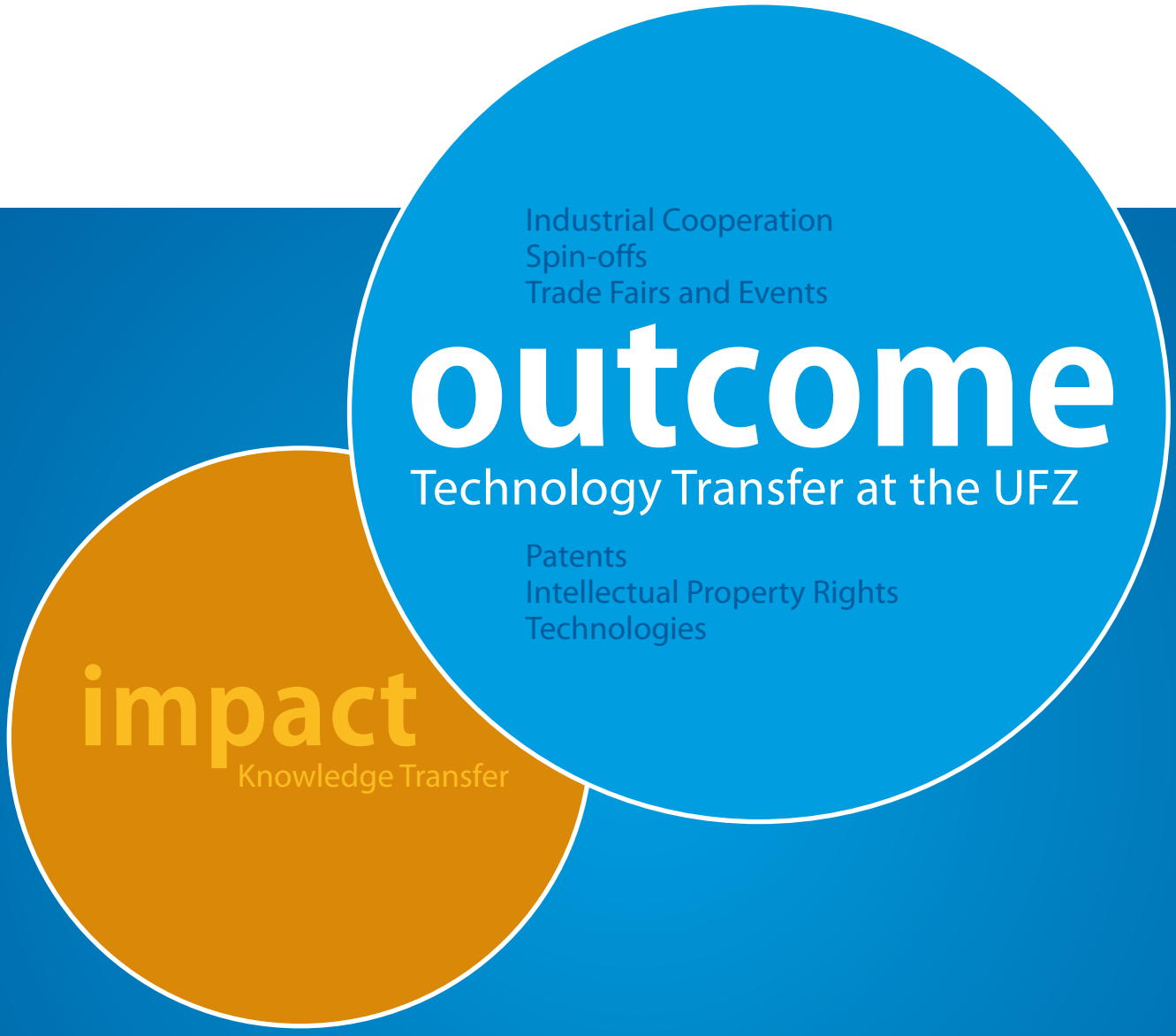
Annual report 2016



HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

Dear reader,

The UFZ carries out excellent research within a wide range of topics related to the environment. It generates sound knowledge and technological solutions to manage our natural resources in a way that society and environment can benefit from it. The transfer of knowledge and technologies into society and business is an integral part of our activities and mission at the UFZ.

For our research endeavours, our institute has a unique infrastructure. Together with over 600 partners from all over the world, we have established a network of know-how that catalyses innovation. The selected examples in this brochure will serve you a first insight into our broad field of technology transfer. It includes the following topics:

- The UFZ Technology Transfer Award 2016
- Examples for our Top Stories
- Innovative Minds at the UFZ
- Our monthly News
- Exemplary Technology Platforms
- Our Offers and Contacts

We are looking for partners from the business sector, who would like to share their process and market know-how in order to develop our innovative approaches to products and production processes.

If we raised your interest, please contact me or my colleagues.

Yours sincerely,

Dr. Joachim Nöller
Head of the Department Knowledge and Technology Transfer

P.S.: We are not only responsible for the transfer of technology but also for the transfer of knowledge. We offer a wide range of activities to provide decision-makers from politics, businesses, society, as well as citizens with tailor-made knowledge. Together, we develop options and management tools further in order to solve your specific problem. Just read our brochure „Impact“.

You can find it on our website:
www.ufz.de/technologytransfer

Dr. Joachim Nöller
Head of Department Knowledge and Technology Transfer

E-mail: joachim.noeller@ufz.de
Phone: 0049 341 235-1033

Technology Transfer Award 2016

Prof. Susann Müller – honored in flow cytometry

Prof. Dr. Susann Müller, Department of Environmental Microbiology, received the UFZ's latest Technology Transfer Award.

According to the honorific speech by her colleagues Prof. Dr. Hauke Harms and PD Dr. Falk Harnisch, Müller has devoted considerable energy, persistence, exemplary scientific diligence as well as a great deal of creativity to the development and dissemination of flow cytometric procedures and applications for over a decade.

One major obstacle for a wider application of flow cytometry has so far been the fact that it was considered unsuitable for all microbiological applications, i.e. used only to characterise human cells in medical research and diagnostics.
This meant that microbial analyses were conducted with sequencing methods, which are very much slower and more costly.
Müller helped to establish flow cytometry as a microbiological tool by developing a procedure to analyse RNA and DNA heterogeneity in pure microbial cultures.

Consequently, the technology can now be used for basic research especially in white biotechnology.
A second key barrier to flow cytometry application used to be the need to analyse the resulting data "manually", based on experience. Müller made use of bioinformatic methods and developed software tools which are easy to use, can be automated, and allow the analysis of the most complex microbial communities. Her procedures, such as "Dalmatian Plot", are widely known and present excellent examples of the open-source idea and its use for the scientific community.
Finally, it would not be possible to establish a new technology without showcasing its added value and reliability. Müller and her working group have verified the practical value of flow cytometric analysis through studies of correlations of microbial communities in biogas reactors and in wastewater plants.
Müller also sets great store by direct transfer of scientific findings into application and has long-standing cooperation with industry partners, including joint PhD projects of company staff. Two examples are the aging processes of yeast cultures in beer production which have an impact on the brewing process and the use of microbes for biological phosphate elimination from sewage water.

Müller's latest research focussed on flow cytometric analysis of intestinal microbiome (in mice) and found correlations with certain illnesses (in this example, rheumatism). Due to the speed and low cost of the technology, we can expect flow cytometry to become a valuable tool for future analyses of human microbiomes, too.

Müller started her career in biochemistry at the Martin-Luther-University Halle-Wittenberg where she obtained her Diploma and PhD. She was appointed as scientific assistant at the Academy of Sciences of the GDR and at the University of Leipzig before joining the UFZ in 2001, where she heads the working group "Flow Cytometry".

Personal website of Prof. Susann Müller

Prof. Dr. Susann Müller
Department Environmental Microbiology

E-mail: susann.mueller@ufz.de
Phone: 0049 341 235-1318

Top story

Carbo-Iron® − Small particles, large impact

From nano-iron…

Clean groundwater (GW) is a valuable resource and the basis for a healthy life. In Germany more than 70% of the drinking water is extracted from GW. Contaminations of GW with organic solvents such as chlorinated hydrocarbons are frequent, rather persistent and require in most cases cumbersome cleaning. Since the 2000s, iron reagents such as nano-iron are used to remove chlorinated hydrocarbons. From the chemical perspective, suspensions of nano-iron are highly effective. However, nano-iron does not form stable suspensions and cannot be transported within the GW aquifer to a sufficient extent, thus can block passages and is not able to produce the required wide reaction zones. Often, a short lifetime of the metal is observed. These disadvantages, which are linked to the natural characteristics of nano-iron, could not fully be overcome so far.

…to more effective carbo-iron®

In order to present an improved nano-iron reagent, Carbo-Iron® as a composite material of colloidal activated carbon and 20-30 Ma% built-in nano-sized iron structures was designed. It is a material developed at the UFZ within a group of scientists around Prof. Dr. Frank-Dieter Kopinke and Dr. Katrin Mackenzie. Carbo-Iron® consists of finely ground activated carbon and zero-valent iron within the carbon grain. The composite material was designed to efficiently build reactive zones in situ in contaminated aquifers, which are able to destroy chlorinated hydrocarbons. The innovative idea is to combine material properties from both – activated carbon and iron – and thus receive a sorption-active reactive material, which can be injected into the aquifer as stable colloidal suspension. The contaminants present in the groundwater in µg/L to mg/L concentrations are collected from the water, enriched at the activated carbon of Carbo-Iron® and are efficiently destroyed by the iron structures.

Carbo-Iron® did not only prove to be a better alternative to nano-iron at the laboratory scale. Field tests carried out in Lower Saxony and Hungary together with the project partner Golder Associates showed a convincing performance of the new material.

Within the framework of the EU project “NanoRem”, Carbo-Iron® has been successfully tested in the project‘s up-scaled trials.

The knowledge gained with Carbo-Iron® is a valuable basis for new tailor-made reactive particles. In the framework of the BMBF project “ContaSorb”, which started February 2017, development of new sorption-active in-situ applicable particle types is underway, which will extend the spectrum of reagents and catalysts applicable in in-situ GW remediation.

For further information please contact Dr. Katrin Mackenzie.

Carbo-Iron® from colloidal activated carbon and iron

Top story

MaxPlace – Where to put the wind turbines?

An old question…

Europe, and especially Germany, has begun to shift from fossil to renewable energy sources. Onshore wind power has so far taken and probably will continue to take the lion’s share of gross electricity production from renewables, mainly due to its high technology readiness level and energy efficiency.

However, especially in densely populated regions such as Central Europe, sites are limited by physical, legal and political factors. At the moment, suitable areas for onshore wind turbines are usually determined by way of geographic information systems (GIS).

However, GIS do not allow conclusions about optimal positioning and energy efficiency of the planned wind turbines.

In practice, planning is therefore realised manually, with the help of highly complex (and expensive), specialised software, or a combination of both.

Moreover, in the planning stage, it is important to maximise the possible energy yield of a given area and take into account other sites close by which may impact on the one being planned. On a regional or even higher planning level, the resources required to plan for multiple sites are also an issue.

… and a new answer

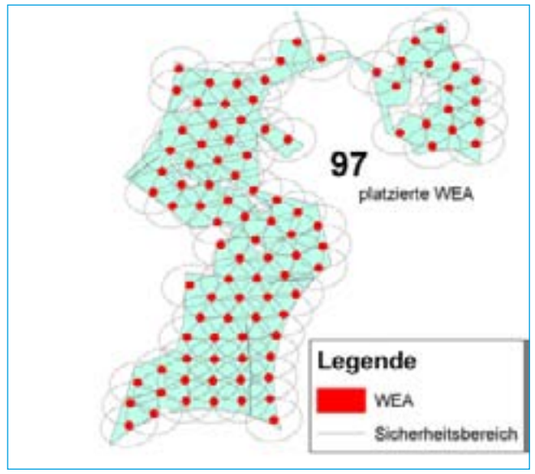
The new software “MaxPlace” which was developed at the UFZ responds to all of these needs.

In a nutshell, MaxPlace calculations maximise the energy potential of a given area. It can be used as a stand-alone software to plan any number of areas in one single computation, making it a prime choice for very scattered locations or large areas. Different algorithms will calculate, compare and assess the distribution of wind turbines on an area which maximises energy yields.

Parameters such as the main wind direction, wind speed and frequency, minimal distances between turbines and to houses, park effects, protected areas and other limitations form the basic data for possible turbine positions. The type(s) of turbine to be used can be chosen freely, and existing ones are also taken into consideration.

The software is ready to use for planners. Commissioned calculations are also possible up to a certain capacity.

For further information please contact Dr. Frank Masurowski.



Distribution of uniform wind turbines with taboo areas using „MaxPlace“, Graphic: F. Masurowski, UFZ

Top story

Market launch of a novel sampler

From laboratory tests…

The protection of natural water resources is regulated by the European Water Framework Directive and the Groundwater Daughter Directive. Monitoring the status of water and chemical analysis requires powerful sampling techniques for a holistic risk assessment and to derive strategies for an efficient reduction of pollution burden. However, more than half of the European freshwater bodies are in a less than good ecological status or potential. The presence of complex mixtures is considered as one of the major drivers causing losses of freshwater biodiversity and ecosystem services.
Effect-directed analysis, which is based on a combination of biotesting, fractionation procedures and chemical analytical methods, allows the identification of the complex mixtures which often occur only in traces. Furthermore, cause-and-effect relationships between contamination and impact are determined.

…to on-site application

The implementation of integrated chemical and effect-based monitoring strategies demands novel automated sampling techniques allowing a real time collection as well as the extraction of large water volumes. For this purpose, UFZ scientists Dr. Tobias Schulze and PD Dr. Werner Brack (Department Effect-Directed Analysis) as well as the company MAXX Mess- u. Probenahmetechnik GmbH, Rangendingen, developed an innovative solid-phase extraction device for the automated on-site sampling of up to 1000 litres of water (Large Volume Solid Phase Extraction, LVSPE).

Sampling device and procedure were developed and validated in the course of several joint research and development projects. The LVSPE device is customisable and available in various configurations, having been established for an effect-based and chemical analysis of water resources by Dr. Schulze. The new device makes it possible to sample large volumes of water on-site by means of solid phase extraction and after separation of suspended organic matter, i.e. transport to a laboratory is no longer necessary.

The long-term cooperation between both partners has now borne fruit in the form of the market launch of the LVSPE device, which expands the product portfolio of classical automated water samplers of the MAXX GmbH. The device was successfully presented at the world-leading fair for environmental technologies, IFAT, in June 2016. Furthermore, a joint patent application for an enhancement of the LVSPE device was submitted.

The two partners will continue to cooperate in the future, in order to optimise the LVSPE device and to improve or newly develop system components. The LVSPE was successfully applied in the UFZ Integrated Project “Healthy Aquatic Ecosystems” and the international EU-funded project “SOLUTIONS”. The main objective of both projects is to provide solutions for a holistic water management with the goal to significantly improve the functionality and status of aquatic ecosystems.

For further information please contact Dr. Tobias Schulze.

LVSPE1000 in the field during the Joint Danube Survey 3

Top story

A chromium reactor steps into the world

Controlling chemical’s fate…

Hydrogen stable isotope analysis of organic compounds has been a valuable tool for hydrology, earth sciences, ecology, biochemistry, environmental research, and many other disciplines for more than 60 years. In our modern life chemicals are ubiquitous. This is why it is important to understand the mechanisms of biodegradation and to identify key factors that make an ecosystem robust against chemicals.

Controlling chemical’s fate is one of the major topics researchers at the UFZ are focusing on. One question is “how hydrogen stable isotope analysis of organic compounds can assist the understanding of the fate of chemicals in anoxic environments such as soil-aquifer systems, freshwater and deep-sea sediments and bioreactors?”

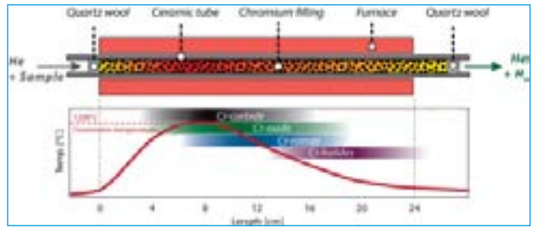
…by converting organic hydrogen to molecular hydrogen

The UFZ Laboratory of Stable Isotopes, headed by Dr. Matthias Gehre, as part of the Department of Analytical Chemistry, developed and patented chromium-based reactors systems. An innovative technique which allows the conversion of organic hydrogen to molecular hydrogen. It is a powerful tool for the measurement of hydrogen isotopic compositions of organic matter that may contain hetero-elements (e.g. nitrogen or halogens) in addition to carbon and hydrogen. The method is unique due its significant improvement in measuring accuracy and allows for the first time online measurements of hydrogen isotopes in presence of hetero-elements. Furthermore, the technique is far less susceptible to matrix effects which frequently occur during high-temperature conversion (pyrolysis), currently the routine method for hydrogen isotope analysis.

The laboratory has 25 years of expertise in the analysis of stable isotopes of light elements (H, C, N, O, S and Cl). It offers a highly modern laboratory equipped with five Isotope Ratio Mass Spectrometers instruments with various interfaces and conducts training courses for modern methods in isotope-ratio mass spectrometry. Furthermore, it owns several licensed method patents and acts as a reference laboratory for the International Atomic Energy Agency (IAEA). Besides the development of innovative methods for gaseous, liquid and solid samples, they have expertise in quality assurance.

Two patent applications were sold to the cooperation partner Thermo Fisher Scientific, a US-American biotechnology company. It took over the registered international industrial property rights and together with the UFZ, it will transfer them to the market. Furthermore, both parties agreed upon a research project for implementation in equipment technology.

The UFZ Laboratory of Stable Isotopes



Schematic drawing of chromium-reactor elemental analyser
Graphic: J. Renpenning, UFZ

Innovative minds

Prof. Dr. Frank-Dieter Kopinke

Department of Environmental Engineering

Prof. Dr. Frank-Dieter Kopinke is head of the Department of Environmental Engineering and professor of technical environmental chemistry at the University of Leipzig. Prof. Dr. Kopinke has worked at the UFZ for more than 25 years now. Before joining the UFZ, he worked at the TU Berlin, Ghent University, and the Academy of Sciences in Leipzig. He holds a Diploma in Chemistry and a PhD in Chemistry from the TH Merseburg.

Prof. Dr. Kopinke's present research is in the fields of environmental catalysis, remediation technologies, and treatment of wastewater and contaminated groundwater. The breadth of his scientific engagement becomes evident in his patent activities and business contacts. His department works together with companies such as Bayer AG, BASF AG, and OVIVO Water.

Personal website of Prof. Frank-Dieter Kopinke

Prof. Dr. Frank-Dieter Kopinke
Head of Department Environmental Engineering

E-mail: frank-dieter.kopinke@ufz.de
Phone: 0049 341 235-1234

Dr. Katrin Mackenzie

Department of Environmental Engineering

Dr. Katrin Mackenzie is a senior scientist at the Department of Environmental Engineering. Before Dr. Mackenzie joined the UFZ, she was a visiting scholar at the University of Oxford and at Binghamton University (New York). Dr. Mackenzie holds a Diploma in Chemistry and a PhD in Chemistry from the TH Merseburg.
Her research focuses on environmental catalysis, reductive dechlorination, nanoparticles, and wastewater and groundwater purification.Together with Prof. Dr. Frank-Dieter Kopinke, Dr. Mackenzie developed Carbo-Iron®, a composite material made from reactive carbon and iron nanoparticles that can be used in groundwater remediation. Dr. Mackenzie has already been successful in gaining Intrapore as a business partner for Carbo-Iron® and ContaSorb, a project which aims at developing composite materials for the sorption and destruction of „conventional" and „new" halogenated groundwater pollutants.

Personal website of Dr. Katrin Mackenzie

Dr. Katrin Mackenzie
Department of Environmental Engineering

E-mail: katrin.mackenzie@ufz.de
Phone: 0049 341 235-1760

Innovative minds

Prof. Dr. Ralph Meißner

Department of Soil Physics

Prof. Dr. Ralph Meißner is a senior scientist at the Department of Soil Physics and professor for watershed management at Martin-Luther-University Halle-Wittenberg. At the UFZ, Prof. Dr. Meißner is head of the research group "Transport and Scaling Processes in Soils" and head of the lysimeter facility in Falkenberg. Before Prof. Dr. Meißner joined the UFZ in 1995, he had appointments at the Institute of Water Management (Berlin), the Sachsen-Anhalt State Office for Environmental Protection (Magdeburg) and the GKSS Research Centre Geesthacht GmbH. He holds a Diploma in Engineering and PhDs in Agricultural Science and in Technical Science from the University of Rostock.

Prof. Dr. Meißner is particularly interested in the influence of land use changes on the amount and quality of water, renaturalisation of low moors, and the agricultural use of wastewater and mud.

As part of his research, Prof. Dr. Meißner has contributed significantly to the development of lysimeter technologies and invented a shaping technology for the extraction of large-volume monoliths. Prof. Dr. Meißner has been extremely successful in acquiring third-party funding and, in this way, realising various projects both in Germany and abroad.

Personal website of Prof. Ralph Meißner

Prof. Dr. Ralph Meißner
Department of Soil Physics

E-mail: ralph.meissner@ufz.de
Phone: 0049 391 810-9771

PD Dr. Falk Harnisch

Department of Environmental Microbiology

Dr. Falk Harnisch is head of the working group "Microbial Bioelectrocatalysis and Bioelectrotechnology", which he joined in 2012. Before his appointment at the UFZ, he was a visiting scholar at the Advanced Water Management Centre of the University of Queensland. He also worked as senior scientist at the Institute of Environmental and Sustainable Chemistry of the TU Braunschweig. Dr. Harnisch holds a Diploma in Biochemistry and a PhD in Environmental Chemistry from the University of Greifswald.

In 2015, Dr. Harnisch not only received the UFZ Research Award, he also won the "Science for Solving Society's Problems Challenge" jointly held by the Electrochemical Society and the Bill & Melinda Gates Foundation. For his project that proposes to develop a microbial fuel cell that could clean wastewater while generating clean water and electric energy, he received a prize money of $50,000. It was used to purchase a toilet which was set up in the UFZ science park in order to generate energy from feces.

His passion for science resulted in his 2013 co-edited article "The Chemistry of Breaking Bad". The authors analysed the portrayal and plausibility of chemistry in the US series Breaking Bad, arriving at the conclusion that apart from small errors, the series depicts scientific details in a realistic manner and with great attention to detail.

Personal website of Dr. Falk Harnisch

PD Dr. Falk Harnisch
Department of Environmental Microbiology

E-mail: falk.harnisch@ufz.de
Phone: 0049 341 235-1337

New Projects

First business talk sparked great interest

On December 7, 2016, the first business talk in the new “Cluster Team Environment” took place with 50 participants. Under the title “Environmental technologies for business and society: Identification of new business opportunities”, this first business talk combined lectures with room for discussion. The speakers were Annegret-Claudine Agricola from Tilia GmbH, Hannes Mollenhauer from the Department of Monitoring and Exploration Technologies and Karen Görner from the Department of Knowledge and Technology Transfer. After the business talk, participants had the chance to explore the UFZ laboratories with two guided tours.

The next business talk will take place at Leipziger KUBUS in March 2017. The contextual focus will depend on the feedback of the first business talk and will thus be even more aligned with the interests and expectations of the participating companies.

The cluster team is a joint project by the city of Leipzig’s “Network Energy and Environment (NEU e.V.)” and the UFZ, and targets environmental and/or energy technology companies from Leipzig and surrounding regions, or those interested in starting business here. Its purpose is to connect these companies and to foster an exchange with science and the local council.

For further information please contact karen.goerner@ufz.de.

First impressions from the business talk within the Cluster Team Environment

Sale of Leipzig foam tester successfully started

The Leipzig foam fester was developed by Dr. Lucie Moeller and Prof. Dr. Andreas Zehnsdorf at the UFZ department Centre for Environmental Biotechnology (UBZ). It is a test kit that allows substrates to be investigated for their tendency to foam in biogas plants. In order to test a substrate’s tendency to foam, the substrate is poured into the test kit’s glass container, half of which is filled with active fermentation material. Then, the device is turned on and within a few hours, the user can see the result: as soon as foam starts to form, it is clear that the substrate has a tendency to foam. Hence, the Leipzig foam tester allows for a unique and easy type of investigation and, in this way, helps to prevent material as well as economic damages. Foaming in biogas plants can block gas pipes, severely damage sensors, and destroy fermenter roofs.

The Leipzig foam tester is manufactured and sold by Eismann & Stöbe GbR. Eismann & Stöbe GbR is a Leipzig-based company that specialises in environmental assessment technologies.

THE LEIPZIG FOAM TESTER

Leipzig’s new foam tester

outcome 2016

New Projects

The UFZ’s new brand: Capraferm

The UFZ is pleased to announce the registration of Capraferm as a trademark. Capraferm was invented by Dr. Heike Sträuber who studies the microbiology of anaerobic systems at the UFZ department Environmental Microbiology. Capraferm is an innovative and sustainable process based on anaerobic fermentation. It is used for the production of medium-chain fatty acids, mainly caproic and caprylic acid. Capraferm works without sterilisation of substrates or the reactor, and different kinds of raw material can be utilized. Variations regarding the substrate quality are tolerated. Furthermore, it is not necessary to apply expensive inhibitors for undesired methane production. The process can be coupled to other processes in the sense of a biorefinery, for example to the production of biogas. In order to develop Capraferm into a marketable product, the UFZ is going to collaborate with different partners in research projects.

For further information please contact Dr. Heike Sträuber.

Laboratory reactors for anaerobic fermentation

LSER database workshop on Nov 14 and 15, 2016

The UFZ provides free access for scientists at research institutions and private companies to an online database which allows the calculation of a variety of equilibrium distribution coefficients for neutral organic chemicals such as pesticides and pharmaceuticals with the help of the pp-LFER model.

Professor Michael Abraham from University College London has helped the UFZ to extend this online database to roughly 8000 chemical descriptors and 200 distribution systems. A QSAR will also be added. Based on the molecular structure, this QSAR will allow scientists to calculate those chemical descriptors which are not listed in the database, and thus, significantly extending the field of application of the pp-LFER model. In a workshop on November 14 and 15, 2016, the UFZ presented this database and its application in more detail, also taking into account ionisable chemicals.

UFZ-LSER database

Group picture of the LSER database workshop

New Projects

CoKnow Consulting - a UFZ start-up

Jennifer Hauck has a doctorate in the field of human geography and has been working at the UFZ since 2009. With more than 10 years of experience with interdisciplinary and transdisciplinary processes, she now offers services in this area via her organisation CoKnow (Co-producing Knowledge for Sustainability). Precisely speaking, she organises interdisciplinary and transdisciplinary processes together with her clients, starting with the idea, planning, organisation, implementation and documentation. She also offers support for parts of the process such as stakeholder and network analysis as well as the moderation of scenario or strategic workshops. She transfers her knowledge and skills through seminars and trainings and accompanies processes as a coach. As a small enterprise (SME), she is takes on respective research work packages in third party funded projects.

Further information can be found on her homepage: www.coknow.de

Aptamer patents are looking for partners

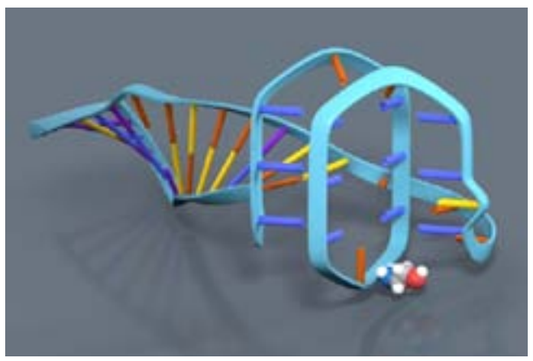
As molecular tools, aptamers are often applied in clinical diagnostics, environmental and food analytics. Aptamers are short, single-stranded nucleic acid oligomers with a three-dimensional secondary structure. This structure allows them to bind to non-nucleic acid targets with high specificity, sensitivity, and selectivity, similar to the antigen-antibody reaction. Aptamers, however, are much more stable than antibodies and can therefore be selected for almost all target molecules. They can be easily modified, e.g. for the fixation on surfaces. Hence, there are multiple fields of application and attractive markets for aptamers.

The UFZ's long-time research and extensive know-how have produced a group of patents, which are offered for transfer:

(1) Aptamers, which bind antibiotics (aminoglycosides, fluoroquinolones, 4-7), for example for the development of biosensors for the detection of antibiotics in food and environmental samples.
(2) Aptamers, which specifically bind protein A (2,3), for example for the purification of protein A or for the development of assays for the detection of Staph. aureus.
(3) Aptamers, which bind ethylamine, for example for biosensors that help to detect ethanolamine in blood or environmental samples.

For further information please contact lydia.woiterski@ufz.de.

Dr. Jennifer Hauck



Aptamer with substance attachment

New Projects

The future of biotechnology at Leipziger KUBUS

The "Zukunftsforum Biotechnologie" is an interdisciplinary association of young scientists at DECHEMA ("Gesellschaft für Chemische Technik und Biotechnologie"), devoted to current issues and trends in biotechnology research.
At the forum's biannual meeting, which took place at UFZ on May 25, 2016, Dr. Florian Centler from the Department of Environmental Microbiology was admitted as new member, Dr. Falk Harnisch from the same department was newly elected as one of two chairmen, and Prof. Dr. Bruno Bühler from the Department of Solar Materials will be leaving the forum after a long-time commitment. This meeting was jointly organised by the above-mentioned departments and addressed current developments such as the digitalisation in biotechnology as well as the planning of future events. As a replacement for the members who will be leaving the forum, several candidates introduced themselves and presented their research, five of whom were elected in a ballot and admitted to the forum as new members.

For further information please contact Dr. Falk Harnisch or Dr. Florian Centler.

Entrepreneur Prof. Dr. Jörg Gabert at the UFZ

In May 2016, the UFZ invited Prof. Dr. Jörg Gabert to speak to young scientists on entrepreneurship. Prof. Gabert is Managing Director at Genolytic GmbH, an innovative, Leipzig-based company operating in the field of molecular biological diagnostics.
Prof. Gabert established his first company way back in 1991. Various new and innovative ventures in the field of diagnostics followed in the later years. At the UFZ, he shared his experiences as an entrepreneur and business man and spoke about the challenges, risks, and hidden opportunities of starting and running a business for young scientists.
This event was organised within the scope of knowledge and technology transfer activities at the UFZ. Seminars, workshops and talks on entrepreneurial topics like business modelling, marketing, tax, law, intellectual property rights as well as career planning are offered to employees on a regular basis.

For further information please contact milina.alber@ufz.de.

UFZ scientists participating at the „Zukunftsforum Biotechnologie"

Prof. Dr. Jörg Gabert

New Projects

Mobile root zone sewage treatment plant cleans communal wastewater

In collaboration with Leipziger Wasserwerke, the UFZ and BAUER-Umwelt GmbH developed a mobile device for root zone sewage treatment. This root zone sewage treatment plant was first put into operation in Leipzig‘s sewage treatment plant at Rosental on April 11, 2016. First measurements prove the excellent performance of the plant, which is going to be further improved for the treatment of communal wastewater until September 2016. The optimisation of the mobile root zone sewage treatment plant is funded by the participating partners and through the technology transfer fund at UFZ.

Mobile, i.e. decentralised root zone sewage treatment plants have a better cost-benefit ratio than central sewage treatment plants. They operate close to nature and can be used exactly where wastewater arises and where it needs to be cleaned.

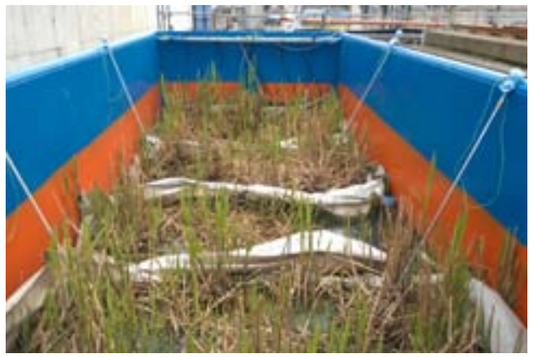
For further information please contact Prof. Andreas Zehnsdorf.

Drying of masonry walls: new prototype tested in apartment buildings

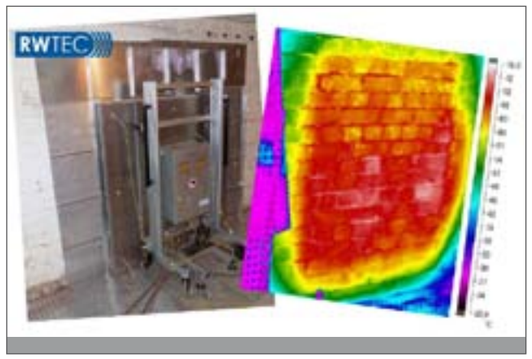
Against the background of flood events, increasing scarcity of affordable housing in metropolitan areas, and growing real estate prices, the restoration of old buildings is gaining increased importance. One of the greatest challenges in the restoration of old buildings is moisture, which can affect different building components.

The research group of Dr. Ulf Roland from the Department of Environmental Engineering is a member of the innovation network RWTec and has worked together with different partners from business and science to develop an innovative solution for fast and efficient drying of masonry walls, based on radio wave technology. In the water soaked basement of an apartment building in Radeberg, the Otto Richter GmbH - Die Feuchteklinik® tested the newly developed prototype under real-life conditions. Measurements of energy input, drying process, and electromagnetic compatibility (EMV) have shown that this type of flexible, fast, and safe method is very well applicable in the restoration of old buildings and that it bears tremendous economic potential, especially in case of damages through moisture. Hence, the next steps are the transfer of this technology into a practical device and a market launch through our partners Otto Richter GmbH - Die Feuchteklinik®, IOT GmbH, and HTWK Leipzig.

Innovation network RWTec (in German)



Mobile Root Zone Sewage Treatment

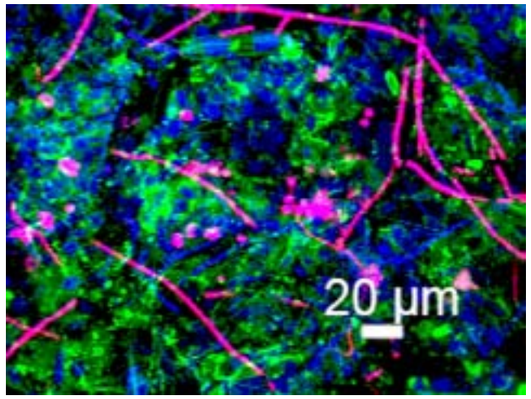


Prototype Masonry Wall Drying

Technology platforms

ACROSS – Validation of satellite data

ACROSS (Advanced Remote Sensing - Ground Truth Demo and Test Facilities) provides field data across different spatial and temporal scales and environmental compartments in order to enhance the interpretation of satellite data for environmental science. The UFZ partly coordinates the ACROSS infrastructure and contributes to the terrestrial platform by investigating hydrogeophysical and ecological parameters like soil moisture, temperature, carbon and water fluxes by using.



Biofilm – Microscopy unit

Microorganisms at interfaces form so-called biofilms which play a key role in a variety of processes. While microorganisms are systematically applied in biotechnological processes, their action in biofouling or the human body may also result in undesirable effects on product quality or health. The technology platform “Biofilm” comprises several laser scanning microscopes, which allow a thorough investigation of structural and functional properties of biofilms and, therefore, contribute to a better understanding of the processes occurring in biofilms.

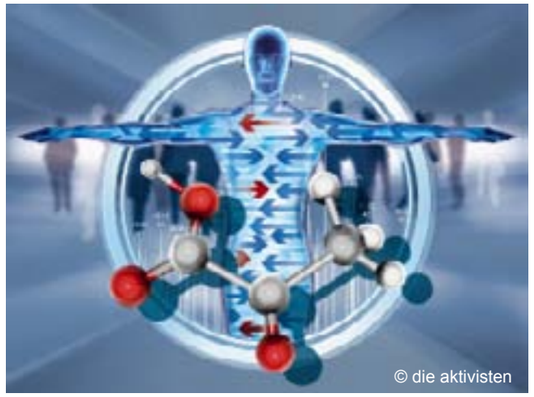
Biotechnikum – Bioreactor technology

The bioreactor pilot plant possesses modern bioreactor technology for the cultivation of different microorganisms like bacteria, yeast and fungi. It offers multi and laboratory bioreactor systems as well as a set of geometrically similar reactors for a scaling up with working volumes. The facility is completed by devices for analytics along the bioprocess and cell separation and thus, enables an integral approach for the investigation, development and optimization of bioprocesses.

Technology platforms

LSI – Isotope analysis

The Laboratory of Stable Isotopes (LSI) has know-how in the analytics of stable isotopes for more than 25 years. It holds several methodological patents which are licensed and acts as reference laboratory for the IAEA. Core competences are online component specific analyses (GC, TCEA, HPCL), the development of methods for isotope analysis for gaseous, solid and liquid samples, quality control and management as well as the development and calibration of international reference materials.



Prometheus/Metabolomic – Mass spectroscopy platform

The Prometheus platform for metabolomics analysis offers most modern mass spectroscopy (GC and LS/MS) for profiling, identification and quantification of exogenic and endogenic metabolites in epidemiological studies and cellular models. The metabolites are extracted and measured from different biological matrices (e.g. serum, urine, adipose tissue as well as eukaryotic and prokaryotic cultures). Data analysis by means of well-established analysis routines allows detecting alterations of amino acids, biogenic amines and lipids in the entire metabolism.

MOSAIC – Hydrogeological subsurface exploration

MOSAIC (Model Driven Site Assessment, Information and Control) is a platform for the model-based, high-resolution exploration of complex subsurface structures by applying and combining minimally invasive methods. The platform combines various methods such as direct push technologies, on-site analytical methods, geophysical, tomographic, as well as hydrogeological techniques. A further innovative approach is the adaptive site investigation.

Technology platforms

Prometheus/Proteomic – Mass spectroscopy platform

Prometheus offers targeted and non-targeted proteomic analysis in simple (gel bands, affinity enriched) and complex samples (extracts from cell culture, tissue, body fluids, microbial consortia). For microbial ecology we developed the Protein-SIP (stable isotope probing) approach as well as bioinformatics tools which are applied to protein-protein-interaction studies and phosphoproteomics. Proteome data analysis is performed routinely by Ingenuity Pathway Analysis.

ProVIS – Visualisation of biochemical processes

ProVIS (Platform for visualization of biochemical processes at the cellular level) provides a unique pool of scientific equipment combining imaging techniques with methods for chemical analysis to study biological samples, structures and surfaces on a nanometer scale. The techniques comprise high resolution atomic force, electron and ion microscopy as well as several mass spectrometry methods which are used to answer questions from fundamental research to applied science.

TESSIN/VisLab – 3D-Visualisation centre

The Visualisation Centre (VisLab) provides a platform for scientists from various fields to explore and analyse complex and spatially heterogeneous data sets. It uses an interactive large-area stereo projection screen which allows immersing oneself in the projected environmental data and, thereby, acquiring new insights in scientific questions and problems. Furthermore, the platform offers opportunities for knowledge transfer among researchers on the one side and knowledge communication to interested citizens on the other side.

About the UFZ

Helmholtz Centre for Environmental Research GmbH

Our Vision

The UFZ is one of the world's leading research centres in the field of environmental research and enjoys high social recognition. It offers ways for a sustainable use of natural resources for the benefit of humans and nature.

Our Mission

Biodiversity, functioning ecosystems, clean water and intact soils are our natural bases of life. In light of global change, all staff at UFZ unite the objective of demonstrating and promoting the compatibility of social development and a healthy environment on the basis of excellent research. As a reliable partner, the UFZ supports politics, businesses and civil society in the process of better understanding the impacts of human activities on the environment and to develop options for social decision-making processes. Therefore, the UFZ addresses societal challenges and creates knowledge and technologies, which should help to identify problems between the environment and society at an early stage and to develop precautionary measures.

Our Structure

The UFZ was founded in 1991 and employs 1,100 people at its locations in Leipzig, Halle (Saale) and Magdeburg. The UFZ is a member of the Helmholtz Association of German Research Centres.

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Our contacts

Dr. Joachim Nöller
Head of Department

E-mail: joachim.noeller@ufz.de
Phone: 0049 341 235-1033

Karen Görner
Business Development

E-mail: karen.goerner@ufz.de
Phone: 0049 341 235-4784

Dr. Lydia Woiterski
Technology Scouting/Screening

E-mail: lydia.woiterski@ufz.de
Phone: 0049 341 235-4778

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