bone parameters based on CT data can answer the following questions precisely:

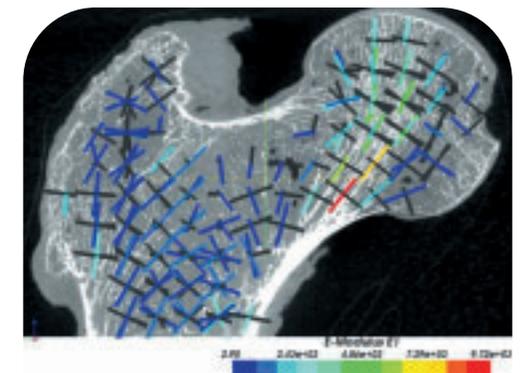
- What load is a vertebra still able to carry?
- What effect does the stiffening of two vertebrae have on one another?
- Are the titanium screws currently in use too large, causing bone absorption?

### Broad Customer Base

CAE Simulation & Solutions was founded as an engineering company in Vienna, in 2000. Apart from biomechanics, the

simulation specialists' customers also come from the fields of mechanical engineering, automotive engineering, metal forming, materials sciences and the sports products industry. At the centre of the company's activities are analytical component design, FEM and CFD calculation, as well as the simulation of complex, thermo-mechanical problems, such as the quenching of cylinder heads.

Examination of the elasticity properties and possible forces in the femur (Femur ILSB Orthotropy)



The project was supported within the FFG's General Programmes.



Information:  
**CAE Simulation & Solutions**  
Maschinenbau Ingenieurdienstleistungen GmbH  
Pitkagasse 2/1/16  
A-1210 Wien  
Phone: +43-1-974-89-91-0  
Fax: +43-1-974-89-91-99  
E-mail: office@cae-sim-sol.at  
Website: www.cae-sim-sol.at

## CALMA-TEC Lärmschutzsysteme GmbH Innovative Noise Barrier Provides “Friendly Noise”

*By means of innovative noise barriers, unpleasant noise spectrums can be transformed into “pleasant” noise, while at the same time significantly enhancing shielding performance.*



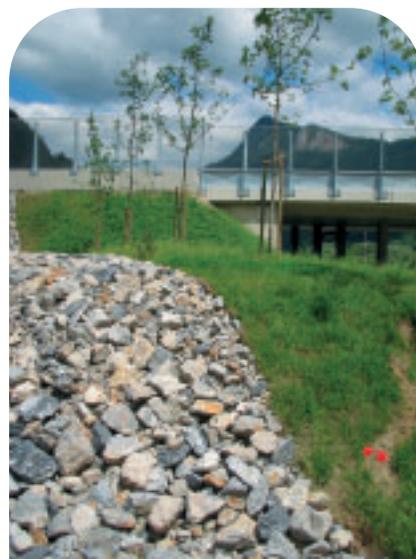
Contemporary noise barrier integrated into a design concept for the S35 motorway at Traföb/Styria

Noise is one of the most wide-spread hazards for human health, as it can cause depression and physical exhaustion. It is an environmental burden that affects an increasing portion of people living in Europe. Improved noise protection is, therefore, a continuously growing challenge in urban planning and street construction, both in the countryside and in densely populated areas.

The project “Calm Tracks & Routes” aims to abate disturbing traffic noise by means of innovative noise barriers and transform unpleasant sound into “pleasant” noise (good vibrations). Its targets are to foster the well-being and acceptance of traffic noise by the affected people, and to achieve a significantly improved shielding performance, acoustic quality and psycho-acoustic performance, combined with an innovative noise barrier design in terms of shape, material and presentation.

### New Materials, Shapes and Surfaces

In order to reach the aforementioned targets, the project focuses on the development of shape, construction and materials that improve the shielding effect of noise barriers. For this purpose, the acoustic properties of noise barriers, and also those inherent inside the barriers, are explored in theoretical and



Almost invisible, transparent noise barrier with landscape design at the S 35 motorway at Traföb/Styria



Barrier offering an unhampered view from the train window and providing the same noise abatement effect as a traditional noise barrier wall (4 m in height), Brannenburg/Bavaria

practical applications. Furthermore, the noise abatement performance of different shape, material and size is investigated regarding absorption and/or modulation of the sound through interference. Moreover, the project partners also examine new materials and surfaces regarding their noise-absorptive or interference behaviour with the purpose of developing new, non-fibrous absorber materials and verifying their noise abatement efficiency. This also involves the use of nanotechnology. As these new noise absorber materials are not respirable, their utilisation is preferred for health reasons.

### Design and Durability are Key

The visual aspect of noise barriers is also of major importance. They should be attractive in design, allow discrete

integration into the landscape, while granting a largely unobstructed view of the surroundings. Top priority is also given to the high durability of noise barriers, including long product life, weathering and shock resistance, and crash performance.

### Competent Partners from all across Europe

The project, which runs from April 2005 to April 2007, is funded within the framework of CRAFT (providing technological assistance for SMEs) of the 6th Research Framework Programme of the EU. Contributors to the project are ten organisations from Austria, Belgium, Germany, Finland, Sweden and Spain, coordinated by CALMA-TEC Lärmschutzsysteme in Mödling, near Vienna.

 **CALMA-TEC**  
**LÄRMSPÖILER®**  
INTERNATIONAL PATENTIERT

The project was supported within the FFG's European and International Programmes.

Information:  
**CALMA-TEC Lärmschutzsysteme GmbH**  
Ursula Brunbauer  
Bahnstraße 4/3/311  
A-2340 Mödling  
Phone: +43-2236-864100  
Fax: +43-2236-864100-25  
E-mail: ursula.brunbauer@calma-tec.com  
Websites: www.calma-tec.com, www.calmtracks.com

## Drexel und Weiss GmbH aerosmart XLS – Compact Passive House Technology for Highly Efficient Building Construction

With its “aerosmart XLS” the Vorarlberg-based company Drexel und Weiss has set new standards for innovative domestic engineering systems, opening up new possibilities for efficient energy use in low-energy houses.

In view of rising oil prices and the need for climate protection, passive and low-energy houses have been of growing interest in residential building construction. With its aerosmart product group, Drexel und Weiss has successfully delivered a complete heating, ventilation, and hot water supply system for passive houses. The system’s heat recuperation through its automatic ventilation is so efficient it supplies a passive house with fresh, filtered and pre-heated air on sunny winter days. For heating, the latent heat, still present after heat recovery, is extracted from used air by means of a mini heat pump; fresh air used for heating is after-heated. With its aerosmart XLS, Drexel und Weiss responded to the changing market requirements of higher heating performance at equal air quantities, by presenting an absolute world first for use in low energy houses.

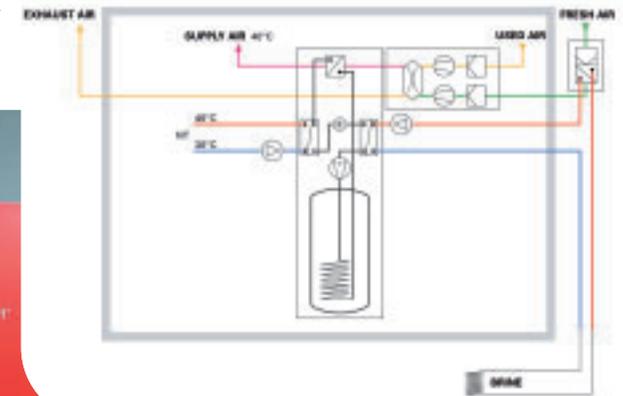
### Thermal Performance Doubled

The patented aerosmart XLS combines the technological advantages of a compact unit for use in passive houses with the high efficiency of a ground-coupled heat pump. Contrary to conventional systems, aerosmart XLS does not only process the limited energy content of used air, but includes an underground brine circulation system. Depending on the type of application and individual usage, this delivers a thermal performance of 2.5 to 3 kW, which is equivalent to an increase of 50 to 100 percent compared with previous methods. The brine circulation system can also be



Fully installed aerosmart XLS

Schematic diagram of aerosmart xls



utilised for pre-heating and pre-cooling the outdoor air. In summer, the soil delivers cooling for the building, while in the meantime being regenerated for the heating season. “With this new product, it is easy to cater to individual architectural wishes and to create higher room temperatures, above 22 degrees”, explained Managing Director Ing. Christof Drexel.

### Pioneers on the Passive and Low-Energy House Market

The company Drexel und Weiss – Energieeffiziente Haustechniksysteme GmbH, situated in Vorarlberg, develops, manufactures, and markets innovative domestic engineering systems for the passive and low-energy house market. As early as 1997, Ing. Christof Drexel, Managing Director of the 2000-founded

company, developed the world’s first, marketable compact heating, ventilation and hot water supply unit for passive houses that is suitable for single-family homes as well as multi-storey buildings. In 2005, the company’s 18 employees achieved a turnover of 3.3 million Euros. Apart from the domestic engineering product “aerosmart”, another distinguished product in the company’s portfolio is the automatic ventilation system “aerosilent”. In 2005, the German branch Drexel und Weiss Deutschland was founded. The export share for 2006 is hoped to reach 40 percent.



The project was supported within the FFG’s General Programmes.

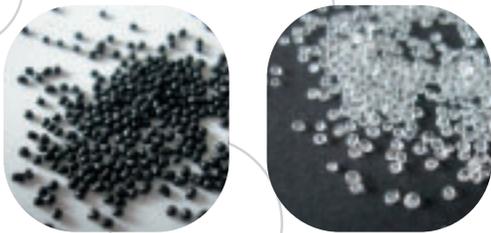


Information:  
**Drexel und Weiss**  
**Energieeffiziente Haustechniksysteme GmbH**  
Achstraße 42  
A-6960 Wolfurt  
Phone: +43-5574-47895  
Fax: +43-5574-47895-4  
E-mail: office@drexel-weiss.at  
Website: www.drexel-weiss.at



## ECON GmbH Innovative Material for Highly Wear-Resistant Pelletising Die Plates

*With its novel, highly wear-resistant material CECONID® for pelletising die plates, the Upper Austrian plastics machine specialist ECON, situated in Pasching, has opened up new opportunities in the manufacturing of plastic pellets.*



The quality of pelletising die plates and pelletising knives is a crucial factor in the success of the production of plastic pellets that meet customer specifications. By developing a material called CECONID®, ECON has realised a significant improvement in the tools used for underwater pelletising. In combination with the thermal separation technique, CECONID® has made it possible to process almost any type of plastic material, notably low-viscosity materials and micro pellets.

### Extremely Hard and Wear-Resistant

CECONID® has a better wear behaviour than hard metal. The wearing layer is composed of resin and matrix materials, has a thickness of only a few tenths of a

millimetre, and is affixed to a carrier material with uniform application of energy. The wearing layer was developed in cooperation with an Austrian research institute and tested on a wear test stand purposely built. Even after weeks of testing, the CECONID® wearing layer did not show any signs of wear at the die plate, and the pelletising knives reached optimum service life.

### New Dimension in Pelletising

Next, a wear-optimised material match was to be found from the extensive variety of possible plate and pelletising knife materials. The pelletising knives run on the die plate during the pelletising process, and cut the plastic material extruded from the die plate. In order to obtain an exact cut and subsequently



Knife head with pelletizing knives



Complete system underwater pelletizing unit EUP



Support body with CECONID® die face plate

CECONID® die plate enables the pelletising of materials, for which no satisfactory processing possibilities have existed to date due to e.g. high abrasiveness.

top-class pellet quality, minor re-grinding of the pelletising knives at the die plate is necessary. Another decisive factor was the plastic material to be processed: The excellent wear properties when processing abrasive plastics (e.g. filled with glass fibre or mineral fillers) were also proved in successful field tests. Using the CECONID® die plate increases the customer's equipment availability, and hence productivity. Costs of production downtimes and expenses for required alterations are minimised. Together with other ECON technologies, the

### From Construction to Production

ECON with its headquarters in Pasching, near Linz, was founded in 1999. The successes of the company are based on the development, assembly and worldwide marketing of innovative solutions for the construction of machines and plants for the plastic industry. As a construction and production company for discontinuous and continuous screen changers, underwater pelletising and pyrolysis furnaces, ECON is an internationally acclaimed special supplier.



The project was supported within the FFG's General Programmes.

Information:  
**ECON GmbH**  
Wagram 1  
A-4061 Pasching  
Phone: +43-7229-87680-0  
Fax: +43-7229-87680-10  
E-mail: office@econ.co.at  
Website: www.econ.co.at

## ekey biometric systems GmbH Fingerprints for Maximum Security

The Linz-based company ekey® allows entry through its gates only after its personalised access system has verified the biometrical data of a person's fingerprint. If the user data matches the stored finger scan, the person is authorised access.



At first the fingerprint, then the finger minutia identification and finally a unique finger code

Biometrical access control systems enjoy increasing popularity in private homes and businesses. With its innovative products the company ekey biometric systems offers a comfortable and secure alternative to keys, passwords and access codes. And this is how it works: The finger is drawn across a scanner, where its biometrical data is compared to stored data. This ensures that the house, garage, PC or other secured equipment can only be accessed by authorised persons. The solutions developed and marketed by ekey® comprise software, hardware and services.

### Every Fingerprint is Unique

Access control systems are based on biometrics, i.e. biological characteristics such as fingerprints. ekey® TOCAhome is an inexpensive stand-alone access system for up to 99 users for private households or small businesses. Rounding off the portfolio of building access systems, ekey® TOCANet administers

effortlessly a virtually unlimited number of users (depending of the terminal type), terminals, and time windows.

### Aiming at Maximum Data Protection

Data protection is of the highest priority to ekey biometric systems. Therefore, data from other systems cannot be imported into ekey® products. Similarly, also the biometrical data of ekey® solutions cannot be exported into other systems. In order to prevent internal abuse, ekey® TOCANet is equipped with a so called "Works Council Function", which ensures that important data can only be viewed in the presence of the company's works council when the system is active.

### Minimal Storage Space – Double Security

Storing data for 200 fingerprints on ten terminals requires less than 500 kilo-



ekey® finger scan:  
also ideal for outdoor use



Your finger is the key: comfortable opening of doors in every-day situations

bytes of storage space. Moreover, ekey® has implemented a dual security feature for fingerprint recording. Firstly, fingerprint recording is effected thermally, measuring the temperature differences between a finger's furrows and ridges. These special marks, called minutiae points, are stored as a biometric key, which cannot be converted back into the finger's image. Secondly, line sensors require the finger to be drawn over the reading unit instead of only being placed upon it. The ensuing code also eliminates the possibility of calculating the fingerprint that it is based upon.

### Growing Market Share

Within no time, ekey® has advanced to market leader in the area of finger scanners in Austria and Europe, and is, due to its continuously growing market share, among the world's leading suppliers. Since 2004, the company, which employs a staff of 40, has also run a sales office in Germany, and since 2006, in Liechtenstein/Switzerland. Last year, its turnover increased by more than 100 percent. Its export share is currently at approximately 80 percent of its production.



The project was supported within the FFG's General Programmes.

Information:  
ekey biometric systems GmbH  
Lunzerstrasse 64  
A-4030 Linz  
Phone: +43-70-6910-9669  
Fax: +43-70-6980-3562  
E-mail: office@ekey.net  
Website: www.ekey.net

## EnergyCabin Produktions- und Vertriebsges.mbH Hot Water from a Container

*A revolutionary concept for hot water generation and heating has been developed by a consortium of small and medium-sized enterprises with the support of the Austrian Research Promotion Agency FFG. The resulting system called "EnergyCabin" cuts heating costs by up to 50 percent.*

Fossil fuels are becoming increasingly scarce and expensive across the world. This tendency will continue in the coming years for obvious reasons, such as the political situation in the Near East and growing demand owed to economic growth in China, and Asia as a whole. However, already alternatives are available, which include Austrian products, such as biomass firing, large solar-thermal plants, and solar cooling plants, as well as services, like analysis and optimisation tools, and economising and plant contracting. These offer an ideal escape from the energy crisis by boosting the efficiency of energy utilisation and the use of renewable energy sources.

### Complete Package in Five Standard Sizes

In the framework of a two-year project and under the supervision of the Graz-based company CONNESS, the consortium developed an entirely new system for heating and hot water supply, made it ready for series production and launched it successfully on the market. The "EnergyCabin" is a compact, portable, container-shaped system, which can be connected on delivery and fully replaces traditional heating systems. The system blends the two environmentally friendly technologies of solar energy and pellet heating and complements them with a modern control system. The result is a fully factory-prepared lodge made from wood or steel, containing the technical appliances and the pellet storage area, alongside a standard service

The unit is available  
in various sizes



On summer days, the sun's energy is sufficient to generate hot water

contract that includes the adaptation of the building's engineering appliances, remote maintenance, differentiated billing, and complete financing. The EnergyCabin is available in several standard sizes, ranging from an output of 10kW for single-family homes to 1,250 kW for commercial premises. The user can purchase or lease the equipment, or, to avoid major investments, simply pay for the energy used – so called Plant Contracting.

### Automatic Conveyor

The EnergyCabin also holds the pellet storage. Pellet conveyance works fully automatically and is maintenance-free. Since June 2006, wood chip fired Energy Centres have also been available. Due to the boiler's outstanding 92 percent

efficiency, heating costs can be reduced by up to 50 percent. During the warm season, the average amount of required hot water can be generated exclusively by the solar plant. The system's components are produced by Austrian manufacturers and feature superior quality. The EnergyCabin can be connected effortlessly to existing heating systems via "Plug and Play" and fully replaces any inefficient boiler (gas, oil, etc.). The system is particularly cost-effective if integrated in new buildings as it eliminates the need of a separate heating cellar.

The EnergyCabin can be connected immediately on delivery



The project was supported within the FFG's Structural Programmes.

Information:  
**EnergyCabin Produktions- und Vertriebsges.mbH**  
 DI Karl Heinz Lesch  
 Grazerstraße 27  
 A-8200 Gleisdorf  
 Phone: +43-3112-36777-0  
 Fax: +43-3112-36777-40  
 E-mail: office@energycabin.com  
 Website: www.energycabin.com

## FH OÖ Campus Hagenberg Virtual Guide Dog for the Visually Impaired

*Thanks to a multiple award-winning invention at the Technical College Hagenberg, the almost-blind will in the future be able to organise their lives more independently. A mobile device has been developed that incorporates phone and text messaging features, appointment management, route planning via GPS and much more.*

A great number of visually impaired people would be able to physically and mentally accomplish day-to-day tasks without outside help, if not hampered by technical barriers. For example, the letter size on mobile phones and organizers is often simply too small to be readable. The basic idea behind the “Virtual Guide Dog” is derived from the fact that even severely visually impaired persons are able to discern colour up to 98 percent. As a result, the Virtual Guide Dog’s touchscreen is equipped with a unique colour-coded guidance system that enables users to navigate almost as easily through the menu as people with normal eyesight.

### Utilisation of Remaining Visual Strength

In addition, the symbols are tailored to the needs of the various forms of visual impairment. By this way, the “Virtual Guide Dog” stimulates actively the



VPA navigation using GPS

remaining visual strength. This is also the reason why the option of visual illustration has been explored rather than that of Braille, which is read with the fingertips. “Right from the start, we have worked with 15 visually impaired people. They wished to utilise their remaining sight in order to train their visual strength”, explained DI (FH) Gudrun Hejnzlreiter-Wallner, scientific assistant of the research project. The involvement of severely visually challenged people throughout the development and testing phases of the Virtual Guide Dog explains the product’s high acceptance among the target group.



Navigation in practical test – available shortly

### Basic Version Available in Autumn

As the product is specially user friendly, it is also suitable for visually normal and elderly people. Even completely blind people are able to use the device after a slightly longer training period, because all visual elements can be presented acoustically. In this case, a grid pattern specifically developed for the mobile device’s touchscreen is applied, allowing the blind to activate the correct control elements. The basic version of the Virtual Guide Dog will be available by autumn 2006 from the project partner company Digital Concepts, in Linz ([www.digital-concepts.com](http://www.digital-concepts.com)). Programme extensions, such as navigation, a MP3 player, the recording of voice memos, are available as a supplement.

### IT Stronghold Hagenberg

The Softwarepark Hagenberg near Linz, accommodates College courses, numerous businesses and University insti-

tutes. At present, more than 1,100 students enjoy its diverse educational BA and MA courses in the fields of software, systems and media. Unique to the Softwarepark is its close cooperation with national and international research institutes and businesses.

### Supporting partners:

- Österreichischer Blinden- und Sehbehindertenverband (Austrian Association of the Blind and Visually Impaired People), Linz
- Occupational Training and Rehabilitation Centre BBRZ, Linz
- Mobilkom Austria, Linz
- Ludwig-Maximilian University, Max Planck Institute of Psychiatry, Munich

The project was supported within the FFG’s Structural Programmes.

### Information:

**FH OÖ Campus Hagenberg**  
c/o FH OÖ F&E Competence Center Hagenberg  
Hauptstraße 117  
A-4232 Hagenberg  
Phone: +43-7236-3888-0  
Fax: +43-7236-3888-99  
E-mail: [info@fh-hagenberg.at](mailto:info@fh-hagenberg.at)  
Website: [www.fh-hagenberg.at](http://www.fh-hagenberg.at) bzw.  
[www.virtueller-blindenhund.at](http://www.virtueller-blindenhund.at)

## Forschungsinstitut für Molekulare Pathologie GmbH (IMP) Why Twins are not Completely Identical after all

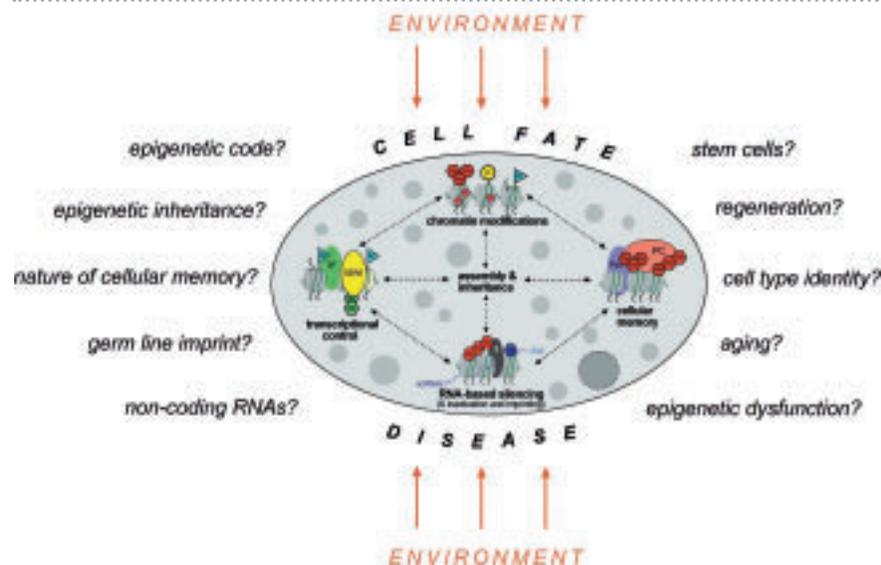
Although identical twins possess the same genetic information, they can differ biochemically. The cause of this phenomenon, the regulation of genes and their transformation into proteins are the core issues of epigenetics. The know-how in this scientific field across Europe is now being linked under Austrian coordination.

A growing number of scientists believe in the existence of an epigenetic code, which extends considerably the information of the genetic code. Closely associated with this are physiological processes in the individual development of organisms. A key aspect in this research is the understanding of how gene regulation information, which is not determined by genetic material, is transferred from one generation of cells and organisms to the next. Epigenetics could provide a way to reprogramme genetic information without direct intervention and to influence its effects. Epigenetic research has a profound influence on agriculture as well as human biology and diseases, including knowledge on stem cells, cancer and aging processes.

### 12.5 Million Euros for European Top Research

Numerous worldwide leading epigenetic research laboratories are located in Europe. In order to link and promote the work of these institutions, the Epigenome Network of Excellence has been initiated with financial support by the EU's Research Framework Programme. Coordinated by the Research Institute of Molecular Pathology (IMP) in Vienna, 25 research teams, 26 associated members and 12 NETs (Newly Established Teams) have committed themselves to the furtherance of epigenetic research in Europe within a five year period (2004 to 2009). The Network of Excellence has been granted 12.5 million Euros in EU

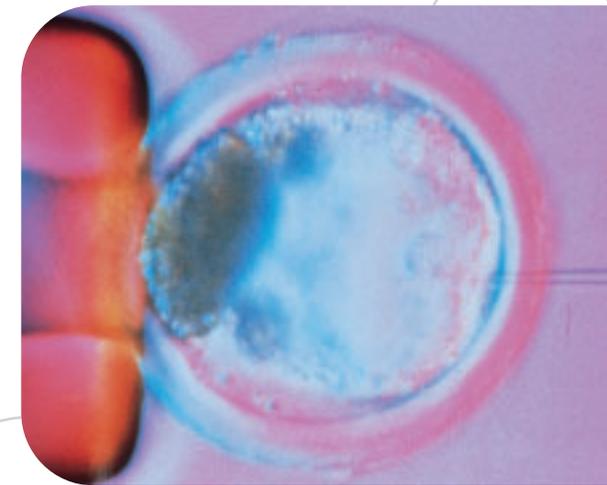
#### Big questions in Epigenetic Research



funding. It envisages to set up a central, virtual institute pursuing three major goals: the promotion of scientific discoveries through a joint research programme; the integration of young colleagues via the NET programme; and the establishment of an open dialog through an interactive website.

#### Focus on Molecular Mechanisms

The ambitious research programme covers eight topics, ranging from chromatin modifications (alterations of the chemical structure of the genetic information) to cell destiny and diseases. The special feature of this research programme is its concentration on molecular mechanisms by using complementary model systems. Utilising the project members' expertise and existing synergies, some of the key questions of modern epigenetic research are being addressed. The goal of the Epigenome



Network of Excellence is to provide clear and perceivable benefits to the entire epigenetic community. This is why members and non-members alike are supported by means of conferences, workshops, educational visits, joint resources and an interactive website. The vision of this Network of Excellence is to develop an efficient framework that integrates existing synergies and grants Europe worldwide leadership in epigenetic research. The Epigenome Network of Excellence is internationally supported by a scientific advisory board.

The project was supported within the FFG's European and International Programmes.

Contact:  
Thomas Jenuwein  
Forschungsinstitut für Molekulare Pathologie GmbH (IMP)  
Dr. Bohr-Gasse 7  
A-1030 Wien  
Phone: +43-1-797 30  
E-mail: jenuwein@imp.univie.ac.at  
Website: www.imp.ac.at/

## Brains & Pictures The Virtual Cameraman

*The high-tech innovation “Virtual Cameraman” is a fully programmable, remotely controlled studio camera system, which can be ideally utilised for live broadcasts. Its outstanding advantage is its ability to produce newscasts cost- and staff-efficiently at a high visual level.*



The control unit operates the entire camera system in real-time

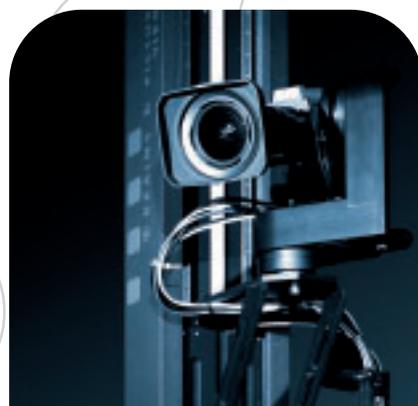
Today's national and international broadcasting companies are required to show newscasts around the clock – even at times, when camera staff is scarce and expensive. Consequently, the company Brains & Pictures developed a fully programmable, remotely controlled studio camera system titled “The Virtual Cameraman”. It works nearly without noise, and is, therefore, the optimal choice for live broadcasts, enabling news speakers to produce newscasts entirely autonomously, without the need of camera staff. The system is very cost-efficient, while offering high-quality visual results. For studio- and client-specific presentation and realisation requirements, individual solutions are developed. The remote head is moved on a rail, enabling highly precise right/left and up/down movements of

the camera. In addition, RoboCAM robots guarantee the precisely motorised motion that studio cameras usually have.

### The TV Studio of the Future

The entire system – consisting of several cameras, pan & tilt heads, robots and rails – is centrally controlled via software. The control unit is used for programming positions and movements in real-time. This TV studio of the future does not only allow for innovative image composition, but also minimises the need of resources by utilising intelligent process and sequence control. This project was made possible by pooling expertise and experience in the fields of production, visual and special effects, live broadcasts and post production, as well as robotics, automation technology and software engineering for real-time systems.

The rail is a freely selectable linear axis, on which the Remote Head can be moved



RoboCAM – different types of robots control the precise, motorised movements of studio cameras

### Cooperation with Robot Specialist

It was especially these manifold requirements that brought together Brains & Pictures and Robotics Technology Leaders from Munich. Both companies employ a team of experts who combine decades of experience in the aforementioned knowledge and technology fields and whose collaboration is unique in the world. In a very short time, it was possible to develop an extensive range of hardware and software products and align them to day-to-day studio practice. The Virtual Cameraman can be used in a broad spectrum of different applications, some of which are already being developed, e.g. Internet-based decentralised control systems, safety and monitoring systems, systems for live broadcasts and live events, as well as video conferences. In the meantime, the news studios of n-tv, WDR and RTL have already been implementing the Virtual Cameraman successfully.

### From Initial Idea to Final Production

Brains & Pictures was founded in 1995 by the acclaimed Viennese film-maker and cameraman Georg Riha. Situated in Tullnerbach/Lower Austria, the company's field of expertise is the conception and realisation of unique special visual effects. Brains & Pictures does not only assist its clients in planning, constructing and starting-up the TV studio of the future, but also ensures long-term provision of the most up-to-date and reliable studio equipment – at any time and any place!



The Remote Head NS 15 enables highly precise pan (right-left) and tilt (up-down) movements of cameras weighing up to 15 kg



The project was supported within the FFG's General Programmes.

Information:  
**FWG-Riha-Brains & Pictures**  
 Brennenmaistrasse 1  
 A-3013 Tullnerbach  
 Phone: +43-2233-55323-0  
 Fax: +43-2233-55323-429  
 E-mail: office@brainsandpictures.com  
 Websites: www.brainsandpictures.com  
 www.brainsandpictures.com/vc

## GE Medical Systems Kretztechnik GmbH & Co OHG Ultrasound Device in Notebook Format

Thanks to the technological market leadership of GE Medical Systems Kretztechnik, 3D and 4D ultrasound has established itself rapidly as the new imaging standard. Now, the company presents its "Voluson i", a portable diagnostic ultrasound device with 3D and 4D functionality in the size of a laptop computer.



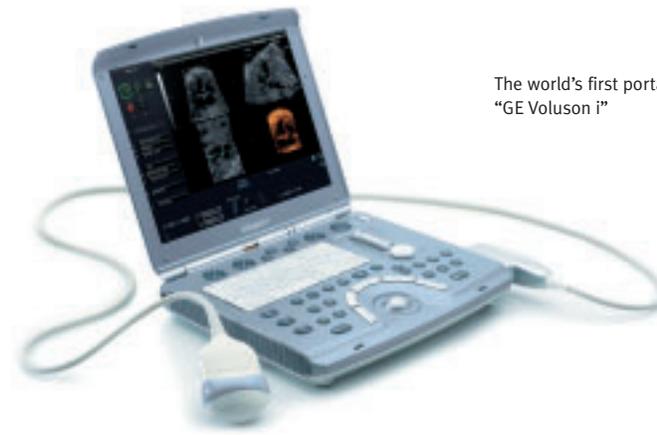
3-dimensional ultrasound image of a fetus in the womb taken with "Voluson i"

Apart from special 3D/4D functionalities – 4D stands for dynamic three-dimensional data – this new ultrasound device was also designed to offer all the conventional features of medium-class equipment. Alongside its usability in obstetrics and gynaecology, the additional comfort of a portable device was also a decisive requirement. Diagnostic ultrasound devices send electronically focused acoustic waves in the MHz frequency range into the body. The sound waves expand and are reflected at organ boundaries and cells, and the received echoes are transformed into image data. The hardware is based on complex digital

and analogue electronics, consisting of discrete components as well as application-specific integrated circuits (ASICs), digitally programmable logic devices (FPGAs), and DSPs. This hardware is connected to a PC via a PCI interface. The PC is primarily responsible for signal and image processing, as well as the control of the hardware and user interface software.

### Small but Powerful

One of the most difficult challenges was the miniaturisation of the transmit and receive electronics. Less heat generation and long battery operating times were also crucial parameters. Additionally, the model Voluson i had to be positioned recognisably as a sibling device of the high-end-machine Voluson 730. The Voluson 730 console image quality and performance specifications had also to be taken into account when designing the new laptop. This was accomplished by developing a new user-interface concept, consisting of hardkeys and on-screen menus. Clinical validations in and outside Austria have confirmed the



The world's first portable 3D/4D ultrasound device "GE Voluson i"

achievement of these ambitious goals, giving the green light to the product's official market launch in June 2006. This project set a milestone in 3D/4D ultrasound technology and consolidated GE Kretztechnik's market leadership in this medical field.

### Global Medical Engineering Network

GE Healthcare offers medical engineering solutions and services that significantly aid the medical care of patients. The company's expertise in the areas of medical imaging and information technologies, medical diagnostics, patient monitoring, efficiency enhancement, pharmaceutical research, and biopharmaceutical manufacturing technologies provides doctors worldwide with new possibilities for the prediction, dia-

gnosis, information and treatment of diseases. GE Healthcare is a business unit of the General Electric Company with an annual turnover of 15 billion US\$ and has its headquarters in the United Kingdom. Kretztechnik is a pioneer and globally leading manufacturer of medical 3D and 4D ultrasound devices. It has been a subsidiary of GE Medical Systems since 2001.



Draft design of the user interface comprising hardkeys and on-screen menus (above), as well as an interior view of the hardware of the "Voluson i" (below)

GE Healthcare



The project was supported within the FFG's General Programmes.

Information:  
**GE Medical Systems Kretztechnik GmbH & Co OHG**  
 Tiefenbach 15  
 A-4871 Zipf  
 Phone: +43-7682-3800-0  
 Fax: +43-7682-3800-47  
 E-mail: kretz@med.ge.com  
 Website: www.gehealthcare.com

## GeoVille GmbH Satellite Data Facilitate Environmental Monitoring

*A newly developed satellite-based information system enables significantly easier and standardised surveys of the extent and condition of forests. Such surveys are required for the obligatory CO<sub>2</sub> balance sheets that all Kyoto signatory states must present each year.*

The Kyoto Protocol, which was signed in 1997 and became effective in February 2005, envisages a worldwide reduction of greenhouse gas emissions by the year 2012. Its member states committed themselves, among other things, to regularly publish CO<sub>2</sub> balance sheets. Forests play a major role in this context, as they act as so called CO<sub>2</sub> sinks, and (can) have a positive effect on the CO<sub>2</sub> balance. However, criticism has arisen regarding the method of crediting the existence of forests – as CO<sub>2</sub> sinks – to emissions balance sheets, which also includes disapproval of costly or barely reliable survey methods.

### Satellite Data and Laser Measurement System

In the framework of the “NEOS-QUICK” project, led by the Innsbruck-based company GeoVille, a new system has been developed capable of deriving reliable

information on the extent and condition of forests from satellite data. The system utilises existing data from modern satellites (ENVISAT, TerraSAR, PLEIADES) combined with laser measurement techniques. From this database, evaluations on the condition of forests, forest area and stock density are performed. These calculations are subsequently integrated into spatial models and used as the basis for various environmental monitoring tasks, particularly for the independent survey of the CO<sub>2</sub> balance in the scope of the Kyoto Protocol.

### Premiere in Malaysia

The system provides numerous advantages. Firstly, it is considerably cheaper than a “manual” forest inventory on site; secondly, it uses and combines already existing data, eliminating the need for major investments for new measurement devices or methods; and thirdly, this measurement procedure is objective and impartial, and has passed respective validation. As a result, the system has successfully commenced its first commercial operation in Malaysia.



Keep an eye from space on land use & forestry



Detailed information on forest area and state from Earth Observation data



### “Door Opener” on the International Market

GeoVille was founded in 1998 and specialises in Geographic Information Systems, remote sensing based on satellites and aerial photography, cartography, urban, regional and spatial planning, and environmental monitoring. Apart from GeoVille as the project coordinator, the Institute of Photogrammetry and Remote Sensing of the Vienna University of Technology, ARC Seibersdorf research, and ARC systems research were also

involved in the project. The compilation of solidly grounded process expertise in the course of the project enables GeoVille to successfully offer its services to the international market and to stand its ground against fierce competition. An example are GeoVille’s recently won projects in the frame of the EU and ESA Initiative “Global Monitoring for Environment and Security” (GEOLAND, SAGE and GSE Land).



The project was supported within the Aeronautics and Space Agency of the FFG.

Information:  
**GeoVille GmbH**  
 Museumstraße 9 – 11  
 A-6020 Innsbruck  
 Phone: +43-512-562021-0  
 Fax: +43-512-562021-22  
 E-mail: info@geoville.com  
 Website: www.geoville.com

## Guger Technologies OEG Triple Simultaneous Measurement of Brain Waves

*The company g.tec has introduced an innovative multi-channel system for analysing brain waves. This enables doctors to carry out simultaneously three recordings for electroencephalograms, electrocorticograms and microelectrode arrays.*

The simultaneous, threefold measurement of brain waves was the objective of this medical innovation. The multi-channel system developed by the Styrian company Guger Technologies – in short: g.tec – completes three measurements simultaneously utilising a special technique. An Electroencephalogram (EEG) is recorded with electrodes attached to the head's surface using conductive gel. Its benefits are the non-invasive derivation and good time resolution of the signal. Its only weakness is the small signal-to-noise distance. The second analysis tool, the electrocorticogram (ECoG), is recorded via implanted strip electrodes, which must be placed directly onto the cerebral cortex. ECoG derivations have a major advantage. They provide a significantly better signal-to-noise distance and higher space and time resolution than

an EEG. Spontaneous brain activity and event-related potentials (ERPs) can therefore be measured with much higher precision. This derivation's disadvantage is its invasive nature and its consequently limited applicability.

### Enabling Long-Term Analysis

Microelectrode arrays (MEA) are the third method used for measuring brain waves. They must be applied directly into the brain. MEAs possess a large number of electrodes arranged on a very small area. Having been designed for long-term analysis, they can remain implanted for months or even years. Due to the extremely small size of the electrodes, even the action potentials of individual nerve cells can be recorded.



Conventional derivation of the brain activity by means of surface electrodes

the development and utilisation of neuroprotheses. In addition to the European medical CE certification, the equipment has also won FDA approval for the American market.

Although MEAs are the most invasive derivation technique, they provide the best signal quality, and the sensors can be removed without causing lasting damage.

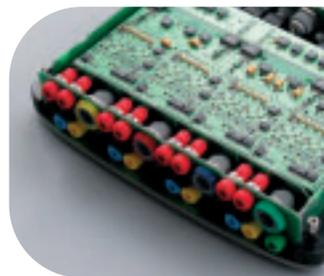
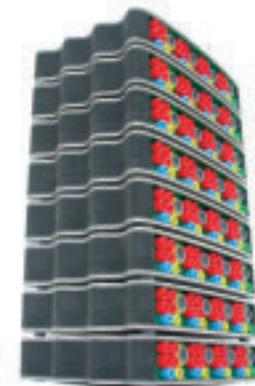
### Unique System for Simultaneous Derivation

The novel g.tec multi-channel system for measuring brain waves is primarily used in medical research. Epilepsy and tumour diagnostics is also a tried and tested area of usage. The multi-channel system has also proved of considerable value in medical rehabilitation, e.g. in

Multi-channel measuring system for invasive and non-invasive electrophysiological derivations in the human body

### Exact Analysis of Biosignals

Situated in Graz, Guger Technologies OEG – or g.tec – was founded in 1999. It specialises in the development of bio-signal recording, processing and analysis systems, and also includes study design and data analysis for research institutes and scientists.



The project was supported within the FFG's General Programmes.



Information:  
**Guger Technologies OEG**  
 Herbersteinstraße 60  
 A-8020 Graz  
 Phone: +43-316-675106  
 Fax: +43-316-675106-39  
 E-mail: office@gtec.at  
 Website: www.gtec.at

## Project: EASTPELL Affordable Biomass Heating Boilers for Eastern Europe

*Together with Austrian and Eastern European partners, the Salzburg-based company Hartl Energy-Technology KEG is presently setting up, within the scope of the project EASTPELL, a strategic cooperational network for the technological development of low-cost biomass heating systems.*



Austrian wood pellet heating technology enjoys an excellent international reputation. Its low emissions, high operating efficiency and maximum comfort are considered top of the range across the world. However, this also entails fairly high prices, making this technology unsuitable for successful distribution in markets with low purchasing power. In order to remedy the situation, Hartl Energy-Technology KEG, founded by DI Herbert Hartl, initiated the cross-border project EASTPELL. In cooperation with three partners from Bulgaria and

Slovakia, equivalent, alternative low-cost biomass heating systems will be developed. "Based on our time-tested technology, the existing pellet or wood boiler system will be adapted so as to optimally meet the market requirements in the Central European countries", explained Managing Director Herbert Hartl.

### Start of International Cooperation

Hartl Energy-Technology KEG (Salzburg) coordinates a total of seven project partners, all from small and medium businesses. From Austria, sht-Heiztechnik GmbH (Salzburg), HET Heiz- und Energietechnik Entwicklungs-GmbH,



and Heinz Dietl Metallwaren (Upper Austria) are involved. The Bulgarian contributing companies are ERATO Product GmbH and S.B.R. GmbH, and Keimex s.r.o. from Slovakia also has a part in the cooperation.

components is utilised as a crucial prerequisite for cost reduction. Possible alternative combustibles other than wood logs, such as cherry or olive stones, are also being investigated.

### The Journey is the Reward

Among others, the planned projects include a new low-cost wood heating boiler with a natural draught wood carburator to be developed on the basis of design studies, prototypes and field tests. The aim of the carburator is to reach an emission reduction of approximately 75 percent compared with traditional heating systems, and an efficiency exceeding 90 percent. Analogue technology using currentless

### Techno-Z as an Innovation Hub

Situated at Techno-Z Salzburg, Hartl Energy-Technology KEG, which is a company of the sht Group, specialises in technology marketing, primarily in the field of biomass technology. Within a large network of technology and founding centres, Techno-Z Salzburg combines 200 high-tech businesses with more than 1,000 staff, research institutes, universities, while also providing accommodation for employees and students.

The project was supported within the FFG's Structural Programmes.

#### Information:

#### Hartl Energy-Technology KEG

Techno-Z Salzburg

Jakob-Haringer-Strasse 1/110

A-5020 Salzburg

Phone: +43-662-908386

Fax: +43-662-908386

E-mail: herbert.hartl@energy-tech.at

Website: www.energy-tech.at

## hofer forschungs- und entwicklungs GmbH & Co KG New Double Clutch Transmission for Special Machines

The company hofer, an international engineering company located at Garsten/Upper Austria has worked out a new continuously variable transmission for heavy all-terrain working machines.

Increasing fuel costs and the requirement for cost effective, simple to operate and comfortable working machines are requiring more than ever efficient step less drive systems. hofer forschungs- und entwicklungs GmbH & Co KG has developed an innovative transmission system, that combines two advantages: The hydrostatic drive provides best functionality by means of step less adjustment of the transmission ratio. The mechanical drive brings benefits by best efficiency and high overall ratio.

### Continuously Variable Ratio by Electronic Transmission Control

This new transmission system, so-called "Variable Double Clutch Transmission – VDC" works on the principle of hydrostatic- mechanical power superposition. The total transmission comprehends

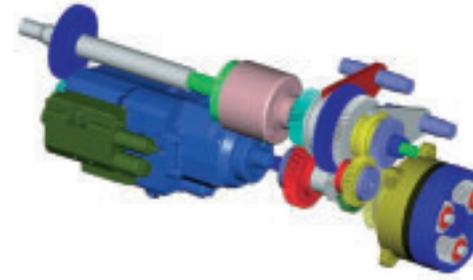
three major components – the four speed double clutch transmission, the hydrostatic unit with variable pump and constant motor and a summarizing planetary gear at transmission output, which combines the mechanical and hydrostatic power. A continuous adjustment of the transmission ratio is achieved by controlling the hydro in combination with the mechanical gear. Over the whole speed range, there is permanent torque flow between the combustion engine and the wheels.

### Ready to use from Agric Tractor to Construction Machinery

The driver just has to select forward or reverse and by pressing the driving pedal, the vehicle accelerates up to the desired speed – without interruption from creeping speed up to maximum

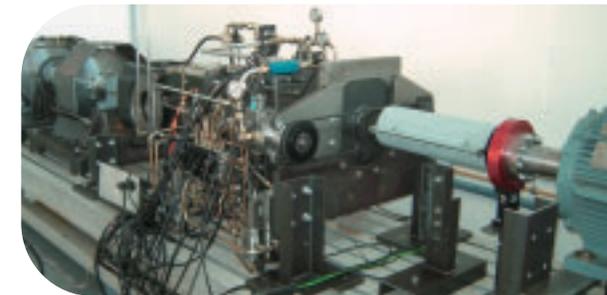


Test vehicle  
with front-end loader



3D-CAD model of the transmission (left) and  
VDC transmission on functional test bench (bottom)

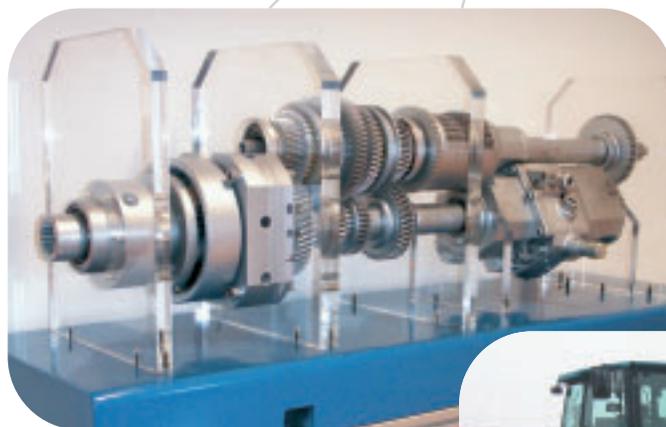
cruising speed. The VDC transmission system is suited best for agric tractors, handling machines, wheeled loader and similar construction machines, also for municipal vehicles. It is the ideal continuously variable transmission for all applications, where high drawbar pull, high cruising speed and best efficiency are required at competitive production costs.



### Specialist for Engine, Transmission and Driveline

The hofer group was founded in 1980 as pure engineering company. Today hofer is employing almost 400 persons. There are 14 subsidiaries, most of them located close to their primary customers in auto-

motive industry, like in the area of Stuttgart, Ingolstadt, Wolfsburg, Munich or Cologne. The Upper Austrian headquarter of the hofer company was founded in Steyr in 1999 and is now located in Garsten, close to Steyr. hofer's extraordinary competence in the fields of engine, transmission and driveline makes hofer a well known and accepted partner in automotive and off road industry.



Mock-up of VDC transmission (above)  
and test tractor with rotary harrow (right)



The project was supported  
within the FFG's General Programmes.

Information:  
**hofer forschungs- und entwicklungs GmbH & Co KG**  
Gewerbepark 1  
A-4451 Garsten/Steyr  
Phone: +43-7252-70661  
Fax: +43-7252-70661-50  
E-mail: h.aitzmueller@hofer-powertrain.at  
Website: www.hofer.de

## Holzforchung Austria Wood – an Ideal Choice in Balcony Construction

With the support of the FFG and the involvement of manufacturers and coating material producers, Holzforchung Austria (HFA) has completed a project dealing with the optimal design of wooden balconies.

Balconies and terraces expand our living space into its natural surroundings and bring the garden closer to our homes. This is also true in urban dwellings. Wood as a building material combines considerable ecological and technological advantages with superior outdoor usability. Being exposed to rain and sun, balconies made of wood must be able to withstand extreme weather conditions, and this is why their construction and surface treatment must meet exacting standards. Often, home owners are discouraged by catch phrases such as “intense service”, “unwanted weathering effects” and “short lifespan”, and as a result, eventually resort to alternative materials. In order to halt this trend and

investigate potentials for improvements, HFA initiated, together with balcony manufacturers from industry and trade and coating material producers, an innovative research project for optimising and technically advancing the production of wooden balconies.

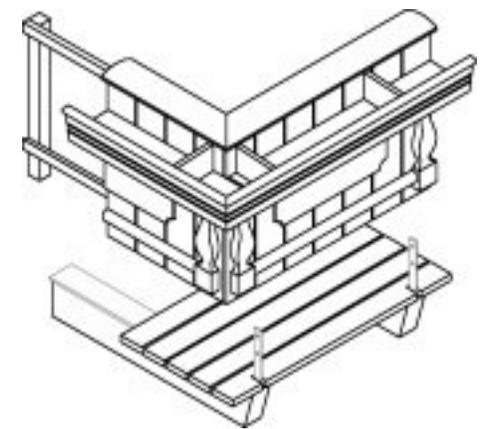
### The Right Structure is Key

The project’s objective was to prolong the lifespan and service intervals of wooden balconies, and to improve the weathering resistance of the surface. In order to render a simplified structure within the complex task of balcony construction, each single component, such as handrail, banister pillar and flower box, was examined separately. A simple example of this optimised detail design is found in the vertical banister rods. Most often these rods are notched or fixed with dowels into the lower horizontal cross joist, and consequently water can collect in the created holes, developing moisture cavities. These favour the growth of wood-destroying fungi and cause the wood to rot. However, it was found that if the rods are installed in front of the cross joist, screwed in from behind, this risk can be eliminated.

there is a great variety  
of balkony-constructions



the handrail is a highly stressed  
part of balconies



### New Tool for Planners and Builders

The results of this research project have now been made available to the interested public in the form of a technical brochure. It highlights issues in building regulations and structural stability in Austria and Germany. Furthermore, it provides tips and hints on material selection, wood protection, coating and wood service. Its comprehensive design catalogue illustrates and evaluates for each balcony component recommendable measures and solutions in need of improvement. As an additional aid, the appendix includes service instructions and a quality assessment tool for balconies. As such, the brochure is an efficient tool for builders and planners of balconies and terrace flooring made of wood.



### Almost 60 Years Experience in Wood Technology

The Austrian Wood Research Society (ÖGH) was founded by private initiative in 1948 as a non-profit association. Amongst its members are businesses, institutions and individuals from the entire timber industry (forestry and all sectors of wood-working and wood-processing). The ÖGH is the parent organisation of Holzforchung Austria (HFA), which was established in 1953. ÖGH’s business activity is centred around the promotion of research and testing in the area of wood technology. ÖGH is furthermore committed to making research results available for practical usage.

The project was supported  
within the FFG’s General Programmes.



Information:

**Holzforchung Austria**

Austrian Forest Products Research and  
Accredited Testing Laboratory

Franz Grill-Strasse 7, A-1030 Wien

Phone: +43-1-7982623-0

Fax: +43-1-7982623-50

E-mail: hfa@holzforchung.at

Website: www.holzforchung.at

## icomedias Österreich Systemhaus GmbH Information Networks without Barriers

*The combined, barrier-free transfer of important information via the most suitable medium is the objective that icomedias' content management system ico»enterprise.cms accomplishes when sending the recipient loss-free data and information.*

Free access to information and communication systems may be hampered by a wide array of obstacles, ranging from human (visual, hearing, speaking impairment, problems due to old age, etc.) to situational and local factors (mobile devices with small displays, ambient light reflection, usage while driving, etc.). This is particularly true for disabled people, but also applies to other users who face similar situations when access to information is blocked.

### Finding the Appropriate Presentation Form

An innovative project, conducted by icomedias Systemhaus Österreich GmbH, has explored the simultaneous, barrier-free transfer of information from ico»enterprise.cms to various output

media. The suitable presentation form (Internet, terminal, large display, vocal readout, PDA, smart phone) is chosen on-demand regarding the respective situation. The technical solution (XML) utilises the same content, while choosing the most appropriate form of presentation (Device Situation Specific Rendering). Most system components are based on Open Source software (Linux), allowing cost-efficient, broad application possibilities. In its first year, the project, which is partly funded by the FFG, has already won several commissions and received positive feedback from practical users.

### Positive Customer Feedback

Kunsthhaus Graz, for example, in cooperation with Nokia, realised the presenta-



tion of content via ico»enterprise.cms on a PDA (Nokia 770 Internet Tablet). This device can be operated via touch-screen. Content can be presented in the form of audio/spoken text in multiple languages and on video. Since April 2006, barrier-free guided tours in museums have been available. Since October 2005, the Styrian Provincial Government has been cooperating with the Styrian FH Joanneum University of Applied Sciences, in devising special measures for barrier-free accessibility using ico»enterprise.cms. Within the scope of this cooperation, interfaces have been developed for implementing the planned vocal read-out system "Text-to-Speech (TTS)" to enable MP3 downloads and download via podcast. icomedias has been honoured with the Austrian State Award for Multimedia (e-Government category) alongside inter-

national prizes for projects in the field of civil protection.

### Research in Three Competence Centres

icomedias develops and supplies innovative communication solutions based on web, mobile and multimedia technologies. The company, with offices in Graz and Berlin, works for public and private clients, and is committed to long-term, cooperative relationships. icomedias entered the market as a full service multimedia agency in 1995. Its range of services is concentrated in its three competence centres Information Management, E-Content & Multimedia, and Digital Signposting.



The project was supported within the FFG's General Programmes.

Information:  
icomedias Österreich Systemhaus GmbH  
Entenplatz 1  
A-8020 Graz  
Phone: +43-316-721671-0  
Fax: +43-316-721671-103  
E-mail: office@icomedias.com  
Website: www.icomedias.com

## Innovacell Biotechnologie GmbH

### Healthy Bladder through Gentle Cell Therapy

*The Tyrolean company Innovacell helps patients with urinary incontinence by applying a minimally invasive cell therapy. As part of this process, body-own muscle stem cells regenerate the weakened bladder sphincter until it has regained full functional efficiency.*



Optical quality control

Especially in old age, urinary incontinence is one of the most frequent urological diseases. In Austria, around 800,000 people suffer from bladder weakness, which heavily compromises the affected individuals' quality of life. Now, these tissue defects can be remedied using special muscle tissue cells. In collaboration with the University Hospital Innsbruck, Innovacell Biotechnologie GmbH managed to develop an innovative cell therapy for treating urinary incontinence, which has been implemented successfully since 2002.

#### Cells Re-build the Muscle

Stress incontinence is an involuntary loss of urine that occurs during physical activity, such as coughing, sneezing, or exercise. The most common reason is a defect in the external urethral sphincter, a small muscle that usually closes



Microscopic analysis of cell cultures

the urethra when under stress. In a "weak bladder", this muscle does not function properly anymore. The cell therapy "urocell" takes advantage of the natural regeneration ability of cells, thus restoring the functioning of the weakened sphincter. On the basis of muscle stem cells, new muscle fibres are grown, which permanently re-strengthen the closing mechanism. The cells used are adult stem cells, which are derived from the patient's own body tissue. Their usage is, therefore, ethically unproblematic.

#### Successes in Munich, Vienna and Bern

For the urocell therapy, a small muscle biopsy is removed from the patient. These tissue samples are then treated in specialised clean room laboratories and reproduced employing special



Cell culture at the laminar airflow

procedures in line with the valid GMP Guidelines. After eight weeks, the newly grown cells can be injected into the patient's damaged muscle with a specially devised, patented ultrasonic probe. Subsequently, the new cells grow into the bladder sphincter and regenerate it. Rejection does not occur, as the patient's own (autologous) tissue is utilised exclusively. This technique helps patients regain their natural ability to control urinary flow. The Urology Department of the University Hospital Innsbruck has already achieved very good results with its urocell cell therapy in over 250 patients: most patients report that their quality of life has improved considerably. Meanwhile, the therapy's successes

have also found international acclaim, as the cell therapy is now also being practised in hospitals in Munich, Vienna and Bern.

#### Tissue Engineering Research

Innovacell Biotechnologie GmbH is a Tyrolean company, founded in 2000 as a spin-off of the University Hospital and University Innsbruck. Based on its solid experience and expertise in molecular biology and project management, the company specialises in the advancement of, and services in, the field of tissue engineering. In several projects, the specialists at Innovacell are exploring further possible regenerative applications of the body's own muscle cells. Currently, the company employs 15 staff.



Working in the GMP-facilities

**innovacell**  
biotechnologie

The project was supported within the FFG's General Programmes.

Information:  
**Innovacell Biotechnologie GmbH**  
Mitterweg 24  
A-6020 Innsbruck  
Phone: +43-512-573680  
Fax: +43-512-573680-5  
E-mail: office@innovacell.at  
Website: www.innovacell.at

## it2oone e-invoice System Development GmbH New Product Range for Electronic Invoicing

The Viennese company it2oone develops innovative software solutions, which provide and verify signatures for digital data and documents. The basis of these solutions is an EU regulation that stipulates that, as of 2004, electronic invoices must bear a digital signature.

As early as 2001, the EU issued an electronic invoicing regulation requiring a digital signature on each electronic invoice. Founded in the same year, it2oone acknowledged these legislative innovations, and at an early stage took advantage of its competitive edge in development. Today, it is able to offer ready software products that meet these requirements. A digital signature ensures two things: the issuer of the invoice can be precisely identified, and any later manipulation of the invoice is recognised immediately.

### Aiming at the B2B Market

Following its intense research activities, it2oone has developed a broad product range for electronic invoicing. The products it2oone FILEsigner, it2oone FILEsender and it2oone PROXYsigner are series-produced and manage outgoing invoices. Ingoing invoices are automatically checked by it2oone FILEinspector for conformance to the legal requirements. it2oone digital Server and it2oone MAILsigner cover the entire

workflow for incoming and outgoing invoices. In the business-to-business market, the issue of electronic invoices is of crucial importance, as it saves tremendous amounts of cost and time by utilising the possibility of input tax deduction.

### Setting Out for Europe

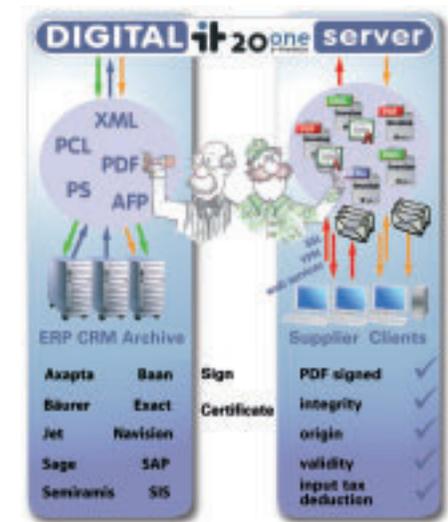
Due to the enormous size of the evolving European market, the extremely short amortisation time for it2oone customers and the company's substantial edge in development suggest a high earning capacity for it2oone's product range. Presently, it2oone cooperates with more than 40 qualified partner companies across Austria, including A-Cert, A-Trust, Wincor Nixdorf, Data Systems Austria, Naviconsult, SageKHK, CrossIT, ILS Consult, and ArchivAustria. Additionally, due to European-wide uniform regulations regarding digital signatures, it2oone has the prospect of exploring the entire European market beyond Austria and Germany by teaming up with strategic sales partners.



it2oone FILEsigner (left) and it2oone DIGITALserver (below) the cutting-edge software for e-billing

### Complex Technology, Simple Application

it2oone e-invoice System Development GmbH was founded in 2001. The it2oone team consists of seven employees, who achieved a turnover increase in 2005 of more than 35 percent. For 2006, the company expects another rise equivalent to 40 percent on the previous year. The company has been among the few suppliers which have specialised in electronic invoicing from the outset. it2oone's philosophy is, "As the technology (cryptography etc.) and the legal situation (the entire EU) is very complex, the integration and application at the customer's premises should be all the simpler".



The project was supported within the FFG's General Programmes.



Information:  
it2oone e-invoice System Development GmbH  
Bandgasse 2/22  
A-1070 Wien  
Phone: +43-1-99 00 046-0  
Fax: +43-1-99 00 046-50  
E-mail: office@it2oone.at  
Website: www.it2oone.at

## Project: NANO-HEALTH Nanoparticles in the Fight Against Chronically Diseases

*NANO-HEALTH is a research and development project, funded within the scope of the Austrian NANO Initiative. In this joint research project, eleven project partners, deriving from the national BioNanoNet network, collaborate in search for new ways of diagnosing and treating diseases, such as diabetes or PAH (Primary Arterial Hypertension).*

Nanotechnology, as the hope of modern medicine, pursues the ambitious goal of improving the lives of the chronically ill. It aims to explore new therapeutical approaches against common diseases, e.g. diabetes, by making use of innovative nanoparticles. The NANO-HEALTH research project is composed of participating partners from all over Austria and is coordinated in Styria. It devises nanotechnological strategies on how pharmaceutical agents can be locally delivered to the diseased organ, or at the focus of a disease. Innovative nanoparticles are not only expected to open up new, non-invasive forms of therapy, but also to substantially improve patients' quality of life. Nanoparticle technology is also intended to be used for early diagnosis of wide-spread diseases, such as cancer.

Agent synthesis on a laboratory scale



Nanofilm scales for molecular characterisation of surfaces

### Multifunctional Nanoparticles

Nanoparticles must fulfil multiple functions: They must bind the agent, transport it "piggy-back" and deliver it precisely at the affected organ. In addition, they must be toxicologically harmless and 100% biodegradable and, finally, they must also be in-vivo observable and traceable for pharmaceutical testing. Visualisation is achieved by Magnetic Resonance Imaging (MRI), radioactivity and fluorescence. Alternative, non-invasive application forms, e.g. inhalation, could make agents, such as insulin in the case of diabetes or calcitonine in osteoporosis, behave more patient-friendly and therapy-specific. The NANO-



Chemical analysis has become indispensable in many fields of nanomedicine



HEALTH project uses four different nanoparticles – lipoproteins, protamins, PLA-HSA, and thiomers – for the development of this novel transport medium.

### BioNanoNet Initiative

The eleven project partners come from the university, non-university and industrial sectors, and are part of the well-established "BioNanoNet" network. This considers itself a connecting link bet-

ween nanotechnology and medicine ([www.bionanonet.at](http://www.bionanonet.at)). The joint research project NANO-HEALTH, which started in March 2005, is scheduled to last at least for five years. For its first two years, funding of 1.8 million Euros has been made available. Joanneum Research acts as the project coordinator.

### The partners of the joint research project NANO-HEALTH are:

- Institute of Biophysics and X-Ray Structure Research (Austrian Academy of Sciences, Graz)
- Institute of Cancer Research (Vienna Medical University)
- Institute of Histology and Molecular Cell Biology (Medical University Innsbruck)
- Institute of Pharmacy (Leopold-Franzens University of Innsbruck)
- Institute of Pharmaceutical Sciences – Pharmaceutical Technology (Karl-Franzens University Graz)
- Clinical Department of Nuclear Medicine (Medical University Innsbruck)
- Max F. Perutz Labor, Institute of Chemistry (University of Vienna)
- Institute of Medical Technologies and Health Management (Joanneum Research, Graz)
- JSW Research, Graz
- piCHEM Research and Development, Graz
- Thiomatrix Research and Consulting, Innsbruck



The project was supported within the FFG's Thematic Programmes.

Contact:  
Dr. Frank Sinner  
**Joanneum Research Forschungsgesellschaft mbH**  
Auenbruggerplatz 20/3  
A-8036 Graz  
Phone: +43-316-876-2103  
Fax: +43-316-876-2104  
Website: [www.joanneum.at](http://www.joanneum.at)  
E-mail: [frank.sinner@joanneum.at](mailto:frank.sinner@joanneum.at)

## Project: NSI Nanostructured Surfaces and Interfaces

Whether in semiconductor physics, medicine, process technology or sensor technology – nanotechnology has become an inherent part of a wide range of scientific domains. A joint project called “Nanostructured Surfaces and Interfaces” (NSI) has now been launched in Upper Austria. Its objective is to pool competences and make available existing expertise and infrastructure to the Austrian industry.

This joint project was submitted to the Austrian NANO Initiative by a consortium of three research institutions and three companies headed by the Nano-Science/Technology Center Linz (NSTL). The NSI project aims to create a broad, nationally and internationally competitive centre of competence in the field of nano sciences and technologies in the forthcoming years.

### Focusing on Three Competence Areas

The NSI joint project covers three of the four core competences of the Nano-Science/Technology Center Linz and integrates them into the concept of the Austrian NANO Initiative. These three competence fields are Biocompatible Nanostructures, Polymers and Nano-composites, and Metal Surfaces and Interfaces. Within each of these areas, interdisciplinary sub-projects have been granted funding. In addition, tight links exist with the project “Gen-AU-Projekt Nanoreader”, which had also been funded.

The following projects receive funding:

#### Nanostructured und Biofunctionalised Surfaces (NABIOS):

In this project, methods from semiconductor technology and surface science are combined with molecular chemistry and single molecule spectroscopy in order to develop an innovative DNA analysis procedure.



A view into the colourful world of nanostructures

#### Nano-Biocompatible Polymerfoils (NBPF):

In this project the surfaces of polymer foils are nanostructured by laser radiation in a way that allows the ordered arrangement of cell cultures for medical diagnosis and therapy.

#### Nanomeric Organic Actuators (NANORAC):

This entirely new approach employs organic semiconductors to realize nano-electromechanical (NEM) functionality (e.g. for electronic switches).

#### Sol-Gel-enhanced Catalysts for the Fabrication of Carbon-Nanotubes (SolTube):

The long-term goal of the project is the generation and use of carbon nanotubes as membranes for nanofiltration purposes.

#### Optical Properties of Metal Clusters on Crystalline Surfaces (MetClust):

In this project, the basic properties of nanometer-sized metal clusters on crystalline PET and quartz-surfaces are investigated using optical und magneto-optical methods.

#### In-Line-Characterisation of Nanometer-Thick Metal Layers on Polymerfoils (PolyMet):

This project is closely related to MetClust and aims toward an exploitation of the optical techniques developed in Met-Clust for industrial surveillance of foil production lines.

The project was supported within the FFG's Thematic Programmes.

Contact:  
Univ. Prof. Dr. Friedrich Schäffler  
**Institute of Semiconductor and Solid State Physics**  
**Johannes Kepler University Linz**  
Altenberger Straße 69  
A-4040 Linz  
Phone: +43-732-2468-9606  
Fax: +43-732-2468-650  
E-mail: [friedrich.schaffler@jku.at](mailto:friedrich.schaffler@jku.at)  
Website: [www.nanoscience.at](http://www.nanoscience.at)

## Kabel-X Vermarktungs GesmbH Speeding on the Data Highway

*The company Kabel-X has developed the world's only successful process for decoring cables. With its method, virtually every cable's copper core can be replaced cost-effectively and speedily with fibre optics.*

Demand for broadband technology for the Internet and its manifold applications has been steadily increasing. Meanwhile, most of primary and secondary networks have been converted to fibre optics. However, broadband connections for end consumers are still a long time coming, due to the fact that many telecommunication companies still invest in technical solutions for the existing copper networks. However, future broadband networks require upgrading to fibre optics. This is the reason Kabel-X has defined as its prime business objective the full conversion of copper cable networks to fibre optics networks. Under the identical name, "Kabel-X", the company has devised a worldwide process for decoring underground and overground copper lines and inserting fibre optics.

Insertion of Miniducts into decored cable sheaths



### Copper out, Fibre Optics in

Whether corrugated steel, aluminium, lead, plastic or coaxial sheath cables – the Kabel-X technology requires only minimal localized digging for the extraction of old copper wires from the cable sheaths and their replacement with new fibre optics. Instead of, as previously, digging up the entire cable length, the cable is now only accessed at two points, 50 to 400 metres apart. A special Kabel-X fluid is pumped under pressure into the space between cable sheath and cable core wrapping, detaching the core from the sheath. Next, the old cable core is extracted mechanically and treated for clean, environmentally friendly disposal or recycling. Simultaneously, an empty, accurately fit sheathing for the new fibre optics cable is drawn into the old cable sheaths. Afterwards, these so called "miniducts" are connected, the pits are closed, and, finally, the empty cable sheath is refilled with fibre optics.

### Little Cost, High Efficiency

Apart from the positive environmental aspects – old cables can be recycled homogeneously, and the fluid is biodegradable –, this technique can save 40 to 90 percent of costs in comparison to traditional cable replacement sy-



After exposing the cable, the fluid pump, developed by Kabel-X, is attached and the lubricant is pumped in

Then the cable core can be pulled out and at the same time the miniducts are inserted into the empty cable sheath remaining in the ground



tion. Finally, the localized digging minimises costs for planning and authorization procedures and limits the scale of the construction site.

### Worldwide References

Kabel-X Vermarktungs GmbH was founded in February 2003. The same year, a research and development centre was established in Ybbsitz, Lower Austria. The company's business objective is to internationally market the Kabel-X system, which has been globally patented by its inventor Alois Pichler. Kabel-X has developed in-house all required machinery, auxiliary and operating materials alongside the gliding fluid. At present, the company employs ten staff in Austria. Leading businesses in the telecom, infrastructure and power supply industries worldwide have applied Kabel-X's revolutionary technology.



stems. This is also due to its significantly faster completion time, and the overall reduction in planning and bidding costs. Furthermore, a large part of official regulatory procedures cease to apply, as work completed by Kabel-X is classified as a service, and not as a new installa-



The project was supported within the FFG's General Programmes.

Information:  
**Kabel-X Vermarktungs GesmbH**  
 Josefstädterstraße 91/1/10  
 A-1080 Wien  
 Phone: +43-1-40300-30  
 Fax: +43-1-40300-3030  
 E-mail: office@kabel-x.com  
 Website: www.kabel-x.com

## Project: NaDiNe – Nano-Diamond-Network Nanotechnology in Tyrol

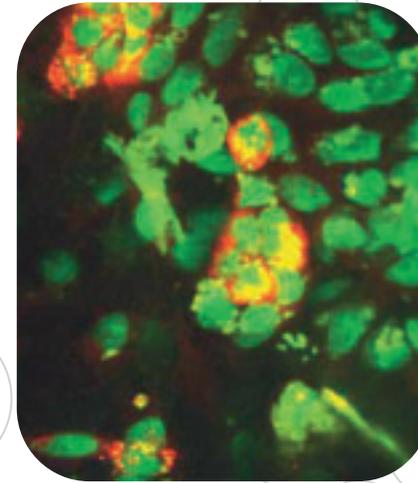
*Within the scope of a joint project, the Tyrolean “Nano-Diamond-Network” – in short NaDiNe – investigates a unique material for biotechnological applications: the ultra nano-crystalline diamond layer (UNCD).*

Diamonds have proved to possess outstanding material properties for use in biotechnology, such as biocompatibility, high chemical resistance, numerous linking possibilities for biomolecules, and transparency. The project’s ambitious goal is to make use of the innovative nanostructured UNCD layer in multiple industrial applications. Under the cooperative leading of the Kompetenzzentrum Medizin Tirol (KMT) and rho-BeSt coating, the researchers, who are engaged in seven different projects, focus on three key developments. Firstly, it was discovered that UNCD ideally promotes the growth, attachment and differentiation of living cells outside the human body and could be used in cell engineering; secondly, UNCD enables

quick biomedical and chemical analyses; and thirdly, in the future, UNCD might even make possible the generation of artificial organs.

### Highly Sensitive Biosensors

Nano-biosensors are utilised for biomedical and chemical analyses. Applying a UNCD film makes the sensors biocompatible, and biomolecules in combination with a suitable measuring technique could be used to recognise cancer at a very early stage. NEMS (Nano Electro Mechanical Systems) are electro-mechanical objects that are employed in microscopic small spaces. In this field of application, a UNCD film could generate ex-



Visualisation of insulin (red) presence and cell nuclei (green) of insulin producing cells on quartz glass with nano-crystalline diamond (UNCD)

tremely sensitive detectors for monitoring chemical and physical parameters. Furthermore, the exact dosing of liquids at the pico and nano scale would no longer be unthinkable.

### Symbiotic Partnership

The project’s goal is to translate the findings from years of intense basic research in the area of surface engineering into concrete, economically feasible applications. This can be achieved by intensifying the collaboration between Universities and industry, in particular. “Joint research is an international trend. Singular research initiatives have hardly any chance of achieving major break-

throughs”, believes KMT Managing Director Gordon Koell. Over a period of five years, Kompetenzzentrum Medizin Tirol (KMT) will manage and coordinate, together with the company rho-BeSt coating, the joint project “NaDiNe”, which is supported by the Austrian NANO Initiative. A total of 15 partners from the medical, industrial and economic sectors are involved. This includes companies such as SONY DADC Austria AG, MED-EL GmbH and TILAK (Tiroler Landeskrankenanstalten GmbH), as well as three Tyrolean Universities.



The project was supported within the FFG’s Thematic Programmes.

Contact:  
Gordon Koell and Dr. Doris Steinmüller  
**Kompetenzzentrum Medizin GmbH**  
Leopoldstraße 1/3  
A-6020 Innsbruck  
Phone: +43-512-576526  
Fax: +43-512-576526-4320  
E-mail: office@kmt.at  
Website: www.kmt.at

“NaDiNe has managed to present a convincing total concept. Heavy investments in nanotechnology secure new, top-level jobs in research”, Gordon Koell, Managing Director of KMT, said, pleased with the development



## Lenzing Plastics HDPE-Yarns for Perfect Artificial Turf

The Upper Austrian firm of Lenzing Plastics presents “Lenzing Grass”, an innovative artificial turf which combines sports functionality with extreme performance properties and also fits well into the landscapes.

Lenzing Plastics began in 2000 to develop HDPE-yarns for use in artificial turf. In those days artificial turf was vehemently rejected by players and football officials. The reason: Artificial turf yarns were made of 10 to 12mm wide tapes which were fibrillated during the manufacturing process. The artificial turf yarn didn't look or feel anything like real turf. Service life was limited, the material caused injuries to the players and it wasn't sufficiently UV stabilized. This was the state of the market when Lenzing Plastics started the project to develop a better artificial turf yarn.



Artificial turf – the ideal playground surface for nursery schools, Birmingham/England

The 12 mm wide fibrillated tape was replaced by a “grass bundle” of 16 separate yarns. The pile-weight used remained essentially the same.

### Reduction of the Yarn Width

Today artificial turf is fully established in football, hockey and in landscape applications in hot regions where water is precious. Lenzing Plastics experience in extrusion dictated the selection of polyethylene (PE) as a raw material. PE-resins available on the market were combined to attain the desired UV-stability and service life required. Systematically reducing the yarn width greatly improved, the appearance of the turf.

### Completely New Turf Generation

The advantage of this new generation of non fibrillated yarns in artificial turf is a turf that is not easily damaged. The durability is higher and it looks like natural turf. In order to stabilize it, special systems had to be found which were resistant to the interactions with mixed-in granulates. The raw material choice was governed by the high specifications on touch, kindness to the skin and friction properties. It wasn't easy to extrude such narrow yarns in the required width of up to 150µm. The real challenges were waiting for Lenzing Plastics



Twisted Lenzing Grass on finished artificial turf (left)

Multi-functional playing fields, Basel/Switzerland (below)



### Composition of a modern artificial turf system



in the subsequent steps: the 8 separate yarns had to be twined together in order to make the yarns processable for the manufacturer. Because of the good research project results, “Lenzing Grass” was introduced onto the market so successfully that this year an additional production line will be added.

a technology which allows the production of films, tapes and yarns with extremely high tensile strength. The company is structured into two fields. In the field of thermoplastics Lenzing Plastics concentrates on the production of films, fabrics, tapes and multi-layer laminates. In the field of Polytetrafluoroethylene (PTFE) specialized yarns, fibers and films are produced from the high-tech material and offered in a broad spectrum of products.

### Main Emphasis on Synthetic Materials

Lenzing Plastics is one of the worlds leading producers of products made of polyolefin's and fluoropolymers. The main expertise of the company is the mono-axial stretching of polymers,



The project was supported within the FFG's General Programmes.

Information:  
**Lenzing Plastics GmbH**  
 Werkstraße 2  
 A-4860 Lenzing  
 Phone: +43-7672-701-2851  
 Fax: +43-7672-918-2851  
 E-mail: [plastics@lenzing.com](mailto:plastics@lenzing.com)  
 Website: [www.lenzing.com/LenzingGrass](http://www.lenzing.com/LenzingGrass)

## MARK Metallwarenfabrik GmbH New Deep-Drawing Technique for Turbocharger Hose Coupling

An innovation project realised by the Upper Austrian company MARK Metallwarenfabrik has impressively demonstrated how an innovative metal forming technique can make a major impact on the European automotive industry.



A coupling as a metal formed part

Instead of the previously used turbocharger hose couplings, consisting of two parts that had to be assembled, a solution was to be devised that utilises only one operational step. Further aims of the project were to more than double the hose coupling's operational lifespan, reduce the costs for the entire coupling system and improve safety during installation and operation. These complex specifications had been defined by Henn, the largest of MARK Metallwarenfabrik's automotive customers, which supplies VW, DaimlerChrysler and BMW, among others.

### Successful Teamwork

In order to master this challenging task, the MARK project team stroke out on entirely new paths. This included:

- Calculation and optimisation of the metal forming die via computer simulation
- Close cooperation with Henn for optimising the deep-drawn part geometry
- Production of prototypes
- Cooperative development, with the company Manzoni, of a machine especially adjusted to the product. For the series-production, a deep-drawing press seven metres in height and weighing more than 100 tons had to be installed in the factory hall of MARK Metallwarenfabrik.
- Adjustment of all series tools on a hydraulic test press
- Implementation of the tools directly at the machine manufacturer's plant in Italy, so to recognise and resolve potential problems with the tools and the machine at the earliest possible stage in the project.
- Utilisation of a special sheet metal alloy, which is modestly priced and grants the required deformability. This was also undertaken in close cooperation with the sheet metal producers.



Some stages of the metal forming process



Procedural stages of tool production



Metal forming press of 290 tons with 20 stations

### Significant Increase in Lifespan

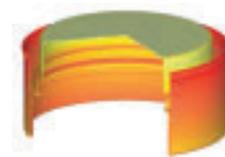
The pre-production run on the press manufacturer's premises in Italy commenced without any major hitches. The product dimensions of the first three series were highly satisfactory and have already been approved by Henn and its main customers VW, Daimler Chrysler and BMW. The lifespan of the new coupling was increased nearly tenfold. Due to this result, the future requirements of the automotive industry that requests ever higher charging pressures can be met optimally. This makes available

a more economical and highly secure coupling system, which just might become the new standard for the European car industry.

### Deep-Drawing Specialist

With this product, the company expects to achieve a turnover equating approximately 7 Million Euros in the medium term (in the next three to four years), equalling about 30 percent of its present turnover. Founded in 1920, the Upper Austrian company MARK is among the leading European manufacturers of small metal parts. Its core competence lies in the deep-drawing of metal parts. This process is being constantly advanced by MARK, providing innovative and cost-effective fastening solutions for the automotive and technical subcontracting industries.

FEM simulation of the metal formed part



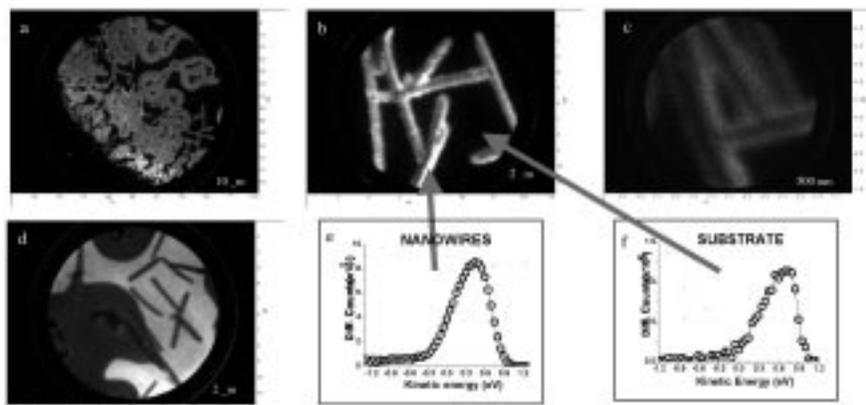
The project was supported within the FFG's General Programmes.

#### Information:

**MARK Metallwarenfabrik GmbH**  
A-4582 Spital am Pyhrn Nr. 555  
Phone: +43-7563-8002-0  
Fax: +43-7563-8041-0  
E-mail: info@mark.at  
Website: www.mark.at

## Project: NANOCOAT Multi-Functional Surfaces with Nanostructured Layers

The project cluster NANOCOAT incorporates partners from Styria, Upper Austria and Vienna, and explores innovations based on nanostructured, multi-functional surfaces. Its research activities centre on providing anti-abrasion layers with extended functionality.



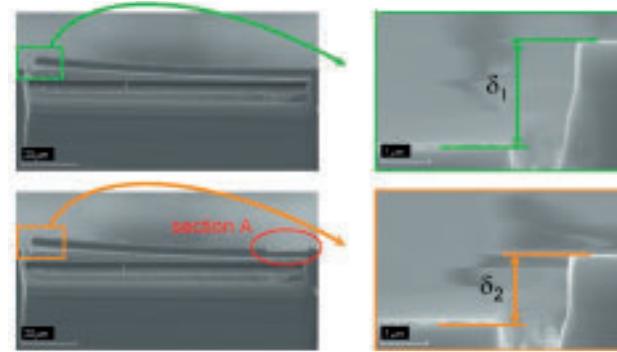
Project BI.III “OxideNanolayers”: PEEM images of VN surfaces: (a) – (c) Oxidised VN coating. (d) Annealed at 500°C in ultrahigh vacuum. (e,f) Energy filtered photoemission spectra of the regions indicated

The future surfaces of tools, building components and functional components are expected to fulfil a growing array of functions. The joint project NANOCOAT, which is funded by the Austrian NANO Initiative, aims to establish a complete innovation chain for the development of multi-functional, nanostructured surfaces. The cluster’s activities range from basic to industrial research and are supervised by the Materials Centre Leoben. The project team is composed of researchers and developers from Universities, extra-University research institutions and companies.

### From Groundwork to Final Application

“StressDesign” is one of the four basic research projects and is dedicated to

providing insight into the behaviour of nanostructured layers under stress in changing temperatures. “LowFriction-Coatings” focuses on innovative layers of hard materials based on Magneli phases for tools and construction components. “OxideNanolayers” deals with the characterisation of the oxidation behaviour of nanostructured layers. “NanoInterfaces” investigates the boundary surface composition and the material transport in nanostructured layers. As part of the applied research projects, “AntiadhesiveLayers” examines the development of new anti-adhesive anti-abrasion layers for tools and building components, including their industrial production. “ColouredCoatings” explores decorative layers with high wear resistance, and “PolymerMetal-Coating” investigates the coating of plastic materials with thin films using



Project BI.I “StressDesign”: Micro-mechanical investigations for the determination of the depth profile of residual stresses in thin films (specimen preparation by means of a Focused Ion Beam Workstation)

vacuum techniques. The project members are confident that first results can soon be put into practice with partners from industry. Besides the provision of essential theoretical know-how, NANOCOAT promotes the development of

innovative products with nanostructured, multi-functional surfaces. At present, the establishment of a Centre for Multi-functional Surfaces, which will cover various domains of expertise, is under preparation.

### NANOCOAT Project Partners:

#### Research Partners

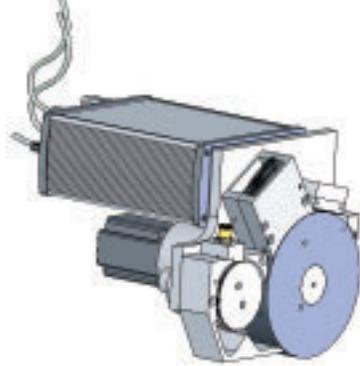
- Materials Center Leoben Forschung GmbH
- Mining University Leoben (Montanuniversität):
  - Department of Physical Metallurgy & Materials Testing
  - Institute of Physics
  - Department of General, Analytical and Physical Chemistry
- JOANNEUM RESEARCH Forschungsgesellschaft:
  - Laser Center Leoben
- Karl Franzens University Graz:
  - Institute of Experimental Physics
- Vienna University of Technology
  - Institute of General Physics
- Vienna University
  - Department of Physical Chemistry
- Austrian Academy of Sciences:
  - Erich Schmid Institute of Materials Science

#### Corporate Partners

- BOEHLERIT GmbH & Co. KG
- Rübiger GmbH & Co KG
- Böhler Edelstahl GmbH
- SECAR Technologie GmbH
- IONBOND Austria GesmbH

The project was supported within the FFG’s Thematic Programmes.

Administrative Coordination:  
Univ.-Prof. Dr. Reinhold Ebner  
**Materials Center Leoben**  
Franz-Josef-Strasse 13  
A-8700 Leoben  
Phone: +43-3842-45922  
Fax: +43-3842-459225  
E-mail: ebner-r@mcl.at  
Website: www.mcl.at



## Medek & Schörner GmbH Programmable Printing on Cables

*The traditional company Medek & Schörner produces innovative machines for high speed printing on cables, wires and tubes. With a recent development named PXP the Viennese enterprise placed a revolutionary quality boost in this sector.*

PXP is the name of this recent innovation which could be accomplished with FFG support. The new programmable cable printer offers a considerably improved robustness when compared to existing ink jet printers, which makes it suitable for the usual demands in rough cable production environment. A specially developed dry toner allows perfect adhesion of the prints on practically all cable insulation materials. The PXP also turned out to fulfil the cost-saving criterion by clearly improved cost-effectivity, compared to usual hot foil printers. Both the technical development of the marking unit and the theoretical research necessary to understand the magnetic properties of the printhead were challenging, and the activities also

focused on the development of the special hi-tech toner powder and its production technology which needed many hours of scientific laboratory work. Theoretical studies were also necessary to deliver the computational baselines for numerical calculation and optimization of the operating parameters.

### Printing at higher speed

Printing text and graphics at cable production speeds needs sophisticated electronic control. A fruitful co-operation with a Viennese hardware and software development firm resulted in the creation of "OPAL", an ultra high speed process control system – the usual proces-

Innovative process control "OPAL 3"



Toner microscopy

sor types available on the market did not comply with the extreme requirements of the new application. Quick realization of various electronic controls for the tests was as well a challenge as the development for the special high speed driver controller for the electronic print-head. The software had not only to manage all speedy signals in the OPAL controller, part of it had also to be developed for a comfortable user shell which appears on the computer screen.

### Family enterprise in the fourth generation

The company Medek & Schörner GmbH with its site in Vienna was founded in 1929 and has kept its family owned structure until today, meanwhile in the fourth generation. The enterprise focused its work in the past 50 years on the

production of marking machines for cables, wires and tubes. The deep manufacturing structure and the highly skilled employees allow ideas to mutate to finished products in a quick and direct way. This direct touch to the technical background also guarantees an optimal support for customers and users. The four columns Medek & Schörner is based on are precision mechanics, machinery engineering, industrial control and hi-tech electronics. Development and production are exclusively governed by highest quality requirements. Modern 3D-design (SolidWorks) guarantees the designer's ideas to turn into a finished product very quickly, by the help of state-of-the-art CNC machining tools.



PXP-Software

**Medek & Schörner**



The project was supported within the FFG's General Programmes.

Information:

**Medek & Schörner GmbH**

Kuefsteingasse 32, POB 27

A-1142 Wien

Phone: +43-1-982 32 04-12

Fax: +43-1-982 32 04-912

E-mail: k.descovich@medek.at

Website: www.medek.at

## Innsbruck Medical University Bee Poison Against Cancer

*Most people fear the sting of the honey bee (Lat.: Apis mellifera) because of its painfulness, and for some it is even life threatening. It is, therefore, rather surprising that this unpleasant insect sting is a glimpse of hope in the fight against cancer.*

This notion is being investigated at Sentimun Biotechnology, located at the Kompetenzzentrum medizin tirol KMT (www.kmt.at). The KMT is an industrial network, which has been sponsored by the Austrian Federal Ministry of Economics and Labour and the Tyrolean Future Foundation since 2002. From the complex cocktail of substances that a bee injects when it stings, the Sentimun researchers use only one highly purified component, the enzyme "Secretory Phospholipase A2". This enzyme attacks the outer membrane of human cells and cleaves fat molecules (lipids), such as phosphatidylcholine, known as lecithin, which can trigger inflammation processes.

### Enzyme Alters Cancer Cells

In search of a treatment against cancer, these properties are exploited in two ways at Sentimun. Firstly, the bee venom enzyme has been found in cell culture studies to have an effect on so called dendritic cells, which are the sentinels of the immune system and can also trigger immune reactions against tumours. The ensuing inflammation process incites the immune system to act. Secondly, the bee venom enzyme has an effect on cancer cells. As these cells are initially body-own cells, the immune system finds it difficult to recognize them. Treatment with bee venom enzyme alters the

Sentimun researcher in the lab



Treatment with bee venom enzyme alters the cancer cells

cancer cells, which enables the body's immune system to identify the cancer cells as its target. Both principles aim at developing a cancer vaccination that mobilises the immune system against cancer.

### Joint Research

The start of this research project was marked by a medical congress on lipid-cleaving enzymes in Berlin, in 2004. There, contact was established to colleagues from the University of Illinois in Chicago, who have provided valuable expertise. Meanwhile, with the support of the Center for Academic Spin Offs Tyrol (CAST), the research results have been filed for patent protection and have been published in internationally renowned medical journals. According to

Univ.-Prof. Dr. Martin Thurnher, Scientific Director of Sentimun, the decisive factors for success are substantial, long-term funding, the good professional and human environment within the network, good consultation services and also the tight link with the University hospitals. The highly professional organisation of the KMT, which is headed by Gordon Koell, was also singled out in the evaluations of the years 2003 and 2005 by the Christian Doppler Research Association (CDG) and the Austrian Research Promotion Agency (FFG) as well as by national and international referees.



The project was supported within the FFG's Structural Programmes.

Information:  
**Immunology and Immunotherapy Laboratory**  
**University Department of Urology**  
 Innsbruck Medical University  
 Anichstraße 35  
 A-6020 Innsbruck

Supervisor: Univ.-Prof. Dr. Martin Thurnher  
 Phone: +43-50504-24867  
 Fax: +43-50504-24817  
 E-mail: martin.thurnher@uibk.ac.at  
 Website: www.immuntherapie-ibk.at

## ORIDIS™ Biomed GmbH A Smart Research Engine to Fight Liver Disease

*Developing innovative treatments for acute and chronic liver diseases is the mission of ORIDIS™ Biomed. Since its inception, the company has successfully built portfolio of F&E programs for the treatment of severe diseases of the liver, and developed its Tissomics™ platform for tissue analysis.*

For patients suffering from primary liver cancer and several other chronic diseases of the liver, current treatment options are anything but satisfying. In many cases, transplantation is the only option, for liver cancer surgical resection is the only effective treatment option. At the same time, the incidence of severe liver disease is growing. Worldwide, primary liver cancer is the fifth most common cancer. And more and more people are being hospitalized with chronic liver diseases, requiring expensive medical support during the period in hospital. This is widely regarded as the long-term consequences of viral hepatitis infections and modern life-style:

which includes obesity, diabetes, side-effects of medications, excessive drinking of alcohol.

### R&D program in liver tumor

This increasing incidence of liver disease without effective medical treatments is the therapeutic focus of the research and development programs initiated by ORIDIS™ Biomed, with support from the Austrian Research Promotion Agency (FFG), among others. ORIDIS™ Biomed's most advanced program is for the treatment of primary liver cancer: Three promising lead compounds have been



Research labs of ORIDIS™ Biomed – Innovative therapeutic solutions for patients with severe liver disease

identified. Currently the selection of a candidate for further development is ongoing. “Our compounds are highly effective against liver cancer cell lines”, says Peter Hecht, Ph.D., CEO of ORIDIS™ Biomed. Preclinical data show that these substances demonstrate a high specificity with low basal toxicity – indicating a potentially good side effect profile.

### Analyzing tissue samples

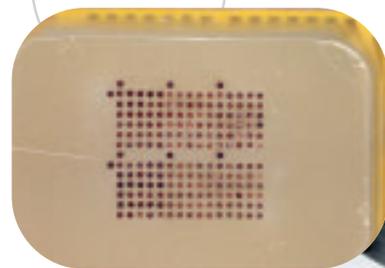
In addition, the Graz company has developed a “smart” research engine which uses a tissue bio-bank, collected from thousands of patients to discover and verify medically relevant targets for use in drug discovery. “We are conducting a clinical trial on a chip” explains Peter Hecht. “This approach increases the success rate of pharmaceutical projects, offering a tremendous potential in an industry where a single innovative drug

substance that is brought to the market is calculated to cost over \$800 million – largely due to the fact that even in the clinical phase of development, when the highest costs occur, only two out of five drug candidates are successful and make it to market approval.

Due to the advantages that this platform offers in drug discovery, big pharmaceutical and diagnostics companies as well as other biotechs have become interested in the Tissomics™ platform: It has been used in a number of successful external co-operations and partnerships.

### Financing round in 2004

ORIDIS™ Biomed was founded in July 2001 by two scientists from the Institut of Pathology at the Medical University Graz and two pharma top executives. The company successfully closed a first financing round in Autumn 2004.



Analysis of tissue samples with Tissomics



Clinical trial on a chip: Improved success rates for R&D projects

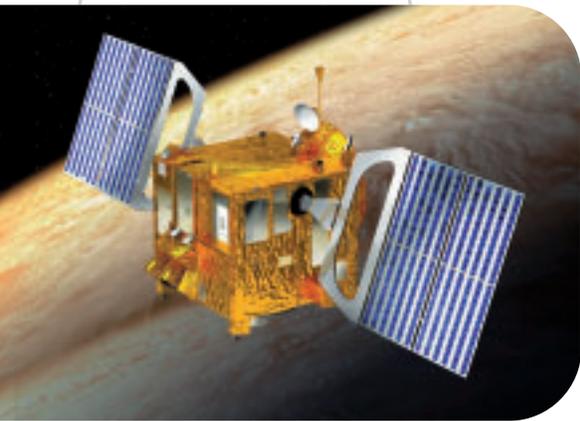
**ORIDIS** Biomed

The project was supported within the FFG's General Programmes.

Information:  
**ORIDIS™ Biomed Forschungs- und Entwicklungs GmbH**  
 Stiftingtalstraße 3 – 5  
 A-8010 Graz  
 Phone: +43-316-325776  
 Fax: +43-316-325776-22  
 E-mail: info@oridis-biomed.com  
 Website: www.oridis-biomed.com

## Space Research Institute of the Austrian Academy of Sciences **Dog Days on Venus**

*Launched last November, the “Venus Express” spacecraft is presently investigating the atmosphere of our sister planet Venus. On board is equipment developed with Austrian know-how.*



The “Venus Express” spacecraft, orbiting around Venus with Austrian high-tech

The atmosphere of Venus is truly a place to avoid: With a temperature of approximately 500 degrees Celsius, an air pressure equalling 92 times that on the Earth’s surface and a carbon dioxide concentration of 96 percent Venus is an extremely hostile place for humans. And yet, it is this atmosphere that is of scientific interest. The goal of this ESA

mission is the detailed exploration of the planet’s atmosphere and plasma environment as well as the erosion of the atmosphere, i.e. the loss of material from the atmosphere due to the solar wind. The findings are also hoped to provide insight into the evolution of the Earth, as both planets shared certain similarities in the past.

### **No Protective Shield**

Unlike Earth, Venus does not possess any significant magnetic field. Without this “protective shield”, the planet is heavily exposed to solar wind and cosmic radiation. In order to investigate the direct impact of solar wind and cosmic radiation on the upper layers of Venus’ atmosphere, Venus Express is equipped, among seven measurement devices, with a highly sensitive magnetometer. This magnetometer has been built by researchers from the Space Research



Venus Magnetometer

Institute of the Austrian Academy of Sciences, with financial support by the FFG. The device has been developed and built in cooperation with the Technische Universität Braunschweig (Braunschweig Institute of Technology) and the Imperial College in London. Its predecessor is already in operation on the ESA mission “Rosetta”.

### **Utmost Precision**

The magnetometer “VEX-MAG” consists of two sensors, an electronics box – including sensor electronics, data processing unit and voltage supply – and a one metre long boom made from carbon fibre. One sensor is mounted on the boom and the other on the surface of the satellite. This configuration of two sensors is necessary to separate the satellite disturbance from the scientifically relevant measurement data. The sensitivity of the measurement device is

approximately 0.1 nanoTesla (one billionth of a Tesla), which equals a 500,000<sup>th</sup> part of the magnitude of the Earth’s magnetic field.

### **Orbit Reached in Mid-April**

The measured magnetic field data help define the Venus plasma boundary and study the solar wind interaction with the Venus atmosphere. In addition, these data are also required and utilised by other instruments aboard Venus Express (e.g., the ion spectrometer ASPERA). Venus Express was launched on 9 November 2005, and in mid-April 2006 it entered orbit around Venus, where the space probe will stay for at least 500 days. So far, the mission has proceeded to the utmost satisfaction of all scientists involved.

The project was supported within the Aeronautics and Space Agency of the FFG.

Information:  
**Space Research Institute  
of the Austrian Academy of Sciences**  
Schmiedlstraße 6  
A-8042 Graz  
Phone: +43-316-4120-501  
Fax: +43-316-4120-590  
Website: [www.iwf.oeaw.ac.at](http://www.iwf.oeaw.ac.at)

## Project: RONCALLI A Co-Pilot for Trouble Spots

With RONCALLI telematics, a traffic telematics system has been developed that processes the flood of traffic-relevant information for drivers by means of a satellite positioning and client/server communication (GPRS) system. As such, it is able to alert drivers in good time to critical spots and dangerous situations.

With growing traffic volumes, demand rises for innovative telematics systems that navigate traffic through streets efficiently and in real-time. Many drivers wish to receive comprehensive and reliable data delivered directly into their cockpits to help them steer clear of trouble spots. At last, the electronic driver assistant “RONCALLI telematics” offers assistance. It has been developed by a consortium including arsenal research, PRISMA solutions and other well-known partners. The principle of RONCALLI telematics is based on the combination of up-to-date vehicle data, such as GPS position and speed, with traffic-relevant information, which is administered by a central server. At present, this continuously updated traffic content includes accident black spots, school

areas, speed limits, and street condition data, such as ruts in the road or lack of road surface grip.

### Use of Standard Components

The key components are a satellite navigation receiver and a mobile terminal equipped with a mobile radio interface, such as a PDA. The vehicle can be equipped with various sensor options. The terminal is connected with the RONCALLI telematics server via the mobile radio interface, so that the PDA fitted with RONCALLI telematics turns into an individual, digital co-pilot. In future, the creation of an extensive virtual marketplace providing a gradually enlarged database for traffic-relevant data and services is planned.



RONCALLI system in operation



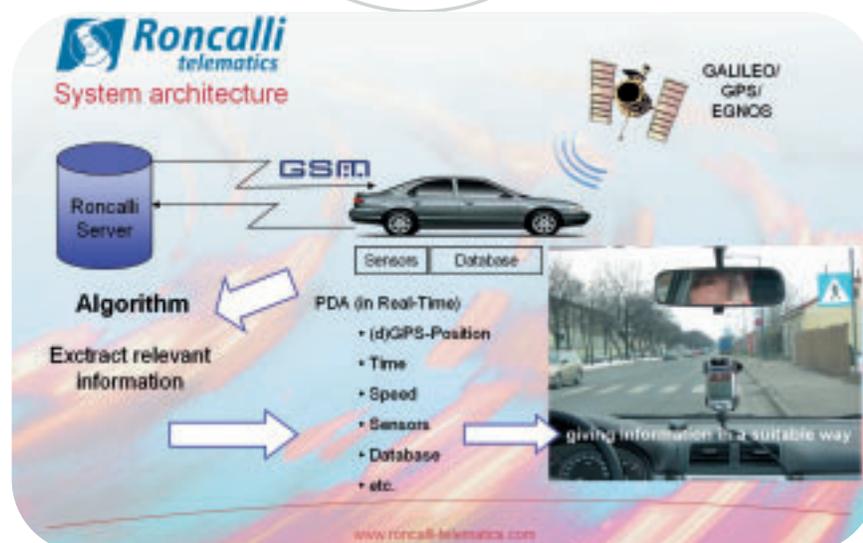
RONCALLI Client with services (sensitive areas, ISA – Intelligent Speed Adaptation, accident hotspots, road condition)

### Test Run in Klosterneuburg

The technical solution of the RONCALLI project has been successfully field-tested in a practical environment. For this purpose, in Klosterneuburg, Lower Austria, a test bed was installed with the support of the City Council. Three vehicles of the municipal fleet were equipped with the necessary technical instruments for testing and verifying the findings of each project phase.

### Project Partners:

- PRISMA solutions EDV-Dienstleistungen GmbH
- Österreichisches Forschungs- und Prüfzentrum Arsenal GmbH
- Oesterreichische Kontrollbank (OIS – OeKB Information Services)
- Austrian Road Safety Board
- University of Natural Resources and Applied Life Sciences – Institute for Transport Studies
- Office of the Lower Austrian Provincial Government
- Austrian Federal Railway – Passenger Traffic Unit
- Traffic Network East Region
- ÖBB-Postbus GmbH
- Driving School Fürböck
- Civil Surveyor Stix
- City Council of Klosterneuburg, Housing Authority (Stadtbauamt)
- Technical University of Munich – Chair of Geodesy



**Roncalli telematics**

The project was supported within the Aeronautics and Space Agency of the FFG.

Information:  
**PRISMA solutions EDV-Dienstleistungen GmbH**  
 DI Nik Widmann  
 Klostergasse 18  
 A-2340 Mödling  
 Phone: +43-2236-47975-12  
 Fax: +43-2236-47975-90  
 E-mail: nik.widmann@prisma-solutions.at  
 Website: www.prisma-solutions.at  
 www.roncalli-telematics.com

## Rieder KG Special Window as Active Avalanche Protection

Rieder KG has launched a window that serves as an effective protection against avalanches. It is equipped with a special glass and a fastening system that can withstand even extreme snow pressures.



Special windows made by Rieder: the avalanche protection window

In the alpine region, avalanches pose a permanent threat in wintertime. Together with Holzforschung Austria, Rieder KG, which is situated in Ried, in the Zillertal valley, has developed and produced an avalanche protective wooden window that is unique on the Austrian market. Thanks to its special fastening system and composite safety glass, this special window is able to absorb pressures of 5,

10 and 15 kN/square meter. The avalanche protective window is tested according to ÖNORM B 5301, a standard that details the avalanche danger zones, including the respective load classes and static loads.

### Wood Outperforms Other Materials

The windows made by Rieder, which are marked by a special label, guarantee superior quality and maximum safety to customers, who are constantly reminded to keep their windows closed in avalanche danger zones. In extreme cases of snow load, wood has proved to possess excellent properties that are second to no other material. "Craftsmanship with system, and life-long quality", is the motto of Rieder KG. In the production of



Rieder's windows production plant in Kaltenbach/Zillertal



This label marks special avalanche protection windows

their windows and doors, state-of-the-art equipment and production methods alongside highly specialised know-how warrant best precision results.

### Double-Testing of Wood Quality

The utilisation of first-rate Austrian wood is a top priority to Rieder KG. Only slow-grown wood from above 1,000 m sea level is used for window production. A careful drying process ensures slow internal stress decrease, thereby enhancing durability and holding power. All Rieder wooden windows are TÜV certified, even if they are not intended for avalanche protection, and also carry the Austrian Quality Seal. This double-testing ensures that the windows satisfy even the most exacting quality demands.

### From Joinery to Complete Supplier

Rieder KG was founded in 1945 as a joinery and carpentry firm. Situated in Tyrol, the company is known as an innovative and distinguished complete supplier in the field of wood manufacturing. Construction and civil engineering, carpentry, as well as window, door and furniture construction are the core of this family business. At present, Rieder KG employs some 240 staff. The company's vast range of window solutions offers an exceptional breadth of choice to the consumer. Whether it is weatherproof wooden windows, practical wood-aluminium windows or easy-care plastic windows, there is no requirement that cannot be fulfilled to the customers' utmost satisfaction.



The project was supported within the FFG's General Programmes.

#### Information:

**Rieder KG**  
Kaltenbach 120  
A-6272 Ried/Zillertal  
Phone: +43-5283-2201-0  
Fax: +43-5283-2201-109  
E-mail: [tischlerei@riederkg.at](mailto:tischlerei@riederkg.at)  
Website: [www.riederkg.at](http://www.riederkg.at)



## Schoeller-Bleckmann Oilfield Equipment AG With High Precision to the Top

*SBO's secret of success is to always be one step ahead in the development and manufacturing of high-precision components for the oilfield service industry. This includes the development of high-strength non-magnetic steels and suitable processing technologies.*



Schoeller-Bleckmann is world market leader in high-precision components made from non-magnetic steel for the oilfield service industry

The products manufactured by SBO are predominantly employed in directional drilling technology that allows to steer the drillbit during drilling. This way, oil and gas deposits that are not situated directly underneath the drilling rig can be targeted. In offshore drilling, which has become increasingly important, this technology is used exclusively – with products made by Schoeller-Bleckmann Oilfield Equipment AG. Oil and gas drillings carried out at a depth of several kilometres below the surface, and at a distance of up to 18 km from the drilling rig, encounter temperatures of several hundred degrees Celsius and extremely high pressures, and, therefore, require the drillstring components to be of superior quality. In terms of technological requirements and complexity, modern exploration technology can be best compared with astronautics.

### Intense Network for Technological Development

Although SBO, being a medium-sized enterprise, does not pursue research activities on its own, the company has been able to assert its leading market position over decades. When developing new materials and processing technologies, SBO has available a far-reaching network.

On the one hand, SBO collaborates very closely with its raw material suppliers, such as the specialty steel group Boehler-Uddeholm, and on the other hand, SBO takes advantage of the profound technological know-how of university institutions, for example, the Vienna University of Technology or the Mining University Montanuniversität Leoben.

### Concentrated Innovative Power

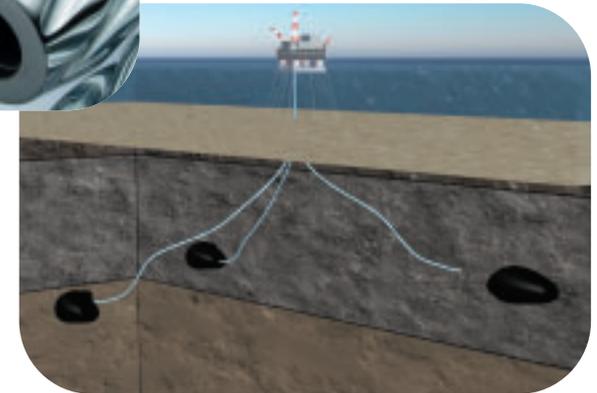
An example of such cooperations is "Gunhole Drilling", a special technique developed by SBO in cooperation with the Vienna University of Technology.



The collars produced by Schoeller-Bleckmann are used as "high-tech housings" for special measuring instruments, sensors, aerials and generators



Schoeller-Bleckmann products are chiefly used in directional drilling



Schoeller-Bleckmann also delivers on-site products and services, which are directly required in the oil field, near all significant oil and gas centres

Having absolutely nothing to do with weapons technology, it deals with drilling boreholes several metres in length into high-strength stainless steel components, while maintaining minimum deviations of up to a few hundredths of a millimetre. These boreholes are used for inserting electronic components, such as special antennas. Another example is "Laserwelding", a processing technology developed by SBO, which applies a particularly durable wear protection to drillstring components. Furthermore, SBO has been developing, together with US research institutions, innovative drilling motors. By focusing the company's development expertise on the high-tech market niche oilfield service industry, the company has gained a technological edge of several years over its competitors.



### With Innovations to the Worldwide No. 1

Schoeller-Bleckmann Oilfield Equipment AG (SBO) is the global market leader for high-precision components made from non-magnetic steel for the oilfield service industry. SBO's products help secure oil and gas supply for today's modern industrial society. SBO is a perfect example of how medium-sized companies can prevail in the world market by focusing its resources on niche products, consistent technological advancement and strong customer-orientation.

The project was supported within the FFG's General Programmes.

Information:  
**Schoeller-Bleckmann Oilfield Equipment AG**  
 Hauptstraße 2  
 A-2630 Ternitz  
 Phone: +43-2630-315-110  
 Fax: +43-2630-315-101  
 E-mail: info@sbo.at  
 Website: www.sbo.at

## Sciencepark Graz

### Keel Web Element – Premium Construction System Made from Wood Cuttings

The “keel web element” is an innovative, intelligent and patented wood composite material, of which very high strength is a predominant feature. It is produced in accordance with an entirely new approach in manufacturing technology and opens up new sales markets for the Austrian sawmill industry.

Today, ecological sustainability, recycling management and total energy balance are essential requirements that determine the market value and acceptance of new construction elements. With his exceptional architectural diploma thesis titled “Entwicklung eines lastabtragenden Bauteils aus Holz” (Development of a Load-Supporting Construction Element Made from Wood), DI Stefan Krestel, together with fellow students from the Graz University of Technology, outlined the project for an innovative wooden construction element called keel web element, which has since been built at the Sciencepark Graz.



Crosssection of a hollow chamber system

#### Little Weight, High Bearing Capacity

The keel web element is a uniaxially directed construction element, capable of bearing high loads. It consists of a top and a bottom boom made from saw wood (wood face) and webs made from plywood. The webs' characteristic curvature, which resembles the keel of a boat, does not only give the construction element its name, but also plays an important role in the production process.

The curvature is responsible for the element's high stability as it distributes the load crossways to its principal direction of stress, thereby creating a truss effect. In the keel web element, only the stati-

cally necessary amount of material is used, which generates a favourable ratio between bearing capacity and own weight. A further requirement of the concept was good value creation from wood cuttings, i.e. wood face material from the sawmill industry, and its intelligent processing to produce a highly efficient construction element.

#### Flexible Filling for Noise and Heat Insulation

The new material possesses optimum shaping flexibility, enabling new technical applications in residential and indu-



A young business with DI Stefan Krestel (in the picture left) and Raimund Köchl being in charge of technical development



The first successfully constructed building

trial construction, and eliminates the need of time-consuming and cost-intensive jig construction. Due to its hollow chamber design divided into separate compartments, it can be filled with both solid or insulation material, depending on the requirements. “A construction element such as the keel web element is not only a product, but rather a comprehensive concept that opens up a great variety of new application possibilities”, is DI Stefan Krestel convinced, who, together with Raimund Köchl and DI (FH) Gerhard Schmid, is in charge of the development of the keel web technology at the Sciencepark Graz. A cooperation partner for the keel web element has been found, and the first sample building in innovative keel web technology, equipped with roof and ceiling elements spanning 5.5 to 7.5 metres, has already been built.

#### Think-Tank for Start-Up Companies

Since its foundation in 2002, the Sciencepark Graz has served as the academic founding centre of the Graz University of Technology, the Karl-Franzens University, the Medical University Graz and the Steirische Wirtschaftsförderung (Styrian Institute of Economic Development). Sciencepark Graz assists graduates with innovative business ideas by providing consultation, coaching, infrastructure, and funding. Its partners are the Technikum Joanneum (Technical College Joanneum), the Styrian Institute for Economic Promotion WIFI, the University of Music and Dramatic Arts Graz, the Austrian Academy of Sciences, Joanneum Research, the Centre for Applied Technology (ZAT), and the City of Graz.

The project was supported within the FFG's Structural Programmes.

Information:  
**Sciencepark Graz**  
 Infeldstraße 21a  
 A-8010 Graz

DI Stefan Krestel, DI (FH) Gerhard Schmid  
 Phone: +43-316-873-9127  
 Fax: +43-316-873-9109  
 E-mail: krestel@sciencepark.at  
 Website: www.sciencepark.at

## SolveDirect.com Internet-Service GmbH Service Management On Demand: Faster. Better. Cheaper.



*SolveDirect.com operates the world's largest service management platform. It provides holistic solutions for on-demand helpdesk management, cross-system coupling, and data clearing of all service partners involved in the service process, while at the same time eliminating system outages and dramatically cutting service costs.*



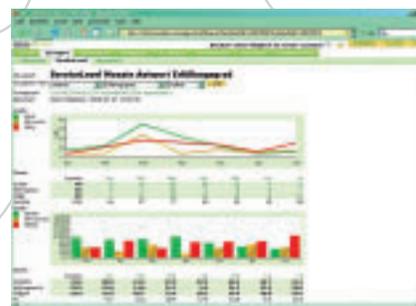
Webinterface of the application SD.call

Today, virtually all operational procedures in large companies require a well-functioning IT infrastructure. But what if this system fails? As company-to-company IT processes have become the vital backbone of numerous day-to-day procedures, the Viennese company SolveDirect commenced in 2000 to develop an industry-neutral Service Management Platform, which is able to "orchestrate" services worldwide. As part of the platform's outstanding benefits, service procedures can be harmonised between companies in as little as two to six

weeks time. In addition, SolveDirect shortens the problem solving time to less than half, which considerably reduces costly IT failures. The adapter technology SD.bridge for integrating service partners directly into in-house processes has successfully been applied by more than 120 companies, including IBM, SIEMENS, BMW Group, Raiffeisen Informatik, Lufthansa Systems, Allianz, and Generali.

### Data Clearing via Platforms

SD.bridge is a data clearing platform, connecting different types of helpdesk systems of service providers and their clients. The automated electronic data



Webinterface of the application SD.report



exchange between the systems considerably speeds up and facilitates service management processes, while reducing communication costs by up to 60 (!) percent. Internal workflows and existing applications remain unchanged. All that is needed for the implementation of SolveDirect's innovative solutions is an Internet browser, which makes complicated introduction projects a thing of the past.

### Service Management On Demand

SolveDirect's innovation ServiceDesk SD<sup>2</sup> can be adjusted to any company within only a few days, a task which used to take months, if not years. The results are quicker usability and not even one third of the running costs of other servicedesk products. Subsequently, ServiceDesk SD<sup>2</sup> is an economic, complete on demand solution for efficient service management. Access is guaranteed at any time via the Internet

or mobile data terminals. ServiceDesk SD<sup>2</sup> does not require investment in hardware, software or internal procedures.

### Internet Technology in Real-Time

SolveDirect.com Internet-Service GmbH provides web-based products and services for IT service management including all procedures between endusers and service providers. The features and functions of SolveDirect's solutions are based on the ITIL standard (IT Infrastructure Library). SolveDirect was founded in Austria, in 2000, and has been managed by an international team specialised in IT service management, applications and partner management.



The project was supported within the FFG's General Programmes.



Information:  
**SolveDirect.com Internet-Service GmbH**  
 Landstraßer Hauptstraße 71/2/313  
 A-1030 Wien  
 Phone: +43-1-585 35 55  
 Fax: +43-1-585 35 55-111  
 E-mail: office@solvedirect.com  
 Website: www.solvedirect.com

## TCG Unitech Systemtechnik GmbH Mechanical Water Pump with Thermoplast Housing

*A new thermoplast-based, plastic-optimised design has demonstrated that costs and weight of a mechanical water pump for car engines can be reduced without compromising stability and performance.*

The Upper Austrian company TCG Unitech Systemtechnik GmbH develops and manufactures, among other products, mechanical water pumps for the engines of leading automotive manufacturers. Presently, pump housings are made of die-cast aluminium. In an innovation project, TCG investigated whether a common automotive water pump could also be made from thermoplastics. Evidently, the new product had to comply with the requirements of the performance specifications (belt strength, fatigue strength, etc.). The water pump bearing was integrated into the housing as an insert during the plastic injection moulding process.

### Load Endurance Testing

The project was based on a water pump of a 4-cylinder petrol engine. First, the housing design was aligned to plastic material properties. This was followed by FE calculations and several rounds of gradual design optimisation. Afterwards, prototype tools were produced, and the parts were injection-moulded using two different types of thermoplasts. The analysis of these new parts was followed

by static tests of 30 pumps in each material category (pressing in and out of the bearing, leakage tests, breaking loads, etc.). Several thousand hours of constant-load testing at alternating rotational speeds and temperatures were executed on six pumps in each material category. Finally, static tests were carried out on the endurance-tested parts in order to analyse the influence of the cooling medium and the dynamic load on the plastic materials.

### Thermoplast Delivers Cost Benefits

The results revealed that the water pump bearing does not experience any impairment by the thermal effects during injection moulding. The housing withstands the required loads with a large safety margin, even after continuous operation. Both tested plastic materials



Test setup:  
6-fold testbed at - 40 °C



Model for finite element calculation

proved to be suitable alternatives to traditional aluminium die-casts. Furthermore, the new materials grant cost savings when compared to aluminium pumps. This equals up to 10 percent of the part price and up to 25 percent of the tool costs, providing the appropriate geometry is applied. These benefits are complemented by a weight reduction of up to 25 percent. Compared to alternatives made from duroplast materials, the simpler processing of thermoplast and its 100 percent recyclability are also distinct advantages.



Functional plastic water pump

### Innovative Pump Technology as a Goal

TCG Unitech Systemtechnik GmbH is headquartered in Micheldorf/Upper Austria, and engages in the development and production of oil and water pump systems primarily for the automotive sector. Its product portfolio ranges from simple water pumps to complex mechanically controlled and electrical systems. The company's reference list includes numerous projects with distinguished OEMs and automotive manufacturers, such as BMW, AUDI, and VW. Innovation being a central pillar of TCG Unitech Systemtechnik, 15 percent of employees work in the development of new products and processes.



The project was supported within the FFG's General Programmes.

Information:  
**TCG Unitech Systemtechnik GmbH**  
 Kollingerfeld 2  
 A-4563 Micheldorf  
 Phone: +43-7582-690-1546  
 Fax: +43-7582-690-546  
 E-mail: [info@systemtechnik.co.at](mailto:info@systemtechnik.co.at)  
 Website: [www.systemtechnik.co.at](http://www.systemtechnik.co.at)

## Project: Open Trusted Computing (OpenTC) As Secure as a Bank Safe

*Computer systems have security holes, which allow attackers to intrude, and read, alter or destroy data. Now a new system promises to improve security on computers and electronic devices, where the respective development activities are performed under Austrian coordination.*



The OpenTC team with Technikon Managing Director Klaus-Michael Koch (centre)

In the framework of the project “Open Trusted Computing” (OpenTC), a consortium of 23 partners from industry, science and research aims to advance the development of trusted and secure computer systems based on Open Source software. The project, which is coordinated by Technikon Forschungs- und Planungsgesellschaft mbH, received funding worth 17.1 million Euros from the EU’s Research Framework Programme. The results will be published as Open Source, thereby making it available to a wide user base. Current computer systems and PCs suffer from security holes, which permit hackers to intrude,

directly access and change data in the system. The ensuing economic damage is enormous for both businesses and individual users. Critical public and private telecommunication infrastructure is also at great risk.

### Integration of Software and Hardware

The technical solution of OpenTC makes security an integral part of the hardware and software. At present, traditional computer systems try to patch their weak spots with an increasing amount

of security layers, such as firewalls or virus scanners. OpenTC complements these layers or, if necessary, replaces them with an integrated security system. The OpenTC key technology for computer protection is a special hardware, called Trusted Platform Module (TPM), which is similar to a Smart Card, combined with a specially layered software architecture. The main objective of OpenTC is to develop, integrate and adjust existing and new components to compose a complete trustworthy system. The ensuing novel security procedures and possibilities are based on low level software layers and hardware, and generate security zones for the operating system, software applications and users.

phones, automotive electronics, and industrial automation. At the same time, it provides a basic technology for the securing of complex distributed systems with multi-layered security zones, such as routers, switches or wireless networks. OpenTC enhances security even during authentication, thereby significantly enhancing protection against attacks from the Internet via Phishing, viruses, Trojan Horses, and Root Kits. OpenTC expects to provide a way of running critical processes, such as electronic banking or e-commerce, in a secured environment shielded from external attacks.

### Wide Range of Use

Apart from its use in PCs, the OpenTC architecture can be extended to cover a great variety of areas and devices, such as servers, grid computing, mobile



The project was supported within the FFG’s European and International Programmes.

Information:  
**Technikon Forschungs- und Planungsgesellschaft mbH**  
 Richard-Wagner-Strasse 7  
 A-9500 Villach  
 Phone: +43-4242-23355-0  
 Fax: +43-4242-23355-77  
 E-mail: [coordination@opentc.net](mailto:coordination@opentc.net)  
 Website: [www.opentc.net](http://www.opentc.net)

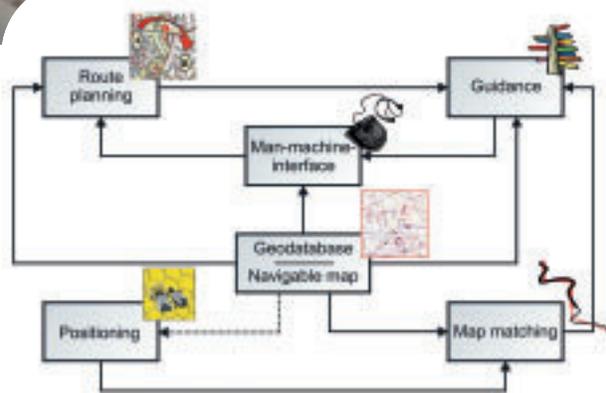
## Project: PONTES Navigation System for Blind People in Urban Environments

*To increase the mobility of blind people in urban environments, a navigation system called PONTES was presented by Graz University of Technology. As far as positioning is concerned, GPS is combined with a compass and step detection.*

In addition to common orientation aids like the white cane, the Institute of Navigation and Satellite Geodesy from Graz University of Technology has developed an overall navigation concept with social relevance. The navigation system is tailored to the special needs of blind people and includes all navigational components to guide the user to the desired destination: position determination, route planning, and guidance

### Geodatabase

Based on a digital map, a positioning module, and a portable computer, the blind person is guided by the system from an arbitrary starting point to a desired destination. Additionally, the user receives obstacle warnings along the route. For the first time, a very detailed geodatabase is used within the navigation system. Based on this database, a detailed path network with high accuracy is generated to support route planning and guidance. With the help of accurate and safe guidance instruction the user is guided to the desired destination. Moreover, possible safety risks for blind people are taken into account. The various influences are summarized by a specific cost function which allows



The system also includes obstacle warnings for blind persons, e.g.: "Attention there is a postbox!"

the routing algorithm to automatically avoid potential, hazardous situations for blind people (e.g., pedestrian crossings without traffic lights).

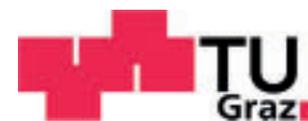
### Safety is guaranteed

Another innovation of PONTES is the use of a multisensor system for the positioning module. Besides a GPS receiver for single point positioning, this module includes a magnetometer triad and a gyrocompass for course determination, an accelerometer triad for step detection, and a barometric altimeter for height determination. These additional components allow dead reckoning to overcome GPS data gaps caused by shadowing effects in densely populated areas with high buildings. The Pedestrian Navigation Module (PNM) is kindly offered by the Swiss Vectronix AG.



### PONTES started 2005

The Institute of Navigation and Satellite Geodesy was founded in 2004 due to a new structure of faculties. On 1st of May 2005 PONTES started in cooperation with the project partners; these are the Styrian Association of Blind and Visually Impaired People, and the Vectronix AG, Heerbrugg/Switzerland. The navigation system was developed in close cooperation with potential users.



The project was supported within the Aeronautics and Space Agency of the FFG.

Contact:  
Ao.Univ.-Prof. DI Dr.techn. Manfred Wieser  
**Institute of Navigation and Satellite Geodesy**  
**Graz University of Technology**  
Steyrergasse 30  
A-8010 Graz  
Phone: +43-316-873-6830  
Fax: +43-316-873-8888  
E-mail: wieser@geomatics.tu-graz.ac.at  
Website: [www.inas.tugraz.at/forschung/pontes/](http://www.inas.tugraz.at/forschung/pontes/)

## Project: GOCE Tracing Gravity

*As of 2007, the European satellite "GOCE" (Gravity Field and Steady-State Ocean Circulation Explorer) will measure the Earth's gravity field with previously un-attained precision – an achievement Austrian researchers will play a major role in.*

In 2007, the European Space Agency ESA intends to launch its own satellite, which will be capable of surveying the Earth's gravitational field more accurately by a factor of 100. The data will serve as a basis for a three dimensional model. Gravity, though averaging  $9.8 \text{ m/s}^2$ , is not constant across the Earth's surface. It varies between  $9.78$  and  $9.83 \text{ m/s}^2$ . Gravity depends on altitude, i.e. the distance from the geocentre, and also on the type and composition of the Earth's crust and body. In addition, the Earth, in rotation, is not, strictly speaking, a

sphere, but rather an ellipsoid (egg-shaped). Its radius is 21 km longer at the equator than at the poles, which is another reason for the Earth's gravitational deviations.

### 100 Million Measurement Data

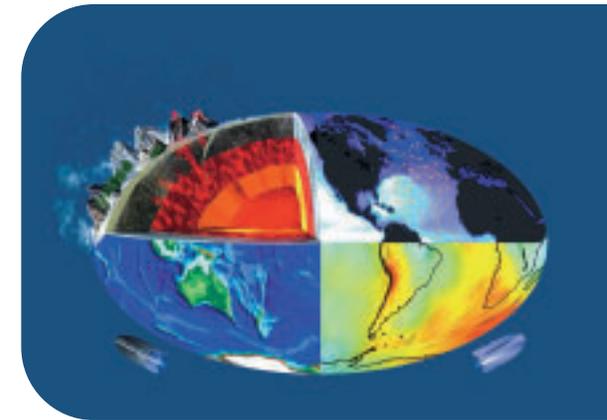
Austrian researchers take part in the mission "GOCE" in numerous ways. Austrian Aerospace and Magna Steyr supply components for the control and propulsion system, while the Institute of Navigation and Satellite Geodesy of the Graz University of Technology, together with the Space Research Institute of the Austrian Academy of Sciences, handles the processing and storing of the collected data. During its 20 months of scheduled mission duration, several 100 million measurement data will be recorded. In order to analyse these data, the researchers from Graz have deve-

loped special algorithms, including parallel solution strategies using super-computing on PC clusters.

### Satellite with a Propulsion System

The GOCE satellite is planned to travel in a very low orbit at approximately 250 km altitude, which is necessary to guarantee the extremely exact measurements of gravity, as precision decreases the further from the Earth. However, this also has its problems, as some – if only very thin – atmosphere is present at this altitude. For this reason, airflow, i.e. air resistance, and other influencing effects need to be compensated by an active propulsion system. Austrian researchers are also actively involved in the highly complex GPS calculation of the satellite's orbit and the derivation of the gravitational field information via "Satellite-to-Satellite Tracking" (SST).

Before the onset of the era of artificial satellites, data of the gravitational field could only be collected on the ground



Global climate forecasts will also profit from GOCE

and at sea, an extremely time-consuming and cost-intensive measurement set-up for the generation of an accurate picture of the entire planet. These measurements are now complemented and extended by satellite observations. Furthermore, it is also the hope of climate scientists that the satellite, which is five metres long and weighs approximately 1.2 tons, will enable simpler and more precise global climate forecasts by enhancing knowledge on ocean currents and the fluctuations of the sea level.



Artist's impression of GOCE satellite, due to launch in 2007

The project was supported within the Aeronautics and Space Agency of the FFG.

#### Information:

#### Institute of Navigation und Satellite Geodesy Graz University of Technology

a.o. Univ.-Prof. R. Pail  
Steyrergasse 30  
A-8010 Graz  
Phone: +43-316-873-6359  
Fax: +43-316-873-8888  
Website: [www.inas.tugraz.at](http://www.inas.tugraz.at)

#### Space Research Institute of the Austrian Academy of Sciences

Univ.-Prof. H. Sünkel  
Schmiedlstraße 6  
A-8042 Graz  
Phone: +43-316-4120-701  
Fax: +43-316-4120-790  
Website: [www.iwf.oeaw.ac.at](http://www.iwf.oeaw.ac.at)

## Project: ISOTEC Nanotechnology Conquers Sensor Technology and Optoelectronics

*Initiated by the Austrian NANO Initiative as a joint project, ISOTEC investigates new organic semiconductors and their utilisation in opto-electronic components and sensors.*



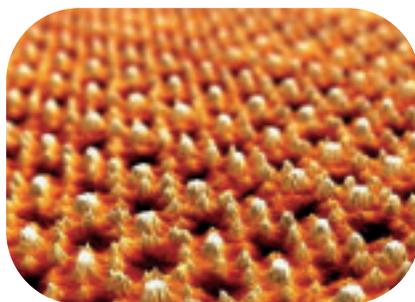
Flexible light-emitting element

ISOTEC (Integrated Organic Sensor and Optoelectronic Technologies) is a perfect example of a concerted interplay of basic research, applied research, and industrial development. It explores new application areas in sensor technology and optoelectronics by applying and combining novel organic semiconductors as well as nanotechnological structuring and production methods. The project's target is to utilise innovative sensor and construction elements for the monitoring of foodstuffs, indoor air and workplace safety, or even for rapid medical tests in

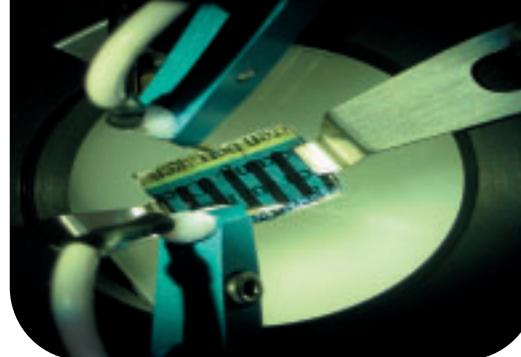
emergency situations. Under the supervision of the JOANNEUM RESEARCH and the Graz University of Technology twelve research topics are being investigated, six of which are basic research oriented, and six that are directed at application-related subjects and issues. ISOTEC is funded by a 3.7 million Euro grant.

### Nanotechnology Centre in Weiz

In order to ensure long-term research in the key subject "Integrated Organic Sensor and Optoelectronics Technologies", ISOTEC's activities are planned to be pooled in its own research and technology centre. For this purpose, the NanoTecCenter Weiz Forschungsgesellschaft mbH was founded on 28. February 2006. In July 2007, it will begin its operation in a building currently being constructed in Weiz. Until its re-location, research activities will continue at the Graz University of Technology, the facilities of JOANNEUM RESEARCH Forschungsgesellschaft mbH, and partner institutes.



S-layer grid in the nanometer scale



Organic photo cell

### Project partners:

#### Extra-university Research Institutions

- JOANNEUM RESEARCH Forschungsgesellschaft mbH
  - Institute of Nanostructured Materials and Photonics
  - Institute of Chemical Process Development and Control
- Association for the Promotion of Electron Microscopy & Microstructure Research
- Erwin Schrödinger Institute for Nanostructure Research
- Forschungszentrum Karlsruhe GmbH, Germany, Institute for Materials Research III

#### University Research Institutions

- Graz University of Technology
  - Institute of Solid State Physics
  - Institute of Analytical Chemistry and Radiochemistry
  - Institute of Chemistry and Technology of Organic Materials
  - Institute of Materials Physics
  - FELMI
- Karl-Franzens University Graz
  - Institute of Chemistry
- Vienna University of Technology
  - Institute of Applied Synthetic Chemistry
  - Institute of Materials Science and Testing
- Johannes Kepler University Linz
  - Institute of Experimental Physics
- University of Natural Resources and Applied Life Sciences, Vienna
  - Center for Nanobiotechnology

#### Industry

- Alvatec Alkali Vacuum Technologies GmbH (Carinthia)
- ARC Seibersdorf Research GmbH (Lower Austria)
- AT&S – Austria Technologie & Systemtechnik AG (Styria)
- AVL List GmbH (Styria)
- Datacon Technology AG (Tyrol)
- EV Group E. Thallner GmbH (Upper Austria)
- Nano-S Biotechnologie GmbH
- Sony DADC Austria AG (Salzburg)

**ISOTEC**

The project was supported within the FFG's Thematic Programmes.

Organizational Supervision:  
Dipl.-Ing. Dr. techn. Anja Haase  
**JOANNEUM RESEARCH Forschungsgesellschaft mbH**  
**Institute of Nanostructured Materials and Photonics**  
Franz-Pichler-Straße 30  
A-8160 Weiz  
Phone: +43-316-876-2702  
E-mail: anja.haase@joanneum.at  
Website: www.joanneum.at

Scientific Supervision:  
ao. Univ.-Prof. DI Dr. Emil J.W. List  
**Graz University of Technology**  
**Institute of Solid State Physics**  
Petersgasse 16/1/108  
A-8010 Graz  
Phone: +43-316-873-8468  
E-mail: e.list@tugraz.at  
Website: www.isotec-cluster.at  
www.ntcw.at

## Project: TUNCONSTRUCT Putting Traffic Under Ground

*The exploitation of subterranean space offers unimagined possibilities and could significantly enhance the quality of life in Europe. With the EU project "TUNCONSTRUCT" (Technology Innovation in Underground Construction), the world's currently most ambitious project in the field of tunnel and underground engineering was launched in September 2005. The coordination of the project lies with the Institute for Structural Analysis of the Graz University of Technology (TU Graz).*

The vision of a city, where fine dust and stressful noise are forced underground, has moved one step closer. TU Graz, in collaboration with 41 European partner institutions from science and industry, prevailed with its project idea against fierce international competition. With the large-scale EU project "TUNCONSTRUCT" (Technology Innovation in Underground Construction), whose budget totals 26 million Euros, the most comprehensive research project in the history of TU Graz has begun. "Now, TU Graz has become the European competence centre for tunnelling construction, making the Styrian capital the international hub of tunnelling engineering", stated Hans Sünkel, Rector of TU Graz, proud of the success of his University. "The objective of this project is to significantly reduce the cost and duration of tunnel and cavern construction by employing innovative technologies, and to increase safety and sustainability."

### Technological Stimulus in Tunnelling

A particular focus of "TUNCONSTRUCT" is on the design of safe and inexpensive tunnel solutions for road and rail traffic. For the comprehensive construction of a double-tube tunnel system across Europe, roughly 2,100 kilometres of tunnel must be built within the next 15 years. According to project coordinator Univ.-Prof. Dr. Gernot Beer, the costs of this work amounts to approximately 300 billion Euros. "In order to ensure fast completion of the planned projects, costs and construction time must be reduced. This requires optimisation of all processes in underground construction", he explained. The costs of maintenance and repair over the lifetime of a tunnel, which can match its building costs, are also investigated in detail. Considerable cost and time savings are expected to be achieved by employing embedded sensors or robots. An important contribution of the researchers from Graz is the development of efficient simulation models for tunnel construction.



TUNCONSTRUCT:  
The objective of this EU-project is to significantly reduce the cost and duration of tunnel and cavern construction by employing innovative technologies

### Safer and Cheaper Construction

The researchers expect to achieve substantial savings in tunnel construction by providing efficient data exchange at the construction site and innovative construction equipment. The construction sequence should be largely automated, so that workers can keep clear of immediate danger zones. In the scope of the project, the first Europe-wide tunnelling database is also planned to be set up,

which will contain extensive information on all project phases. In future, all relevant data about European tunnels, from their planning to construction stages, will be available at the press of a button. Equipped with a portable computer and a data helmet, tunnelling engineers will be connected to state-of-the-art visualisation systems, such as augmented virtual reality, and have immediate access to comprehensive data at any time and any place.



The project was supported within the FFG's European and International Programmes.

#### Information:

**Graz University of Technology  
Institute for Structural Analysis**

O.Univ.-Prof. Dipl.-Ing. Dr.techn. Gernot BEER  
Lessingstraße 25/II  
A-8010 Graz  
Phone: +43-316-873-6180  
Fax: +43-316-873-6185  
E-mail: gernot.beer@TUGraz.at  
Website: www.ifb.tugraz.at

## Therm-ic Products GmbH NFG & Co KG

### Hi-Tech against Cold Feet

*With an innovative radio control for shoe heaters and battery packs that are particularly powerful, the company Therm-ic has taken on the fight against cold feet – no matter whether in winter sports or outdoor work.*

In 1985, the idea for a shoe heater emanated from David Macher's personal experience, suffering from cold feet while skiing. Two years later, he was granted the patent for a "Therm-ic Footwarmer". Other patents followed, and new products, such as the hygiene product "ThermicAir" were successfully launched on the market. This innovative product does not only dry soaked shoes but also reduces the germ count of existing bacteria and fungi by the means of UV light, thereby minimising odours. This guarantees a healthy environment for feet. Due to the growing demand in smaller and lighter battery packs, two new developments are now presented by the market leader. Modern design and maximum comfort due to the boot heaters' radio remote control characterise the two innovations called LIIONPACK and CORDLESS.

#### Warmth at the Push of a Button

The objective of the project LIIONPACK was the development of a new rechargeable Lithium Ion battery pack yielding equal heating performance and usability in all existing Therm-ic heating elements. Weight and volume were to be reduced by 30 percent. An absolute novelty is the

radio remote control, which uses a globally available frequency band for transmission and works selectively for several simultaneously operated heating systems without causing interference. The chosen heat setting is displayed on the battery pack as well as on the remote control. The product is also equipped with safety functions that protect against overheating and short circuits, which are permanently monitored by a microcontroller. Although the development of the charging technology for rechargeable Li-Ion batteries is more expensive, it is much easier to use. The globally usable chargers have shorter charging times, which is an additional asset.

#### The Energy Comes from the Sole

The development project CORDLESS goes even one step further and is fully independent from the Therm-ic heating elements. All components required for the CORDLESS heating system are integrated in a slightly thicker insole. Due to the extremely limited space and for safety reasons, special Lithium Ion Polymer batteries must be used, which do not leak nor overheat if damaged. In addition, they must be able to withstand the mechanical pressure and defor-

Warmth just a fingertip away



mation during the feet's rolling motion when walking. The complete integration of the charging, radio and heating systems does not compromise the insole's orthopaedic quality. Also its cushioning properties are not affected by the heating system. Moreover, the charging options and charger have been adjusted to alternative charging via USB.

#### Acclaimed Heating Innovation

Therm-ic Products, with its headquarters in Gleisdorf, Styria, is the leading manufacturer of boot heaters, dryers and war-

mers as well as boot fitting systems. Its time-tested recipe for success is the use of innovative, modern design blended with cutting-edge technologies, while constantly exploring new markets. In 2002, the company was awarded the "Most Innovative New Business in Austria in the Past 25 Years" for its overall achievements by the Austrian Wirtschaftsservice (AWS).



Liionpack + ThermiControl remote control



The project was supported within the FFG's General Programmes.

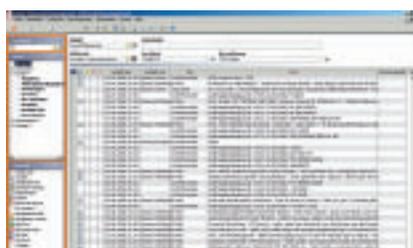
#### Information:

**Therm-ic Products GmbH Nfg. & Co KG**  
 Fritz-Knoll-Straße 3  
 A-8200 Gleisdorf  
 Urs Maron (CEO/Partner)  
 Phone: +43-3112-36026-42  
 Fax: +43-3112-36026-6  
 E-mail: maron@therm-ic.com  
 Website: www.therm-ic.com

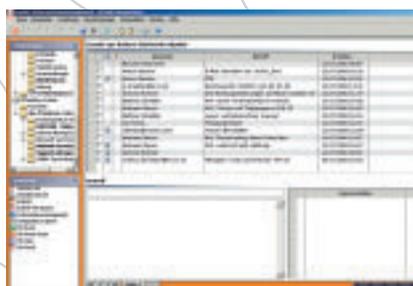
## TIP Technik und Informatik Partner GmbH INSIDE X Puts Order into the Information Jungle

The company TIP Technik und Informatik Partner GmbH, located in Dornbirn/Vorarlberg, has developed an innovative ECM software solution: INSIDE X is a well-structured information platform, which untangles any data chaos and provides comfortable access to information.

The handling and structuring of the daily flood of information demands increasingly intelligent strategies, methods and software systems. What makes TIP's ECM solution (Enterprise Content Management) clearly stand out from similar developments, is the immediate, efficient and easy usability of all information. Documents, mails and archived information are made available at the push of a button, while also allowing interactive access to corporate data. Today, companies work with the most diverse software products for administering data about customers, suppliers, employees and complex business operations. Searching for information can therefore be inefficient and time-consuming. INSIDE X is a new software system that bundles information from all included systems and presents it in the form specified by the client, protected by an authorisation system. INSIDE X also connects to MS Office products. Other data types can be included in the software cycle via the integrated file management system. INSIDE X is equipped with open inter-



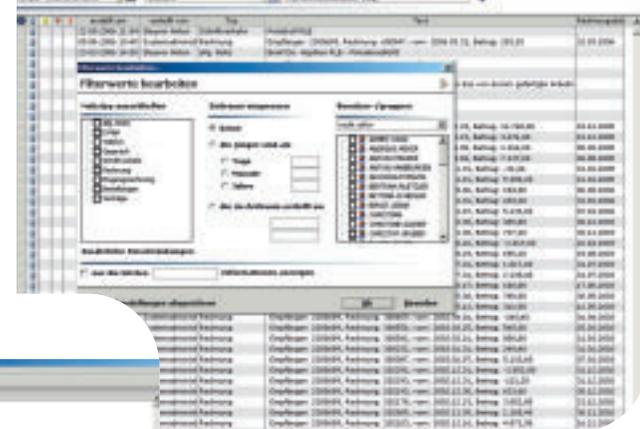
Information management (above) and E-mail integration (below)



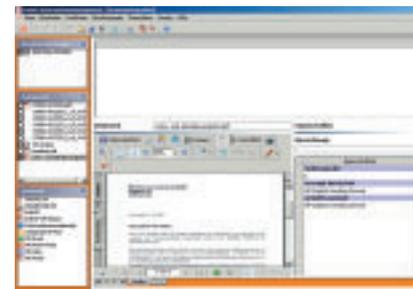
faces to facilitate the incorporation of data stock from external suppliers and with TAPI to integrate phone functions.

### Access Data Selectively ...

Data mining is another important field in the company's activities. TIP's product "Open Data Miner" is displayed in INSIDE X via an interface and allows the user to analyse data by accessing various databases from INSIDE X. Existing information can also be further processed for e.g. sales and marketing purposes. Apart



Filter values (above) and Scanner integration (left)



from these basic functions, INSIDE X also possesses a function for the flexible integration of individual requirements called "User Defined Forms". This enables the structured linking of data that either is not yet included in any software system, or is not available in an organised way. All of these functions help a business to shorten its communication paths and make them more efficient. Within split seconds, the required data is displayed on the screen, and can be recorded, analysed, processed or printed and distributed. All kinds of information, be it phone calls, mails, documents, or data from existing software systems, is instantly available.

### ... and Save Time

"The utilisation of INSIDE X has proved to save up to one hour and a half of work each day – for every employee working with the software," explained Anton Steurer, Managing Director of TIP. "We are particularly proud that INSIDE X is an ECM solution that is able to stand up to even large competitors." TIP Technik und Informatik Partner GmbH considers its core task in rendering the usability of information more efficient. The company's other key businesses include software solutions for staff management, efficient data utilisation and data management, as well as professional IT services.



The project was supported within the FFG's General Programmes.

Information:  
TIP – Technik und Informatik Partner GmbH  
Bildgasse 18a  
A-6850 Dornbirn  
Phone: +43-5572-33280  
Fax: +43-5572-53541  
E-mail: office@tip.co.at  
Website: www.tip.co.at

## Transfercenter für Kunststofftechnik Wood Plastic Composites – New Value Creation from Wood Fibers

A research project has revealed that natural fiber reinforced plastics containing over 60 percent wood and which are produced in a one-step direct extrusion, are particularly efficient and cost-effective materials.



Polymers, natural fibers and composites

Especially in the USA and Japan, the market for natural fiber reinforced plastics is booming, yielding annual growth rates of over 25 percent. Also in Europe hemp and flax fibers are no longer a novelty to the automotive industry. It is therefore not surprising that the price-sensitive building industry now has also discovered wood fibers and splints as a low-cost material and future main component of Wood Plastic Composites (WPC). The present project of the Upper Austrian Transfercenter für Kunststofftechnik (TCKT) analysed highly-filled WPC systems containing a wood portion of more than 60 percent of wood particles.



Sill profiles

### New Processing Technique ...

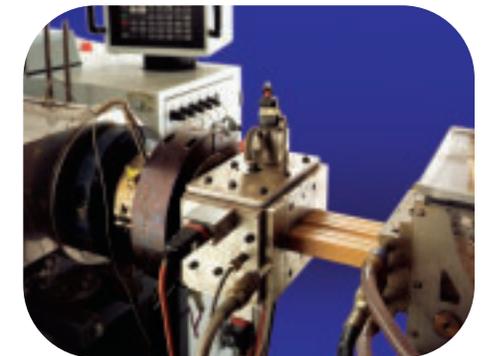
The TCKT research project pursued the following objectives:

- Increasing the value created from wood fibers, which are otherwise utilised as additives only in, e.g., in pellets and the flake board industry
- Systematic analysis of the property matrices of these new materials
- Optimisation of the formulation regarding wood fiber properties and processing technique
- Development of an innovative processing technique, feeding the correct dosage of wood fibers directly into the extruder
- Accumulation of technological and material-specific basic know-how for the production of marketable products



Extrusion line  
for WPC production

WPC extrusion die for sill profile  
by the company Greiner Extrusionstechnik



### ... and Direct Extrusion as a Method of Solution

The participating partner companies (Cincinnati Extrusion GmbH and Greiner Extrusionstechnik GmbH) solved the technological problems, i.e. the development of a wood fiber dosage system for direct feed and an extrusion die, by means of two independent projects. As a test object, an experimental profile for building structure was defined, which was not exposed to direct weathering, but nevertheless posed very high requirements on material quality and the extrusion technique. From the range of polymers, only polyolefins (polyethylene and polypropylene) were tested, investigating in detail the influence of the process conditions, the type and quantity of wood, the fiber geometry and the grade of polymer (homo- or copolymers). These tests soon revealed that direct extrusion clearly outperforms any two-step

procedures (i.e. production of a compound, followed by extrusion in a second step), due to the decreased mechanical and thermal damage caused to the wood fibers.

### Know-How in New Technologies

Transfercenter für Kunststofftechnik (TCKT) is a department of the Upper Austrian Research GmbH (UAR) and specialised in fields such as material characterisation, materials and compound development, tool development, CAE, composites and natural fiber reinforced polymers. UAR is also active in contactless sensor technology, biomedical nanotechnology and medical informatics. It is a 100 percent subsidiary of the Upper Austrian Technologie- und Marketinggesellschaft TMG.

# TCKT

The project was supported  
within the FFG's General Programmes.

Information:  
**Transfercenter für Kunststofftechnik**  
Franz-Fritsch-Strasse 11  
A-4600 Wels  
Phone: +43-7242-2088-1000  
Fax: +43-7242-2088-1020  
E-mail: office.tckt@uar.at  
Website: www.tckt.info

## Project: GLOCHAMORE Alpine Indicators of Climate Change

*Although the long-term effects of climate change, global warming and the greenhouse effect on nature is largely undisputed, there is still discussion about how indicators can be reliably determined and measured. To address these shortcomings, a global early warning system in biosphere reservations has been developed under Austrian coordination.*



Industrial exhaust fumes are the main cause of climate change

High mountain ecosystems are particularly sensitive to climate changes. This becomes apparent when comparing the size of glaciers on old and new photographs. Climate change also affects vegetation, alpine lakes and rivers, and the atmospheric composition. However, it is difficult to derive supra-regional or even global tendencies from singular data, and to delimit them from local changes or statistical fluctuations.

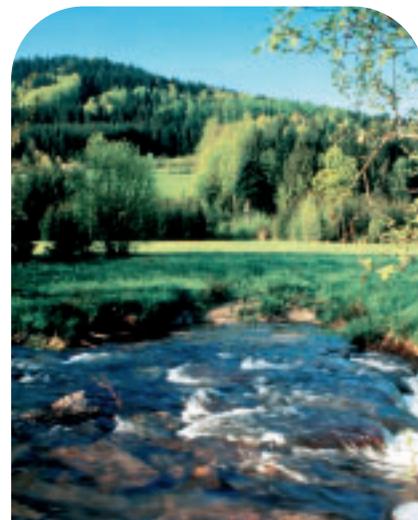
### Sensitive Alpine Ecosystem

So called alpine biosphere reservations are particularly suitable for studying the human influence on climate and nature as a whole. They are natural, highly sensitive ecosystems and possess various indicators for revealing climatic changes. For this reason, in recent years, an inter-

disciplinary early warning system analysing the effects of global change in high mountain habitats was developed within the scope of a large-scale project called "GLOCHAMORE", which was headed by Viennese scientists. The project, which was funded by the EU's Research Framework Programme, was integrated into UNESCO's "Man and Biosphere" Programme and the Mountain Research Initiative (MRI), and incorporated 14 scientific institutions in India and nine European countries.

### From South America to Australia

In the scope of the project, a range of indicators has been defined, which are regularly recorded, monitored and compared. These include air, soil and water temperatures; the extent, distribution and chemical composition of precipitation; the composition, fauna and changes of waterways; and vegetation,



Species survey at a GLORIA observation peak (2,968 m) in the UNESCO biosphere reservation Sierra Nevada (Spain), one of the 26 reservations of the Glochamore project



GLORIA team in the UNESCO Biosphere reservation Ordesa-Viñamala/Pyrenees (Spain)

as well as many others. Satellite data is also included in the evaluation process. 26 different biosphere reservations were then selected from all climate zones across the globe, where this standardised range of indicators is continuously monitored. These biosphere reservations include Torres del Paine in South Patagonia, the Glacier National Park in Montana, USA, Mt. Kenya and other areas in Africa, several regions in Central Europe and Asia, and the Snowy Mountains in Australia. Project coordinator, Univ.-Prof. Georg Grabherr from the University of Vienna, based the GLOCHAMORE project on the existing observation network "GLORIA", which was also funded by the European Union. GLORIA, a network for research on the effects of climate change in alpine environments, had begun its

operation, in 2001, in 18 alpine regions in Europe (see: [www.gloria.ac.at](http://www.gloria.ac.at)). Today, the global GLORIA network, which is coordinated in Austria, comprises 50 regions (26 in Europe, 5 in Asia, 11 in North America, 5 in South America, 3 in Australia & New Zealand). GLOCHAMORE started in November 2003 and was concluded with a large-scale conference including 250 participating scientists from 47 nations, in October 2005.



The project was supported within the FFG's European and International Programmes.

Contact:  
Univ.-Prof. Dr. Georg Grabherr  
**University of Vienna**  
**Department of Conservation Biology, Vegetation and Landscape Ecology**  
Althanstraße 14  
A-1090 Wien  
Phone: +43-1-4277-54370  
Fax: +43-1-4277-9575  
E-mail: [georg.grabherr@univie.ac.at](mailto:georg.grabherr@univie.ac.at)  
Website: [www.univie.ac.at/cvl](http://www.univie.ac.at/cvl)

IQOQI/Austrian Academy of Sciences  
 Institute of Experimental Physics/University of Vienna  
**Quantum Communication in Outer Space**

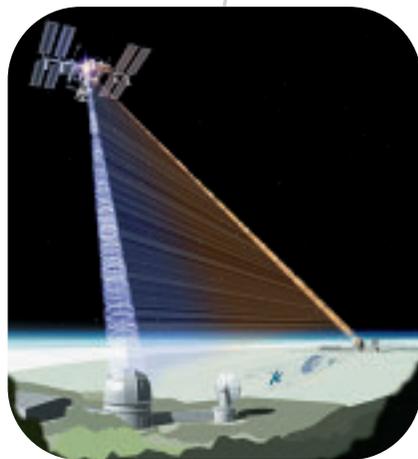
*Exciting innovative experiments in the field of quantum communication have paved the way for revolutionary technologies of the future, such as quantum cryptography and quantum teleportation. Now, an ambitious team around Univ. Prof. Dr. Anton Zeilinger is taking its first steps towards outer space.*

In the scope of a project titled “Quantum Entanglement in Space Experiments”, Univ. Prof. Dr. Anton Zeilinger from the Institute of Experimental Physics and the 2003-founded Institute for Quantum Optics and Quantum Information of the Austrian Academy of Sciences are currently conducting a fascinating test series. “Entanglement” is a fundamental principle in quantum physics and an essential prerequisite for the application of quantum communication in quantum cryptography and quantum teleportation. This principle is based on the

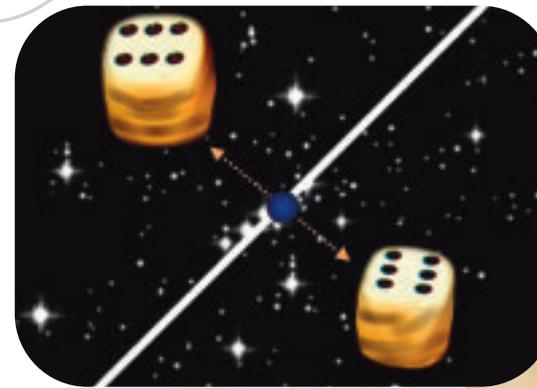
phenomenon that two entangled light particles (photons) always remain connected, however far apart.

**Basic Research Intensified**

The project has been supported in various ways by the funding programme of the FFG’s Aeronautics and Space Agency. Its key activities include studies for the design of a quantum communication terminal for outer space; analyses of quantum communication tests with satellites at a Laser Ranging Station; research into highly efficient sources of entangled photons, which must be adapted to the harsh conditions in Space; successful experiments on the ground with quantum communication at a distance of 144 kilometres; as well as research into quantum communication with movable or flying units in an attempt to simulate satellite transmission on the ground. These activities have won the group of researchers around Univ. Prof. Dr. Anton Zeilinger a worldwide reputation of being at the forefront of innovation in this field.



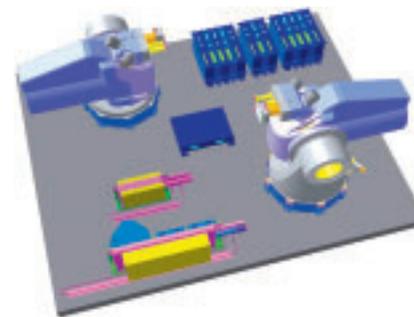
Satellite based quantum communication will be explored for long-distance applications



Quantum entanglement (Erwin Schrödinger, 1935): Two entangled particles can only be described by their joint behaviour. Measurements on the individual particle will always lead to random results

**A Vision of Worldwide Quantum Communication**

The direct transmission of entangled photons in free space can theoretically be achieved via telescopes or glass fibres, but these only cover a maximum distance of tens of kilometres. Earth satellites are the only way of bridging larger distances, where the photons need to overcome only a few kilometres of dense and interference-prone atmospheric layer, before entering the vacuum of outer space, where they can spread unhampered. Therefore, in the future, the vision of a world-spanning quantum communication network in outer space could become reality.



The preliminary design of the quantum communication terminal (QCT) to be established on ISS



**International Cooperation**

The Institute of Experimental Physics at the University of Vienna and the Institute for Quantum Optics and Quantum Information (IQOQI) of the Austrian Academy of Sciences are internationally highly respected centres for quantum physics. The project “Quantum Entanglement in Space Experiments”, which has been expanding fast due to its funding by the Austrian Space Programme, has attracted substantial interest from the European Space Agency ESA and other national space agencies. Meanwhile, it involves six scientific partners and four industrial businesses across Europe.

The project was supported within the Aeronautics and Space Agency of the FFG.

Contact:  
 Prof. Anton Zeilinger  
**IQOQI, Institute for Quantum Optics and Quantum Information**  
**Austrian Academy of Sciences**  
 Boltzmannngasse 3  
 A-1090 Wien  
 Phone: +43-1-4277-29571  
 Fax: +43-1-4277-29552  
 E-mail: iqoqi-vienna@oeaw.ac.at  
 Website: www.quantum.at

## VIKING GmbH Sustainable Lawn Mowing of the Future

*Soon, innovative mulching mowers made by VIKING will be available, much to the delight of garden owners. Following a great number of tests, they will be equipped with an optimised cutting technique and housing shapes.*

The Tyrolean company VIKING manufactures lawn mowers that employ predominantly the rotary mower principle. With this, grass cuttings are collected and in some models even shredded in a procedure called mulching. Normally, collected grass cuttings must be disposed of after mowing. In mulching mowers, however, the grass cuttings are shredded so finely that they do not have to be removed, but can be left on the lawn to rot. This solution does not only support the principle of sustainability, as it circulates the nutrients back into the soil, but offers also significant economic advantages. For this reason, the optimised collection of grass cuttings, mulching, and the technological advancement of mulching mowers have

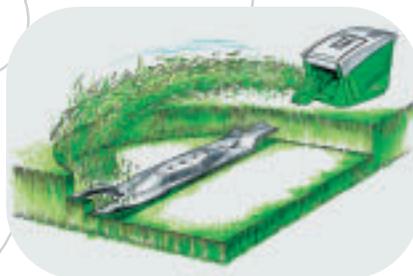
been at the centre of a FFG funding project, which has been carried out in close cooperation with the University of Natural Resources and Applied Life Sciences (BOKU), in Vienna.

### Exhaustive Testing

In 2004, practical baseline surveys were carried out to answer technical questions. In addition, parameters for the assessment of lawns were defined at BOKU and reported to the VIKING factory in Langkampfen with the aim of further improving the existing technical solutions. So far, more than hundred blade variations and numerous housing options have undergone extensive testing.



The VIKING multi-blade shreds cuttings so finely that they disappear in the turf and can be left there to decay



The VIKING multi-blade with four cutting edges, which are mounted at different heights, transports the grass cuttings into the collecting basket of the lawn mower



Serial success: In the past months, VIKING completely renewed its range of lawn mowers. Now, entire series of innovative lawn mowers are available, ranging from series 4 to the professional series 7 and 8



Construction drawing of an adjustable blade drive unit for the mulching of grass cuttings

Some prototypes look promising, such as a model equipped with an engine running at various speeds, whose drive unit can be adjusted to different grass properties (height, density, type). Based on trials using high-speed digital cameras and tests with transparent housings, a deeper understanding of cutting kinematics has been achieved during these tests. Subsequently, the results of the research project recorded so far are quite satisfactory. The research project has furnished impressive proof of the positive effects of mulch mowing on the biological quality of soils and the advantages of technical machine optimisation. Respective technological solutions for optimising the cutting quality and grass distribution are already in the pipeline.

### Premium Strategy for the Garden

VIKING is an internationally leading supplier of motorised gardening tools. What began with the first garden shredder in 1981, has developed gradually into a complete product range of gardening products that fulfil even the highest professional requirements. VIKING produces and sells lawn mowers, ride-on mowers, garden shredders, grass trimmers, hedge trimmers, hedge cutters and tillers. Appreciated by dealers and customers across Europe and affirmed by objective media tests, the company enjoys today a leading reputation as an innovative and service-oriented premium supplier.



The project was supported within the FFG's General Programmes.

#### Information:

#### VIKING GmbH

Hans Peter Stihl-Straße 5

A-6336 Langkampfen/Kufstein

Phone: +43-5372-6972-0

Fax: +43-5372-5372-65957

E-mail: [information@viking.at](mailto:information@viking.at)

Website: [www.viking.at](http://www.viking.at)

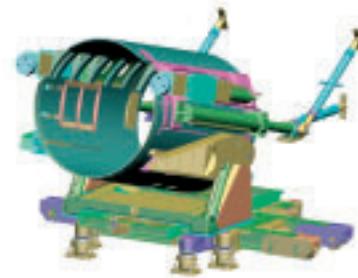
## Voest-Alpine Bergtechnik GesmbH Boxhole Drilling System

*With the fully automatic tunnelling equipment “Boxhole Drilling System”, Voest-Alpine Bergtechnik succeeded to create an innovation in ore mining ready for series production in record time.*



Der Prototyp des VAB Boxhole Drilling Systems ABH 1600 im untertägigen Einsatz

The development of automatic tunnelling and mining systems is a challenge for the innovative power of the entire mining industry. Apart from higher performance and shorter operating times, optimal safety is a major concern. Accident risk is a dangerous dimension in mining, emphasising why automation is a decisive prerequisite in reducing accident and death rates. A committed R&D project by Voest-Alpine Bergtechnik (VAB), which is headquartered in Zeltweg/Styria, dealt with the development of a fully mechanised and partly automated system for cutting “boxholes”, the so called vertical connection shafts for ore transportation



3D CAD model of the “start vehicle”

in mines. In addition to the overall development work, the project included the building of a prototype for a fully autonomous system for cutting boxholes, the testing of its operational application in platinum ore mines, and its advancement to series-production readiness.

### Successful Testing

The autonomous tunnelling equipment “Boxhole Drilling System” allows, for the first time, the opening of a boxhole with a length of up to 30 metres in a maximum of only seven working shifts. This eliminates the need for the previously employed manual drill-and-blast tunnelling, which takes usually around one month for a boxhole of similar length, and puts the staff at extremely high health and accident risks. The realisation of the project, from the first drafts to the actual application, took from 1. July 2003



Borehole profile with retracted drill head

to 30. September 2004. After construction of the prototype, it was tested on a concrete block in Zeltweg, autumn 2004, and afterwards in the South African Newman Shaft platinum mine. From the commencement of the first tests in March 2005 onwards, everything went according to plan. The expected tunnelling performance in metres and time was reached without difficulty. After a one year trial period, the Boxhole Drilling System went “officially” into operation at the Newman Shaft in March 2006.

### Ten Times Faster

After the launching tube is aligned via a remote control panel, the autonomous drill unit starts cutting the boxhole in an inclined upward direction. This new technique shows dramatic time savings: Instead of spending one month on manual tunnelling including the use of explosives, according to the results of the first 18 test boreholes, with the new ABH 1600 system (ALPINE BOXHOLE BORER using 1600 mm boring head

diameter) this work can be done within three days (!). This also includes the installation and removal of the system. The test run on site in RSA was attended by service engineers, on occasion design engineers and measurement engineers of VAB Zeltweg, with participation of the future customer. Subsequently, the machine has already been sold to the customer.

### Innovators in Mining and Tunnelling

As part of the Sandvik Group, Voest-Alpine Bergtechnik GesmbH (VAB) specialises in innovative technologies and accomplishes internationally acclaimed design and development projects. The key products developed and produced by VAB are machines for mining and tunnelling. In 1998, the Swedish Sandvik Group took over Voest-Alpine Bergtechnik into its business area Sandvik Mining and Construction. Sandvik is a globally active group with branch offices in more than 130 countries.



The project was supported within the FFG's General Programmes.

Information:  
**Voest-Alpine Bergtechnik Ges.m.b.H.**  
 Alpinestraße 1/Postfach 2  
 A-8740 Zeltweg  
 Phone: +43-3577-755-584  
 Fax: +43-3577-756-457  
 E-mail: reinhard.neuper@sandvik.com  
 Website: www.sandvik.com

## VRVis Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH Women's Power for Virtual Reality

*The Viennese Kplus Centre VRVis is among the leading Austrian research and development enterprises in the field of virtual reality and visualisation. VRVis incorporates some 50 researchers and 15 to 20 University students. With the support of the FFG, the previously very low proportion of female researchers has been raised significantly.*

Virtual reality and visualisation are key technologies in communication. In a time of ever increasing data volumes, they allow the fast, concise and clear processing of data alongside the realistic presentation of, and interaction with, various objects and environments. The competence centre VRVis – a Public Private Partnership of businesses, research institutes, the City of Vienna, and the Federal Government – successfully provides mission-oriented research, consulting services and product development in the field of virtual reality and visualisation.

### FemInVis Project Launched in 2004

A look at the researcher team's gender make-up at VRVis in mid 2004 was disillusioning as the percentage of women working there was merely 3%, which amounted to one female researcher.

The number of assistant students revealed a similar picture. Since the foundation of VRVis in 2000, only two female students have received training at VRVis. The directive of the "FemInVis" project – Nachwuchskarriereförderung für Forscherinnen (Career Promotion for Female Researchers) – was, therefore, to increase the proportion of women amongst researchers working at VRVis. This project took advantage of a synergy and copying effect, in the sense that female employees encourage other female employees, and positive working experiences with women motivate employers to employ more women.

### Women's Quota Boosted to 10 Percent

Already only 15 months after the launch of the FemInVis initiative, the proportion of women in fully employed scientific



Virtual Reality-Project "Josefsplatz" (left) and Interactive 3D visualisation of medical image data (right)

positions at VRVis had been augmented from 3 percent to nearly 10 percent. In addition, a female student assistant has been short-time employed in the scope of FemInVis. Furthermore, Johanna Beyer has been employed as a junior researcher directly after her FemInVis-financed student assistant position. Since the beginning of the FemInVis project in September 2004, the number of projects carried out by female students at VRVis

has risen notably. The project's total achievement at VRVis comprises thirteen work experience placements and diploma theses by female students, several conference attendances and the first publications of scientific articles.



**Katja Bühler**  
Promotion measure:  
FemInVis project supervision



**Johanna Beyer**  
Promotion measure:  
Scientific assistant



**Caroline Langer**  
Promotion measure:  
Diploma thesis

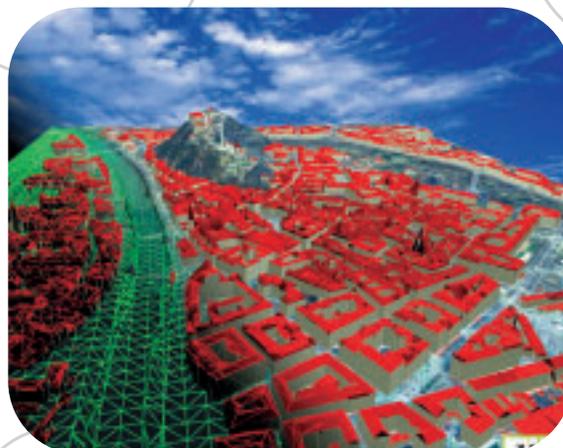


**Laura Fritz**  
Promotion measure:  
Baccalaureate thesis, work experience placement



**Andrea Kratz**  
Promotion measure:  
Scientific assistant,  
Student research project, diploma thesis

3D reconstruction and visualisation of the city of Graz



zentrum für  
virtual reality und visualisierung  
forschungs-gmbh

The project was supported within the FFG's Structural Programmes.

#### Information:

**VRVis Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH**

A-1220 Wien, Donau-City-Straße 1

Dr. Katja Bühler

Phone: +43-1-20501-30702

Fax: +43-1-20501-30900

E-mail: [buehler@vrvis.at](mailto:buehler@vrvis.at)

Websites: [www.vrvis.at](http://www.vrvis.at)

[www.medvis.vrvis.at/projects/feminvis/](http://www.medvis.vrvis.at/projects/feminvis/)

Application oriented research in Austria has a strong partner: the Austrian Research Promotion Agency (FFG). Supervised by the Federal Ministry for Transport, Innovation and Technology and the Federal Ministry of Economics and Labour, it is Austria's principal institution for promoting research, development and innovation. The FFG supports research and development projects of Austrian businesses and institutes through a broad variety of funding programmes and services.

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Managing Director: Dr. Henrietta Egerth, Dr. Klaus Pseiner

### Project supervision FFG:

Mag. Alexander Kosz

### Conception and texts:

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Mag. Alexander Kosz

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